
Effect Of Speech Recognition Technology On Language Proficiency Of Secondary School Students Of Uruan Lga, Akwa-Ibom State

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Abstract

The study investigated the effect of speech recognition technology on the language proficiency of secondary school students in Uruan LGA, Akwa-Ibom State. Three objectives, research questions, and hypotheses were formulated and guided the study. The study was anchored on the cognitive load theory. The study's research design was quasi-experimental. The study's population was 32,905 students from nine (9) public senior secondary schools in the study area. The sample size of 177 students was selected using two intact classes. English Language Proficiency Test was used to collect the required data for the study. The instrument was validated and tested for reliability, with a reliability index of 0.823 determined through the split-half method. The mean score and standard deviation were used to answer the research questions, while the analysis of covariance was used to test the hypotheses at the 0.05 level of significance. Findings from this study showed, among others, that there is a significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA, and there is no significant mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA. The study concluded that speech recognition technology has the potential to improve language learning outcomes for students of all ages and genders. The study recommended, among others, that the Akwa-Ibom State Government should invest in implementing the use of speech recognition technology in English language classrooms, and the government should provide training for teachers on how to effectively integrate speech recognition technology into English language teaching practises for the benefit of all students, irrespective of their gender or age.

Keywords: Speech, Recognition, Technology, Language, Proficiency, Language Proficiency.

Introduction

The rise in the use of technology-assisted technologies in teaching and learning in the 21st-century classroom has had a significant impact on the way students and teachers interact with each other and with the learning process. With the advent of technology, classrooms have become more dynamic and interactive, with students having access to a wealth of information at their fingertips. Teachers can now use a variety of tools to enhance their teaching, such as online quizzes, interactive whiteboards, and educational apps. This has led to a more personalised learning experience for students, who can learn at their own pace and in their way. These benefits have seen the development and use of technology spread to subject areas like the English Language, which focuses on improving students' writing, reading, speaking, and listening skills. One such technology is speech recognition technology, which has revolutionised the way students learn the English Language.

Toledano et al. (2018) posited that speech recognition technology is defined as a system that can recognise and interpret human speech, converting it into text or commands. Also, Way, et. al., (2008) defined speech recognition technology as the ability of a computer to recognise and interpret human speech. In other words, speech recognition technology enables computers to understand and respond to spoken language. This technology has opened up new avenues for language learning, particularly in the areas of writing, reading, speaking, and listening skills. With speech recognition technology, students can practise their pronunciation and receive immediate feedback on their accuracy. This helps them improve their speaking skills and gain confidence in communicating with others. Additionally, speech recognition technology can be used to improve reading skills by providing students with audio feedback on their reading comprehension. It can also be used to enhance writing skills by allowing students to dictate their ideas and have them transcribed into text. Overall, speech recognition technology is a valuable tool for language learners, as it provides a more interactive and engaging learning experience that helps them develop all four language skills more efficiently. However, studies on how speech recognition technology enhances the language proficiency of students in Nigeria are still limited.

Powers (2010) explained that language proficiency is defined as the ability to use language effectively and appropriately in a range of social, academic, and professional contexts. This definition highlights the importance of not only understanding the rules and structure of a language but also being able to apply them in real-life situations. Language proficiency is crucial for communication, as it allows individuals to express their thoughts and ideas clearly and accurately. It also plays a significant role in education and career opportunities, as many jobs require proficiency in multiple languages. However, achieving language proficiency can be challenging, especially for those learning a second language. It requires dedication, practice, and exposure to the language through immersion or formal instruction. Nonetheless, the benefits of achieving language proficiency are numerous, including increased cultural awareness, improved cognitive abilities, and expanded opportunities for personal and professional growth.

In Akwa-Ibom State, attaining proficiency in the English language, the language of education and official communication has been challenging due to the diverse range of languages spoken in the region. Despite the challenges, there are numerous benefits to achieving language proficiency. In Akwa-Ibom State, mastering English can lead to

increased cultural awareness and understanding, as well as improved cognitive abilities such as critical thinking and problem-solving. Additionally, proficiency in English can open up a range of personal and professional opportunities, from higher education to international job prospects. It is based on this premise that this study was considered crucial following the rise in the use of technology in teaching and learning.

There have been several studies conducted to examine the impact of speech recognition technology on students' language skills, most of which were carried out in European countries, with no published work on the subject matter carried out in Nigeria. The available studies include the study of Al-Qudah (2012), which investigated the effectiveness of automatic speech recognition and reported that it is functional in developing learners' pronunciation. Verdugo (2006) tested the effect of automatic speech recognition on learners' intonation patterns. The experimental group that studied using automatic speech recognition showed increased quality of intonation and higher levels of awareness of intonation. The control group indicated no change in intonation. Lastly, Elimat and AbuSeileek (2014) explored the effect of using automatic speech recognition technology (ASR) on third-grade EFL students' performance in pronunciation. The result showed that there were statistically significant differences between the mean scores of the control (regular instruction) and the experimental (ASR) groups in favour of the experimental group.

Based on the foregoing studies, it can be deduced that technology, specifically ASR, is not a replacement for traditional instruction methods but rather a supplement to enhance learning outcomes. Consequently, there is a gap in knowledge as there is no published empirical evidence on the investigated subject matter in Nigeria. To bridge that gap, this study deemed it necessary to investigate the effect of speech recognition technology on the language proficiency of secondary school students in Uruan LGA, Akwa-Ibom State.

Statement of the Problem

English language is an essential tool for communication, and it plays a crucial role in the global community. In a multilingual state like Akwa-Ibom, learning English provides students with the opportunity to communicate with people from different cultures and backgrounds. It also opens up doors for higher education and career opportunities both locally and internationally. However, with calls for the use of technology in teaching English, many teachers are faced with the challenge of adapting to new teaching methods and tools. More especially, considering the benefits that these technologies offer, it would be considered a missed opportunity for teachers to not embrace them. For students who are not privileged to access or utilise these technologies, the digital divide can widen, leading to an unequal distribution of knowledge and skills.

This study was undertaken due to the following problems: First, the problems of overdependence on the traditional lecture method in teaching English have long been criticised for resulting in students' reliance on the teacher as the sole source of knowledge. This approach often leads to a lack of engagement among students, who may become disinterested or even bored during class. Additionally, this method can be particularly challenging for students who struggle with reading and writing, as they are hindered from developing important social and communication skills; rather, they

tend to prioritise memorization over critical thinking and problem-solving, which are essential skills in today's world.

Secondly, by denying students the opportunity to access and use speech recognition technology in teaching English, students miss out on the opportunity to improve their pronunciation and fluency as they do not receive immediate feedback on their speaking skills. This can lead to frustration and a lack of motivation to continue practising. This may be a major problem for students in Akwa Ibom State. For example, when students are unable to read fluently, write correctly, speak fluently, or listen attentively, they may be blamed by their teachers for not putting in enough effort. However, teachers and school administrators need to recognise the impact that speech recognition technology can have on reducing learning disabilities or a lack of access to quality language instruction. Based on the foregoing backdrop, this study investigated the effect of speech recognition technology on the language proficiency of secondary school students in Uruan LGA, Akwa-Ibom State.

Aim and Objectives of the Study

The study investigated the effect of speech recognition technology on the language proficiency of secondary school students in Uruan LGA, Akwa-Ibom State. The specific objectives of the study include to:

1. Examine the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA.
2. Determine the mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA.
3. Ascertain the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age.

Research Questions

1. What is the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA?
2. What is the mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA?
3. What is the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age?

Hypotheses

1. There is no significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA.
2. There is no significant mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA.

3. There is no significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age.

Literature Review

Speech Recognition Technology

Recognition technology has come a long way since its inception. Desjardins, et. al., (2019) defined speech recognition technology as the process of converting spoken words into written text. Based on the foregoing, it can be deduced that applications in the future will continue to push the boundaries of recognition technology. With advancements in artificial intelligence and machine learning, speech recognition technology has become even more accurate and efficient. This will lead to a wide range of applications, from virtual assistants that can understand natural language to automated transcription services that can transcribe audio and video content in real-time (Neri, et. al., 2003). With the help of speech recognition technology, students can interact with educational content more naturally and intuitively. They can ask questions, receive feedback, and even engage in conversations with virtual tutors. Teachers, on the other hand, can use speech recognition technology to assess students' speaking and listening skills in realtime, providing personalised feedback and support.

Gifford (2013), posited that some of the benefits of speech recognition technology to the teaching and learning of the English language include: (1) improved pronunciation accuracy; (2) increased student engagement and motivation; (3) more efficient use of class time; (4) personalised feedback for each student; (5) greater accessibility for students with disabilities; (6) enhanced language immersion through interactive activities; (7) increased opportunities for collaborative learning; (8) the ability to track progress and identify areas for improvement; (9) improved teacher-student communication; and (10) reduced teacher workload. This technology also offers a cost-effective solution for schools that want to provide additional language support without hiring extra staff.

English Language Proficiency

The word "proficient" means a well-advanced skill level. In terms of language, the "proficient" label can refer to someone who is very skilled in the use of a language but who uses the language less easily and at a less advanced level than a native or fluent speaker. Burt et al. (2003), English language proficiency is a complex and multifaceted concept that involves various aspects of language use, such as grammar, vocabulary, pronunciation, and discourse. Butler (2004), explained that English language proficiency refers to the ability to use English effectively in a range of contexts, from everyday conversation to academic writing and professional communication.

Achieving English language proficiency is a challenging task for non-native speakers, but it is possible with dedication and practice. One effective way to improve English language proficiency is through immersion, which involves surrounding oneself with the language by watching movies, listening to music, and reading books in English. Another approach is to take courses or work with a tutor who can provide targeted feedback and guidance. It's important to remember that achieving English language proficiency takes time and effort, but the benefits are significant.

Methodology

The study adopted a quasi-experimental research design. The design was adopted since the study is concerned with the effect of speech recognition technology on the language proficiency of secondary school students in Uruan LGA, Akwa-Ibom State. The design allowed for a comparison of the two instructional methods while controlling for extraneous variables that could have influenced the results. The study's population consisted of 32,905 students from 9 public senior secondary schools in the study area (State Secondary Education Board, Uyo, 2022). A sample size of 177 students was used. The composition of the sample size comprised students from the experimental and control group. Two (2) schools with a sample size of 78 students constituted the experimental group, while 99 students constituted the control group. However, no sampling technique was used in selecting the students since; intact classes were used for the study. The data source for the study was the primary source; an English Language Proficiency Test (ELPT) was designed by the researcher and used for the data collection. The instrument was used to assess students' language proficiency. The instrument consisted of 20 objective-based questions. Each correct answer was awarded 5 marks, totalling 100 marks.

The instrument was validated by two experts; one of whom is an English Educator and the other a Measurement and Evaluation expert all from Ignatius Ajuru University of Education, Rumuolumeni. The instrument was tested for reliability through a test-retest method, with a reliability coefficient of $r = 0.813$, ascertained through Pearson Product Moment Correlation Method. In collecting the required data for the study, SSII students were used, as such, the SS II students from the school chosen for the study who participated in the study were administered the ELPT as the pretest, followed by the instruction delivery to students in the experimental group (students who used the speech recognition technology) and the control group (students who used the lecture method) by research assistants (class teachers) who carried out the instructional delivery. The collected data was analysed in the Statistical Package for Social Sciences (SPSS, Ver. 22) using descriptive and inferential statistics. The mean score and standard deviation were used to answer the research questions, while the analysis of covariance (ANCOVA) was used to test the hypotheses at the 0.05 level of significance.

Presentation of Results

Research Question 1: What is the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA?

Table 1: Mean and standard deviation of mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA

Group	n	Pretest		Posttest		Mean Gain
		\bar{x}	SD	\bar{x}	SD	
Experimental	78	41.67	8.76	72.86	13.55	31.19
Control	99	34.05	9.48	36.58	11.23	2.53

Table 1 shows the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA. The result revealed that the language proficiency of students in the experimental group (Pretest; $\bar{x} = 41.67$, $SD = 8.76$, Post-test; $\bar{x} = 72.86$, $SD = 13.55$, mean gain = 31.19) improved better than students in the control group (Pretest;

$\bar{x} = 34.05$, $SD = 9.48$, Post-test; $\bar{x} = 36.58$, $SD = 11.23$, mean gain = 2.53). The mean gain difference of 28.66 in favour of students in the experimental group showed that the speech recognition technology enhanced students' language proficiency in secondary schools in Uruan LGA.

Research Question 2: What is the mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA?

Table 2: Mean and Standard deviation of the mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA

Gender	n	Pretest		Posttest		Mean Gain
		\bar{x}	SD	\bar{x}	SD	
Male	43	41.44	9.33	72.60	14.15	31.16
Female	35	41.94	8.14	73.17	12.96	31.23

Table 2 shows the mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA. The result revealed that the language proficiency of female students (Pretest; $\bar{x} = 41.94$, $SD = 8.14$, Post-test; $\bar{x} = 73.17$, $SD = 12.96$, mean gain = 31.23) was slightly higher than that of their male counterparts (Pretest; $\bar{x} = 41.44$, $SD = 9.33$, Post-test; $\bar{x} = 72.60$, $SD = 14.15$, mean gain = 31.16). The slight mean gain difference of 0.07 in favour of female students showed that there is a slight difference in the language proficiency of male and female students taught using speech recognition technology in secondary schools in Uruan LGA.

Research Question 3: What is the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age?

Table 3: Mean and Standard deviation of the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age

Age	n	Pretest		Posttest		Mean Gain
		\bar{x}	SD	\bar{x}	SD	
12-15 years	47	41.53	9.32	73.30	14.28	31.77
16 years-Above	31	41.87	8.00	72.19	12.55	30.32

Table 3 shows the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age. The result revealed that the language proficiency of students aged 12-15 years (Pretest; $\bar{x} = 41.53$, $SD = 9.32$, Post-test; $\bar{x} = 73.30$, $SD = 14.28$, mean gain = 31.77) was slightly higher than that of their counterparts aged 16 years – Above (Pretest; $\bar{x} = 41.87$, $SD = 8.00$, Post-test; $\bar{x} = 72.19$, $SD = 12.55$, mean gain = 30.32). The slight mean gain difference of 1.45 in favour of students aged 12-15 years showed that based on age; there is a slight difference in the language proficiency of students taught using the speech recognition technology in secondary schools in Uruan LGA, Awka-Ibom State.

Hypothesis 1: There is no significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA.

Table 4: Summary of Analysis of Covariance (ANCOVA) on the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA
Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	57695.42 ^a	2	28847.71	191.44	0.00
Intercept	34655.70	1	34655.70	229.98	0.00
Group	51791.91	1	51791.91	343.70	0.00
Error	26220.08	174	150.69		
Total	572980.00	177			
Corrected Total	83915.50	176			

a. R Squared = .688 (Adjusted R Squared = .684)

Table 4 showed that there is a significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA. Group: ($F_1 = 343.70$, $df = 174$, $P = 0.00 < 0.05$). Hence, the null hypothesis one was rejected at the 0.05 alpha level. The finding implied that the difference in the language proficiency pretest and posttest of students taught the English language using speech recognition technology and lecture method differed significantly.

Hypothesis 2: There is no significant mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA.

Table 5: Summary of ANCOVA on the mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA
Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	9.20 ^a	2	4.60	0.02	0.98
Intercept	17745.28	1	17745.28	94.27	0.00
Gender	6.44	1	6.44	0.03	0.85
Error	14118.25	75	188.24		
Total	428185.00	78			
Corrected Total	14127.45	77			

a. R Squared = .001 (Adjusted R Squared = -.026)

Table 5 showed that there is no significant mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA. Gender: ($F_1 = 0.03$, $df = 75$, $P = 0.85 > 0.05$). Hence, null hypothesis two was retained at the 0.05 alpha level. The finding implied that the difference in the language proficiency pretest and posttest of male and female students taught the English language using speech recognition technology did not differ significantly.

Hypothesis 3: There is no significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age.

Table 6: Summary of ANCOVA on the mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	25.24 ^a	2	12.62	0.07	0.94
Intercept	17610.50	1	17610.50	93.66	0.00
Age	22.49	1	22.49	0.12	0.73
Error	14102.21	75	188.03		
Total	428185.00	78			
Corrected Total	14127.45	77			

a. R Squared = .002 (Adjusted R Squared = -.025)

Table 6 showed that there is no significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age. Age: ($F_1 = 0.12$, $df = 75$, $P = 0.73 > 0.05$). Hence, null hypothesis three was retained at the 0.05 alpha level. The finding implied that the difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology based on age did not differ significantly.

Discussion of Findings

The study investigated the effect of speech recognition technology on the language proficiency of secondary school students in Uruan LGA, Akwa-Ibom State. The result in Table 1 shows that the language proficiency of students in the experimental group improved better than students in the control group; with a mean gain difference of 28.66 in favour of students in the experimental group. Furthermore, the result of Table 4 showed that there was a significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology and lecture method in Uruan LGA. The findings from this study are corroborated by previous studies by Elimat and AbuSeileek (2014) with findings showing statistically significant differences between the mean scores of the control (regular instruction) and the experimental (ASR) groups in favour of the experimental group.

Table 2 shows that the language proficiency of female students was slightly higher than that of their male counterparts, with a slight mean gain difference of 0.07 in favour of female students. Furthermore, the result of Table 5 showed that there was no significant mean difference in the language proficiency pretest and posttest of male and female students taught English language using speech recognition technology in Uruan LGA. This finding is corroborated by previous research by Al-Qudah (2012), which reported that speech recognition technology was functional in developing learners' pronunciation. This can be attributed to the non-significant difference in the language proficiency of male and female students taught using speech recognition technology.

Table 3 shows that the language proficiency of students aged 12-15 years was slightly higher than that of their counterparts aged 16 years – Above; with a slight mean gain difference of 1.45 in favour of students aged 12-15 years. Furthermore, the result of Table 6 showed that there was no significant mean difference in the language proficiency pretest and posttest of students taught English language using speech recognition technology in Uruan LGA based on age. This finding is corroborated by previous research by Al-Qudah (2012), which reported that speech recognition

technology was functional in developing learners' pronunciation. This can be attributed to the non-significant difference in the language proficiency of students taught using speech recognition technology based on age.

Conclusion

The study, which investigated the effect of speech recognition technology on the language proficiency of secondary school students in Uruan LGA, Akwa-Ibom State, revealed, among others, that the language proficiency of students in the experimental group improved better than that of students in the control group, with a mean gain difference of 28.66 in favour of students in the experimental group. However, it is important to note that the study did not find any significant differences between male and female students or between different age groups. This suggests that the extra instruction was equally beneficial for all students, regardless of their gender or age. Therefore, the study concludes that speech recognition technology has the potential to improve language learning outcomes for students of all ages and genders. With speech recognition technology, language learners can receive personalized feedback on their pronunciation and grammar, which can help them improve their communication skills more quickly and effectively than traditional classroom instruction alone.

Recommendations

Considering the findings, discussion and conclusions of this study, the following recommendations are made:

1. The Akwa-Ibom State Government should invest in implementing the use of speech recognition technology in teaching English language, because of its significant impact on students' language proficiency.
2. The government should provide training for teachers on how to effectively integrate speech recognition technology into English language teaching practises for the benefit of all students, irrespective of their gender.
3. Workshops and seminar should organized for teacherson how to be age-sensitive in integrating speech recognition technology into English language teaching practises.

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