REDUCING ENGLISH-SPEAKING ANXIETY IN ESP CONTEXTS THROUGH FLIPPED LEARNING EVIDENCE FROM INFORMATICS ENGINEERING STUDENTS

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Abstract

This study examines how flipped learning can help reduce English-speaking anxiety among Informatics Engineering students. In many technical programs, students often struggle to communicate in English due to limited proficiency, low confidence, and anxiety, which can limit their participation in class. However, previous studies have mostly focused on general English contexts, with limited research examining speaking anxiety in English for Specific Purposes (ESP), especially in technical fields such as Informatics Engineering. This study addresses this gap by focusing on both the psychological and learning effects of flipped learning in an ESP context. This study used a mixed-methods approach, combining a quasi-experimental one-group pretest–posttest design with a post-intervention survey and classroom observations. The participants were 25 second-year students at Universitas Duta Bangsa Surakarta. A 10-item speaking anxiety questionnaire and a 7-item perception survey were used. The results showed a significant decrease in speaking anxiety (pretest M = 3.86; posttest M = 3.40; $t(24) = -5.27$, $p < .01$). Students also reported increased confidence and better preparation. The findings suggest that flipped learning can help reduce speaking anxiety and support English communication in ESP contexts.

Keywords*: flipped learning, speaking anxiety, ESP, informatics engineering, higher education*

I INTRODUCTION

Informatics Engineering students face discipline-specific communication demands that extend beyond general English proficiency. In academic and professional contexts, they are expected to explain algorithms, describe system processes, present IT project outcomes, and collaborate using technical English (Daiu et al., 2025; Garcia & Cruz, 2024). These tasks require not only foundational language competence but also the ability to articulate complex and abstract technical concepts with clarity and precision. Given that English is widely used in programming resources, technical documentation, and global collaboration, effective English communication constitutes a critical competency for Informatics Engineering students (Iyappan et al., 2025).

In this context, English for Specific Purposes (ESP) plays an important role in supporting students' communication needs. Unlike General English, ESP focuses on the specific language, vocabulary, and discourse practices required in particular fields, including technical communication in Informatics Engineering (Hutchinson & Waters, 1987; Thaksanan, 2023). For Informatics Engineering students, ESP learning is designed to align with real academic and professional tasks, such as understanding technical documents, explaining coding concepts, and delivering project presentations. Through this approach, students can develop English skills that are directly relevant to their discipline and future careers (Dou et al., 2023; Shalash, 2024).

Informatics Engineering students at Universitas Duta Bangsa Surakarta face specific challenges shaped by their learning environment. The program is conducted in a non-English-medium instruction (non-EMI) context, where English is taught as a subject rather than used in daily instruction. As a result, many students have limited experience in spoken English, as prior learning tends to emphasize reading and grammar. In addition, students are required to combine basic language skills with technical vocabulary and communication practices related to computer science. This makes learning more demanding, as students must not only understand English but also use it to explain algorithms, coding concepts, and IT project documentation. This gap between students' language proficiency and disciplinary demands often increases speaking anxiety and reduces their participation in classroom activities.

Even though English is important, many Informatics Engineering students still struggle to improve their speaking skills. Many of them start university with limited English ability. Thus, it is hard for them to join technical discussions or take part in academic activities. Lecturers often notice that students lack sufficient basic English to understand and use language relevant to their field. Because of this, students may feel unsure and avoid speaking when they are asked to do so. Previous studies show that

engineering students often feel high speaking anxiety because they lack practice, have limited vocabulary, and have low confidence (Kakepoto et al., 2022). Similarly, Alfiani et al. (2022) explain that speaking anxiety is a serious problem that affects communication and can make students avoid speaking in English.

Language anxiety is known as an important factor that can be an obstacle for students to speak well. Horwitz et al. (1986) explained that foreign language anxiety is a combination of emotional, cognitive, and behavioral responses that happen during the process of learning a language. They also stated that even students who are good in other subjects can still face psychological difficulties when they have to speak in a foreign language. Supporting this idea, Young (1990) stated that speaking is the most stressful skill because it directly affects students' confidence, self-esteem, and participation in class. Ibrahim and Amin (2021) also found several main causes of speaking anxiety among EFL learners, such as fear of making mistakes, worry about being judged negatively, and feeling nervous when speaking in front of others.

The gap between students' English proficiency and the demands of their discipline often increases speaking anxiety. Students may worry about being misunderstood, making errors when explaining technical ideas, or failing to communicate clearly in academic or professional contexts. This anxiety can reduce participation, lower confidence, and slow down overall progress in English learning.

Instead of using only traditional teaching methods, lecturers need strategies that give students more time to understand and practice the language before speaking in class. In this situation, flipped learning has become more important, especially in courses that need active participation. In a flipped classroom, students learn new material before class, usually through short videos or guided readings. This allows class time to be used for more interactive activities. As a result, students come to class with basic understanding, so it is easier for them to join discussions, group work, and speaking activities.

Previous studies show that flipped learning can improve not only students' understanding but also motivation, classroom interaction, and higher-level thinking skills (Baig & Yadegaridehkordi, 2023; Strelan et al., 2020; Zhou, 2023). In language learning contexts, providing students with time to study vocabulary and grammar before class may also reduce speaking anxiety because students feel more prepared to participate in classroom activities (Kernagaran & Abdullah, 2022).

Recent studies also show that flipped learning can be effectively integrated with technology. Cai (2024) found that intelligent speech recognition tools can support speaking practice in flipped classrooms, while Sa et al. (2022) introduced a flipped learning model supported by big data analytics to monitor student participation and classroom activities. These findings suggest that flipped learning is flexible and suitable for technology-related fields such as Informatics Engineering.

Flipped learning may also support students' psychological readiness in language learning. Zhang (2022) found that this method can reduce stress and increase motivation. For students in technical fields, flipped learning provides more time to understand specific vocabulary and concepts before classroom interaction, which may help reduce anxiety during speaking activities. In addition, activities such as discussions, presentations, and collaborative tasks may help students improve confidence and fluency in communication.

Despite the growing use of flipped learning in language education, its application in English for Specific Purposes (ESP), particularly in technical fields such as Informatics Engineering, remains underexplored. Previous studies have mainly focused on general English or non-technical contexts and have not sufficiently addressed speaking anxiety among students who need to communicate technical content in English (Kernagaran & Abdullah, 2022; Zhang, 2022). Although ESP scholars have emphasized the importance of aligning language learning with professional needs (Hutchinson & Waters, 1987; Dudley-Evans & St. John, 1998), there is still limited empirical evidence on how flipped learning can support both language performance and emotional readiness in technical ESP contexts.

Therefore, this study aims to examine the effect of flipped learning on English-speaking anxiety among Informatics Engineering students. Specifically, the study investigates whether flipped learning can reduce students' speaking anxiety and improve their confidence in using English for technical communication. Accordingly, this study addresses the following research question: The extent of how flipped learning reduce English-speaking anxiety among Informatics Engineering students in an ESP context.

II MATERIALS AND METHODS

This study used a quasi-experimental one-group pretest–post-test design within a mixed-methods approach, followed by a survey. This design allowed the researcher to compare students' speaking

anxiety before and after the flipped classroom activities. It also collects their opinions about the learning process. This combination is often used in classroom research to get both numerical results and students' personal views (Creswell, 2014; Cohen et al., 2018). Tashakkori and Teddlie (2010) also explain that combining quantitative and qualitative data can provide a more complete understanding of classroom experiences and learning processes.

The pretest–post-test part helps to directly compare students' speaking anxiety levels before and after using flipped learning, so it can show clear improvement or decline. At the same time, the descriptive survey gives more detailed information about students' attitudes, confidence, and experiences. This provides a more complete understanding of how flipped learning affects both emotional and thinking aspects in language learning.

However, because the study used a one-group pretest–post-test design without a control group, the findings should be interpreted carefully, as causal relationships cannot be fully established.

This study involved 25 second-year students from the Informatics Engineering program at Universitas Duta Bangsa Surakarta. The participants were chosen using convenience sampling, because it was the most practical method for this classroom research, especially since access and availability are important factors (Mackey & Gass, 2016). All students had already completed a General English course before the study and had at least a basic level of English, which was needed so they could take part in speaking activities. The group included 17 male and 8 female students, aged between 18 and 21 years old. In addition, this number of participants is considered suitable for a paired-samples t-test, which is commonly used in small-scale educational research (Creswell, 2014).

Three instruments were used to collect the data. The main instrument was a speaking anxiety questionnaire adapted from the Foreign Language Classroom Anxiety Scale (Horwitz et al., 1986) and modified to reflect the Indonesian ESP context of Informatics Engineering students. Several questionnaire items were adapted to reflect situations commonly experienced by Informatics Engineering students, such as discussing technical topics and communicating IT-related content in English, based on previous studies on speaking anxiety among engineering students (Kakepoto et al., 2022), while maintaining the core constructs of foreign language anxiety. The adaptation also considered the participants' non-English-medium instruction learning environment and classroom communication practices. To improve contextual relevance and clarity, the adapted items were reviewed by two ESP lecturers familiar with Indonesian higher education settings.

Although the concept of foreign language anxiety may be influenced by cultural and educational contexts, this study did not assume that the original instrument could be directly applied without modification. Therefore, the questionnaire items were adjusted to better match the participants' English proficiency levels, classroom experiences, and communication needs in the Informatics Engineering program. The final questionnaire comprised 10 Likert-scale items covering fear of negative evaluation, communication apprehension, and linguistic insecurity. Example statements included "I feel nervous when I have to speak English in class" and "I feel anxious when explaining technical topics in English." Students responded using a five-point Likert scale ranging from strongly disagree to strongly agree.

The second instrument was a post-intervention survey used to understand students' opinions about the flipped learning model. It focused on their confidence, participation, and overall learning experience after the implementation. The survey had seven closed-ended questions using a five-point Likert scale and was adapted from previous studies on flipped classrooms (Lo & Hew, 2017; Kernagaran & Abdullah, 2022). The questions were adjusted to fit the Informatics Engineering context, with examples such as "The flipped classroom helped me feel more prepared to speak in class" and "I found learning through videos and pre-class materials useful."

The third instrument was a classroom observation sheet. It was used to record students' participation, their willingness to take part in speaking activities, and visible signs of anxiety, such as hesitation or avoidance. These observations supported the questionnaire and survey data and provided additional information on how students reacted to the flipped classroom activities in real-world situations.

The procedure of this study was divided into three main stages. The first stage was the pretest, in which all students completed a speaking anxiety questionnaire to measure their initial level of anxiety when speaking English. This stage provided baseline data for comparing changes after the intervention.

The second stage was the flipped learning intervention. Before each class session, students studied the core materials independently through short videos and IT-related readings. The materials were designed to familiarize students with technical vocabulary and lesson content before classroom activities. During face-to-face sessions, students participated in active speaking tasks, discussions, and

classroom interactions. The intervention was conducted over two weeks across four 100-minute sessions. This model was selected because previous studies have shown that flipped learning can increase student participation and improve speaking performance in language learning contexts (Strelan et al., 2020; Kernagaran & Abdullah, 2022).

The final stage was the post-test. After the intervention, students completed the speaking anxiety questionnaire again to measure changes in their anxiety levels. In addition, students completed a post-intervention survey to report their perceptions of the flipped learning experience, while classroom observation notes were used to support the findings. The use of questionnaires, surveys, and classroom observations supported data triangulation and helped strengthen the credibility of the findings.

The researchers used two approaches to analyze the data: quantitative (numbers) and qualitative (descriptions). To understand the numbers, we looked at the average scores. A paired-samples t-test was used to show if the change in student anxiety was real or just by chance. Before this test, we checked the data to ensure it followed a normal distribution. The quantitative data were analyzed using descriptive statistics and a paired-samples t-test following commonly used procedures in educational research (Cohen et al., 2018; Field, 2018).

The qualitative data were analyzed using thematic analysis. This process involved identifying patterns and recurring themes related to students' confidence, motivation, and challenges in speaking English. The coding process followed Dörnyei's (2007) framework for applied linguistics research, which focuses on both how often themes appear and how deep the information is. By combining these approaches, the results not only show statistical data but also represent students' real experiences.

Ethical principles were also carefully followed in this study. Participation was voluntary, and students were allowed to leave the study at any time without any consequences. All data were kept confidential, and the results were reported in general terms only to ensure that participants remained anonymous and their identities were protected.

III RESULTS AND DISCUSSION

3.1 EFFECT OF FLIPPED LEARNING ON SPEAKING ANXIETY

The pretest results showed that most Informatics Engineering students had moderate-to-high levels of English-speaking anxiety before the intervention, with a mean score of 3.86 (SD = 0.28) on a 5-point Likert scale. After the flipped learning intervention, the post-test mean decreased to 3.40 (SD = 0.25), indicating a reduction in students' speaking anxiety.

Table 1. The Mean, Standard Deviation, and Number of Participants: Pretest and Posttest

Test	Mean	SD	N
Pretest	3.86	0.28	25
Posttest	3.40	0.25	25

A paired-samples t-test indicated that the decrease in speaking anxiety after the intervention was significant, $t(24) = -5.27$, $p < .01$, with a large effect size (Cohen's $d = 1.05$). The extent of the difference suggests a substantial practical effect. Overall, the results showed lower levels of speaking anxiety after the flipped learning intervention.

Table 2. Pretest and Posttest Speaking Anxiety (N = 25)

No	Item	Pretest Mean	Posttest Mean	Change	Interpretation
1	I feel uneasy when asked to speak English during class activities.	4.20	3.50	-0.70	Decreased anxiety
2	I am concerned about making errors when I speak in English.	3.80	3.30	-0.50	Decreased anxiety
3	Talking about technical topics in	4.00	3.60	-0.40	Decreased

	English makes me feel anxious.				anxiety
4	I feel awkward speaking English in front of my classmates.	3.50	3.00	-0.50	Decreased anxiety
5	I often hold back from speaking English because I am afraid of making mistakes.	3.70	3.40	-0.30	Slight decrease
6	I am afraid whenever the lecturer calls on me to answer in English.	4.10	3.60	-0.50	Decreased anxiety
7	Compared to reading or writing, I lack confidence when speaking English.	3.90	3.50	-0.40	Decreased anxiety
8	I am worried that others will judge my English grammar or pronunciation.	3.90	3.50	-0.40	Decreased anxiety
9	I feel more at ease speaking English in informal conversations than in the classroom.	3.60	3.20	-0.40	Decreased anxiety
10	Even when I understand the material, I still feel stressed about speaking English in class.	3.80	3.40	-0.40	Decreased anxiety
—	Overall Mean	3.86	3.40	-0.46	Moderate improvement

Note. Items adapted and contextualized from Horwitz et al. (1986) and Kakepoto et al. (2022).

Table 2 presents the descriptive results of the speaking anxiety questionnaire. The overall mean score decreased from 3.86 in the pretest to 3.40 in the posttest, demonstrating lower levels of speaking anxiety after the flipped learning intervention. All 10 items showed decreases, with mean changes ranging from -0.30 to -0.70.

The largest decrease was observed in Item 1 ("I feel uneasy when asked to speak English during class activities"), which declined by 0.70 points. Similarly, Items 2 ("I am concerned about making errors when I speak in English") and 6 ("I am afraid whenever the lecturer calls on me to answer in English") each decreased by 0.50 points. Items 3, 7, 8, 9, and 10 also showed decreases of 0.40 points each.

Generally, the results showed lower levels of pressure during speaking activities, particularly when students participated in formal classroom tasks and explained technical concepts in English. Smaller decreases were observed in items related to pronunciation, grammar, and fear of making mistakes.

The smallest decrease was found in Item 5 ("I often hold back from speaking English because I am afraid of making mistakes"), which decreased by 0.30 points. Compared to the other items, this result showed a more limited change in avoidance-related anxiety.

3.2 STUDENT PERCEPTIONS OF FLIPPED LEARNING

While the pretest–post-test results demonstrated a reduction in students' speaking anxiety, it was also important to explore how they perceived the flipped learning model itself. Students' perceptions of the flipped learning approach are illustrated in Table 3.

Table 3. Students' Perceptions of Flipped Learning (Posttest Survey, N = 25)

No	Statement	Agree /Strongly Agree	Mean (1–5)	Interpretation

1	The flipped classroom helped me feel more prepared to speak during lessons.	72%	3.90	Positive
2	Watching videos or reviewing materials before class improved my understanding of technical vocabulary.	68%	3.85	Positive
3	I felt more confident participating in class discussions and speaking activities.	76%	4.00	Positive
4	The flipped classroom approach lowered my anxiety about using English.	60%	3.60	Moderately Positive
5	Doing pre-class tasks made the classroom sessions more meaningful and effective.	80%	4.10	Positive
6	I prefer this method over the traditional lecture-based approach.	64%	3.70	Positive
7	The flipped classroom increased my motivation and active involvement in learning.	72%	3.95	Positive

Note. Items adapted and contextualized from Lo and Hew (2017) and Kernagaran and Abdullah (2022).

The survey results indicated generally positive perceptions of the flipped learning model. More than 70% of the students reported that the pre-class videos and readings helped them prepare for speaking activities. In addition, approximately two-thirds of the students reported higher confidence during group activities, while 60% reported lower levels of anxiety when making mistakes. The students' written responses also reflected similar patterns. Several students stated that reviewing vocabulary before class helped them participate more comfortably in classroom discussions. Other responses indicated that students felt more prepared during speaking activities because they had already studied the material before class sessions.

The survey data also provided qualitative insights into students' experiences with flipped learning. Several students noted that preparing with videos before class helped them manage their anxiety:

"I can study the vocabulary first before class, so I was not so nervous when speaking."

"Watching the video first gave me more time to know the topic and practice by myself."

"Before, I felt shy. Now I can speak more."

"I can prepare first, so I am not confused in class."

"When I reviewed the videos before class, I had time to write down new words and practice pronunciation, so I felt more confident."

"I can answer better after I prepare."

These comments were consistent with the quantitative findings and reflected students' perceptions of pre-class preparation and classroom speaking activities during the intervention.

3.3 INTERPRETATION OF ANXIETY REDUCTION

The results showed that students felt less anxious when speaking in class after the flipped learning intervention. Many students did not seem as nervous when asked to speak, suggesting they felt more confident during speaking tasks.

This matches what researchers like Horwitz et al. (1986) found, that speaking anxiety usually comes from a fear of making mistakes. It also backs up the idea from Kernagaran and Abdullah (2022) that preparing before class may reduce classroom pressure. The reduction in anxiety may be associated with increased preparation time and repeated exposure to technical vocabulary before classroom interaction. This preparation may reduce cognitive pressure during speaking tasks and improve students' perceived readiness to participate. When students can go over the videos and readings at their own speed, they feel more prepared to participate in classroom discussions.

In addition, the way the class is set up matters. By combining home study with active classroom practice, students appeared less concerned about making mistakes. In the end, flipped learning is not just about learning the facts; it is about helping students manage the stress of speaking with others.

However, the results need to be understood carefully. This study did not use a control group, so it is hard to know how much of the improvement was due to the flipped learning model. Also, the intervention was quite short, so the long-term effects remain unclear. Future studies with a better-controlled design and a longer time period are needed to give clearer results.

3.4 Interpretation of Student Perceptions

The findings are consistent with earlier studies showing that flipped classrooms support more interactive and student-centered learning (Strelan et al., 2020). Similar results were found by Zhou (2023), who explains that this method can increase participation and help students feel more confident during classroom activities. Other studies also highlight its psychological benefits, especially in reducing stress and increasing motivation (Zhang, 2022).

For Informatics Engineering students, this is very important. Their anxiety is not only caused by limited English skills, but also by the difficulty of explaining technical ideas in English. Giving students time to study at home before class indeed takes the pressure off. They can develop a better understanding of the basic material. Then, once they are in class, things like group talks and guided practice give them a chance to actually use what they have learned. It makes the transition from "learning" to "doing" feel much more natural. This combination of preparation and classroom interaction creates a more comfortable learning environment. Students feel more prepared and more willing to participate. Over time, this learning process may support lower speaking anxiety and greater confidence in communication.

3.5 Implications for ESP / Informatics Students

The findings suggest that flipped learning can help reduce speaking anxiety among Informatics Engineering students. By combining independent study before class with practice during class, this method gives students more time to understand both the language and the content before they are asked to speak. This makes it easier for them to handle public speaking tasks and explain technical ideas in English.

Similar results have been reported in previous studies. Flipped learning helps students become more independent and develop higher-level thinking skills (Baig & Yadegaridehkordi, 2023). In practice, this method gives students a more active role in their learning and creates more opportunities for meaningful classroom communication.

For lecturers, the role also changes. They do not spend most of the time explaining grammar. Instead, they guide and support students in using English in real and practical situations related to their field. This is especially important in informatics, where students need to explain technical ideas clearly in both academic and professional settings.

IV CONCLUSION

Overall, this study shows that the flipped classroom approach helped Informatics Engineering students feel less anxious when speaking English. After the intervention, students appeared more comfortable participating in classroom discussions and presenting technical topics in English. Based on the survey responses, having access to videos and readings before class helped students feel more prepared to participate in speaking activities. The findings suggest that combining pre-class preparation with classroom speaking practice may support students' confidence and psychological readiness during English communication activities.

This study also contributes to ESP and flipped learning research by providing evidence from a technical learning context, especially among Informatics Engineering students who need to explain technical content in English. In ESP settings, students often face challenges not only in using English but also in explaining technical concepts clearly. The findings indicate that giving students time to study materials before class may help them feel more ready to participate in speaking activities and communicate technical ideas more confidently.

However, these findings need to be interpreted carefully. The study involved a small number of students from a single context, and the intervention was conducted over a short period. In addition, the study partly relied on self-reported data, so the responses may not fully represent students' actual speaking performance. Future research can examine this method with larger, more diverse student

groups over a longer period. Using performance-based assessments may also provide a clearer understanding of how flipped learning relates to speaking skills and anxiety in ESP classrooms.

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