

The Impact of Flipped Classroom on Speaking Skills of Engineering Students: An Experimental Study

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Abstract ---The present research work deals with the effectiveness of flipped classroom method on enhancing the first-year students' speaking skills studying in engineering college. Further, the study investigates students' perceptions of flipped classroom learning. 80 students were selected from two different engineering branches based on convenience sampling and equally separated into different groups, i.e., experimental and control. The two participant groups learnt the language through different methods, i.e., the control group was instructed by means of conventional teaching method and the experimental group through the flipped classroom method. Speaking assessments and semi-structured interviews were incorporated as a part of the research. The outcome of this research reveals that the experimental group's performance was better than the traditional group. Further, these results demonstrated a significant difference in speaking outcomes relating to male and female students within the experimental group, indicating female students excelled compared to male students. Besides, the analysis revealed that the students maintained favorable attitudes towards flipped learning.

Keywords— Flipped Classroom; Communication Skills; Tertiary Level Students; English Language Learning; Engineering Students.

I. INTRODUCTION

Speaking is one of the primary ways of communication. It is a simple verbal communication often used to convey people's ideas and emotions. Ur (1996) states that the most crucial language ability, which all students should acquire, is to be able to speak. To master speaking skills students should constantly practice it by actively participating in various day-to-day speaking tasks. The potential to participate in a conversation in the target language, according to Nunan (2001), is a good indicator of success in the language. Undeniably, the proficiency of students in communicating is of the utmost importance in language instruction; consequently, proficiency

in this skill is used to evaluate academic performance. (Alwaely 2004).

Meanwhile, a number of studies have revealed that tertiary level students have faced several challenges in speaking English (Aburezeq 2020). Hence, viable methods of instruction must provide plenty of opportunities for language exposure and practice. According to research, flipped classrooms are considered a successful strategy to teach and improve students' speaking competence. It provides students with a range of opportunities to interact dynamically, get feedback, embrace autonomy and be responsible. It also motivates students to actively take part in meaningful speaking activities (role play, simulations, information gap, brainstorming, storytelling, group work, etc.) (Kayi. 2006). Like this, Zhang (2022) mentions that flipped classrooms serve as a prominent factor in advancing students' oral communication skills. It can be attributed to the various prospects and time provided to develop speaking expertise. Additionally, by giving students access to varied learning resources, the flipped classroom improves the motivation level to learn (Cilliers and Pylman 2022). In its full context, the flipped classroom provides a casual, rich, and systemic learning culture that aids students in honing their language skills (Cevikbas and Kaiser 2022).

Conversely, the flipped classroom's influence on English language learning at engineering colleges has received very little consideration. The current research was undertaken to scrutinize the effects flipped classroom on the students in engineering college while they learned to speak English. The following section covers the primary research questions driving this study.

1. Does the performance of the first year Engineering college students taught using the conventional teaching technique and students instructed using the flipped classroom differ statistically?

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2. Does the experimental group students' performance in their ability to speak English differ statistically between male and female students?

3. What do the students think about the advantages and drawbacks of developing English speaking skills through a flipped classroom?

II. LITERATURE REVIEW

Speaking skills

The four core language abilities, i.e., LSRW (listening, speaking, reading and writing) form the foundation of effective language instruction. However, in EFL/ESL programmes, improving speaking skills is critical. According to Nunan (1999), progress in acquiring a new language is determined by the capacity to embark on a discourse in the (targeted) language. Speaking instruction is essential since it aids students gain speaking abilities so that they can interact fluently and naturally. Moreover, if the appropriate speaking tasks are offered in the teaching process, speaking can increase overall students' interest and turn the English language classroom into a lively and transformative environment (Nunan, 1999). Thus, students' speaking skills must be devised, and English teachers must encourage their growth.

The present study concentrates on the following aspects of proficiency in speaking: body language, grammar, vocabulary, fluency, and pronunciation.

Body language, i.e., modification in terminology, postures, eye contact, gestures, voice modulation that correspond to speaking.

Grammar, i.e., language norms, such as those governing word formation and sentence structure.

Vocabulary, i.e., use of vocabulary to convey the ideas clearly and accurately.

Fluency, i.e., proceeding without pause in the dialogue and displaying a rhythm in the presentation to keep the discourse coherent and interconnected.

Pronunciation, i.e., the way a language, a word, or another sound is pronounced.

Flipped classroom in learning

The term "flipped classroom" is used to refer to a distinct approach of teaching method where instructors record audio-visual lectures, something which students can watch before and outside the class at their convenience. An effective flipped classroom goes beyond simply filming instructional material and transmitting it to students ahead of time; instead, the focus should be placed on the actual classroom time. According to this method, students can engage in activities, have discussions about ideas, get help understanding information that is difficult to comprehend and look into content-related questions during class time. The recordings turn the class into a place in which active learning takes place by giving students the opportunity for discussion and hands-on exercises.

The flipped classroom is largely characterised by two aspects. Utilizing technology to first produce or film video materials before sharing it with students as a self-directed learning resource. The capacity to successfully personalise learning so that each student can proceed at their own pace is the second (Goedhart, N. S., et al. 2019). For instance, Öztürk, M., & Çakıroğlu, Ü. (2021) claimed that students taught using the flipped classroom method proved more effective than traditional teaching method in terms of accomplishment. Student participants concluded that a crucial element was the availability of pause, replay, and reflection on the lesson as necessary. The flipped classroom encourages students to shoulder responsibility to foster language building process by completing homework beyond the class and participating more actively in class. Students grow more focused and self-driven in this type of setting (Fathi, J., & Rahimi, M. 2022).

By flipping the classroom, teachers make use of class time by freeing up overall class time for carrying out the learning process. There will be enough time to accommodate additional material and help underachieving students. Additionally, teachers can encourage students with average and high proficiency level to work on more challenging tasks (Turan & Goktas, 2016).

Language Teaching Through Flipped Classroom

Numerous research findings indicate that the flipped classroom is indeed an effective strategy to enhance language education and establish students' English proficiency. Flipped classroom has proven the potential to foster students' writing skills in particular (Soltanpour and Valizadeh 2018, Hidayat, L. E., & Praseno, M. D. 2021), speaking skills (Sheerah, H. A. H., & Yadav, M. S. 2022), listening comprehension (Thatphaiboon, R., & Sappapan, P. 2022), and reading skills (Fisher, Tran, & Verezub, 2024; Yulian, 2021). Flipped classroom increases active learning and student participation, according to Tazijan, Baharom, and Shaari (2016). It showed that student engagement through flipped instruction improved their speaking skills. Another researcher introduced a digital-storytelling-driven online flipped class method to explore its impact on the readiness of EFL learners to effectively interact and share their perspectives on this strategy (Luan et al., 2024). Chen Hsieh, J. S., Wu, W. C. V., and Marek, M. W. (2017) demonstrated that theory-based flipped teaching employing oral participation also enhanced students' motivation and made them more efficient in class and substantially increased their knowledge related to idioms, indicating that the flipped classroom obtained the class's teaching goals. Al-Naabi (2020) indicates that flipped learning enhanced students' mastery and practical use of English grammar in speaking. The study also emphasized that flipped methodology was well received by students. In the same way, as noted by Li and Suwanthep (2017) flipped classroom proves a successful technique for imparting EFL speaking. First-year university students who engaged in the flipped classroom instruction performed well in the speaking test. Students liked the flipped classroom,

according to this investigation. Lin and Hwang (2018) examined how flipped classrooms help students strengthen their English skills while presenting. They found many such positive effects over traditional training. The flipped classroom improved students' oral skills, online engagement, collaborative behaviours, and sense of achievement.

Similarly, in India, studies related to flipped classroom have garnered greater attention from researchers, particularly within the framework of engineering and professional education. According to Mohanta & Singh (2016), flipped classrooms lead to active learning by motivating learners to take part in higher-order thinking and problem-solving skills. In particular, after COVID-19 epidemic, implementation of flipped classroom has seen a gradual increase in India. Ramesh et al., (2021) state that students gain access to study the course materials, either books or videos before the session begins and are in a position to dedicate the time in the classroom for engaging learning tasks such as collaborative projects, group discussion, role-play and problem-solving activities. Krishna Chaitanya and Meenakshi Barad Sirigiri (2021) evaluated the implication of flipped classroom in improving the students' communication skills. Though flipped classroom has been a promising method, various challenges such as digital divide, poor infrastructure, limited training for teachers hinder the teaching learning process in India (Ramesh et al., 2021). To conclude, flipped classroom is a paradigm shift in India as it is an effective strategy that has led to the development of active learning and engagement of students. At the same time, it is also necessary to address the challenges in India in terms of teacher training, digital access, etc., to achieve success for regular implementation in classrooms.

Nevertheless, implementing one such strategy doesn't really come without obstacles. Some of the most significant disadvantages of flipping the classroom include low-quality video, difficulty in producing micro-videos, lengthy preparation time for the video, the potential for chaos in the classroom as a result of insufficient network or hardware, and overwhelming work for teachers. Triantafyllou et.al (2015) state that students don't watch the video due to technical problems, they prefer to get knowledge from books and they are not used to such kind of instructions. Kim et al. (2014) say that flipped classroom is a good way to teach and understand, but several teachers only use it to substitute video-based instruction before class and use lecture period to complete assignments.

III. METHODS

Study Design

This research incorporated a quasi-experimental framework, incorporating pre- and post-tests to see how the dependent variables such as body language, grammar, vocabulary, fluency and pronunciation changed following the treatment (Cook & Campbell, 1979). The flipped classroom approach with

instructional design was the independent variable. Moreover, the study involved carrying out semi-structured interviews with students of focus groups to obtain the response for the third research question. For semi-structured interviews, 15 (7 females and 8 males) students were selected.

Participants

The participants belonged to first year B. Tech Pharmaceutical Technology (N = 40) and B.E Geoinformatics Engineering (N = 40), enrolled in a Technical State University, Chennai, Tamil Nadu during the year 2022-2023. On an average, these students received a decade of education in English. Before this study, all the participants were not exposed to the flipped classroom methodology. One-third of the participants reported having undergone blended learning experiences during their secondary education. The students were assigned to experimental and control groups through convenience sampling. The following section deals with a brief outline of each instructional method employed in this study.

Procedure for flipped classroom

The present study spanned for a period of 11 weeks. In addition, the research process was organized into three major phases: (1) a preparatory phase aimed at enhancing speaking skills, (2) an instruction phase to implement flip teaching, and (3) a phase dedicated to comprehensively evaluate the outcomes of teaching and learning. In the preparatory phase for speaking skills, students were given an introduction to prepare and communicate in English, and the importance of speaking skills for engineering students, especially in the campus interview. Prior to implementing the instructional intervention, all students underwent a pre-test in order to assess each and everyone's proficiency in oral communication. Based on the analysis of the pre-test, it was noted that there were no noticeable differences between groups in relation to the speaking abilities of the students. Next, the instructional phase of implementing flipped classroom involved evenly distributed topics over a period of eight weeks. The topics are summarized as follows: (1) Mastering English using 'technology/gadgets', (2) Practicing English by analysing 'pros and cons of lockdown', (3) Learning English with 'interviews of different personalities', (4) Acquiring English using 'movies', (5) Enhancing English by exploring the 'positives and negatives of remote learning', (6) Learning English with 'staying safe on social media', (7) Learning English with 'sports', and (8) Learning English with 'green is great'. Table 2 reveals the course plan of the traditional and flipped classrooms. Subsequently, a post-test was administered during the evaluation phase. Also, the participants completed a questionnaire and were invited for individual follow-up interviews to discuss their learning experience. Per week, each topic was scheduled in two 50-minute class periods. The class period was dedicated to the warm-up activities, pedagogical guidance, speaking activities and feedback on student performance, as mentioned in Table 1. The speaking practice involved various speaking activities such as introduction, role-play, group discussion, picture description, product description, asking for directions, making suggestions, asking for clarification, negotiation, persuading, giving advice, complaining, describing a place, etc. For the control group, the traditional approach of teaching was implemented where the

duration of the class was allocated for instructions, warm-up, lecturing, exercises and speaking activities.

We acknowledge that confounding variables like teacher/teaching quality play a vital role in impacting the study's outcomes while comparing two teaching methods (flipped and traditional methods). To enhance the dependability of the present study and alleviate the influence of such confounding variables, we took certain steps, which are as follows.

Firstly, the same teacher taught both the experimental and control groups. This approach helped us to reduce the variability arising from different teaching styles. As the same teacher taught both the groups, the difference in the language enhancement was attributed to the instructional method (i.e., traditional and flipped classrooms). Secondly, to ascertain that the content remained constant, the same lesson plan was used for both the groups. Though both groups, experimental and control, participated in flipped and traditional classrooms, respectively, the learning outcomes were the same. Thirdly, equal resources were provided for both groups, which includes reading texts, secondary materials, etc., to ensure that there is no difference in the provision of resource materials. Finally, the researchers also ensured that the students from both the groups belonged to the same demographic and academic background.

While doing a comparative study using two approaches, the impact of confounding variables is possible. But the above-mentioned measures helped us to reduce the impact and strengthen the validity of the study. As a steady consistency was maintained with regard to teaching, assessment and resource materials for both the groups, the improvement in language learning can be attributed to the flipped classroom.

TABLE 1
A STUDY COMPARING TRADITIONAL AND FLIPPED CLASSROOM
BASED ON TIME ARRANGEMENTS AND INSTRUCTIONAL METHODS

Traditional classroom			Flipped classroom		
Activities	Time	Method	Activities	Time	Method
Warm-up activity	10 min	F2F	Warm-up activity	10 min	F2F
Vocabulary/ Grammar Teaching	30 min	F2F	Listening & speaking exercises along with grammar and vocabulary exercises based on the video/ audio shared.	30 min	F2F
Vocabulary/ Grammar exercises	25 min	F2F	Guided and Independent speaking practice	45 min	F2F
Speaking Activities Homework (after class and students	35 min	F2F	Feedback on speaking Video, audio, and text material	15 min	F2F

must present it to the class next week)	(sent along with follow activity/ exercise)
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*F2F – Face to Face

TABLE 2
WEEKLY COURSE PLAN OF TRADITIONAL AND FLIPPED SECTIONS

Week	Traditional		Flipped		
1	Introduction to course and course design				
2	Oral proficiency Pre-test				
	In-Class	After-Class	Topic	Before-Class	In-Class
3	Lead-in, Exercise & Speaking	Home work Practice Quiz	Tech/ Gadgets	Lead-in, texts & video/ Audio	Exercise & Speaking
4	Lead-in, Exercise & Speaking	Home work Practice Quiz	Pros and cons of lockdown	Lead-in, texts & video/ Audio	Exercise & Speaking
5	Lead-in, Exercise & Speaking	Home work Practice Quiz	Interviews of famous people	Lead-in, texts & video/ audio	Exercise & Speaking
6	Lead-in, Exercise & Speaking	Home work Practice Quiz	Movies	Lead-in, texts & video/ audio	Exercise & Speaking
7	Lead-in, Exercise & Speaking	Home work Practice Quiz	Positive and negatives of remote learning	Lead-in, texts & video/ audio	Exercise & Speaking
8	Lead-in, Exercise & Speaking	Home work Practice Quiz	Stay safe on social media	Lead-in, texts & video/ audio	Exercise & Speaking
9	Lead-in, Exercise & Speaking	Home work Practice Quiz	Sports	Lead-in, texts & video/ audio	Exercise & Speaking
10	Lead-in, Exercise & Speaking	Home work Practice Quiz	Green is great	Lead-in, texts & video/ audio	Exercise & Speaking
11	Oral proficiency Post-test				

2. DATA COLLECTION AND ANALYSIS

To collect data, this study employed semi-structured interviews and speaking rubric. Besides, the data was analyzed using SPSS software, version 2022.

Speaking rubric

A speaking rubric was constructed for a total of 25 marks to evaluate students' speaking performances in the pre-test and post-test. Various parameters used for assessing speaking skills are body language, grammar, vocabulary, fluency, and pronunciation. Regarding inter-rater reliability, the performance of the students was assessed by two raters (both the researchers). The inter-rater reliability was determined using Krippendorff's alpha and resulted in a coefficient of .75, demonstrating a satisfactory level of reliability (Hayes & Krippendorff, 2007). The speaking proficiency test involved an individual talk, where students were either given a topic to speak about or describe a picture. The scores achieved by the

students, from the pre- and post-tests, who underwent flipped and conventional teaching were evaluated using the SPSS 22 statistical analysis programme.

Semi-structured interviews

In this study individual interviews were conducted with 15 participants. Their responses were recorded in audio format for transcription and analysis. Qualitative data analysis was used to identify and generate relevant themes pertaining to research questions. This process yielded key themes that offer valuable insights into the research topic, providing a basis for comprehensive understanding of students' viewpoints regarding flipped classroom teaching.

IV. RESULTS

First Question

Does the performance of the first year Engineering college students taught using the conventional teaching technique and those instructed using the flipped classroom differ statistically?

TABLE 3
MEAN, STANDARD DEVIATIONS, AND T-TEST FOR THE PRE-TEST SCORES OF EXPERIMENTAL AND CONTROL GROUPS

Area of speaking	Group	No	M	SD	T	p
Body language	Experiment	40	5.74	0.60	0.30	0.761
	Control	40	5.70	0.71	5	
Grammar	Experiment	40	5.60	0.64	1.18	0.640
	Control	40	5.62	0.70	1	
Vocabulary	Experiment	40	6.36	0.63	2.15	0.542
	Control	40	6.16	0.72	4	
Fluency	Experiment	40	6.28	0.57	2.37	0.519
	Control	40	5.98	0.68	6	
Pronunciation	Experiment	40	3.96	1.01	1.75	0.082
	Control	40	4.26	0.66	5	
Total Score	Experiment	40	11.21	0.78	1.54	0.041
	Control	40	12.41	0.65		

Table 3 illustrates a comparison of the pre-test scores between the experimental and control groups focusing on speaking skills, which includes body language, grammar, vocabulary, fluency, and pronunciation. The experimental group (N=40) had mean scores of 5.74, 5.60, 6.36, 6.28 and 3.96 for all five aspects of speaking skills, respectively. Conversely, the control group (N=40) had mean scores of 5.70, 5.62, 6.16, 5.98 and 4.26, respectively. Likewise, the t-test analysis illustrated that there was an absence of considerable disparity in the scores between the two groups, as evidenced by t-values of 0.305, 1.181, 2.154, 2.376 and 1.755, and p-values of 0.761, 0.640, 0.542, 0.519, 0.082, respectively. To conclude, it was observed that the two groups did not show any notable differences on the basis of pre-test scores.

TABLE 4

MEAN, STANDARD DEVIATIONS, AND T-TEST FOR THE POST-TEST SCORES OF EXPERIMENTAL AND CONTROL GROUPS

Area of speaking	Group	No	M	SD	T	P
Body language	Experiment	40	10.98	1.40	14.99	0.0001
	Control	40	6.80	2.03		
Grammar	Experiment	40	11.97	1.80	11.31	0.0001
	Control	40	6.19	1.79	1	
Vocabulary	Experiment	40	13.22	1.60	8.89	0.0001
	Control	40	7.89	1.26		
Fluency	Experiment	40	12.27	2.04	9.84	0.0001
	Control	40	6.05	1.70		
Pronunciation	Experiment	40	9.68	2.64	8.31	0.0001
	Control	40	5.73	2.13		
Total Score	Experiment	40	33.43	3.12	11.54	0.0001
	Control	40	22.32	2.11	4	

Table 4 displays the detailed comparison of the post-test results of the experimental and control groups about speaking skills, comprising body language, grammar, vocabulary, fluency, and pronunciation. The experimental group (N=40) attained mean scores of 10.98, 11.97, 13.22, 12.27 and 9.68, respectively. On the other hand, the control group (N=40) attained scores of 6.80, 6.19, 7.89, 6.05 and 5.73, respectively. Likewise, the conclusion of the t-test revealed a marked difference between the two groups, as evidenced by t-values of 14.99, 11.31, 8.89, 9.84 and 8.31, and a p-value of 0.0001 for all the aspects of speaking skills.

From the findings in Table 4, it is evident that the students in the experimental group facilitated through flipped classrooms performed better than the control group. It is apparent that flipped classrooms influenced the development of students' speaking skills positively.

Second Question

Does the experimental group students' performance in their ability to speak English differ statistically between male and female students?

TABLE 5
MEAN, STANDARD DEVIATIONS, AND T-TEST FOR THE PRE-TEST SCORES OF EXPERIMENTAL GROUP REGARDING GENDER

Area of speaking	Group	No	M	SD	T	p
Body language	Male	19	4.05	0.22	1.378	0.172
	Female	21	4.14	0.36		
Grammar	Male	19	4.00	0.00	1.452	0.150
	Female	21	3.91	0.37		
Vocabulary	Male	19	6.50	0.51	0.404	0.687
	Female	21	6.45	0.60		
Fluency	Male	19	7.00	0.07	1.070	0.288
	Female	21	6.97	0.17		
Pronunciation	Male	19	2.98	0.42	0.256	0.798
	Female	21	3.00	0.42		
	Male	19	11.00	0.53	0.214	0.654

Total Score	Female	21	13.00	0.42
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Table 5 presents a pre-test score analysis of the male and female students in the experimental group in the context of their speaking skills, encompassing body language, grammar, vocabulary, fluency, and pronunciation. The mean scores of the male students (N=19) are 4.05, 4.00, 6.50, 7.00, and 2.98, respectively. Conversely, the mean scores of the female students (N=21) in the experimental group exhibited average scores of 4.14, 3.91, 6.45, 6.97, and 3.00, accordingly. The t-test findings signify that there exists no notable statistical difference between male and female students in the experimental group. This is supported by the t-values of 1.378, 1.452, 0.404, 1.070, and 0.256, and the corresponding p-values of 0.172, 0.150, 0.687, 0.288, and 0.798, accordingly. In general, the research unveiled that there exist no noteworthy differences between students of both genders in the pre-test scores.

TABLE 6
MEAN, STANDARD DEVIATIONS, AND T-TEST FOR THE POST-TEST SCORES OF EXPERIMENTAL GROUP WITH REGARD TO GENDER

Area of speaking	Group	No	M	SD	T	P
Body language	Male	19	8.02	0.22	2.212	0.003
	Female	21	10.05	0.36		
Grammar	Male	19	9.00	0.00	3.430	0.003
	Female	21	10.91	0.37		
Vocabulary	Male	19	12.10	0.51	2.104	0.002
	Female	21	11.08	0.60		
Fluency	Male	19	14.00	0.07	2.215	0.003
	Female	21	15.81	0.17		
Pronunciation	Male	19	8.78	0.42	3.765	0.002
	Female	21	10.00	0.42		
Total Score	Male	19	23.31	0.53	6.21	0.002
	Female	21	27.34	0.61		

Table 6 displays a comparative analysis of the post-test scores of male and female students belonging to the experimental group, with regard to their speaking abilities, which include body language, grammar, vocabulary, fluency, and pronunciation. The study reports the average scores of male students (N=19) as 8.02, 9.00, 12.10, 14.00, and 8.78, respectively. In contrast, the female students (N=21) in the experimental group demonstrated mean scores of 10.05, 10.91, 11.08, 15.81, and 10.00, respectively. According to the t-test, significant statistical difference was noted in the speaking scores of male and female students in the experimental group. The findings are substantiated by the t-values of 2.212, 3.430, 2.104, 2.215, and 3.765 and their corresponding p-values of 0.003, 0.003, 0.002, 0.003, and 0.002, respectively. Overall, the study identified substantial differences between male and female students, as measured by the post-test assessments.

Third question

What are the students' perspectives on the advantages and drawbacks of developing English speaking skills through a flipped classroom?

The qualitative results confirmed that the flipped classroom can upgrade speaking proficiency in several ways. Flipping the classroom has several benefits, which include (1) Enhancing desire to learn and communicate, (2) Increased engagement in language learning, (3) Increased student ownership of learning, (4) Improved critical thinking skills, (5) Increased teacher-student interaction (6) Scope for adaptability to learn on self-directed basis (7) Improve access to learning resources (8) Flexible learning approach. The following student replies demonstrate the merits of the flipped classroom:

"As the video is shared before the class, it gives me time to prepare".

"After watching the video, I practiced speaking at home at my own pace. I also learnt to pronounce new words and use them correctly."

"Reading short articles prior to the class empowered me to explore new words and fueled my enthusiasm to take part in classroom discussions. I used the new vocabulary in the speaking activities in class. It also helped me to improve my reading skills."

"My confidence level has increased, as I am able to spend more time at home practicing speaking. I clarified my doubts during class with my teacher."

"We all get feedback from our teachers on our speaking skills. Based on the feedback we are able to correct our mistakes. We learn from each other's mistakes."

"As I am aware of what I am going to speak at class, I am able to speak before my friends without hesitation."

"As we get proper guidance beforehand, we are able to improve our speaking skills."

On the other hand, various challenges were also highlighted by the students. They include: (1) Lack of time for out-of-class preparation, (2) Difficulty in clarifying the doubts with teachers, (3) Poor network connectivity, (4) Homework from other subject teachers and assessments, (5) Some activities were difficult for students with limited English proficiency.

The following viewpoints from students illustrate the challenges faced by the students:

"We have assessments for other subjects, we are unable to spend time watching videos and preparing for speaking activities."

"Sometimes, I was not able to clarify my doubts instantly, though the teacher was a part of the WhatsApp group."

"The videos were difficult and a bit long. I was not able to concentrate."

"I had network issues at my home and I have to go a bit far from home to watch or download the video."

"The articles shared to read were not of my interest and I didn't read it."

"I spend more time on other apps and feeds while using my mobile phone to read or watch videos shared by the teacher."

The positive outcomes in relation to flipped learning concurs with the findings of Murdoch and Lin (2023) on online learning. The primary aspects that both studies emphasize revolves around engagement of students and self-direction. Likewise, in this context, it can be comprehended that students while engaged in flipped learning understood the importance of learner autonomy, interaction and clarity. Therefore, these components play a vital role when students are involved in flipped and online learning.

V. DISCUSSION

The next question in this study deals with the gender factor. It aims to find out whether there is a notable difference between the speaking skills of male and female students within the experimental group. A noteworthy finding of the present investigation pertains to the notable variation in the English-speaking ability exhibited by the experimental group participants, owing to their gender. The conclusions drawn from the study imply that applying the flipped classroom strategy resulted in a remarkable improvement in the oral communication abilities of female students, relative to their male peers.

The outcomes were noticeable, and it could be due to female students' ability to express emotions, as mentioned by Vo (2022) and Oflaz (2019). Numerous studies have indicated that women tend to exhibit greater expressiveness of various emotions, such as despair, dissatisfaction anxiety, disbelief and delight, in comparison to men (Sun et al. 2020; Sobin and Alpert 1999). Generally, women employ varying intonation and pitch while they speak. It is also believed that women inhabit a social construct, which influences their speaking abilities. The outcomes of this study concur with previous research works (Ismail 2015 and Beiser & Hou 2001), which demonstrates that women's proficiency in using technology enhances their language abilities.

The last question aimed at understanding the students' point of view on the integration of flipped classroom in the development of speaking abilities. According to the viewpoint of the students, employment of flipped classroom for developing speaking has both advantages such as decrease in speaking nervousness, increase in higher-order thinking skills, peer-interaction, motivation, engagement of students and disadvantages like increased workload for students, internet related issues, time consumption and less appealing tasks. Language acquisition demands dedication, persistence, continual efforts and practice. To optimize learning outcomes in language classes, students are expected to participate in a variety of tasks in the target language. Constrained classroom time can push teachers to omit essential components that contribute to successful language instruction (Turan and Akdag-Cimen 2020). Implementation of flipped classroom leads to academic achievement through student engagement

(Chen Hsieh, Wu, & Marek, 2017), use of technology to increase teacher-student interaction (Bergmann & Sams, 2012), thereby implying that students have adequate time for in-class speaking activities. Flipped classrooms also foster individual learning and they learn at their own pace (Basal, 2015). Also, students have the provision to watch or read materials in advance and could also practice it till they get a hold of the idea. In other words, they come prepared with a topic to the class, which is highly helpful in classroom tasks. Thus, it is implied that flipped classrooms help students to become independent and learn at their own pace, develop higher order thinking, and engage in learning.

However, the study revealed difficulties coupled with setting up the flipped classroom. For instance, some students did not watch the video or listen to the audio prior to the class. To overcome this challenge, we formulated a few strategies to ensure that flipped classroom was beneficial for all of them. Firstly, before the start of the session the researchers recapped the video or audio content to ascertain that students who did not perform the assigned task before the class still had the required context to take part in the classroom tasks. Secondly, the flipped classroom involved more time, group discussions, introduction, role-play, picture description, product description, etc., which reinforced the key ideas and offered additional chances for students to pick up who had missed the pre-class task. Thirdly, to motivate students to engage in watching or listening to the pre-class content the teachers asked simple questions in the form of a quiz from the audio and video content. Likewise, some participants expressed dissatisfaction with their screen time. This finding corroborates with Young et al.'s (2014) study, wherein respondents identified video watching as their most time-consuming activity. Similar to traditional classrooms, flipped classrooms require students to complete homework by watching videos and reading texts outside of class. Likewise, Correa (2015) found that students may attend classes without completing their homework, and Zappe et al. (2009) argued in favour of providing certain lectures in their traditional format rather than flipping them. Evseeva and Solozhenko (2015) suggest that teachers must meticulously and methodically create and execute this method, and colleges and universities should offer assistance for teachers and students to facilitate flipped classroom implementation. Of course, flipped learning has advantages such as student-centered instruction, increased motivation, and more time for classroom activities, but individual differences may cause some students to not prefer it. In spite of these challenges, flipped classroom made an impact on students, reinforcing the importance of active and collaborative learning. The limitations of the study include sample size being limited to 80 second language engineering students and the sessions were conducted for 11 weeks with two hours allotted for each week.

Though the present study aims at understanding the role of flipped learning and its impact on engineering students, it offers a significant foundation for understanding how team interaction could be further examined through flipped classroom. Earlier, studies have projected the positive impact of cooperative learning models using flipped learning. For instance, Eryilmaz

and Cigdemoglu (2018) proved that cooperative flipped learning helped learners decrease their social anxiety and Gopalan and Klann (2017) revealed that team-based learning can enhance academic success. Henceforth, researchers in future can study how peer and teamwork can lead to positive learning outcomes by refining flipped learning models.

Implications for the Engineering Education Community

The present study emphasizes the potential transformation of the flipped classroom method in improving the speaking skills of engineering students. Competency in speaking skills is key for employment, impactful collaboration and competitiveness at global scale in an engineer's career. Further, flipped classroom promotes active learning, providing scope for students to take part in real-time speaking activities. This improves their communication skills in terms of pronunciation, grammar, fluency, content and body language. Applying flipped classrooms for teaching engineering students ascertains that graduates are well-equipped with key soft skills in their career development.

Future Scope of the Study

In this study, the researchers provide a strong foundation to explore the enduring influence of flipped classroom on speaking skills and engineering graduates' professional growth. Future studies can be extended through this approach pertaining to other skills like writing, critical thinking or using AI and virtual reality for better outcomes in language learning. Moreover, studies can focus on other challenges related to digital access and infrastructure facilities to adapt flipped classrooms for successful implementation where resources are under-developed. A study on teacher training programs to enhance implementation of flipped learning is deemed to be vital for refining and expanding the transformative potential in engineering education.

CONCLUSION

The research study analyses the impact of flipped classrooms on the oral proficiency of engineering students and their attitudes towards learning English speaking skills. The findings indicate that incorporating flipped classroom improved their speaking skills and positively influenced their attitudes towards speaking in the English language. The implementation of self-directed and collaborative precourse tasks, along with in-class activities, resulted in increased satisfaction with flipped classroom, higher motivation to engage, and greater participation in speaking activities. As per the research conclusions and discussions, the researchers propose that flipped classroom can be effectively implemented in speaking courses. Flipped classroom approach facilitates active, motivated, and engaged participation of students in speaking tasks. It involves performing flipped classroom activities outside of class and monitoring students' progress. Student engagement is enhanced when video, audio and text materials align with their interests.

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