

## IMPACT OF AI ON ESL LEARNERS' SPEAKING SKILLS: AN EXPERIMENTAL STUDY OF VOICE CHATBOT

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### Abstract

The aim of this study was to investigate the "Impact of AI on ESL Learners' Speaking Skills: An Experimental Study of Voice Chatbot". This study utilized an experimental method to determine how AI voice chatbots influence ESL learners' ability to speak English. A pre-test along with post-test schedule was used to track the alterations in students' speaking abilities. Two groups were used: Two study groups were formed: an experimental group using chatbot-based speaking instruction and a traditional classroom group serving as controls.

Secondary school students who learned English as their second language made up the research participants. Students enrolled in schools connected with KFUEIT outreach programs completed this study. Participants were selected through purposive sampling based on teacher evaluation results along with previous performance assessments which indicated speaking deficits. The study involved two groups with 30 participants each in the experimental set up and 30 participants in the control set up. Statistical procedures analyzed the quantitative findings collected through pre-tests and post-tests. Within-group improvements were assessed using paired t-tests which helped compare the experimental and control group performances through independent t-tests. AI-powered voice chatbots transform ESL learners' speaking abilities according to research findings that demonstrate their significant benefits for language education. The relevant educational organizations can utilize the research results.

### 1.1 INTRODUCTION

Through language people can both exchange their thoughts and feelings while building bonds between different social groups. The world uses English as a major communication tool, so students and businesses constantly need its skills to connect globally. In Pakistan English ranks as the second language for learning because students need it to succeed in their studies and professional life. Higher education institutions use English for teaching and students see it as both their path to professional growth and open international paths

(Aliakbari, et. Al., 2025). Despite English's vital role in education and business many ESL students in Pakistan struggle to improve their speaking ability. Under traditional Pakistani teaching systems grammar and memorization take up most learning time which provides little space to develop spoken English fluency through daily practice Salsabil & Rakhmawati, (2025).

In English for Speakers of other Languages contexts students learn to communicate effectively by speaking English with fluency using proper

pronunciation while interacting properly. Fluency means smooth speech with natural conversation flow while pronunciation requires exact sound production to make content clearly understandable. The right use of grammar and sentence patterns helps learners deliver their messages accurately. Students who learn interactional competence succeed in discussions by knowing when to speak and respond plus how to understand what others mean during talks. When students feel self-assured, they can talk without worry even in their non-native language environments (Aliakbari, et. Al., 2025). English functions as Pakistan's most important academic and industry language while connecting students to the world so teaching speaking needs special attention. Students face many obstacles to learning English in formal settings because they experience minimal English access away from class and receive traditional teaching methods in large groups with little actual speaking practice (Aliakbari, et. Al., 2025). The introduction of voice chatbots driven by AI technology lets us develop learner-focused digital environments that engage students naturally. These digital tools let students learn better English by providing instant feedback and personal exercises in spoken English while overcoming common challenges students face Kang, (2022).

Pakistan's students struggle to speak English better because they cannot find good teachers and live situations where they can practice the language. Students often lack chances to speak English in real-time because their classrooms work with big groups and old learning methods plus a shortage of teaching supplies. The obstacles learners face in English speaking programs drive the need for fresh approaches and learning sources.

New technology using artificial intelligence provides better solutions to overcome these difficulties. The technology field now uses artificial intelligence to build voice chatbots that process natural language input and learn from those interactions. Voice chatbots let students interact and learn through a personal practice platform that checks their speaking quality right away. Chatbot technology enables learners to practice at any speed or time because it replaces

the need for classroom or lab environments according to Han, (2020).

### 1.2 Research Objectives

- i- To evaluate the effectiveness of AI-powered voice chatbots in enhancing the speaking proficiency of ESL learners
- ii- To compare the differences in fluency, pronunciation, and accuracy between ESL learners taught using traditional methods and those taught through AI-based teaching tools.

### 1.3 Research Questions

- i. How do AI-powered voice chatbots impact the speaking proficiency of ESL learners?
- ii. What differences in fluency, pronunciation, and accuracy are observed between learners taught through traditional methods and those using AI-based teaching tools?

## 2. LITERATURE REVIEW

### 2.1 What is Speaking Skill?

A language is consisting of four skills i.e. Listening, Speaking, Reading and Writing. Speaking skill of the language is considered most important skill, as it directly involves in communication. Speaking is a unique skill of a language that helps in communicating face to face interaction verbally. By speaking skill, messages are conveyed from person to person and people in order to interact them Tai & Chen, (2024). A person's skill or property to interact with other people orally is also termed as speaking. So, speaking is a medium of oral communication among people in a specific language community. Anyhow one of the most important things to help people to bring a story is sequential information by using productive vocabulary grammar and pronunciation. Speaking actually is a process of uttering/making sounds through once vocal cord. A person can speak, it means that he can conversate or he can express his feelings, thoughts, emotions and ideas. In short, speaking means conveying messages to other person Shazly, (2021).

## 2.1.1 Contents of Speaking Skills

Speaking skills are furthermore divided into four skills shown below in the picture. These skills are linked together and an essential part of language. It's a complicated mechanism to speak out. If the students have little vocabulary, a lack of desire to use English would be present. When they're not inspired to use English, their anxiety about speaking and using English is growing. Students need to be given enough vocabulary to speak. If you don't have the vocabulary to communicate with, there can be no chat. Unless the students' vocabulary is limited, their word choices may also become limited Koç, (2024).

## 2.1.2 Fluency

It is the aptitude of a person to express or write a native or foreign language simply and precisely. It can be defined as the capability to describe oneself without difficulty and articulately. Fluency's about how relaxed and confident you are in English speaking. If you can speak for an extended period of time, this is a good fluent predictor. It's also about showing a direct relation between any arguments you seek to make. This ability means the listener should be able to hear what you're saying and not get confused Azizimajd, (2023).

## 2.1.3 Vocabulary

Vocabulary consists of meaningful words of a particular language that are understandable by members of the society. In other words, a variety of artistic or stylistic systems, skills, or actions and mechanism. No speaking at all without sufficient vocabulary of a language. When you have no vocabulary to say what you'd like to say, so you can't say it. Being a strong speaker means getting your vocabulary rising constantly. The more fascinating vocabulary you are conscious of, the better your speaking skills. The best way to

improve your vocabulary is to read in English and take a note of any new words you find in a notebook Koç, F. Ş. (2024).

## 2.1.4 Grammar

Grammar Language grammar is a collection of structural rules regulating the composition of sentences, clauses, and terms in an actual language in particular. Grammar matters, and the less errors you produce, the greater your ability to communicate would be. Do not think, however, about making errors either! Perfect grammar does not have to be used by a successful speaker. Certainly, however, making sure that you have mastered the main tenses is a good idea (Huang, (2019).

## 2.1.5 Pronunciation

Webster defines pronunciation as correct word delivery through spoken sounds. Pronunciation includes both standardized speech patterns of specific dialects for language delivery and individual patterns by which someone speaks a language. Pronunciation consists of various subskills that create complexity within this zone of acquisition. An ordinary speaker can maintain conversation while others understand them (Kukulska-Hulme, 2020a). By using their sub-abilities in pronunciation an accomplished speaker can enhance their speech delivery to achieve superior communicative outcomes. Pronunciation sub-abilities consist of word and phrase stress as well as intonation and rhythm and proper usage of language sounds. Multiplying your pronunciation speed can be achieved through copying. Listening to the duration of someone's speech will help you replicate their speech in the most accurate way possible.



Fig. 2.1 Speaking skills

### 2.3 Speaking in Foreign Language Classrooms

Studies show that talking in a foreign language was seen as both the most difficult skill and the features of four language skills (Littlewood, 1981). Real-time processing becomes a main factor which plays a role in how much difficulty students have when producing speech. Under short timeframes a complicated system between speakers and their listeners ultimately develops into existence. Students base their assessment of language acquisition development together with their English course quality on their perceived improvements in oral communication abilities.

The amount of foreign language students encounter leads to increased learner feedback and directly correlates with improved capability. Students develop their foreign language skills based on the amount of meaningful language input through "comprehensible data" as defined by (Warschauer, 2000b).

### 2.4 The variables affecting speaking aptitude make up.

Individuals who possess speaking skills effectively communicate through the target language in both purposeful and dynamic ways. Oral fluency when using a target language mostly depends on achieving proficiency in speaking skills. Students

face multiple obstacles which reduce their chances of improving communication ability because they encounter insufficient time with crowded classrooms and limited practice opportunities beyond the classroom as well as inadequate multimedia systems in classrooms etc. Self-confidence together with motivation alongside anxiety and the environment where students cohabit produce essential effects during language learning processes (Sinha, 2020a).

#### 2.4.1 Attitudes and Motivation

Two complicated factors support variations in language acquisition together with handling a language through multiple approaches. Our emotions and feelings together with our behavioral choices regarding other people and situations depend fundamentally on attitudes (Gonzalez, 2021b). The basis of all mental operations exists in attitudes. Real perceptions along with collective ones become distinguishable through these fundamental definitions. Language learning achievement depends heavily on motivation since this element proves vital for successful outcomes in language acquisition.

#### 2.4.2 Language Anxiety

Learning and utilizing a foreign language makes

individuals experience discomfort together with anxiety along with nervousness in a foreign language context. The experts Gardner and MacIntyre explained language anxiety as "a feeling of stress and discomfort directly correlated with meaning in the second language, including speaking, listening and learning"(MacIntyre, 1991). (Dewaele, 2018) demonstrates that anxiety plays a vital role in the affective domain because it frequently causes problems with oral communication in foreign language learning. Students who experience vocal anxiety avoid using the target language for presentations because they lack confidence while speaking. Students usually choose to stay quiet since they view whole-class speech as a danger rather than a tool to improve their conversation abilities.

#### **2.4.4 Classroom Environment**

The definition consists of various educational fundamentals which include physical aspects of location and psychological dimensions together with teacher-related elements. Scientific research mainly investigates how the classroom environment interacts with multiple effects which include L2 and FL language communication abilities. The initial group of academics believed that actions rely on individual personality attributes and surrounding ecological elements. L2 and FL learner development focuses on both environmental elements and learning interactions that occur between classroom students and between teachers and students.

#### **2.4.5 Teaching English Speaking**

The investigation and instruction of second language acquisition depends heavily on talking practices. The practice of speaking in English language courses has traditionally been limited to drills followed by dialog memorization according to Deterding (2006). The current purpose of teaching speech needs to focus on advancing student speaking ability. The teaching approach enables students to express themselves in communicative situations and master appropriate social behaviors as well as cultural rules (Chen, 2021).

#### **2.5 Difficulties regarding attaining oral proficiency skills**

Azizimajd, (2023) coined the term 'communicative competence'. Oral proficiency is the key to success in any of the society including Pakistan. Attaining English has become a matter of understanding and prestige. People in Pakistan and all over the world learn it for various purposes. Oral competency is considered foremost for attaining good status and position in the society. It is natural that the usage of language has drawbacks, partiality, and problems, Azizimajd, (2023): 3. In oral communication, it is necessary to observe and understand that what the other person wants to convey.

#### **2.6 Different Types of CALL (Computer-Assisted Language Learning)**

The application of computers combined with digital technology defines Computer-Assisted Language Learning (CALL). CALL has gradually transformed through time to match recent technological developments along with educational methods. CALL systems follow three distinct development models which determine the behavioristic, communicative and integrative types of CALL. The recent development of mobile-assisted language learning (MALL) and AI-driven CALL now provides interactive approaches that enhance personalized learning for language students.

##### **1. Behavioristic CALL**

Behavioristic CALL served as the foundational type of technologically enhanced language learning which dominated from the 1960s up to the late 1970s. Operant conditioning from B.F. Skinner served as a key basis for this approach along with behaviorist learning theories because it placed significance on repetition combined with reinforcement.

##### **2. Communicative CALL**

During the 1980s communicative CALL arose as cognitive and communicative learning theories overtook behaviorism. Two key theories from Krashen's Input Hypothesis and Hymes' Communicative Competence Theory influenced

this approach which shifted the focus from memorization to meaningful communication.

The fundamental difference between behavioristic CALL involved its opposing approach which directed students to interact with computers for developing problem-solving skills and contextual understanding.

### 3. Integrative CALL

The technological advances from multimedia and internet spread in the 1990s created the advanced integrated approach of CALL. Through this method of CALL learners received enriched language exposure through the combination of text with pictures and sounds and videos and hypertext.

### 2.7 Features of AI Chatbots

The AI voice chatbots incorporate three essential machine learning strategies that include natural language processing (NLP) and natural language understanding (NLU) and natural language generation (NLG) as Adamopoulou and Moussiades (2020) explain through Figure 2. The AI voice chatbot performed an analysis through NLP processing to identify user messages then extracted significant data points from its built-in patterns which enabled message inference before response generation. The NLU handled two primary functions which enabled the AI voice chatbot to verify spelling as well as translate and comprehend message semantics. The NLG subsystem produces suitable textual outputs based on user-initiated statements (Aliakbari, et. Al., 2025).

### 2.8 Natural Language Processing acts as AI chatbot's core technology

Natural Language Processing functions as the core technology in AI chatbots allowing them to process and understand spoken language correctly. Technology lets chatbots recognize users' meaning from ordinary to complex messages. With NLP technology there isogly chatbots can process different verbalizations of words plus handle context while sounding more natural to users.

### 2.8.1 Speech Recognition

The system turns spoken words into text for the chatbot to handle user demands. For voice-based interactions chatbots need speech recognition systems to handle multiple speech types including regional accents and varieties. Advanced speech recognition technology especially identifies user voice over all other environmental sounds to improve the input quality.

### 2.8.2 Text-to-Speech (TTS)

The chatbot converts its written text responses into audio format which lets it answer users through spoken words. The system creates a familiar and enjoyable interface which brings better user connection during tasks without using hands. Businesses can fine-tune their chatbot voices to talk just like their brand voice (Aliakbari, et. Al., 2025).

### 2.8.3 Contextual Understanding

Contextual understanding lets bots save user history answers which makes their responses both purposeful and easy to follow. When users say "What's the weather like?" He asks "What is the weather like tomorrow?" The chatbot saves the starting query and reports the future weather forecast .

### 2.9 Technology-Enhanced Language Learning

Walker and White (2013) show that Technology-Enhanced Language Learning (TELL) builds on Computer-Assisted Language Learning (CALL) by extending language learning to use different digital tools. TELL moves beyond limited computer-based learning to combine smartphone access alongside tablets and virtual reality platforms to create deeper language learning interactions. Modern education uses technology to expand access for learners to engage with various digital platforms.

Technology serves as an assisting tool to help learners master language skills according to (Aliakbari, et. Al., 2025) the framework treats technological equipment as necessary tools that enable people to speak and communicate better in language classes.

2.10 Theoretical Framework

The Sociocultural Theory created by Kang, H. (2022) serves as our basis for determining how AI-powered voice chatbots enhance speaking skills of ESL students in Pakistan. Through SCT we understand that people learn language best when they interact with others using tools that fit their context. This study uses AI voice chatbot technology to position learners within their learning range (ZPD) while delivering interactive support for real-time feedback, speech improvement, and conversation practice. The boots create social activities that let students practice talking and learn language patterns in

order to use the new skills alone. The affordable chatbot system helps Pakistani students with ESL practice needs despite limited resources and classroom space by enabling judgment-free learning that helps them speak better. Chatbots help learners master practical speaking skills by using them in simulated work situations that respect local workplace patterns. Through AI chatbots that bridge language classroom gaps SCT principles create stronger student motivation and self-assurance as they improve their language skills a new learning method emerges to help Pakistani students.

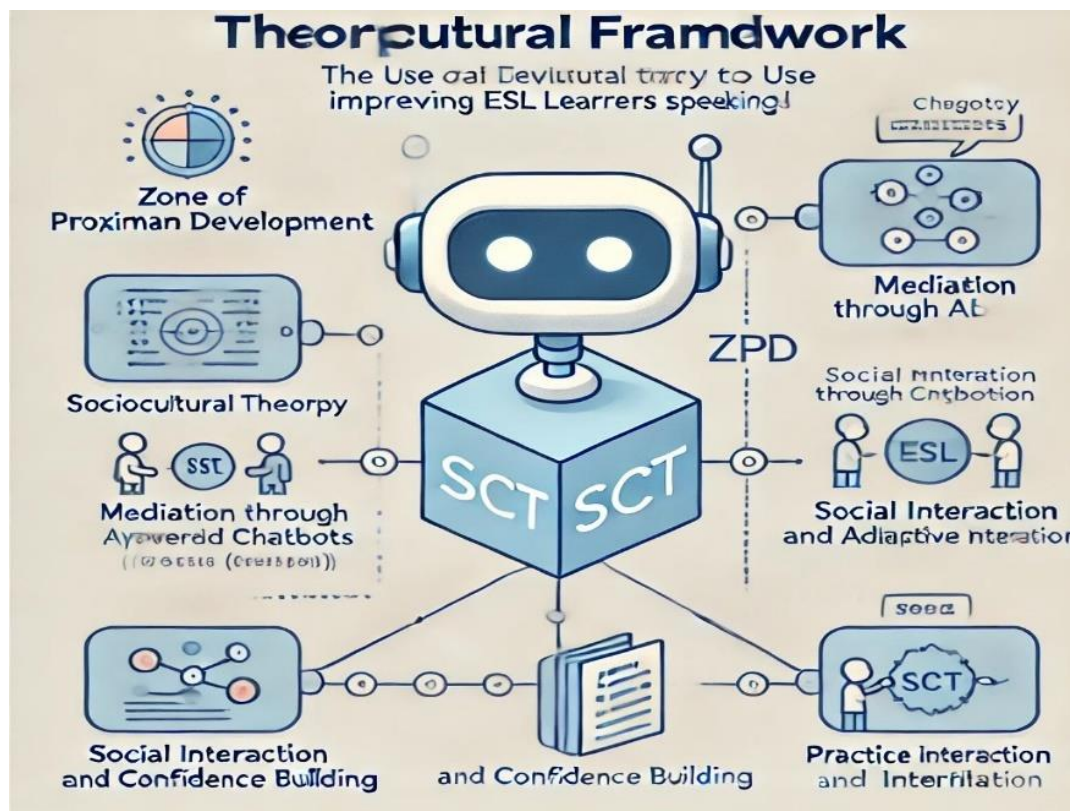


Figure 2.2 Theoretical framework

3. Research Methodology

Research techniques were developed to examine how artificial intelligence (AI) voice chatbots affect English as a Second Language (ESL) students' speaking abilities. All parts of the methodology receive complete explanations here which support KFUEIT undergraduate-level research standards.

3.1 Research Design

This study utilized an experimental method to determine how AI voice chatbots influence ESL learners' ability to speak English. A pre-test along with post-test schedule was used to track the alterations in students' speaking abilities. Two groups were used: Two study groups were formed: an experimental group using chatbot-based

speaking instruction and a traditional classroom group serving as controls. The research design featured controlled experiments which enabled researchers to trace and conclude all performance differences in speaking abilities between groups to the intervention program. The study enabled researchers to compare extensive data about how well AI conversational tools work in comparison to traditional teaching approaches during language learning.

### 3.2 Population and Sample

Secondary school students who learned English as their second language made up the research participants. Students enrolled in schools connected with KFUEIT outreach programs completed this study. Participants were selected through purposive sampling based on teacher evaluation results along with previous performance assessments which indicated speaking deficits. The study involved two groups with 30 participants each in the experimental set up and 30 participants in the control set up. The researchers selected their participant pool with deliberate attention toward obtaining participants from multiple social and learning profiles across gender spectrum and economic standing as well as linguistic exposure backgrounds. The study collected participants from diverse educational and demographic backgrounds to build stronger reliability in its findings which could transfer to analogous ESL learning situations.

### 3.6 Procedure

#### 3.6.1 Pre-Test

Every participant first completed a pre-test to determine their starting conditions in speaking abilities before the project's commencement. Testing occurred in a silent environment where listeners completed speaking assignments independently. The participants used professional-grade audio recording systems to document their answers to allow accurate rubric scoring. Trained language teachers from the team evaluated audio recordings of participants through a standardized rubric to generate precise assessments of their speaking proficiency at baseline.

#### 3.6.2 Intervention

For six weeks the experimental group spent 20 minutes per day participating with the AI chatbot throughout the intervention period. The AI-based chatbot led participants through multiple conversational subjects including descriptions of their daily activities and their favorite hobbies alongside imaginary situations and problem-generation exercises. The designed sessions replicated natural conversations which led students to practice English use within different realistic situations. Each participant received immediate feedback through the chatbot which identified their missteps for improvement and validated their proper language usage thus building unique learning experiences. During the study the control participants experienced conventional speaking activities through teacher-guided discussions together with group role-plays combined with peer interactions. The activities were designed to deliver equivalent practice duration so both groups received equal training conditions.

#### 3.6.3 Post-Test

Both experimental groups completed an identical speaking test after the six-week period as they had done before the intervention. The experiment maintained equivalent testing environments throughout both the pre-test and post-test sessions. Researchers used the identical rubric to examine recorded post-test responses which they evaluated with standard pre-test scoring procedures. The post-test provided data which researchers utilized for comparing pre-test results to measure the speaking progress of each group. Research established how much the experimental group advanced beyond the control group through a comparative examination of their progress.

### 3.7 Data Analysis

Statistical procedures analyzed the quantitative findings collected through pre-tests and post-tests. Within-group improvements were assessed using paired t-tests which helped compare the experimental and control group performances through independent t-tests. The evaluation research enabled better understanding of AI

chatbot performance in improving student speaking ability. Feedback analysis along with observational data showed recurring patterns which included improved oral expression confidence together with lower anxiety levels and increased conversational participation by participants during practice sessions.

**3.9 Reliability**

A preliminary test with 10 research participants confirmed the reliability measures before initiating the formal research procedures. The preliminary implementation allowed task assessments to be refined alongside scoring practices standardization procedures. The

speaking test scores received double evaluation from two independent raters to determine inter-rater reliability scores. The rating agreement between assessors was shown through a strong correlation value of  $\alpha = 0.89$  therefore validating the assessment tool's reliability. The reliability of the test was confirmed through a repeated administration program which retested a selected subset of individuals during a two-week gap resulting in score stability.

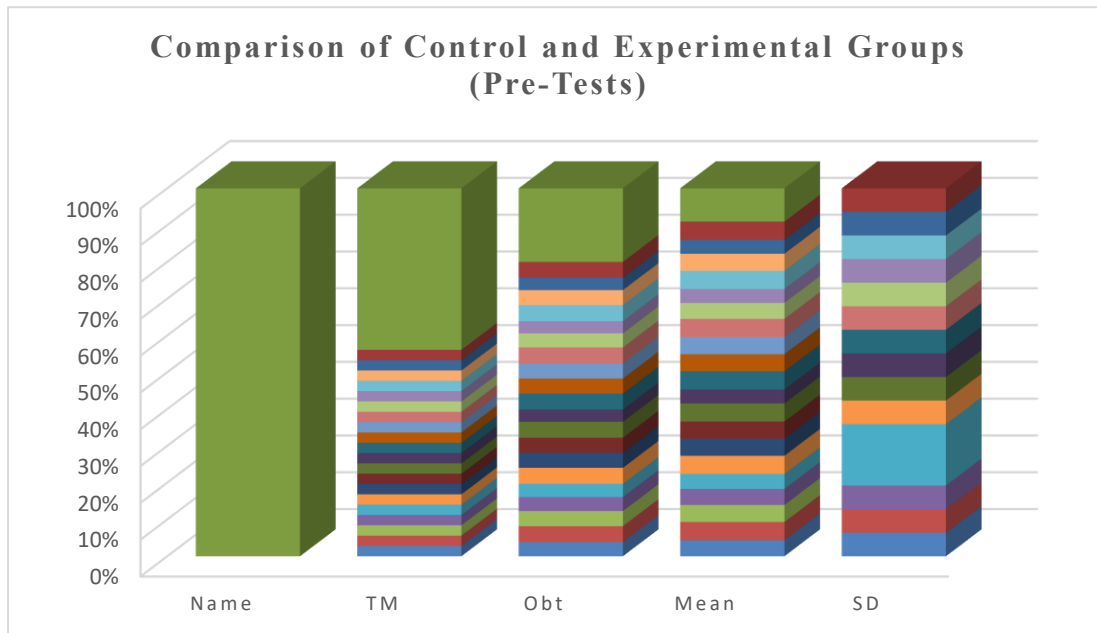
**4. DATA ANALYSIS AND DATA INTERPRETATION**

Data collected from the controlled group from pre-test is presented as follows,

**4.1 Comparison of Control and Experimental Groups (Pre-Tests)**

**Table: 4. 1**

Pre-Test										
Control Group						Exp. Group				
Sr	Name	TM	Obt	Mean	SD	Name	TM	Obt	Mean	SD
1	Stdnt.a	20	5	1.25	0.5	Stdnt. A	20	5	1.25	0.5
2	Stdnt b	20	5	1.25	0.5	Stdnt B	20	5	1.25	0.5
3	Stdnt c	20	6	1.5	0.5	Stdnt C	20	6	1.5	0.5
4	Stdnt d	20	5	1.25	0.5	Stdnt D	20	5	1.25	0.5
5	Stdnt e	20	5	1.25	0.5	Stdnt E	20	5	1.25	0.5
6	Stdnt f	20	6	1.5	0.5	Stdnt F	20	6	1.5	0.5
7	Stdnt g	20	5	1.25	0.5	Stdnt G	20	5	1.25	0.5
8	Stdnt h	20	5	1.25	0.5	Stdnt H	20	5	1.25	0.5
9	Stdnt i	20	5	1.25	0.5	Stdnt I	20	5	1.25	0.5
10	Stdnt j	20	5	1.25	0.5	Stdnt J	20	6	1.5	0.5
11	Stdnt k	20	5	1.25	0.5	Stdnt K	20	5	1.25	0.5
12	Stdnt l	20	6	1.5	0.5	Stdnt L	20	6	1.5	0.5
13	Stdnt m	20	5	1.25	0.5	Stdnt M	20	5	1.25	0.5
14	Stdnt n	20	8	2	0.4	Stdnt N	20	8	2	0.4
15	Stdnt o	20	5	1.25	0.5	Stdnt O	20	5	1.25	0.5
16	Stdnt p	20	5	1.25	0.5	Stdnt P	20	6	1.5	0.5
17	Stdnt q	20	4	1.25	0.5	Stdnt Q	20	4	1.2	0.5
18	Stdnt r	20	6	1.5	0.5	Stdnt R	20	6	1.5	0.5
19	Stdnt s	20	8	2	0.4	Stdnt S	20	5	1.25	0.5
20	Stdnt t	20	6	1.5	0.5	Stdnt T	20	6	1.5	0.5
Total		400	110	28	9.8	Total	400	109	27.5	10



**Graph: 4.1**

Table 4.1 displays the data comparing Pre-test assessment results of control participants with experimental participants. Each of the 20 students had their marks presented separately in this table which reveals their individual score differences. Students from Control and Experimental groups scored nearly identical marks during their pre-test. The results demonstrate that learners in each group exhibit matching aptitude levels with similar study orientation and current skill levels. Both groups combined scored 220 marks from the 400-

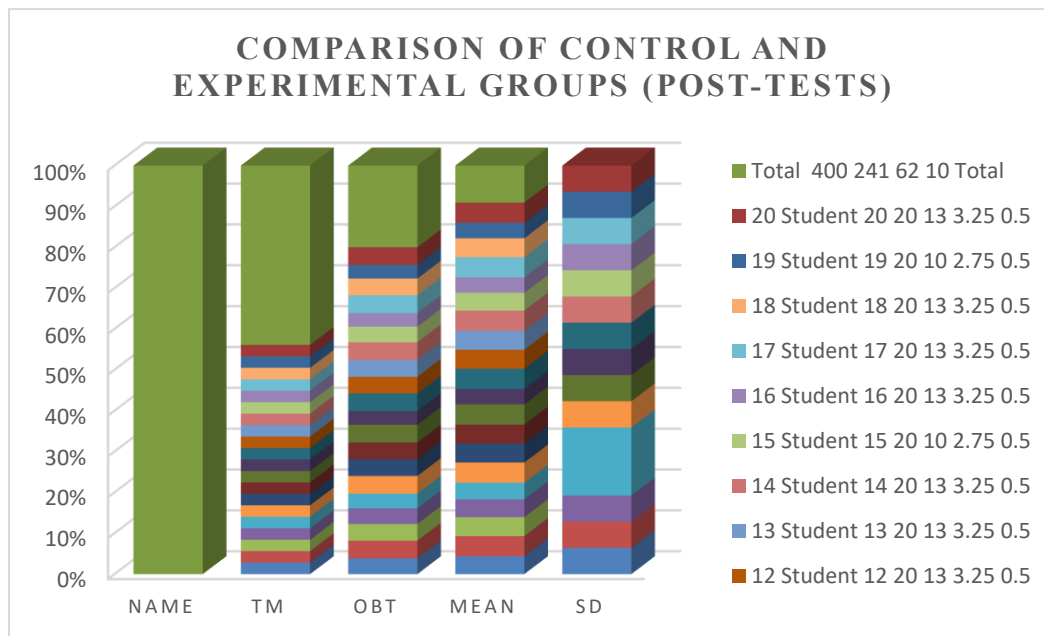
point assessment but experimental learners scored 1 point less than the control group's combined total of 110 marks. Cognitive abilities of both groups have been assessed by mean metrics of 28 and 27.5 with respective standard deviations of 9.8 and 10. Minor difference is negligible. Buildings baseline student knowledge through pre-assessment while distributing experimental and control groups to complete the picture stripe program through content-specific teaching methods. The scores and their comparison become readily understandable in Graph 4.1.

**4.2 Comparison of Control and Experimental Groups (Post-Tests)**

**Table: 4.2**

Post-Test										
Control Group						Exp. Group				
Sr	Name	TM	Obt	Mean	SD	Name	TM	Obt	Mean	SD
1	Stdnt.a	20	13	3.25	0.5	Stdnt. A	20	15	3.75	0.5
2	Stdnt b	20	10	2.75	0.5	Stdnt B	20	17	4.25	0.5
3	Stdnt c	20	13	3.25	0.5	Stdnt C	20	16	4	0
4	Stdnt d	20	13	3.25	0.5	Stdnt D	20	15	3.75	0.5
5	Stdnt e	20	10	2.75	0.5	Stdnt E	20	14	3.50	1.3
6	Stdnt f	20	12	3.25	0.5	Stdnt F	20	17	4.25	0.5
7	Stdnt g	20	10	2.75	0.5	Stdnt G	20	16	4	0

8	Stdnt h	20	13	3.25	0.5	Stdnt H	20	16	4	0
9	Stdnt i	20	13	3.25	0.5	Stdnt I	20	17	4.25	0.5
10	Stdnt j	20	13	3.25	0.5	Stdnt J	20	13	3.25	0.5
11	Stdnt k	20	10	2.75	0.5	Stdnt K	20	17	4.25	0.5
12	Stdnt l	20	13	3.25	0.5	Stdnt L	20	16	4	0
13	Stdnt m	20	13	3.25	0.5	Stdnt M	20	16	4	0
14	Stdnt n	20	13	3.25	0.5	Stdnt N	20	17	4.25	0.5
15	Stdnt o	20	10	2.75	0.5	Stdnt O	20	15	3.75	0.5
16	Stdnt p	20	13	3.25	0.5	Stdnt P	20	13	3.25	0.5
17	Stdnt q	20	13	3.25	0.5	Stdnt Q	20	17	4.25	0.5
18	Stdnt r	20	13	3.25	0.5	Stdnt R	20	16	4	0
19	Stdnt s	20	10	2.75	0.5	Stdnt S	20	13	3.25	0.5
20	Stdnt t	20	13	3.25	0.5	Stdnt T	20	17	4.25	0.5
Total		400	241	62	10	Total	400	313	78.25	7.8



Graph: 4.2

Table 4.1 displays the data comparing Pre-test assessment results of control participants with experimental participants. Each of the 20 students had their marks presented separately in this table which reveals their individual score differences. Students from Control and Experimental groups scored nearly identical marks during their pre-test. The results demonstrate that learners in each group exhibit matching aptitude levels with similar study orientation and current skill levels. Both groups combined scored 220 marks from the 400-

point assessment but experimental learners scored 1 point less than the control group's combined total of 110 marks. Cognitive abilities of both groups have been assessed by mean metrics of 28 and 27.5 with respective standard deviations of 9.8 and 10. Minor difference is negligible. Buildings baseline student knowledge through pre-assessment while distributing experimental and control groups to complete the picture stripe program through content-specific teaching methods. The scores and their comparison become readily understandable in Graph 4.1.

4.5 Paired Sample T-Test of Pre & Post-Tests (Control Group)

Table: 4.5 Paired Sample T-Test analysis of Pre-Test and Post-Test of Controlled Group

Test	N	M	SD	d	t	Effect Size
Pre-Test	20	5.50	1.0	19	-16.92	0.077
Post-Test	20	12.50	1.39			

\*Difference is significant at .05 level

A paired sample t-test analysis of pre-test and post-test responses appears in table 4.5 for the control group. The data shows that twenty subjects equally took part in each of the tests. The control group participants scored 5.50 for pre-test then moved to 12.50 in post-test measurements with SD values of

1.0 and 1.39. Value of d is 19. Analysis reveals a t value of -16.92 and effective size measurement of 0.077. The test results indicate with a 0.077 value below 0.05 that students showed better progress and developed improved speaking skills after traditional instruction methods.

Table: 4.6 Paired Sample T-Test analysis of Pre-Test and Post-Test of Experimental Group

Test	N	M	SD	d	t	Effect Size
Pre-Test	20	5.45	0.826	19	-28.35	0.73
Post-Test	20	15.65	1.424			

\*Difference is significant at .05 level

The results from the paired sample t-test analysis for pre-test and post-test assessment of the control group appear in table 4.6. Both tests involved twenty participants according to this table. The mean values evaluated pre-test at 5.45 but increased in the post-test stage to reach 15.65 and the post-test standard deviations rose to 1.424 and 0.826. Value of d is 19. A significance level of -

28.35 was established with an effect size calculation of 0.073. A test value of 0.073 demonstrates a statistically significant difference between test results compared to 0.05 hence students demonstrate better progress and speak more effectively after receiving instruction with story strips.

4.6 Independent Sample T-Test analysis of Pre-Test and Post-Test of Control Group

Table: 4.7 Independent Sample T-Test analysis of Pre-Test and Post-Test of Control Group

Test	N	M	SD	d	t	Effect Size
CG Pre-Test	20	5.50	1.00	19	0.172	0.93
CG Post-Test	20	5.45	0.825			

\*Difference is significant at .05 level

Table 4.7 of independent sample t-test demonstrates pre-test and post-post-test results for the control group. Both tests involved an equal number of participants (n=20). Data analysis shows pre-test mean at 5.50 while post-test mean stands at 5.45 with SD scores at 1.00 and 0.825 respectively. Value of d is 19. The research shows

an effect size of 0.93 with a comparison t value of 0.172. The effect size value of 0.93 from these tests stands lower than 0.05 indicating a meaningful difference found between mean scores thus showing students exhibited better progress and enhanced speaking abilities from traditional teaching approaches.

**Table: 4.8 Independent Sample T-Test analysis of Pre-Test and Post-Test of Experimental Group**

Test	N	M	SD	d	t	Effect Size
Exp. Pre-Test	20	10.55	1.70	19	-10.28	0.97
Exp. Post-Test	20	15.65	1.43			

\*Difference is significant at .05 level

A separate t-test analysis of the pre-test compared to post-test data from the control group appears in Table 4.8. The analysis contained identical participant numbers for each evaluation with 20 participants per test. The mean scores demonstrate pre-test results are 10.55 and post-test results reach 15.65 while SD measures 1.70 and 1.43 correspondingly. Value of d is 19. The t comparison value stands at -10.28 while the calculated effect size reached 0.97. Students demonstrated higher levels of progress following AI-based bot instruction as shown by the t value 0.97 that is below 0.05.

## FINDINGS, CONCLUSION and RECOMMENDATIONS

### 5.1 Findings

The study shows that voice chatbots utilizing artificial intelligence have generated substantial beneficial outcomes in English language speaking abilities among Second Language (ESL) learners. Analysis results from pre-test and post-test assessments indicated substantial enhancements in students' spoken English pronunciation alongside fluency and vocabulary mastery and spoken confidence levels. Several aspects of this impact are elaborated below:

#### 5.1.1 Pronunciation and Intonation

The results showed pronounced improvements in learners' pronunciation skills along with their intonation patterns. Through real-time feedback on pronunciation mistakes the AI voice chatbot allowed students to practice and improve their speech sounds. The chatbot provided individualized feedback because traditional classroom limitations no longer applied.

#### 5.1.2 Fluency Development

The learners showed significant improvement in their fluency development during this period. The chatbot system enabled frequent conversations that helped students practice forming sentences and taught them to silence their inhibitions. Realistic conversation responses from the chatbot built a relaxed atmosphere which enhanced learner fluency throughout time.

#### 5.1.3 Vocabulary Expansion

Through its interactive dialog modes the chatbot system allowed users to build up their active word usage. The learners' vocabulary developed more extensively because the chatbot gave them both diverse discussions and context-specific word recommendations. Through their experiences with the chatbot students indicated they developed better abilities to engage in multiple dialogue situations in English.

#### 5.1.4 Confidence Boost

The participants indicated a growth in their English speaking self-assurance. The patient approach combined with judgment-free interactions of the chatbots generated a relaxed environment among learners while decreasing their ESL-related communication anxiety. Through risk-free digital practice learners developed enough self-confidence to speak English in actual real-life situations.

#### 5.1.5 Learner Autonomy

The research demonstrated that AI chatbots promote student autonomy in their learning activities. The system allowed students to practice their speech while being always available so they could approach their studies according to their timetable. Through flexible access students gained independence and the capability to advance

autonomously towards their language acquisition objectives.

The research demonstrates AI voice chatbots create substantial learning opportunities in ESL education by improving how speakers develop their language skills.

## 5.2 Conclusion

AI-powered voice chatbots transform ESL learners' speaking abilities according to research findings that demonstrate their significant benefits for language education. Voice chatbots help ESL learners through customized feedback and interactive practice which combines to solve typical language learning difficulties.

Living scenarios combined with prompt performance assessments powered by AI proved fundamental to maximizing pronunciation and fluency improvement features. Voice chatbots created individualized learning experiences that traditional classrooms fail to deliver since their student-teacher ratios and availability restrict effective personalization. Through its easily accessible platform and self-directed nature the chatbot prompted learners to practice independently which pushed up their language learning speed.

The study produced confidence-building as its fundamental outcome. ESL students commonly experience two difficulties because fear and judgment anxiety prevent them from speaking effectively. RI chatbot created a psychological safe zone which helped learners practice without fear of judgment or rejection. The participants mentioned they gained comfort with their English speech ability during both classroom discussions and actual interactions with native speakers.

In addition to individual benefits, the study also points to broader implications for educational institutions and policymakers. Language learning curricula benefit from voice chatbots as AI tools since they help transform the principles of ESL education. The combination of innovative educational technology with established instructional approaches enables teachers to deliver superior educational experiences that welcome all learners.

This study establishes AI-powered voice chatbots as indispensable technology for developing ESL learners' speaking abilities. The value of voice chatbots in contemporary language education derives from their capacity to serve multiple student needs and develop independent learning while establishing interactive education spaces.

## 5.3 Recommendations

Based on the findings of this study, several recommendations are proposed for educators, policymakers, and technology developers to maximize the benefits of AI voice chatbots in ESL education:

### 5.3.1 Integration into Curricula

Letting educational institutions join their ESL resources with AI voice chatbots. Modern technology provides extra resources that help students extend their practice beyond regular classroom hours with traditional teaching methods. Educational institutions need to teach their teaching staff ways to correctly integrate chatbot technology into their classroom content.

### 5.3.2 Personalization Features

To advance their platforms developers who work on AI chatbots need to build more personalized features. Adjustable difficulty level settings together with custom topic selection options combined with individualized feedback features enhance the learning benefits of these systems. Integrating information which speaks to diverse learner cultural experiences leads to increased engagement during the learning journey.

### 5.3.3 Training for Educators

Teachers need professional development learning about utilizing Artificial Intelligence tools in their language teaching practice. Training programs must educate educators about how chatbots work alongside methods for choosing activities and strategies to track learner advancement. With these professional abilities educators gain capacity to incorporate technology in their educational methods.

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