

Teaching Introduction to Linguistics through an Introtolinguistics Chatbot: A Human-Computer Interaction Study

1. (Corresponding Autor) Dr Zafar Ullah, Assistant Professor, Department of English, University of Education, Lahore (Vehari campus) ,

ORCID: <https://orcid.org/0000-0003-3773-1467>

2. Dr Saeed Ullah, Assistant Professor, Department of Education, University of Education, Lahore, (Vehari campus)

3. Ms Maria Haider, Research Associate, NUML, Islamabad,

4. Karmal Nadeem, Research Associate, NUML, Islamabad,

Abstract

This study aims to experiment with Introtolinguistics Chabot for teaching purposes. We developed it by using the machine learning process in Dialogflow generated by Google. The user asks questions through text or speech; the linguistic chatbot instantly provides the answers in both text and speech. The current research looked at the benefits of a linguistic chatbot for teaching purposes and how it helps to overcome the communication gap between the teacher and the students. The communication gap between the teacher and the students in the linguistics class is a big hurdle in the conventional way of teaching; however, an Introtolinguistics chatbot facilitates the teaching-learning process. In the experimental research, pre-tests and post-tests were conducted from the control and experimental groups. Then, the Knowledge Discovery in Database (KDD) theory was used to check the impact of a chatbot on the learning process, which was found to be more operative. Introtolinguistics chatbot is limited only to linguistics students. Future studies should develop more chatbots freely by using artificial intelligence and machine learning methods. There is a need to build chatbots for every subject to revolutionise post modern digital educational system and e-learning process.

Key Words: Introtolinguistics Chatbot, Dialogflow, HCI, Teaching,

Introduction

Technology plays an essential role in the teaching-learning process. The word “chatbot” combines two words: *chat* and *robot*. Chatbot is an advanced artificial intelligence software that uses online chat/conversation via text or speech. Chatbots are used widely worldwide for various purposes, for example, business intelligence, marketing, etc. A few chatbots are also developed for education, and they are also used for teaching purposes to enhance the teaching-learning process and to give full-time access to autonomous learners.

The linguistic chatbot is developed by using artificial intelligence through machine learning. The user gives the input in the form of text or speech (question related to linguistics); the chatbot processes the given information using artificial intelligence and gives quick answers in the output. The students can ask any question whenever the linguistic chatbot provides the correct answer to the user. Linguistic chatbot helps to overcome the communication gap between the teacher and the students and helps to improve the teaching-learning process.

Chatbots are used for e-learning, and several experiments have shown the practical results of using chatbots for learning. Chatbots provide answers based on the questions, keywords from questions, context related to the question, etc. and help to increase student’s interaction, provide them with a platform for sharing their views, experiences and allow them to ask any question as many times as they want without any alteration in the answer. Chatbots are working as e-tutors to help with e-learning in this advanced digital world (Colace, Santo, Lombardi, Pascale, Pietrosanto, & Lemma, 2018).

Weizenbaum (1996) developed the first-ever chatbot named ELIZA, programmed for psychotherapist works and help in the treatment of patients in the medical field. It makes a significant impact on artificial intelligence work and focuses more on machine learning. In 1995, Wallace originated ALICE chatbot, which stands for Artificial Linguistic Internet Computer Entity, used as a conversational agent for the user. Chatbot developments started in 1996, and till now, a lot of chatbots have been developed, including Siri (2010), Google Now (2012), Amazon Echo (2014), Alexa, Cortana (2015), Bots for Messenger (2016), Google Home (2017), AlphaGo Zero (2018) and in future, the number will further increase (Chokshi, 2020).

Research Question

This study addresses the following research question:

1. How does the newly built Introtolinguistics chatbot facilitate learners in learning the subject Introduction to Linguistics to BS 1st semester students of NUML, Islamabad?

Hypothesis

The development of the Introtolinguistics chatbot and its use in the teaching process helps to a great extent to teach the basics of linguistics by overcoming the communication gap between the teacher and the students, consequently helping to enhance the teaching-learning process ubiquitously and autonomously.

Objectives

The current study aims to accomplish the following objectives:

- i. To build an Introtolinguistics chatbot for teaching the subject introduction to linguistics.
- ii. To bridge the communication gap between the linguistics' teacher and the students through the use of a chatbot.
- iii. To give easy access and quick feedback to linguistics learners by using a chatbot.

The statement of the problem

The communication gap between the teacher and the students is a big issue in the conventional educational system. Most students cannot ask questions in class because they are shy and less confident. The communication gap between the teacher and the students affects the teaching-learning process. The communication gap is covered through the use of technology. The chatbot is designed by the use of artificial intelligence for the learning process to improve the communication gap. So, there is a need to use chatbots to overcome the communication gap.

Significance of the study

The present experimental research helps to bridge the educational gap between the teacher and the students, but it also helps to improve the online teaching-learning process and give a quick response to the students of linguists through the designed linguistic chatbot. Introtolinguistics chatbot also helps to replace or support linguistics teachers. The learners chat/communicate

through text and speech; the provided answers in the text are audible. According to one study, chatbots will soon replace 60-70% of work.

Learning through chatbots interactively was very effective in the COVID-19 pandemic situation. It helps in bridging the educational gap between the teacher and the students. During the pandemic, students used the Introtolinguistics chatbot to enhance their knowledge. Through the Introtolinguistics chatbot, students get their answers ubiquitously.

Delimitation

The current experimental research aims to use a linguistic chatbot for teaching purposes; hence, this is limited only to linguistic students. As the data is collected from the 1st-semester linguistics students after using a linguistic chatbot, the sample size is limited to the linguistic students of the National University of Modern Languages. Only they were provided with a newly designed Introtolinguistics chatbot by the research team through the use of artificial intelligence.

2. Literature Review

The study aimed to develop a linguistics chatbot through the use of artificial intelligence and provide a human-computer interaction through text or speech and provide relevant answers to the students at any time. Chatbot is designed so that input in the form of text or speech is given; a chatbot provides a relevant answer from the designed intent to the user. The chatbot has been used for a long time; the first-ever chatbot, ELIZA, a psychotherapist chatbot, was developed by Joseph Weizenbaum in 1956 and worked on pattern matching (Weizenbaum, 1983). Richard S. Wallace (Wallace, 2003) developed ALICE chatbot having 40,000 different responses; it worked on Artificial Intelligence Markup Languages (AIML). HeX chatbot (Hutchens, 1997) was developed by Jason Hutchens to give answers and introduce new topics.

According to Robert Dale (2016), Apple's Siri, Microsoft Cortana, Amazon's Alexa, and Google's new Assistant Four are the most used technologies based on a voice-driven digital tool that provides assistance using artificial intelligence or machine language. These developments are basically based on the chatbot. Before the voice assistant, a text-based chatbot was used, but now both text and voice-based chatbots are developed and used for faster access to relevant content. Microsoft CEO Satya Nadella said that chatbots will "fundamentally revolutionise how everybody experiences computing". He explained that now people are developing chatbots, "the new

interface” where people have human dialogue for various apps and websites. Satya Nadella further stated that Microsoft created a new Skype bot, and in the very first week, about 20,000 people signed up to use the latest innovative chatbot. It reveals that people have advanced in the use of chatbots.

Frye and Carpenter (2004) conducted research on university students for language learning through chatbots and found that 85% of students found chatbots relaxing, and 74% found them entertaining. Moreover, chatbots repeat the same answer often without getting tired or bored. It also provides an opportunity for shy students to ask questions and get a response. According to Frye and Carpenter (2006), chatbots are helpful for accessible speaking, listening, self-analysing, and reviewing and for teacher assistance. The linguistic chatbot will help the students overcome the communication gap between the teacher and the students and enhance learning.

Pereira (2006) used chatbots for computer science students and found that students got involved and self-guided themselves in preparations. Massive Open Online Courses (MOOC) suggested the chatbot of Hutchens (2006) for personal and professional courses for teachers and students. A similar chatbot was developed by Crutzen and colleagues (Crutzen, Peters, Portugal, Fisser & Grolleman, 2011) to answer questions from youth by providing feedback about drugs, alcohol, etc. It showed that chatbots have a lot of potential to improve the health sector. Chatbots are used differently for medical, business and communication purposes; as technology is progressing daily, and new areas of learning also emerge. Similarly, chatbots are used in educational sectors as well. The use of chatbots in the teaching-learning process will help to revolutionise academia. There is still a need to develop a relevant chatbot for the teaching-learning process and give accessibility to the students.

Mark Zuckerberg (2016) stated that chatbots are the solution for app overload; he announced that the Messenger platform will use chatbots for chatting with people for business purposes. He said, “We think that you should just be able to message a business in the same way that you message a friend.” It showed that chatbots provide a friendly environment for the user for their benefit. The same is the case if we use chatbots for the teaching-learning process. Chatbots will provide a friendly environment for the students and help to improve learning. According to Nielsen (2016), Messenger is used by 900 Million people globally and is the fastest-emerging app

in the world. The Messenger platform uses a chatbot designed to chat and provide answers to the users.

Chatbots are developed through Artificial Intelligence (AI) using Natural Language Understanding (NLU) based on machine learning (ML) hence more reliable. As for linguistics, chatbot is based on machine language (ML) easy to use and more comfortable. The user uses either text or speech to get the relevant answers at any time. Chatbots are user-friendly, and they can use the same answer several times. Chatbots never irritate or get tired like humans; they never mind repetition, boredom, sleep and tiredness.

The knowledge discovery process is used in the current study to extract valuable knowledge from the data. Knowledge discovery in a database (KDD) is a procedure for analysing and understanding data, including input data, data processing and transformation, data mining, interpretation and evaluation, and information (Köster & Grawunder, 2003). The present study applies the KDD process to analyse the data through a chatbot based on the theory of Rakesh Agarwal aimed to explore meaning patterns. Through the use of the Knowledge Discovery theory, many chatbots for E-learning are used, and still, there is a need to develop in today's world. As distance learning increases, especially after the spread of COVID-19, new means of learning are promoted, and chatbots are the best option for the teaching-learning process for effective results.

Chatbots are used in academia to revolutionise the learning process; they help to act as a teacher figure for the students and provide information 24/7 in a friendly environment. Learning chatbots helped the students to overcome the communication gap and help to improve the teaching-learning process (Firth, 2017). Christi Olson, an international expert on chatbots, said, "Gartner predicts that by 2020, people will have more conversations with chatbots than their spouse." The future of chatbots is not only limited to text and speech but also, in future, they will not only talk but also think like human beings (Greene, Greene & Greene, 2019).

With the progress in science and technology, a new e-learning trend is emerging to give students access to relevant educational material outside of the classroom and improve the teaching-learning process (Travis, 2008). Like a learning management system, the software is used for online teaching. Likewise, the linguistic chatbot is also used for E-learning to improve the teaching-learning process and to fill the communication gap between the teacher and the students.

NUMLINA chatbot was built to teach English speaking skills, and it replied to students' queries as a linguistic partner. The user study proved efficacy and benefits for language learners (Ullah, Ullah, Khalid, & Abbas, 2023). Based on the earlier chatbots, an Introtolinguistics chatbot was developed for teaching introduction to linguistics by using machine language that provides human-computer interaction.

3. Research Methodology

Research design

The current experimental quantitative research design is used to check the benefits of the linguistics chatbot for teaching-learning purposes and how the linguistic chatbot is helpful for the students to overcome the communication gap in the learning process.

Research Methodology

Experimental research helps to find the impact of online software and chatbots on teaching. The Introtolinguistics chatbot was designed with Dialogflow, which is a natural language processing (NLP) platform used for integrating intents. After the use of the Introtolinguistics chatbot, the participants were given a questionnaire about their experience. With the help of collected data, chatbots' impact on the teaching-learning process was investigated. T test was applied to the quantitative data.

Theoretical Framework

The present research is based on the development of a linguistic chatbot through the use of machine language and artificial intelligence. The Knowledge Discovery in Database (KDD) theory of Rakesh Agarwal has been applied. The KDD theory is used to collect and analyse the data. The chatbot is developed according to the outline of the introduction to linguistics taught at the Department of English, NUML.

KDD is used to extract valuable knowledge from a large amount of data. It deals with the methods and techniques used to get relevant data from huge data quickly. In the past knowledge is extracted from the data based on manual interpretations and analysis, which is a highly subjected and time-consuming process, but KDD automatically generates, extracts, and evaluates useful

knowledge from a huge amount of data. KDD helps to convert user data into knowledge and save it from data overloading.

Currently, the existing data is increasing due to the large number of objects and fields in which data is used, e.g. $N=10^9$. There is a need to get quick access to the user data and convert it into knowledge; KDD is helping us to do so. It is also used in the machine learning process to find useful patterns from the data and to use it in knowledge discovery. KDD focuses on the overall process or steps that are involved in extracting helpful knowledge or knowledge discovery.

The KDD process includes nine steps for knowledge discovery (Maimon & Rokach, 2006, p. 3), i.e. Developing and Understanding the domain, Selection, and Addition, Preprocessing and Cleaning, Transformation, Data Mining, Evaluation, and Interpretation of discovered Knowledge.

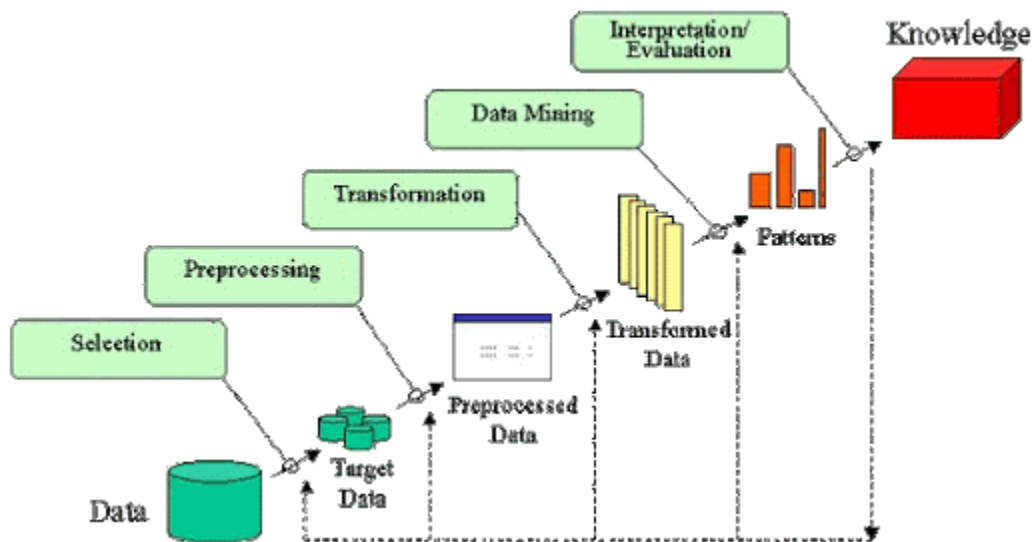


Figure 1. KDD steps

1. **Developing and understanding the application domain** is the first step towards knowledge discovery. In the initial step, goals are defined, what to do, and how to do it?
2. **Selection of data:** In the second step, data are selected or created based on knowledge discovery.
3. In the third step, **data cleaning and preprocessing occur, missing data values** are added, and extra information is deleted.

4. **Transformation:** In the 4th step, data is transformed; it is a project-specific step that requires the right data to be transformed to get correct knowledge.
5. **Data mining** depends upon the goals of the KDD process; it has two important tasks; *prediction* related to supervising data and *descriptive* data mining related to unsupervised data. Data mining is an important process in which data patterns are extracted.
6. **Choosing the data mining algorithm:** The algorithm is chosen for the representation of data mining; the selection of methods and representation is done.
7. **Employing the data mining algorithm:** The selected way of representation is used for data mining, classification and regression.
8. **Evaluation and interpretation:** Patterns are evaluated and interpreted, and knowledge discovery is documented.
9. **Using the discovered knowledge:** During the final step, discovered knowledge is further documented and incorporated in the discovered knowledge in the processing system. This step includes the final rechecking of all previous steps and resolving the conflicts of previous knowledge.

The KDD process is applied to interpret and evaluate the use of a linguistic chatbot for the teaching-learning process and how the Introtolinguistics chatbot is helpful in overcoming the communication gap in the learning process.

Participants

The National University of Modern Languages students from the English department, an undergraduate from 1st semester, participated in the experimental research. The students of the 1st semester are chosen because the linguistic chatbot is developed according to the course outline of NUML Department of English, which is the course for 1st-semester students. The sample consisted of 100 students; 50 students were part of the control group, while 50 others were part of the experimental group. Pre-testing and Post-testing are used to check the impact of the Introtolinguistics chatbot in the learning process. After pre-testing, the experimental group is provided with the chatbot, and their experiences are recorded. Similarly, the controlled group response is also recorded. Both groups are compared when the responses are recorded, and the result is found. Hence, the impact of Introtolinguistics chatbots on the learning process is found.

Instrument

Online chatbot software is built using the Dialogflow platform supported by Google, and it is trained according to the subject outline of Introduction to Linguistics. The students use the given chatbot to ask questions based on their outline of the linguistics course, and the Introtolinguistics chatbot responds. The experiences and responses of both groups, the controlled and experimental groups, are recorded and used for final analysis.

4. Results

To find out the use and benefits of linguistics Chatbot in the teaching-learning process and how it will help to overcome the communication gap between the teacher and the students' two groups of students from NUML, BS English UGS has taken, one is the controlled group and the other is the experimental group. The pre-test and post-test are conducted from both groups to collect the data. Then, the collected data are analysed using the KDD process, and data in the form of the result is generated.

Pre-Test and Post-Test Analysis

Group A is a controlled group, while Group B is the experimental group; a total of 40 students participated in the present research, out of which 20 students were in Group A and 20 students in Group B. Pre-test was conducted to get to know where the participants' stand. The participants of both groups (Group A and Group B) were given question papers in the form of short question answers to know about their current knowledge of linguistics. The pre-test had five questions, each containing four marks, so the total pre-test marks were twenty.

Table 1 Total marks in pre-tests and post-test

Total Marks	20 Marks (5x4 = 20)
Total number of questions	5 Questions
Each question carries	4 Marks

Following are the checking criteria for the answers of the pre-test and post-test from both groups. As each answer carries four marks, these four marks are further distributed as 1 mark for the correct Sentence Structure, one mark for the Use of linguistics terms, one mark for the use of correct spellings and one mark for no Grammatical Mistakes.

In the pre-test, both groups are given the following easy and simple questions:

- 1) Define linguistics.
- 2) What is the bow-wow theory?
- 3) What do you know about the controversy that animals lack language?
- 4) What does fixed reference mean in linguistics?
- 5) What are the distinct properties of human language?

After pre-testing from group A, the control group is taught linguistics in the traditional way of teaching. In contrast, in group B, the experimental group is provided with the linguistics chatbot and the participants are asked to use the linguistics chatbot for the teaching-learning process. After the post-tests from both groups, both groups were provided with question papers in the same way as they were given in the pre-testing, but now, the questions turned out to be a little complex, as mentioned below:

- 1) What is linguistics and which aspects it deals with?
- 2) What is an onomatopoeia, and to which theory of linguistics it is related?
- 3) How can we say that animals lack language when they can make sounds?
- 4) What does fixed reference mean in linguistics? Is this the property of human language if YES/NO? Explain with examples.
- 5) What are the distinct properties of human language that make them different from animals?

An independent samples t-test was applied to compare the mean score of the control group and the experimental group in the pre-test. The summary is illustrated in Table 2. When post-testing is conducted for both groups, the difference between both groups is compared using the KDD process for further data analysis. The participants of group B, the experimental group, are then provided with an online questionnaire to learn about their experience with the chatbot.

Table 2 Independent samples t-test on Pre-Test Scores

<i>Group</i>	<i>N</i>	<i>M</i>	<i>df</i>	<i>SD</i>	<i>t</i>	<i>P(2-tailed)</i>
Control	20	3.28	38	1.01	-.40	.665
Experimental	20	3.37		1.89		

Table 2 shows the comparison of the mean score of the control and experimental groups in the pre-test. The score of the control group ($M= 3.28$, $SD= 1.01$) and the score of the experimental group ($M= 3.37$, $SD= 1.89$) for $t(38)= -.40$ and $P= .665$ (2-tailed) showed that there was no significant difference between the mean score of the control group and experimental group.

An independent samples t-test was applied to compare the mean score of the control and the experimental group in the post-test. The summary is illustrated in table 3.

Table 3 Independent samples t-test on Post-Test Scores

<i>Group</i>	<i>N</i>	<i>M</i>	<i>df</i>	<i>SD</i>	<i>t</i>	<i>P(2-tailed)</i>
Control	20	4.85	38	.55	-23.86	.000
Experimental	20	7.85		.39		

Table 3 indicates the comparison of the mean score of the control and experimental groups in the post-test. The score of the control group ($M= 4.85$, $SD= .55$) and the score of the experimental group ($M= 7.85$, $SD= .39$) for $t(38)= -23.86$ and $P= .000$ (2-tailed) showed that there was a significant difference between the mean score of the control group and experimental group. The experimental group got scores significantly better than the control group.

Analysis

Group A consisted of 20 male and female participants from BS English 1st semester. The Knowledge Discovery in the Database theory is used to analyse the following gathered students' data. Following is the collected data from group A.

Table 4 Results of the controlled group

Sr.No	Names of the Participants	Pre-test Results	Post-test result	Range (difference)
1.	Ghuncha Tahir	08	12	04
2.	M. Talha Wazir	04	09	05
3.	Waqas Ali	02	08	06
4.	M. Farhan Khan	01	09	08
5.	Huraira Fatima	02	07	05
6.	Ehsan Aziz Khan	02	10	08
7.	Arooba	04	08	04
8.	M.Ahmad khan	01	07	06
9.	M. Baqar Haider	02	06	04
10.	Amna Firdous	03	09	06
11.	Sangeen Khan	02	05	03
12.	Amna Masood	04	10	06
13.	Tooba Noor	04	06	02
14.	Tanweer Hussain	03	06	03

15.	Ayesha Khalid	02	04	02
16.	Afaq Khan	07	09	02
17.	M.Ubaid Hassan	03	08	05
18.	Muhammad Uzair	03	09	06
19.	Kainat Zulfiqar	02	06	04
20.	Nadir Hassan	04	07	03

Table 5 Comparison of average

Total Number of Students	20
Average of Pre-test	$60/20 = 3.15$
Average of Post-test	$155/20 = 7.75$
Average Range	$92/20 = 4.6$

There were a total of twenty students in Group A, In the controlled group, the average for the pre-test was 3.15, while the average of the post-test was 7.75. The average range was 4.6, which shows the difference between the pre-test and the post-test. It also shows the improvement in the students' results after teaching them through conventional means of education.

GROUP B; THE EXPERIMENTAL GROUP

The experimental group also consists of 20 participants, male and female participants from BS English 1st semester.

Table 6 Range of Pre-test and post-test

Sr. No.	Names of the Participants	Pre-test Results	Post-test Results	Range (difference)
1)	Sana Zubair	05	12	07
2)	Shayan Ahmed	07	10	03
3)	Alisha Khan	03	08	05
4)	Mubashir Ahmad	02	09	07
5)	Fawad Hussain	08	13	05
6)	Hafiz Asad Mehmood	08	13	05
7)	Iftikhar Alam	04	11	07
8)	Majid Khan	02	12	10
9)	Aleena Hamayun	03	12	09
10)	Amna Masood	04	13	09
11)	Mansha Kanwal	02	10	08
12)	Fatima Gul	03	11	08
13)	Aqib Talha	02	09	07
14)	M. Mehran Khan	02	08	06
15)	Muhammad Ajmal	02	10	08
16)	Muhammad Farman	05	11	06
17)	Anees-ur-Rehman	03	09	06
18)	Muhammad Waqas	06	11	05

19)	Imran Ullah	02	07	05
20)	Zain-ul-Iman	04	10	06

Table 7 Results of the experimental group

Total No of Student	20
Average pre-test	$77/20 = 3.85$
Average post-test	$209/20 = 10.45$
Average Range	$132/20 = 6.6$

There were twenty students in Group B; The experimental group. The pre-test average is 3.85, while the post-test average is 10.45, which shows an average range of 6.6. It means that after the use of the linguistics chatbot by the students, their learning increases which is evident through their output in the post-test. Learning with a chatbot helps students learn and know the answers to the questions, which later helps them in their post-test.

Group A; The Controlled Group

Table 8 Overall output of the controlled group

Total No. of Students	20
Average of Pre-test	$63/20 = 3.15$
Average of Post-test	$155/20 = 7.75$
Range	$7.75 - 3.15 = 4.6$
Average Range	4.6

Table 8 shows the pre-test and post-test results from the control group. There is a total of twenty students, and the average response for the pre-test in Group A is 3.15, while the average result of the post-test is 7.75, which shows the improvement of students taught by conventional teaching. The average range of the pre-test and post-test is 4.6, which shows the difference between both tests.

Figure 2 shows the output of both tests from Group A, the controlled group:

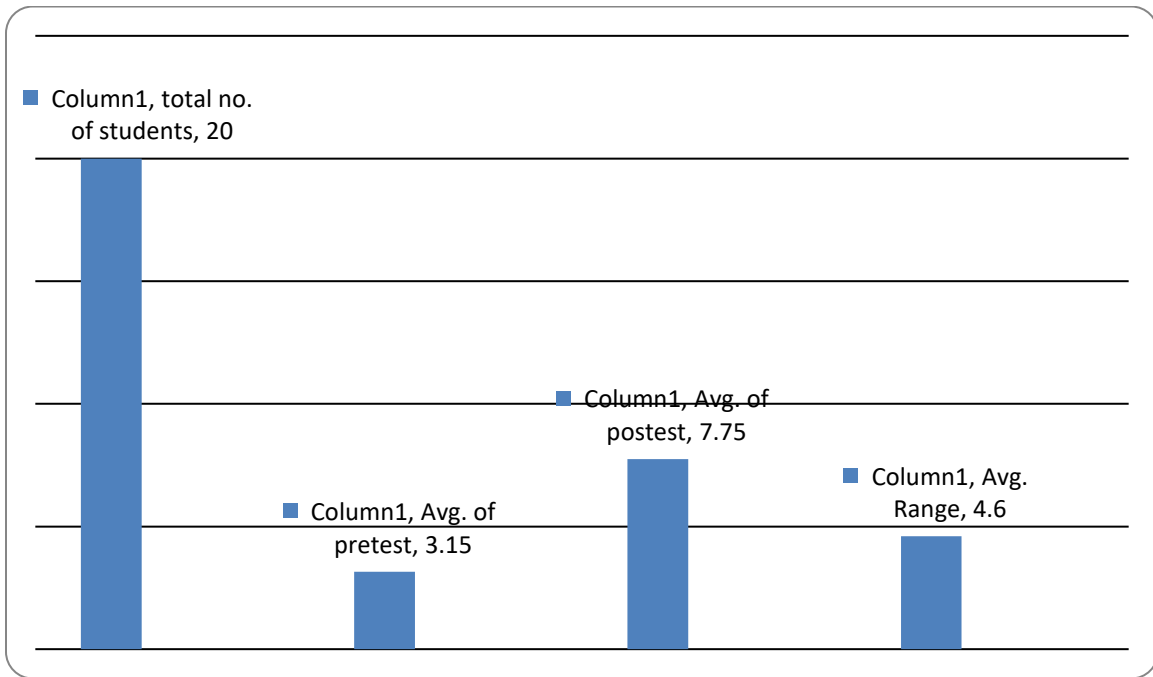


Figure 2 Results of the controlled group

GROUP B; THE EXPERIMENTAL GROUP

Table 9 Overall output of the experimental group

Total No. of Students	20
Average of Pre-test	$77/20 = 3.85$
Average of Post-test	$209/20 = 10.45$
Average Range	$10.45 - 3.85 = 6.6$

There are 20 students in the experimental group, and the average of the pre-test is 3.85. After the pre-test, Experimental group' group B is provided with the Introtolinguistics chatbot for

the teaching-learning process. The link to the Introtolinguistics chatbot is shared with them; <https://bot.dialogflow.com/5ff55587-3f53-4da5-a693-2959a2f90725>. The participants used the link to get free access to the linguistics chatbot to ask questions related to linguistics in text form or voice. The chatbot provides the answers to the user and helps students in the learning process. After conducting the post-test of the experimental group, the average post-test is 10.45. It shows the improvement in the students' learning. The average range of group B is 6.6. Figure 3 further elaborates the above-mentioned analysis;

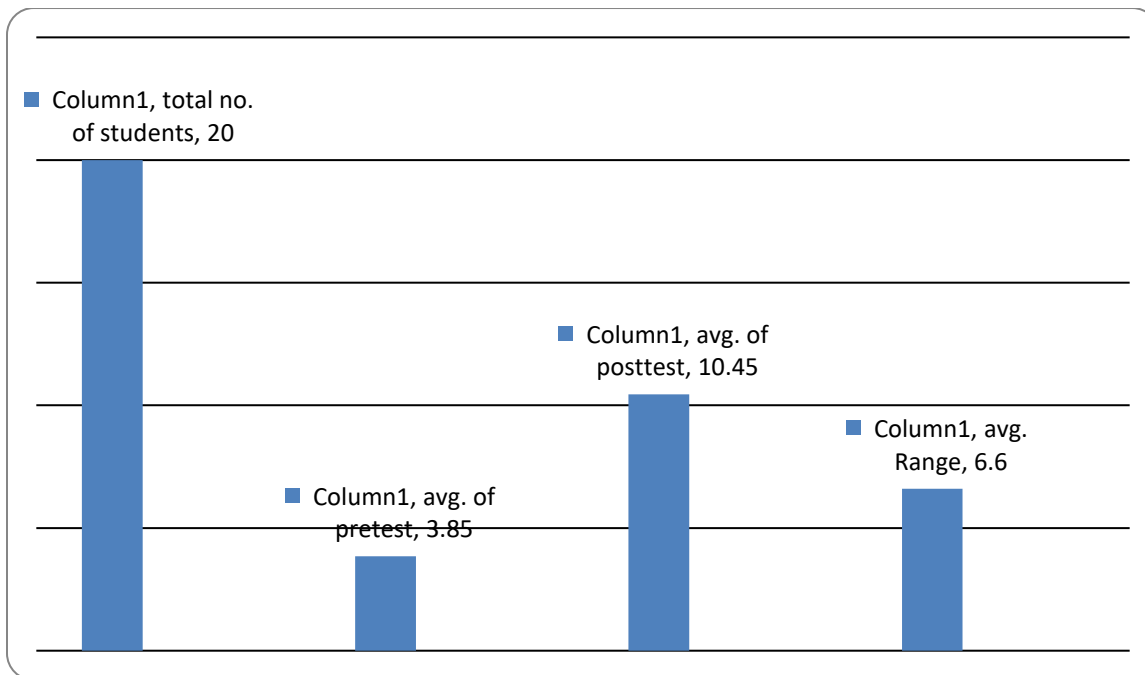


Figure 3 Results of the experimental group

To check the impact of the Introtolinguistics chatbot on the teaching-learning process, the comparison of the average of post-test from both of the groups', i.e. Group A- The Controlled Group and Group B-The Experimental group is given below.

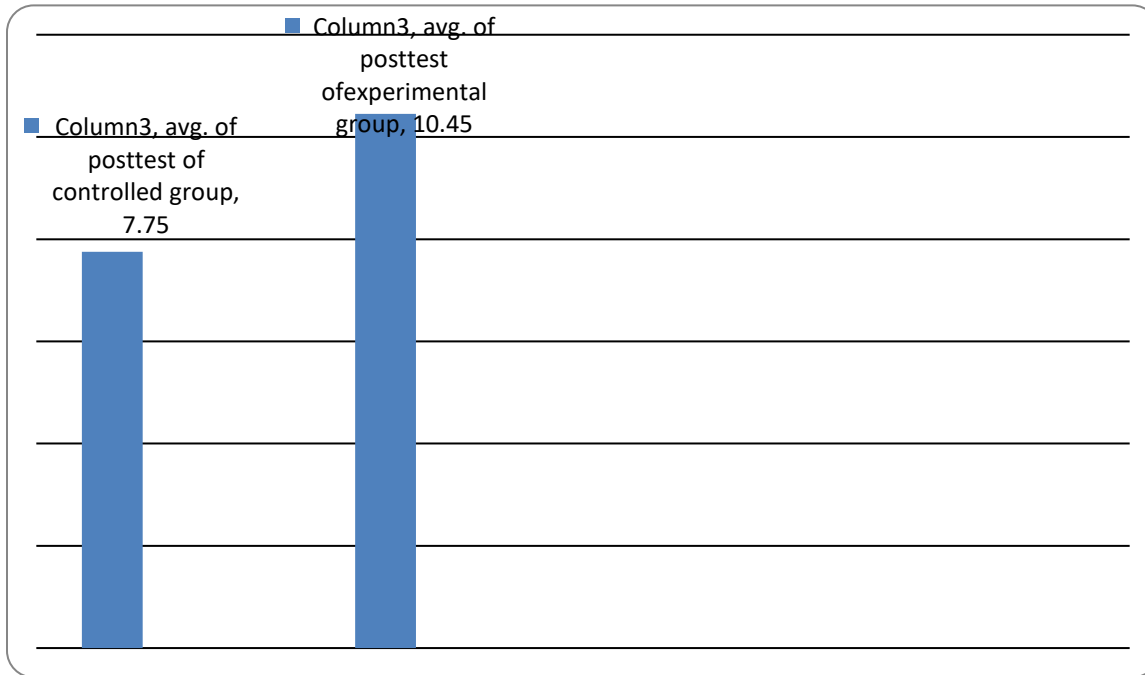


Figure 4 Comparison of results from both groups

The above-mentioned chart 3 shows that the linguistics chatbot is more effective in the teaching-learning process than the traditional way of teaching. After comparing the results of both groups, the data analysed the performance of group B; the experimental group is higher than group A due to using an Intro to linguistics chatbot for the teaching-learning process. The students find the linguistic chatbot easy to use and more comfortable, which helps them learn. The post-test results from the experimental group show that the impact of chatbot-advanced technology on the learning process is much higher. To cope with the digi-modern age, our educational system needs advanced educational tools and software and uses them for the teaching-learning process to improve it.

To know the students' experiences from the experimental group, the present study administers an online questionnaire in the form of Google Docs so that the students' responses are recorded automatically. The link <https://forms.gle/imifX71evxb6RmWv9> is for the online questionnaire shared with the experimental group to know their experience with the linguistics Chatbot. The questionnaire has ten multiple-choice questions, and options are given with each question. Following are the questions and responses of the students;

Table 10 Percentage of participants' responses

Sr. No	Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Linguistics chatbot is user-friendly and easy to use	23%	57 %	14%	4%	2%
2	The chatbot provides answers quickly	26%	67%	3%	1%	3%
3	Chatbot helps to overcome the communication gap	36%	44%	14%	4%	2%
4	Linguistics chatbot is helpful for the teaching-learning process	27%	66%	3%	2%	2%
5	Chatbot provides an opportunity to ask as many questions as to the user like	32%	57%	2%	6%	3%
6	The user can ask a question in the form of text or speech	31%	58%	6%	3%	2%
7	Chatbot gives quick feedback	36%	46%	8%	4%	3%
8	There is no alternation in the answers if the user repeats the same question	42%	44%	4%	4%	6%
9	The chatbot is helpful in distance learning	34%	54%	6%	2%	4%

5. Discussion

Study in hand aims to provide a free access linguistics chatbot for the teaching-learning process to the students, which they use at any place at any time. Two groups are taken to check

the impact of the Introtolinguistics chatbot on the learning process. Groups A and B conducted pre-tests and post-tests to reveal the difference between the experimental and controlled groups. Afterwards, the averages of both the post-tests are compared, which gives the average range of 6.6 by showing the impact of the linguistics chatbot on the students' learning.

When both pre-tests and post-tests are conducted from both groups, the improvement in the students' learning is visible through the results. To know about the experience of learning through chatbot and how the users/ students of the experimental group found it. They were provided an online questionnaire, and their responses were recorded automatically in the Google form. Following is a further discussion of students' responses.

Using the KDD process to analyse the above data, the research revealed that 85% of the students think that chatbot is user-friendly and easy, and 85% of the students agreed that chatbot helps overcome the communication gap in the teaching-learning process. 93% of students agreed that the Introtolinguistics chatbot provides them with the relevant answers, and 95% of students agreed that there is no alteration in the answer of the chatbot if the user repeats the same question many times, while 5% of students showed no response and remained neutral. 90% of students agreed that a Chatbot gives quick feedback, and 94 % agreed that a chatbot could be used to ask questions in text or speech form.

Almost 93% of students agreed the chatbot is helpful in the teaching-learning process and surely helps in distance learning as it provides the user with a free environment to ask any question and give quick feedback to the students. The user uses the linguistics chatbot at any time and asks questions as often as the user likes. The best thing about the chatbot is that it always stays energised, there is no alternation in the chatbot's answers, and there is no specific time to use it and ask questions. Chatbots work effectively in the modern digital era, where technology is an integral part of human lives.

Bringing chatbots into the educational arena surely revolutionises the whole educational system. It helps the students in their learning process by providing them with someone who answers their queries at any time at any place. The young generation is more comfortable with advanced technology; the youth of today have their cellphones in their hands 24/7; youngsters use chatbots as fun, which also teaches them and improves their learning. Learning chatbots also

provides an opportunity for students who are shy or have less confidence to ask questions. It also provides an opportunity to those who have language problems or to those who do not ask questions in the classroom to think about how to translate and communicate their question in the class properly to the teacher in front of the whole class.

The last question (10) from the questionnaire is: there is a need to develop a more educational chatbot; in the responses, the users are given the options YES/NO/MAYBE. In response to the last question, 70% of the students said yes while 25% replied Maybe; it shows that most of the students agreed to the future development of the learning chatbots. Following is the chart that shows the primary responses and experience of the chatbot of the experimental group- Group B about linguistics chatbot:

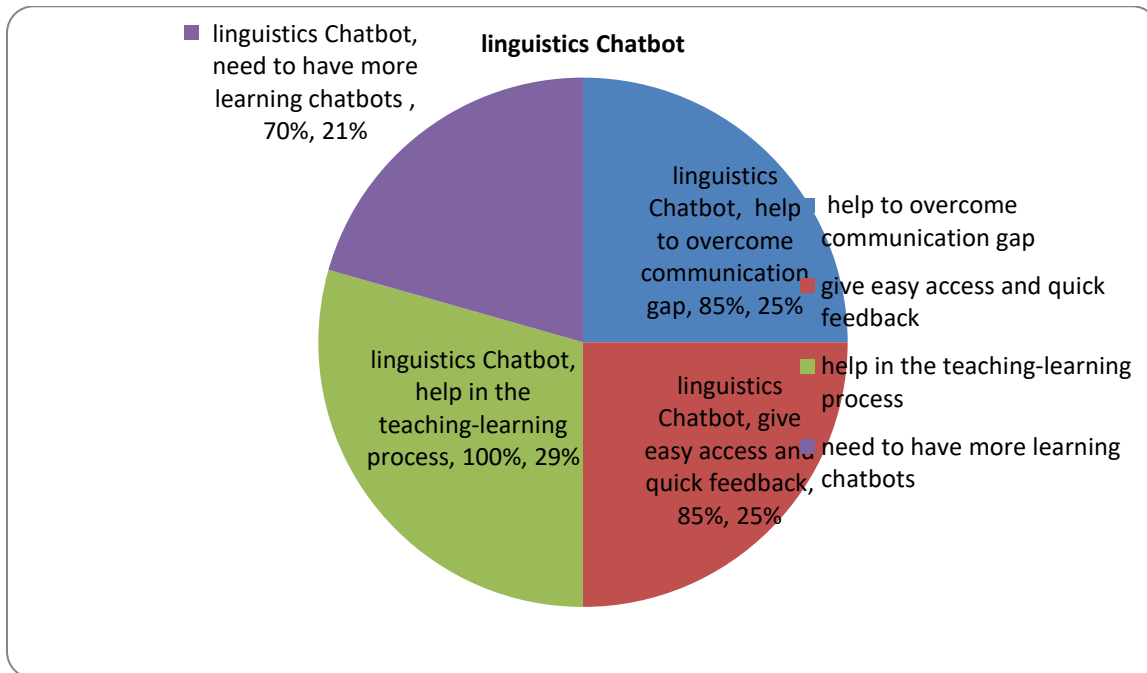


Figure 5 Results of the Questionnaire

By using the KDD theory to collect, process, and finally get valuable data from a huge amount of the data, it is estimated that 85% of the users agreed that linguistics chatbot help to overcome the communication gap, and 85% agreed that it is easy to use and provided quick feedback to the user. About 93% of users agreed that the Introtolinguistics chatbot helps in the

teaching-learning process. 70% of users agreed that there is a need to have more learning chatbots in our educational system to enhance learning among students.

Human-computer interaction is an interdisciplinary field advancing fast by providing users with an accessible medium for interacting with computers. The main objective of the research is to provide an accessible, user-friendly environment for the students to use for the learning process. The linguistics chatbot helps the students in their learning process by interacting with them. The students interact either in the form of a written text message, or they use voice notes. The chatbot gives auto-replying answers; for example, if the user writes hi, the chatbot replies hi, how can I help you? The ability to interact with the students without any time constraints helps them use it and improve their learning and knowledge about linguistics.

6. Conclusion

The current research deals with the development, use, and benefits of a linguistic chatbot developed by the research team using machine learning through artificial intelligence. Chatbots are primarily used for marketing and business purposes, but only some are developed for learning. If the number of learning chatbots is increased and used in our educational institutes, it will not only help to overcome the communication gap between the teacher and the students in the class but also help the students in the teaching-learning process. The findings of the current study are in accordance with the study of Ullah, Ullah, Khalid and Abbas (2023).

The present study took two groups: the controlled group A and the experimental group B. Both groups participated in the pre-test to learn about their already existing knowledge. Afterwards, the control groups are taught conventionally, while the experimental group is provided with the linguistics chatbot. Afterwards, the post-tests were conducted by both groups, and data is collected. By comparing the post-test of both groups, the research finds that chatbot is more effective in the teaching-learning process and helps to overcome the communication gap.

After the experimental research, the results are obtained by both groups and results are drawn to know about the students' experience with the chatbot; the research team provides them with an online questionnaire, and the students' responses are recorded automatically. From the students' responses, the research found that most students think it is helpful and easy to use.

Moreover, their experience of learning with Introtolinguistics chatbot remains good, which is evident in the output the students gave in the post-test.

The research objectives are to develop a linguistics chatbot to bridge the communication gap between the linguistics' teacher and the students, give easy access to the students and provide them with quick feedback; the ongoing research remains successful in achieving these research objectives. The research team developed the linguistics chatbot using artificial intelligence and providing students freely.

There are many benefits of the linguistics chatbot as it gives 24/7 easy access to the students, a friendly environment to ask any question, and quick feedback by providing the most relevant answer to the students. Humans get tired; with repetition, there is an alteration in the teacher's response, but there is no alteration in the chatbot's answer; it repeats and provides the same answer to the students as many times as they ask. By providing the students with a user-friendly environment, the linguistics chatbot allows them to ask questions to enhance the students' learning process and help overcome the communication gap between the students and the teacher.

Limitation:

The current experimental research is limited only to the linguistics chatbot, and the sample used in the study is also limited to BS English 1st semester students. The chatbot's intents are also limited to what the research has put there. There is a need to put more intents into the chatbot for learning that provides easy and free access to the students and helps them to ask any question at any time to improve students' learning.

Recommendation

In contemporary technological era where everything is progressing daily, and unfortunately, due to the COVID-19 pandemic, there is a considerable shift in the academic arena as education is now shifted to E-learning, and chatbots are used for the teaching-learning process. It gives an easy, user-friendly, and quick response to the students that help them learn. The use of the Introtolinguistics chatbot in the learning process has positive impacts on the students, manifested in the results from the data collected by the students. There is a need to develop more educational chatbots for learning purposes. There is no negative aspect of the educational chatbot, so increasing the number of educational chatbots will help improve the teaching-learning process and help the students overcome the communication gap in their learning.

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