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Speaking Difficulties in Presenting Physics Experiments: A Survey Study

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Abstrack: Speaking difficulties in English-medium physics experiment presentations remain an underexplored issue, as they involve linguistic, psychological, and discipline-specific factors. This study aims to identify the types and levels of speaking difficulties experienced by physics students during experiment presentations. A descriptive quantitative survey design was employed involving 61 respondents, consisting of 56 physics students and five physics teachers or lecturers. Data were collected using a validated questionnaire measuring several domains of speaking difficulty, including pronunciation, fluency and delivery, vocabulary and grammar, interaction and question-and-answer sessions, and content organisation. The data were analysed using descriptive statistics. The results indicate that pronunciation, fluency, and delivery constitute the most dominant challenges (M = 3.10), followed by interaction and Q&A (M = 3.05) and vocabulary grammar issues (M = 3.04), while content organisation is the least problematic aspect (M = 2.90). Speaking anxiety is at a moderate level (M = 3.20), mainly characterised by physical symptoms and fear of negative evaluation. Furthermore, 87% of respondents reported insufficient oral proficiency despite having conceptual understanding of physics content. These findings highlight the need for structured speaking training in physics courses, particularly focusing on technical vocabulary mastery, guided oral explanations, and simulated Q&A practice to support clearer and more confident scientific communication.

INTRODUCTION

Speaking difficulties in educational settings represent a persistent challenge for students in expressing ideas orally during classroom activities. Selimović-Korjenić (2025) argues that such difficulties primarily stem from limited grammatical accuracy, which restricts students' ability to communicate ideas clearly and effectively. In addition to linguistic factors, low self-confidence often reduces students' willingness to participate in oral classroom interactions (Azmy, 2023). Psychological factors related to instructional practices and students' perceptions of peer evaluation further influence their ability to articulate learning outcomes, resulting in ideas that are not adequately expressed during classroom activities (Selimović-Korjenić, 2025). Although these challenges occur across various classroom contexts, they are particularly pronounced in physics education, especially during physics experiment presentations. In this context, students are required to explain experimental procedures, describe observed phenomena, and relate experimental findings to relevant theoretical concepts. To convey scientific understanding accurately, physics

learning requires the use of discipline-specific terminology, mathematical equations, and graphical representations (Doran, 2017). Students with stronger conceptual understanding tend to present clearer and more coherent explanations that are closely connected to underlying course concepts, whereas students with limited understanding often produce less effective and less coherent oral presentations (Treagust et al., 2017).

For students, the ability to articulate their thoughts is very important, especially if they want to share them in a classroom setting. Communication skills allow students to clarify their thoughts, analyse information, and participate in exchanges of ideas that require precision and articulateness. Gascoigne et al. (2020) argue that students learn to synthesise information, draw valid conclusions, and communicate their understanding when they engage in meaningful learning and communication of science. However, because students are often given limited opportunities to discuss physics topics verbally, they often struggle when presenting the experiment results. Therefore, it is essential to explore the relationship between speaking challenges and conceptual understanding to improve how students communicate their understanding of science.

There is a wealth of prior research that accounts for the high levels of speaking anxiety suffered by students. According to Ediwarman et.al 2023, presenters must deal with anxiety, lack of focus, and mumbling. They explain that having self-doubt and overwhelming anxiety is the most contributing factor to this constant distraction. In their study on self-efficacy beliefs in story elaboration and sharing, Le et al. (2023) illustrated the positive impact of storytelling approaches on classroom participation. Positive attitudes and a strong sense of self-assurance particularly self-confidence are associated with smoother and clearer speech production (Baktillah et al., 2024; Yuliana et al., 2024).

No other studies have attempted to combine speaking difficulties and communication skills in the context of learning physics. Most studies examine the components of public speaking anxiety and the psychological factors separately from the linguistic ones, without considering their integration when students explain physics concepts. Also, studies in language education seldom address the specific communication needs of physics presentations. This gap in the literature provides a case for studies to focus on the interrelation between speaking difficulties and communication skills in learning physics.

To complement the literature, the researcher observed that students in physics classes often struggle to convey their ideas clearly and confidently during experiment presentations. Precision and articulation are critical in explaining the fundamental principles of physics in students' presentations. Students often overlook these skills because they focus too much on polishing their presentations and obtaining accurate results in their experiments. Unpolished presentations and a lack of clear articulation are issues many students face and result from a combination of limited opportunities to speak on a scientific topic, self-esteem issues, and performance anxiety (Kustyandari et al., 2025). These observations indicate that structuring speaking tasks with feedback is critical for enhancing students' confidence and improving their ability to communicate scientific ideas effectively.

Students who have difficulty communicating ideas with confidence and assurance because of their lack of public speaking experience are having challenges creating and presenting slides for a physics experiment. Speaking is a complex sub-

skill of communication which involves the fluent and accurate usage of a language along with its structures and components, including correct use of grammar, pronunciation, and vocabulary (Candraloka et al., 2019). Speaking problems, including a lack of mastery of the low and high levels of a language, and pronunciation problems, articulated and inefficient communication (Noori et al., 2024). Speaking is a complex phenomenon encumbered with psychological issues and lack of self-efficacy in public speaking. This leads us to address the phenomenon of speaking as a multi-dimensional task (Quinto et al., 2025).

Students' confidence and efforts are often impacted by speech anxiety or communication apprehension. It typically presents with symptoms of distress and behaviours that are dysfunctional, and are actually doing the speech. This has been documented by Quinto (2025). Simply put, communication skills are critical when learning and teaching the subject. As with all other courses, one must be able to convey their ideas proficiently. However, one must be able to ask questions, collaborate with others, and combine theoretical knowledge with the practical aspects of the discipline (Wijayanti et al., 2025; Saldo et al., 2020; Rusilowati et al., 2013). Problem-based learning, as well as other open learning models, help students develop their conceptual knowledge and scientific skills, as well as their ability to work in a team and thus their communication skills, which are necessary for learning the subject.

In addition to the psychological and linguistic challenges students encounter, they also encounter difficulties arising from the organization and structure of scientific presentations. Most students experience difficulties constructing their explanations in a cohesive manner, which leads to a lack of clarity in transitions, then breaks the smooth logic flow with regard to the procedures, results, and theory of the experiments being discussed (Sharif, 2021; Hansel & Schutz, 2025). Problems in choosing appropriate scientific vocabulary that aligns with grammatical structures also lead to misinterpretation of concepts, especially when relevant technical vocabulary, unit symbols, and or other abbreviated terms are misused (González Ardeo, 2013; DIPC, 2019). There are also pronunciation, fluency, and pacing issues, along with the overuse of fill words and a lack of proper pacing, that result in diminished audience comprehension (Tarr & Alicea-Muñoz, 2024). In addition, students often face challenges in the question-answer phases, particularly when they are confronted with varying accents along with the need to generate impromptu speech in a contextually relevant manner (Sharif, 2021; Hansel & Schutz, 2025). Considering these factors together shows that difficulties in speaking during physics experiment presentations are complex and require specific teaching assistance.

These speaking difficulties in physics experiment presentations not only affect students' oral performance but also have profound implications for the teaching and learning process of physics. The inability of students to provide complete and thorough descriptions of the experimental procedure, experimental results, and key concepts related to the experiment will also limit teachers' ability to accurately measure or assess their students' level of conceptual understanding, meaning that false assumptions about students' understanding of experimental content may go unnoticed for an extended period of time. Over time, this situation may have a detrimental effect on the Development of students' ability to reason scientifically, communicate effectively, and develop the confidence necessary to create competencies in physics. Furthermore, because precise language and logical, clear explanations are required when

communicating scientific concepts, difficulties in communicating clearly will compound the failure to meet the above-mentioned objectives. In addition, although the impact and context of speaking difficulties, speech anxiety, and conceptual understanding of physics have received some attention, little has been written about this topic in depth, making it an area of urgency to promote the use of more effective instructional strategies, assessment practices, and targeted pedagogical interventions within the physics classroom.

Building upon the above background, this study aims to investigate students' speaking difficulties when giving physics experiment instructions. In particular, we aim to identify the nature of students' speech difficulties, their anxiety when speaking, and how well they understand physics concepts in their spoken expression. As a result, we will try to respond to the following research inquiries:

1. When students present physics experiments, which speech disorders are most common?
2. How much does speech anxiety affect students in that situation?
3. How do students' speaking skills during presentations relate to their comprehension of physics concept?

RESEARCH METHODS

This study employed a descriptive, quantitative survey design to investigate the speaking challenges students face during physics experiment presentations. A quantitative approach was used to collect and analyse data from 61 participants, consisting of 56 physics students and five physics teachers or lecturers, providing an overview of the occurrence and characteristics of speaking difficulties (Kazanskaia, 2025). The method also managed to collect data capture trends shown in variables in stage detailing, wording, grammar, social features affecting communication, and factors influencing speech fluency (Slater et al., 2024). The subjects were semi-purposively selected participants with relevant prior experience in teaching and learning physics, along with additional input from teachers and lecturers. This theoretically enhanced the understanding of the problems the learners experienced. Overall, this approach provided a comprehensive perspective on the multiple dimensions of speaking difficulties encountered in physics experiment presentations.

The research employed a survey to investigate the speech obstacles students face when presenting their physics work. Rizanti et al. (2024) consider the survey technique reliable and valid for obtaining information about language- and psychological-related constraints that students face in supporting verbal performance. In this case, it was not manipulated, as the independent variable was examined phenomenologically in a study focusing on student speaking challenges. The dependent variable, student speaking challenges, was measured using indicators such as anxiety, vocabulary knowledge, argument skills, pronunciation, and self-efficacy. In addition, the questionnaire was carefully developed, including questions that measured these variables, to systematically collect and organise data. The questionnaire was selected based on its ability to provide in-depth information about students' speaking challenges.

To ensure the instrument's validity, it underwent content validation by a panel of experts in physics education and applied linguistics. This instrument was designed to analyse the initial part of organisational skills related to oral presentations in English on how to perform a physics experiment, focusing on the types of speaking problems

associated with it. Having a logical order, seamless transitions, and structure can be a challenge. Students, for example, are not able to open and close discussions consistently (Sharif, 2021). They explain the steps of the experiments in a way that makes it unclear to the audience (Hansel & Schutz, 2024) how to interpret the discussion and results sections, which makes it unclear to the audience (Tarr & Alicea-Muñoz, 2024). The related challenge on the use of vocabulary and grammar that is at the same level is to explain the experiments adequately. Students fail to use the appropriate scientific vocabulary (Tarr & Alicea-Muñoz, 2024). They have the challenge of avoiding false cognates and the misuse of symbols of units (González Ardeo, 2013), and they speak in a way that is not grammatically correct in an impromptu (DIPC, 2019; Sharif, 2021).

Even though these are crucial, pronunciation, fluency, and delivery are just as crucial. They might affect how well the audience understands the material. When a speaker is anxious and speaks at an irregular pace, fillers and long pauses can disrupt the flow of information (DIPC, 2019; González Ardeo, 2013; Sharif, 2021; Tarr & Alicea-Muñoz, 2024). They must use appropriate gestures and regulate their pitch, pace, and volume to speak clearly. The instrument also considers students' ability to participate in a question-and-answer session. They need to follow the question stream, respond to it in a clear, spontaneous way, and ask them to define and engage in the process. Challenges consist of hearing different accents and sentence structures (Sharif, 2021), choosing the correct vocabulary (González Ardeo, 2013), respecting the politeness principles (DIPC, 2019), and fighting the instinct of self-doubt especially with the finality of the answer (Hansel & Schutz, 2024).

DATA COLLECTION PROCEDURE

The data were collected through an online survey distributed via Google Forms. The first aspect of the methodology, which supported credibility, found that the responders directly addressed the speaking difficulties students faced when presenting in physics experiments. The second supporting aspect protected the participants' anonymity and confidentiality. So the method of data collection ensured that the data were credible and systematically organised to document the difficulties students experienced in performing physics experiments.

Data Analysis

Data analysis entails thoroughly examining questionnaire answers to ascertain completeness and consistency. Then, descriptive statistical methods are utilised to assess, for example, anxiety, vocabulary knowledge, pronunciation, argument structure, and overall confidence. Descriptive analysis is important for summarising data so that patterns for screening, categorisation, and method correlation can be developed (Loeb et al., 2017). Therefore, the data analysis yielded consistent, understandable results regarding students' language difficulties in discussing physics experiments.

RESULT AND DISCUSSION

Result

Based on data using a 5-point Likert scale (1 is "never experienced," 5 is "often experienced"), physics students and teachers report the most difficulty with pronunciation, fluency, and delivery in English. The mean score for this category is 3.1. Challenges in interaction and responding to questions follow, with a mean of 3.05. Issues with vocabulary and grammar rank next, at 3.04. The lowest mean score, 2.9, is for organizing and structuring physics content. All four categories fall within the moderate range (2.9–3.1). This indicates that most physics students and teachers quite frequently face challenges, especially in pronunciation, fluency, and responding to questions.

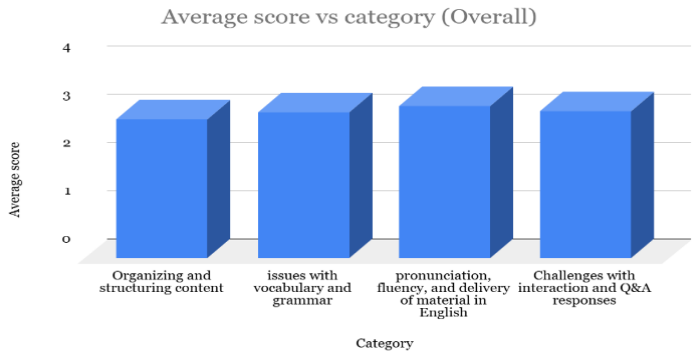

Figure 1. Bar chart of the average score of Speaking Difficulty in Presenting Physics Experiments in all categories (Overall)

When teacher and student data were separated, teachers experienced the greatest difficulty with vocabulary and grammar, with a mean score of 3.38. This was followed by organizing and structuring content, with a mean score of 2.88, followed by issues with pronunciation, fluency, and delivery of English material, with a narrow difference of 2.84. The least common problem experienced by teachers was challenges with interaction and Q&A responses, with the lowest mean score of 2.72.

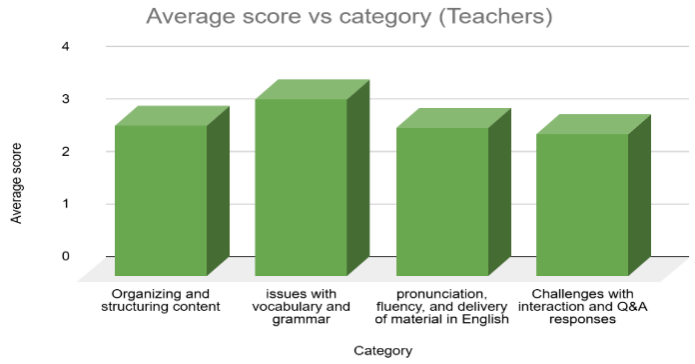

Figure 2. Bar chart of the average score of Speaking Difficulty in Presenting Physics Experiments in all categories (Teachers)

Meanwhile, students experienced the greatest difficulty with English pronunciation, fluency, and delivery, with the highest mean score of 3.19. This was followed by challenges with interaction and Q&A responses (mean score: 3.08) and

with vocabulary and grammar (mean score: 3.01). The least common problem experienced by students was organizing and structuring content, with the lowest mean score of 2.9.

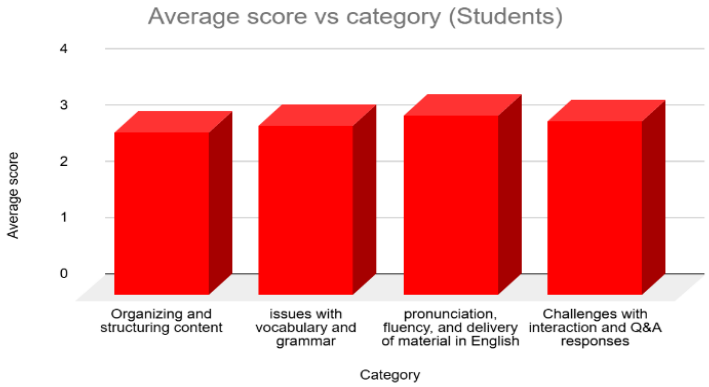

Figure 3. Bar chart of the average score of Speaking Difficulty in Presenting Physics Experiments in all categories (Students)

Finding

The survey, using a 5-point Likert scale (1 = never, 5 = often), shows that the top speech difficulties physics students face during experiment presentations are in pronunciation, fluency, and delivery of material in English (mean 3.1). Challenges with interaction and Q&A responses follow closely (mean 3.05), as do issues with vocabulary and grammar (mean 3.04). Organizing and structuring content is the least reported difficulty (mean 2.9). All mean scores (2.9 to 3.1) indicate moderate difficulty. This demonstrates that students often struggle with speech in English-medium physics presentations, especially with articulation, fluency, and interactive responses.

Although the combined data revealed moderate difficulties across all categories, separating students (n = 56) and teachers (n = 5) yielded interesting and interpretable differences. Students reported pronunciation, fluency, and delivery as their greatest challenge (M = 3.19), reflecting the heightened real-time performance pressure and anxiety they experience as presenters being evaluated by peers and lecturers. In contrast, teachers identified vocabulary and grammar as their primary difficulty (M = 3.38), possibly because they are more aware of the need for precise, discipline-specific terminology when explaining complex concepts to learners, even though they face lower immediate performance anxiety. Both groups, however, rated organizing and structuring content as their least troublesome area (M = 2.9), which suggests that experience level has a bigger effect on preparing content than on delivering it. That technical physics vocabulary was the biggest problem (87% overall). This shows that the main problem is still the same for all types of respondents.

The survey, using a 5-point Likert scale (1 = never experienced, 5 = frequently experienced), shows that physics students experience moderate speech anxiety when giving English-language presentations on experiments, with an average score of 3.2. The strongest indicators are physical symptoms such as a faster heartbeat and a shaky voice, which averaged 3.4. Right behind them are mental worries, such as fearing criticism or forgetting material, at 3.3. Behavioral cues, including avoiding eye contact and pausing often, scored 3.1 on average, while struggling to begin the presentation

was the least common, at 2.9. In all, these scores from 2.9 to 3.4 points to speech anxiety being fairly standard among the students, mainly driven by physical and mental challenges during physics experiment talks.

From the data obtained from all respondents, who were physics students and teachers, when asked, "What is your main difficulty when speaking in a physics experiment presentation using English?" 87% of respondents reported the main difficulty in physics presentations as the technical vocabulary of physics, even though they actually understood the physics concept they were going to present. Still, they have difficulty in translating it into academic English.

DISCUSSION

The results of this study show that problems with speaking English during physics experiments are not just language or psychological issues, but rather a complex problem that arises most often when students try to translate physics concepts they understand well into precise academic English. Although Likert data indicated that Pronunciation and Fluency were the most frequently reported difficulties in performance (mean 3.1), the open-ended questions confirmed that technical understanding was the main root cause (87% of respondents). Candraloka and Rosdiana's (2019) theoretical claim that speaking competence in academic settings depends heavily on accuracy, especially the mastery of domain-specific lexis, rather than just general fluency, is strongly supported by the fact that 87% of respondents identified technical physics vocabulary as their primary barrier, even though they said they had a good understanding of the concepts. In their book "Language and Literacy in Science Education," Wellington and Osborne (2001) say that you cannot fully understand scientific ideas without knowing the discipline's distinctive language system. Therefore, the researchers' findings validate and extend these fundamental theories to the specific context of physics experiments, where the theory by Wellington and Osborne was initially written in the mother tongue, not for the presentation of physics experiments in English as a second/foreign language. However, their theory is also applicable when non-native students and teachers have to present physics experiments in English-medium instruction.

Language difficulties (technical vocabulary) are a universal root problem for students and teachers, but these language difficulties trigger significantly higher levels of anxiety and more severe psychological symptoms, specifically in the learner group (students). At the psychological level, the study's moderate but consistent speech anxiety, which was mainly manifested as physical symptoms like a shaky voice and an accelerated heartbeat, as well as mental concerns about forgetting information and fear of criticism, is entirely consistent with the theoretical explanation of communication apprehension offered by Hsu. (2008). According to them, anxiety related to public speaking has long been associated with perceived deficiencies in rhetorical skill, fear of receiving a poor grade, and physical signs of stage fright, all of which worsen when speakers feel ill-prepared or linguistically uneasy. This feeling of linguistic insecurity is caused by the fact that it's hard to rapidly remember the right technical physics words, even when you have a good comprehension of the concepts. This makes you feel more physically aroused and leads to bad ideas. The fact that people had trouble with pronunciation and fluency (as shown by the Likert data) aligns with other studies showing that self-doubt and extreme anxiety make people more likely to be distracted and to speak more slowly and unclearly (Sugiyati et al., 2021;

Ediwarman et al., 2023). This pattern directly supports Quinto et al.'s (2025) more recent findings that limited speaking practice and increased performance pressure exacerbate public speaking anxiety in academic settings. This argument is also supported by the fact that public speaking anxiety is actually a problem that can be learned to overcome, not just an unchangeable trait. In essence, it all depends on structured practice, emotional management, and constructive criticism. Well, in line with what the theoretical framework suggested earlier, our data now powerfully demonstrates that subjective barriers (fear) and language barriers (especially technical jargon) reinforce each other. In English-language presentations of physics experiments, these two factors are by no means isolated from one another.

These results carry significant implications for science education. Doran (2017) and Treagust et al. (2017) emphasise that genuine conceptual understanding in physics is demonstrated through multiple representations verbal, diagrammatic, and mathematical. When language barriers make it hard to speak, students and educators cannot show how much they really understand, which is what Gascoigne et al. (2020) warned about: limited opportunities for oral communication make it harder for students to put together what they know and have meaningful scientific conversations. Left unaddressed, this gap risks long-term disengagement from physics and reduced STEM Equity among non-native English speakers.

Even though the current moderate difficulties seem to go against studies that show that communication is a strength in learning physics (Wijayanti et al., 2025; Rusilowati et al., 2013; Rizaldi et al., 2024), the difference is easy to explain by the fact that those studies were done in the students' first language and in curricula that were explicitly designed to improve oral skills through inquiry-based and STEM approaches. The current research, by contrast, examines unplanned, high-stakes presentations in a second language without systematic prior speaking training conditions that dramatically increase the cognitive and affective load.

This study is different from other ones that looked at public speaking anxiety (Ediwarman et al., 2023; Sugiyati et al., 2021), the use of scientific language (Le et al., 2023), or psychological barriers (Yuliana et al., 2024; Baktillah et al., 2024) on their own. It combines all three areas in the understudied context of English-medium physics experiment presentations, addressing the research gap identified in the introduction.

In practice, physics classes need to go beyond focusing solely on experimental accuracy and include explicit, regular speaking training such as building technical vocabulary, conducting simulated Q&A sessions, and learning how to manage anxiety as core components. This aligns with both Quinto et al.'s (2025) growth-mindset recommendations and Gascoigne et al.'s (2020) call for meaningful opportunities for oral communication.

The moderate sample size (N=61), intentional selection of teachers, dependence on self-reported data, and exclusive focus on English-medium instruction constrain generalizability. So, future research should use larger, multilingual, and longitudinal designs and test focused interventions to see whether regular speaking practice can make the problems observed much less severe.

CONCLUSION

This study clearly shows that physics students and teachers have moderate problems with English-language experiment presentations. The most complex parts are pronunciation, fluency, and delivery (M = 3.10), followed by interaction/Q&A and vocabulary/grammar issues. Speech anxiety is also moderate (M = 3.20), primarily because of physical symptoms and fear of negative evaluation. Crucially, the analysis confirms that this psychological burden is disproportionately borne by students. It is important to note that there is a big difference between strong conceptual understanding and oral performance, as 87% of participants said that technical physics vocabulary not a lack of knowledge was their main problem. This study fills a significant gap in the literature by examining linguistic, psychological, and domain-specific factors in an EMI context that have not been studied extensively before. It also builds on existing theories (Wellington & Osborne, 2001; Candraloka & Rosdiana, 2019) and shows how important it is for physics curricula to include systematic speaking training so that students can confidently explain what they really understand.

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