Impact of AI-Assisted Flipped Classroom on Speaking Skills of Pakistani ESL Learners

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ABSTRACT

The current study investigates the effectiveness of an Artificial Intelligence (AI)-assisted flipped classroom model on the speaking skills of Pakistani L2 learners. In a flipped classroom, traditional teaching methods are inverted where learners first encounter new content independently through technology and then engage in interactive, collaborative learning activities during face-to-face sessions. AI tools offer the potential to enhance speaking skills in an ESL context by providing immediate feedback, personalized practice, and engaging learning experiences. This research explores how the combination of AI technology and flipped classroom methodology affects students' speaking proficiency, confidence, and overall learning outcomes. The study uses a mixed-methods approach, incorporating both qualitative and quantitative data from pre-tests, post-tests, and interviews. The study highlights that AI-assisted flipped classrooms significantly improve the speaking skills by fostering more interactive and personalized learning experiences of Pakistani ESL learners. These advancements provide an effective, student-centered approach to language acquisition. The findings contribute to understanding how AI can be used to foster language acquisition, specifically in speaking, among Pakistani ESL learners.

Keywords: *Flipped classroom, artificial intelligence, speaking skills, ESL learners*

INTRODUCTION

The English language has become the lingua franca of the world. It means that people from all over the world use it to communicate with one another despite having different mother tongue languages. This phenomenon resulted in the increase of the importance of communication in the current global world (Crystal, 2003). Observations reveal that limited opportunities for practice and feedback cause ESL learners to struggle with speaking proficiency. Traditional English language classrooms often rely on rote learning and passive teacher-student interactions, leaving little space for students to actively engage with the language. With the advent of technology, there has been a growing interest in using artificial intelligence (AI) to enhance language learning.

AI-assisted technologies may give real-time feedback and individualized learning experiences, which are critical for improving speaking abilities. The flipped classroom, in which students access instructional information outside of the classroom (usually via films, online resources, or digital technologies) and participate in collaborative and interactive activities during in-class sessions, has gained popularity as an innovative educational technique. The combination of flipped learning and AI has the potential to alter how

ESL learners in Pakistan approach speaking practice by providing additional possibilities for individual study, practice, and feedback. AI-assisted tools can deliver immediate, personalized feedback on speaking tasks, enabling learners to refine their pronunciation, fluency, and accuracy in real time—an approach shown to significantly improve speaking skills and self-regulation compared to traditional instruction (Qiao, H., & Zhao, A. 2023).

The flipped classroom technique, when compared to other methods of teaching, brought more significant changes that dramatically affect the development of language proficiency and also facilitate and hasten the process of learning and acquisition. The logic of flipped classrooms is that language learning does not only occur at school. The classroom environment is the place of the realization and application of what is learned. Videos, lesson notes, and various internet platforms give opportunities to the ones who are willing to learn new languages. According to Mazlan, R., Mahamod, Z., and Jamaludi, K. A. (2024), the flipped classroom approach has been shown to significantly enhance language proficiency and accelerate learning by allowing students to engage with instructional materials independently and use classroom time for active application and interaction, resulting in improved academic performance and critical thinking skills compared to traditional methods.

In Pakistan, the learners of English as a Second Language (ESL) often face challenges in developing speaking skills due to traditional, teacher-centered classroom structures. The AI-assisted flipped classroom offers an innovative approach to addressing these challenges by promoting learner autonomy and personalized learning. The current study aims to investigate the effectiveness of an AI-assisted flipped classroom in improving the speaking skills of Pakistani ESL learners, as it may provide more interactive, engaging, and tailored opportunities for practice, ultimately enhancing learners' fluency, confidence, and overall speaking proficiency.

Problem Statement

Though English is taught as a compulsory subject in which students often find it difficult to express themselves fluently and accurately in Pakistan (Ali et al. 2014 and Rahman, T. 2001). One of the reasons for such deplorable results may be an insistence on the ESL classrooms where students are primarily engaged in passive learning, focusing on grammar, vocabulary, and reading comprehension, while opportunities to practice speaking in real-world contexts are minimal. While some technological solutions have been introduced in Pakistani classrooms, the potential of AI tools in the context of flipped learning remains largely unexplored.

Research Objective

- To examine the effectiveness of an AI-assisted flipped classroom in improving the speaking skills of Pakistani ESL learners.
- To investigate Pakistani learners' perception regarding AI-assisted flipped classroom.

Research Questions

1. How does AI-assisted flipped classroom learning influence the Pakistani ESL learners' speaking skills?

2. What is Pakistani learners' perception regarding AI-assisted flipped classroom?

LITERATURE REVIEW

Flipping learning is an approach in which class activities are performed at home and homework is done in the classroom (Hwang, Lai, & Wang, 2015). According to Jarvis (2012), flipped learning provides a student-centered atmosphere that focuses on the student's experience of learning and promotes growth and

development of learning as compared to typical classes where instructors are the only source of information. Anwar et al. (2024) found flipped classroom instructions engaging, motivating, and enjoyable. These studies have shown that by shifting content delivery outside of class time, students have more opportunities for hands-on practice and collaborative activities, which can lead to improved language proficiency, particularly in speaking skills (Zhang, 2018).

Østerlie & Bjerke (2023) explore how flipped learning affects student motivation and preparation for future responsibilities. The students claimed that flipped learning improves motivation, enriches learning, and prepares them for future teaching in school situations. Singay's (2020) research also stresses the benefits of flipped learning in a second language situation, focusing on student viewpoints. The findings revealed that students valued the improved learning environment and increased use of technology, which aided in grammar acquisition and peer collaboration.

According to Alebrahim and Ku (2020), students valued the dynamic and engaging environment produced by the flipped classroom, which contrasted with typical lecture-based learning. This adjustment was identified as a crucial element in increasing their academic involvement. Bergmann and Sams (2012) implemented the flipped classroom instructional technique in a high school chemistry course and discovered that the method increased teacher and peer interaction.

Artificial Intelligence (AI) integration in education, particularly in language learning, has been shown to provide personalized learning experiences, real-time feedback, and adaptive content that caters to the individual needs of learners (Wang et al., 2020). AI tools, such as speech recognition and natural language processing applications, can help ESL learners improve their pronunciation, fluency, and vocabulary usage by offering instant corrections and suggestions (Kukulska-Hulme, 2012). Furthermore, AI can support learners in practicing speaking in a low-pressure, non-judgmental environment, fostering confidence and encouraging risk-taking in language use (Heffernan & Heffernan, 2014).

However, while both the flipped classroom and AI-assisted learning show promise, studies on their combined impact on speaking skills, particularly in the context of Pakistani ESL learners, remain limited. Previous research highlights the need for culturally appropriate technological interventions and the potential for digital tools to bridge educational gaps in regions with limited access to traditional language learning resources. Given Pakistan's unique educational context, where many students face challenges related to insufficient speaking practice and limited teacher-student interaction, the application of AI in a flipped classroom setting could offer a novel solution to enhance speaking proficiency.

RESEARCH METHODOLOGY

The study utilized a mixed-method quasi-experimental research design to provide a comprehensive analysis of the intervention's effectiveness. The quantitative component assessed the effectiveness of the AI-assisted flipped classroom on students' speaking skills, while the qualitative component explores students' perceptions, experiences, and challenges. The quasi-experimental approach involved a single group of learners who were exposed to the AI-assisted flipped classroom, with pre- and post-assessments to evaluate the changes in speaking skills over time.

The samples of the study, selected through convenient sampling technique, were from a public sector school located in the city of Sialkot, Punjab, Pakistan. They were Matric-level learners. The total sample size consisted of 40 participants, ensuring a manageable group size for both testing and interviews. The participants were divided into two groups: in the experimental group, 20 students participated in the AI-assisted flipped classroom intervention, and in the control group, 20 students received traditional, teacher-led English instruction with a focus on speaking skills.

Pre- and posttests were the primary tools for assessing the learners' speaking skills. Both tests focused on the key areas of fluency, accuracy, pronunciation, and overall speaking confidence. The pretest was administered before the start of the flipped classroom intervention to gauge initial speaking abilities, while the posttest was administered after the intervention to measure any improvements. The tests were designed to be comparable, ensuring valid measurement of skill development. To gain deeper insights into the learners' experiences with the AI-assisted flipped classroom, semi-structured interviews of (n=10) students from the experimental group were conducted after the intervention. These interviews provided qualitative data on how learners perceived the effectiveness of the AI tools, their engagement with the flipped classroom model, and the challenges they faced. The semi-structured format allowed for flexibility, enabling the interviewer to probe further based on responses while still maintaining consistency across interviews.

Participants were first given the pretest to assess their speaking skills. Then, they participated in the AI-assisted flipped classroom intervention, which involved using language learning platforms that provided personalized speaking exercises, feedback, and interactive content, allowing learners to engage with materials at their own pace before participating in live classroom discussions. This approach enabled learners to practice speaking in a supportive, self-directed environment, while in-class sessions focused on application and interaction, aiming to enhance their speaking proficiency. After the intervention, participants completed the posttest to measure improvements in speaking skills. Finally, a subset of the participants was interviewed to gather qualitative data on their experiences and perceptions of the AI-assisted flipped classroom model.

The quantitative data from the pretest and posttest were analyzed using paired-sample t-tests to identify any statistically significant changes in speaking skills. The qualitative data from the semi-structured interviews were analyzed using thematic analysis to identify common themes and insights related to learners' experiences and perceptions of the AI-assisted flipped classroom.

RESULTS AND ANALYSIS

The study's first objective was to examine how an AI-assisted flipped classroom affected Pakistani ESL pupils' abilities to speak. To achieve the study's goal, participants were given a speaking proficiency exam, which served as a pre-test, to measure their speaking abilities in terms of fluency, pronunciation, vocabulary usage, and grammatical accuracy. The test consisted of a brief oral interview with two ESL professors in which students answered questions and delivered a short presentation. Following the intervention, the same teachers conducted a comparable speaking test considered as a posttest to assess increases in speaking proficiency. The same interviewers administered and graded the pre- and posttest to maintain uniformity. The findings are as follows:

Group	N	Mean Pre-Test Score	Mean Post-Test Score	Mean Change in Score	Std. Deviation	Std. Error Mean
Experimental Group	20	5.0	8.4	+3.4	1.8	0.403
Control Group	20	5.0	5.8	+0.8	0.8	0.179

Table 1: Pre- and Posttest Scores (Paired Sample Statistical)

Table 01 represents the statistical result of the performance of the samples against pretests. The experimental group shows a significantly higher improvement in speaking skills, with a mean change of +3.4 points compared to the control group's mean change of +0.8 points. The mean post-test score for the

experimental group is 8.4, while the control group has a mean post-test score of 5.8, reflecting a great improvement in the experimental group.

The graphical representation of the performance of the control group before and after intervention has been given below:
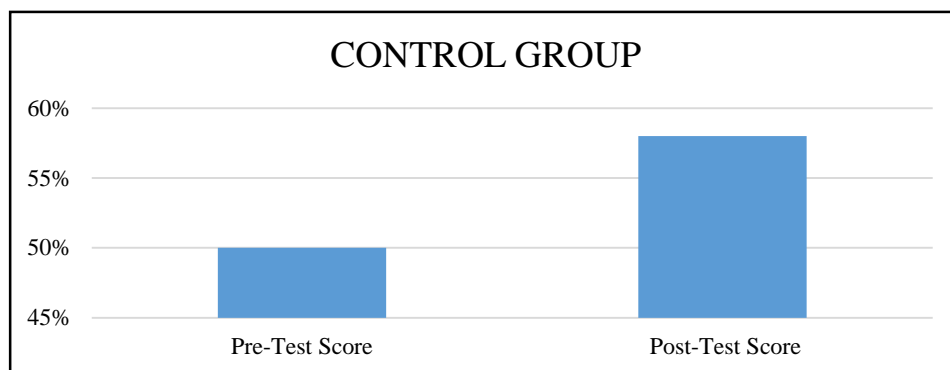

Figure 1: Performance of control group

The results for the control group are presented in Figure 1. The average pre-test score was slightly above 50%, while the average post-test score increased to just above 60%. This indicates a modest improvement in performance from pre-test to post-test within the control group, suggesting some learning or familiarity effects even in the absence of the experimental intervention.

Below is a graphical reflection of the experimental group's performance both before and after the intervention.
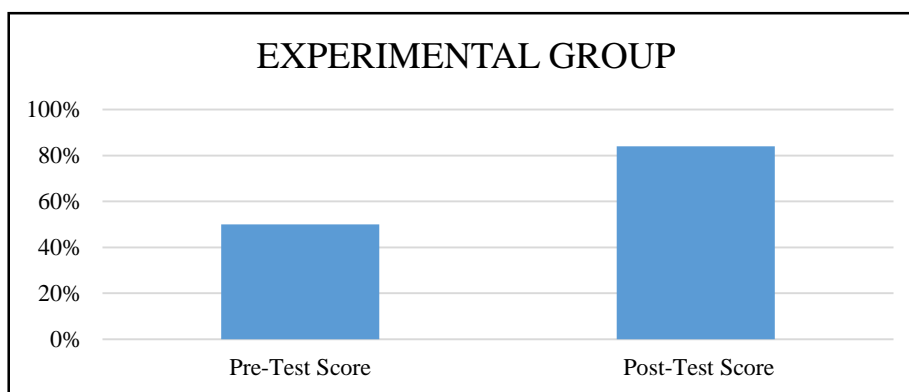

Figure 2: Performance of experimental group

Figure 2 indicates that the post-test score is significantly higher than the pre-test score, suggesting an improvement in performance or knowledge after an intervention or experiment. The vertical axis is labeled with percentages (0%, 50%, 100%), illustrating the increase from pre-test to post-test.

The second objective of the study was to ascertain the perception and experience of the experimental group's participants regarding the AI-assisted flipped classroom model. The perception was gleaned through semi-structured interviews. These interviews aimed to provide qualitative insights into how the intervention influenced their speaking skills, engagement, and overall learning experience. The interviews were designed to be flexible, allowing the researchers to probe deeper based on students' responses while

maintaining a focus on key areas related to the impact of the AI-assisted approach. The findings of the data are as under:

Personalized learning through AI

The majority of the participants in the study shared positive experiences with the AI tools used during the flipped classroom sessions. They highlighted that the AI platform's personalized speaking exercises allowed them to practice at their own pace, which they found particularly helpful for building confidence in their speaking abilities. According to S1, *the real-time feedback on pronunciation and fluency motivated me to continue practicing outside of class time*. However, most of them also noted that while the AI provided useful corrections, there were moments when the system did not fully address more complex errors related to grammar and context. Overall, they felt the AI tools played a significant role in enhancing their self-study process and preparing them for in-class discussions.

Increased confidence in oral communication

The participants of the study reported a notable increase in their speaking confidence after participating in the AI-assisted flipped classroom. Before the intervention, they manifested hesitation and anxiety when speaking in English. However, the ability to practice speaking with the AI platform in private, without fear of judgment, helped reduce their anxiety. *The repeated practice, paired with gradual exposure to real-time class discussions, made me more comfortable speaking in front of others* (S7). According to S4, *the flipped classroom model allowed me to focus on the content at home, which led to more effective participation during live sessions*. They felt that the classroom discussions became easier to engage with, as they had already practiced key phrases and vocabulary through the AI system.

Advancements in fluency and pronunciation

Most of the samples of the study indicated the significant improvements they observed in their fluency and pronunciation through the AI-assisted platform. They noted that the AI exercises focused heavily on pronunciation drills, which helped them understand the nuances of intonation and stress patterns. Through repetitive practice, they were able to refine their speech and noticed fewer errors during class discussions. Additionally, S6 mentioned *the AI's speech recognition technology was especially beneficial in pinpointing specific pronunciation errors they had not been aware of before*. However, they also pointed out that while the AI helped with pronunciation, it did not always provide context-specific feedback for more complex speech patterns, which they felt could be addressed in future iterations of the system.

Enhanced learning engagement and autonomy

Most of the samples of the study argued for greater engagement in learning. They appreciated the flexibility of completing assignments and practicing speaking skills at their own pace, which enabled them to revisit difficult content or topics that they had not fully understood in previous sessions. They felt that this approach fostered a sense of ownership over their learning. Additionally, S9 stated, *I enjoyed the interactive components of the in-class sessions, where I could apply what I had learned through AI exercises in real-life speaking situations*. Most of them mentioned that this combination of independent learning and collaborative practice helped solidify their speaking skills more effectively than traditional classroom models.

Challenges and recommendations for improvement

Although the majority of the samples of the study showed positive perception about the AI-assisted flipped classroom, they highlighted several challenges they encountered. One major issue was the limited ability of the AI platform to address contextual speaking problems, such as cultural nuances or the use of idiomatic expressions. While the system could correct pronunciation and basic grammar, it was less effective in

guiding students on how to speak naturally in a variety of contexts. S5 also noted *there were occasional technical issues with the AI platform, such as delayed feedback or malfunctioning voice recognition, which at times hindered their practice*. They suggested improvements to the AI system, including more contextual speech exercises and better technical support to enhance the learning experience.

The semi-structured interviews provided valuable insights into the learners' experiences with AI-assisted flipped classrooms. Overall, students expressed significant improvements in speaking confidence, fluency, and pronunciation, as well as greater engagement with the learning process. While the AI tools were seen as beneficial in providing personalized practice and immediate feedback, students also identified areas for improvement, particularly around the system's ability to address more complex, context-specific aspects of speaking. These interviews underscored the potential of AI-assisted flipped classrooms to support ESL learners in developing their speaking skills, while also highlighting the need for ongoing refinement to fully meet learners' diverse needs.

DISCUSSION

The study reveals several key insights into how this instructional model affects learners' speaking proficiency and their perceptions of AI-assisted flipped classrooms. The AI-assisted flipped classroom approach appears to have a significant positive impact on learners' speaking skills, particularly in terms of fluency, pronunciation, and confidence. The results from both the pretest and posttest show clear improvements in these areas, suggesting that the combination of self-paced, technology-supported learning with in-class interaction allows learners to develop their speaking abilities more effectively than traditional methods alone. The ability to practice speaking outside of class, with the help of AI tools providing instant feedback and targeted exercises, contributes to the gradual buildup of confidence and skill, which is critical for language learners.

The perceptions of Pakistani ESL learners toward AI-assisted tools were generally positive, with students appreciating the flexibility and personalized nature of the learning experience. Many learners reported that AI tools helped reduce their anxiety around speaking, as they could practice without the fear of judgment from peers or teachers. However, some students also expressed concerns about the limitations of AI in addressing complex, context-specific language features, such as idiomatic expressions, cultural nuances, or advanced conversational skills. While the AI system provided useful feedback on basic pronunciation and grammar, it struggled to replicate the dynamic, contextual feedback a human instructor could provide. This highlights a key limitation of AI-assisted learning. While it offers significant advantages in providing immediate, personalized support, it cannot yet fully replace the depth of interaction and contextual learning that traditional, human-centered instruction offers. Therefore, the study suggests that a hybrid model, combining AI-driven learning tools with human guidance, may be the most effective approach for enhancing ESL learners' speaking skills in the future.

The flipped classroom model, when supported by AI tools, also aligns with the growing demand for learner-centered and flexible educational approaches. The study emphasizes the importance of fostering learner autonomy, which is crucial in language acquisition. By allowing students to review and practice material before engaging in live sessions, the flipped classroom model empowers them to take responsibility for their learning. This, combined with the AI's ability to provide tailored feedback, encourages learners to be more active participants in their language development. Future research could explore ways to further refine AI tools to address the more nuanced aspects of speaking, as well as the potential of combining AI with peer feedback to enhance contextual learning.

CONCLUSION

The AI-assisted flipped classroom positively influences Pakistani ESL learners' speaking skills by offering them opportunities for personalized, self-paced practice and real-time feedback that enhances fluency, pronunciation, and overall confidence. Learners showed notable improvements from the immediate feedback provided by AI tools, which allow them to identify and address speaking challenges outside of traditional classroom settings. This approach promoted active engagement, enabling learners to work on their weaknesses independently before applying their skills in live class discussions, ultimately fostering greater speaking proficiency. Pakistani students generally expressed positive views, appreciating the flexibility and personalized support the tools provided. Many students felt more confident and less anxious when practicing speaking skills, as the AI tools allowed them to practice in private and at their own pace. However, some students highlighted challenges, such as the system's limited ability to address more nuanced aspects of language, like idiomatic expressions or cultural contexts. Despite these limitations, the majority of students recognized the value of the AI-assisted flipped classroom in enhancing their speaking skills and expressed a strong willingness to continue using such tools in future learning experiences.

REFERENCES

Alebrahim, F., & Ku, H. Y. (2020). Perceptions of student engagement in the flipped classroom: a case study. Educational Media International, 57(2), 128-147.

Ali, S., Ahmad, N., Manzoor, N., & Naseer, S. (2014). Students' Perceptions about Teaching English as Compulsory Subject at Secondary Level in Punjab, Pakistan. *Bulletin of Business and Economics (BBE)*, *3*(1), 21-33.

Anwar, M. N., Ahmed, N., and Zahid, M. (2024). Effect of Flipped Classroom Teaching on Paragraph Writing Skills of Pakistani English Language Learners. *International Journal of Social Science Archive. 7*(2), 1126-1136.

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. International society for technology in education.

Chen, F., Wang, Y., & Chen, C. (2019). *Flipped classroom models and their effectiveness in the context of language learning*: A *review. Journal of Educational Technology & Society*, 22(1), 49–63.

Crystal, D. (2003). *English as a global language*. Cambridge university press.

Heffernan, N. T., & Heffernan, C. L. (2014). The ASSISTments ecosystem: Building a platform that brings scientists and teachers together for minimally invasive research on human learning and teaching. *International Journal of Artificial Intelligence in Education, 24*, 470-497.

Hwang, G. J., Lai, C. L., & Wang, S. Y. (2015). Seamless flipped learning: a mobile technology-enhanced flipped classroom with effective learning strategies. *Journal of computers in education, 2*, 449-473.

Jarvis, P. (2012). *Towards a comprehensive theory of human learning.* Routledge.

Kukulska-Hulme, A. (2012). *Language Learning with Technology: Ideas for Integrating*

Technology in the Classroom. Cambridge University Press.

Mazlan, R., Mahamod, Z., & Jamaludin, K. A. (2024). Isu serta Cadangan Penambahbaikan Kualiti Pengajaran dan Pembelajaran Penulisan Karangan Bahasa Melayu Sekolah Menengah. *e-BANGI Journal*, *21*(4).

Østerlie, O., & Bjerke, Ø. (2023). Flipped Learning in Physical Education Teacher Education-The Student Perspective. *Journal of Teacher Education and Educators, 12*(1), 7-27.

Qiao, H., & Zhao, A. (2023). Artificial intelligence-based language learning: illuminating the impact on speaking skills and self-regulation in Chinese EFL context. *Frontiers in Psychology*, *14*, 1255594.

Rahman, T. (2001). English-teaching institutions in Pakistan. *Journal of Multilingual and Multicultural Development, 22*(3), 242-261.

Singay, S. (2020). Flipped learning in the English as a second language classroom: Bhutanese students' perceptions and attitudes of flipped learning approach in learning grammar. *Indonesian Journal of Applied Linguistics*, *9*(3), 666-674.

Zhang, L. (2018). English flipped classroom teaching model based on cooperative learning. *Educational Sciences: Theory & Practice, 18*(6).