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Needs analysis of speaking skills for Mathematics Education students in academic contexts

Aprilia Helmiyati Alim[1], Annisa Deliza[1], Melly Tiana[1], Dwiyani Pratiwi[1], Sukarno[1]

[1]Universitas Negeri Yogyakarta, Indonesia

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Abstract

This study explores the English language requirements of Mathematics Education students in academic settings using a qualitative descriptive methodology. The urgency of this study lies in the growing academic demand for non-English major students—particularly those in mathematics and science disciplines—to actively participate in English-medium academic practices such as thesis presentations, seminar discussions, and international collaboration. However, English speaking skills are often overlooked in ESP programs for these learners, resulting in a gap between what is taught and what is needed in the field. Data were gathered through interviews and document analysis involving ten third-semester Mathematics Education students at an Indonesian university. The findings revealed that students require speaking skills primarily for academic presentations, journal article discussions, and seminar participation. Key challenges include lack of confidence, grammatical inaccuracy, limited fluency, and difficulty in pronunciation—particularly of mathematical terminology. Students expressed interest in using digital and authentic academic sources such as YouTube videos, podcasts, and subject-related materials, and they preferred interactive learning environments involving group work and practical speaking tasks such as discussions, presentations, and role-plays. These findings highlight the need for a more contextualized English for Specific Purposes (ESP) program that integrates academic content relevant to students' disciplines and leverages digital media for increased engagement. The implications for both English for Specific Purposes (ESP) and English as a Foreign Language (EFL) contexts indicate that particularly, a need for specific content-based speaking instruction that meets the academic requirements for students in non-English majors who require English language instruction from a discipline-specific context.

✉Correspondence Address:
Universitas Negeri Yogyakarta
Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55281
E-mail: Apriliahelmiyati.2023@student.uny.ac.id

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INTRODUCTION

In the modern global academic context, English has come to be a key communication tool for cross-disciplinary communication (Kurniawan, 2024). For the Math Education field, English communication has come to be considered one of the top academic skills in the globalized academic sphere of the modern era. Increasingly, they come to be expected to perform academic tasks such as the presentation of the research paper, attending seminars, and reading journals from the global sphere (Anisa et al., 2023). The erstwhile exclusive domain of the language/social science students, these activities come to be viewed equally for those from education and technical streams, even mathematics. Nevertheless, even as English becomes more and more in demand, English education to the Math Education students in most non-English-speaking countries, including Indonesia, falls short by neglecting the speaking skill.

Speaking skills, namely in the academic field, play a deciding role in the growth of students' confidence and achievement (Ningrum & Listyani, 2022). Students will typically be asked to explain mathematical concepts, present the result of research, or participate in question-and-answer sessions in seminars. All these activities demand fluency, accuracy, clarity, and appropriate usage of academic discourse (Cesaria et al., 2024). However, most English language curricula for non-English majors remain concerned with reading and writing with scant regard for oral communication (Caniglia et al., 2017). The consequence is the existence of a tremendous gap between the skills they acquire and the skills they will need in the field of study in Mathematics Education (Bernstein, 2022).

In order to address this issue, there has been renewed interest in the English for Specific Purposes (ESP) field (Işık-Taş & Kenny, 2020). ESP is language study specifically tailored to the needs of the learner's professional or academic milieu (Hutchinson & Waters, 1987). English for Academic Purposes (EAP) in ESP places special emphasis on preparing the student for the language abilities they must be able to handle in academic contexts (Ryu, 2022). For students in Mathematics Education, for example, it means being able to take part in academic discussions, produce formal presentations, and understand spoken academic English. For EAP teaching to be effective, according to Flowerdew and Peacock (2001), it must take consideration not only of general competence in language but also of the communicative needs specific to the specialist field of study.

Several studies have highlighted the importance of contextualized language instruction for university students. For example, Otuma et al., (2022); Maharani and Yunita (2023) found that motivation, exposure to English, and learning experiences significantly influenced the language proficiency of Mathematics Education students. However, most of this research has focused broadly on reading comprehension or writing skills, and there is relatively little attention paid to oral communication a skill that is central to academic success but often underdeveloped among non-English majors.

This lack of attention is concerning, especially when we consider that students frequently report difficulties in expressing themselves in English during academic activities (Kulsum et al., 2025). Common issues include grammatical errors, limited vocabulary, pronunciation difficulties particularly with subject-specific terminology and a general lack of confidence (Tantri et al., 2023; Capacio & Datugan, 2024). These problems are not only linguistic in nature but also psychological, as students often experience anxiety and hesitation when asked to speak in front of others (Gobena, 2024). As Cao et al. (2024) observe, a classroom environment that fails to support active language use contributes significantly to students' speaking anxiety and low participation.

To design effective speaking instruction for this population, it is important first to understand what learners truly need. This is where needs analysis becomes crucial. Needs analysis, as defined by Hutchinson and Waters (1987), involves identifying the "necessities" (what learners must be able to do), "lacks" (what they currently cannot do), and "wants" (what they hope to learn). According to Huang (2019), Long (2005) emphasized that needs analysis is essential for creating effective, learner-cantered language programs. In the context of Mathematics Education, this approach enables educators to pinpoint the specific speaking functions students are expected to perform and tailor instruction accordingly.

The decision to focus on speaking skills as opposed to reading, writing, or listening is deliberate. Speaking is arguably the most immediate and interactive of the four language skills, yet it is also the most challenging for many learners, particularly in academic contexts (Van Tuyen et al., 2019). Unlike reading and writing, which can be practiced privately and revised, speaking requires real-time processing and performance (Fairjones, 2018). For students in Mathematics Education who are preparing to become teachers or pursue higher education, the ability to speak confidently and clearly

is essential (Melissa et al., 2023). It not only affects their academic performance but also their future careers, where they may be required to present ideas, explain complex content, and collaborate with colleagues in English-speaking environments (Ikhsan et al., 2020).

Another defining feature of this study is its focus on Mathematics Education students in Indonesia. While the general challenges faced by EFL learners have been well documented (Abrar et al., 2024), the specific speaking needs of students in this discipline and cultural context remain underexplored. This study seeks to fill that gap by offering a targeted investigation of how Mathematics Education students perceive their speaking challenges, what kind of language tasks they are expected to perform, and what learning strategies or formats they find most effective. It draws from both interview data and document analysis to provide a rich, triangulated understanding of the learners' situation (Morgan, 2024).

By bringing attention to a group of learners whose needs are often overlooked in language education planning, this study aims to contribute not only to the development of more effective ESP speaking courses but also to the broader discourse on equity in language instruction for non-English majors (Ekayati et al., 2020). It is hoped that the findings can inform curriculum designers, teachers, and policymakers about the real-world communicative demands facing Mathematics Education students and offer practical solutions for addressing them. When such needs are not recognized, students may struggle silently unable to fully participate in academic life or seize professional opportunities that require strong oral communication skills (Imad, 2022).

In sum, this study responds to the pressing need for a better understanding of English-speaking demands within the field of Mathematics Education (Maharani & Yunita, 2023). It positions speaking not as an optional or secondary skill but as a central component of academic competence (Nurpahmi et al., 2020). Examining learning needs in terms of their contexts and learners opens up their access and bridged gaps towards targeted provision through curriculum-fitted learning and real needs of learners towards an inclusionary and relevant practice in English language education. This perspective investigates the English-speaking needs of students of Mathematics Education on mainly two fronts, namely, what students say they need to learn or improve to practice their academic speaking skills better, as well as what these students think they ought to be able to do within English-speaking academic settings. Findings will be useful in the development of a more meaningful and contextually relevant spoken English course geared to most actual learning needs.

METHODS

This research employed the qualitative descriptive research methodology to determine the English-speaking needs of the students in the field of study for Mathematics Education in academic contexts. The reason for doing this was to achieve in-depth understanding of the participants' experience, perception, and needs for learning without manipulating variables. For needs analysis purposes, the qualitative descriptive design is effective in ascertaining what the leaners require, lack, and want in terms of speech skill acquisition (Creswell, 2012).

The research was carried out at Yogyakarta State University with the participation of ten third-semester undergraduate students from the study program of Mathematics Education. The participants were sampled purposively based on the criterion of whether they took at least one English-related course. The result was ensuring they were exposed to English in the academic surroundings to the extent they were able to reflect on the experience in the study context. The study institution was selected because of its convenience, relevance, and the researcher's familiarity with the academic environment. Participants were notified of the research purpose and the way the research would be conducted before the interview through WhatsApp messages, and the voluntary consent to participate was obtained through confirmation of the chat. The participants' identities were anonymized, and the confidentiality of the information was maintained in accordance with the ethical principles of qualitative research by Pietilä et al. (2020).

Two key data collection techniques used were syllabus analysis and semi-structured interviews. The interview schedule was developed from the basis of English for Specific Purposes theory, namely the model of needs analysis by Hutchinson and Waters (1987), and principles of academic speech teaching by Dörnyei (2007) (See Table 1). The schedule included open questions regarding difficulty in speaking, preference in learning, and expectation. Interviews were conducted in written manner in one-to-one WhatsApp chat rooms and lasted approximately 30 to 45 minutes. All chat transcripts were archived and used as the main source of qualitative data. Document analysis was conducted using the English course syllabus previously undertaken by the participants. The syllabus was

examined to identify the types of speaking activities embedded in the course, and to evaluate whether these activities aligned with the learners' perceived academic needs. It also served as a means of data triangulation to support the interview findings.

Table 1. Summary of needs analysis

Summary of Needs Analysis

Aspects		The purpose of the questions
Target needs	Necessities	To find out the types of students' necessities
	Lacks	To find out the learner's difficulties toward speaking
	Wants	To find out the learners' needs for learning to speak
Learning needs	Input	To find out the inputs that students want the most
	Procedure	To find out the procedures in the speaking process
	Setting	To find out the desired class setting of doing the tasks
	Learner's role	To find out the role of the learner in the learning process

The data collection process involved three stages: (1) informal observation and preliminary instrument preparation, (2) one-on-one interviews via WhatsApp chat, and (3) syllabus retrieval and review. All communication took place in Bahasa Indonesia to ensure comfort and clarity. Data were analysed using thematic analysis, guided by Braun and Clarke's (2006) six-step framework: familiarization with data, generating initial codes, searching for themes, reviewing themes, defining, and naming themes, and reporting. The coding process was conducted manually using a table in Microsoft Word, with columns indicating direct quotations, initial codes, and final themes.

Themes were derived through both inductive and deductive processes. Deductively, the study adopted the "necessities, lacks, and wants" model by Hutchinson and Waters (1987). Inductively, themes were developed from emerging data patterns and categorized using Nunan's (2004) learner-cantered curriculum framework, which includes input, procedure, setting, and learner roles. To ensure trustworthiness, the study employed multiple validation techniques, including data triangulation (interviews and syllabus), member checking (sharing summaries with participants for confirmation), and peer debriefing (discussing findings with academic colleagues). These strategies were implemented to enhance the credibility, dependability, and confirmability of the research findings.

FINDINGS AND DISCUSSION

How students studying Mathematics Education improve their ability to communicate in English in academic settings

Based on the interview results, the students' target needs were classified into three components: necessities, lacks, and wants. The following numbers provide a clearer understanding of the percentage and types of each goal need.

Students' Necessities

Students consistently identified a range of academic and professional speaking activities as essential to their success as Mathematics Education majors. The most cited needs included class presentations and academic discussions, which were reported by 80% of participants. These activities require students to communicate complex mathematical concepts clearly and accurately in English. Another 70% of students mentioned the need to present academic articles or final projects, particularly in seminars or thesis defences, while 60% indicated that understanding and participating in academic seminars—often involving question-and-answer sessions—was an important skill. Moreover, in the comments on desired skills for future careers, the majority of the students mentioned the necessity to enhance speaking skills for future careers, including potential involvement in international academic conferences or job environments where English-speaking communication is required.

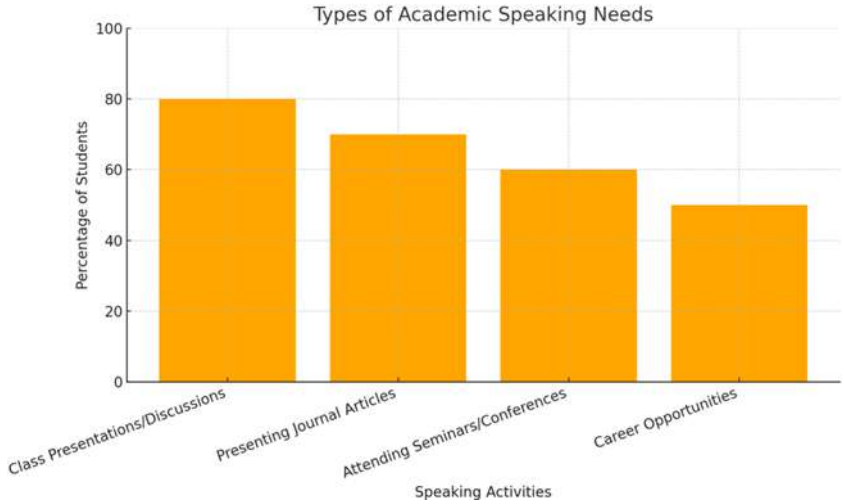

Figure 1. Types of Academic Speaking Needs

All these answers reflect the idea that English-speaking is not only an additional competence but also an integral part in academic success and career preparation. Students acknowledge the point where they might lack sufficient speaking skills to present research, participate in academic discussions, or take advantage of international chances.

Students' Lacks

Even though they found value in the English-speaking proficiency, the majority of the students revealed some underlying issues they grappled with. The overriding issue was the grammar area in which 90% of the students opined that difficulties in sentence structure and accuracy often made them insecure and less informal. Most of them had admitted that grammatical errors robbed them of the ability to express ideas clearly and thus negatively affected speech confidence.

Another important area was pronunciation, cited by 70% of the students, specifically in the pronunciation of technical terms or rare words used very often in mathematics-related materials. The participants also mentioned the lack of fluency by 60%, where they struggled to produce extended speech with constant and coherent ideas. Finally, 60% of the students confessed to feeling lack of confidence, primarily because they were deprived of practice in spoken English in and outside the classroom. This resulted in them feeling nervous, hesitant, and afraid to participate actively in spoken academic activities.

In addition, 60% of the respondents said they had weak self-confidence in English speaking. The reason was blamed on the absence of frequent English exposure in everyday life as well as on prior negative experiences in in-class speaking activities. Students admitted feeling scared and afraid to participate actively, for fear of being criticized for weak performance. These observations reflect how these speaking weaknesses weak grammar mastery, weak pronunciation, lack of fluency, and weak confidence reinforce one another, creating a pattern where speech development is hindered.

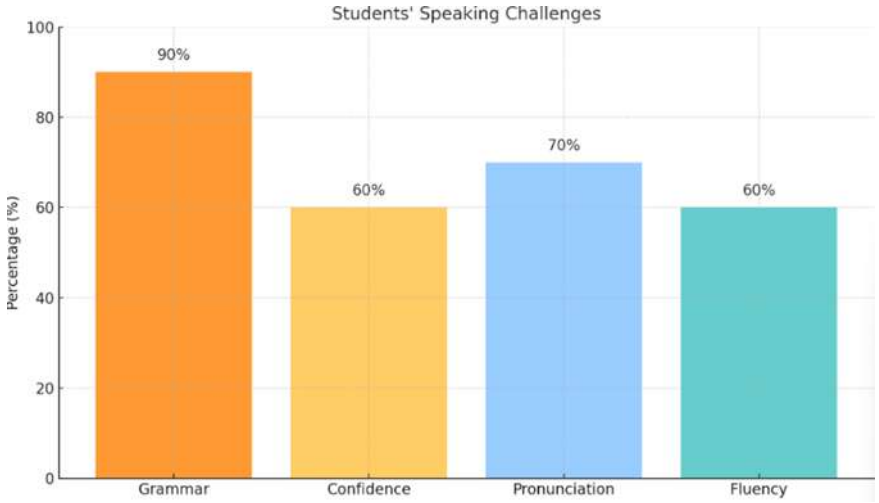

Figure 2. Students' Speaking Challenges

These findings highlight the value of targeted speech practice for the development of technical expertise along with confidence and fluency through repetitive, supportive practice. Filling these gaps is essential to the preparation of students in the field of Mathematics Education for communication in the academic environment.

Students' Wants

In addition to needs and deficiencies, the students themselves also expressed definite preferences for specific types of media, methodologies, and speaking practice they believed would improve English-speaking skills. Students' "wants" reflect aspirations for more contextualized, practical, and motivating courses in speaking. Among the strongest affinities was the adoption of digital media. Self-reported interest in studying from YouTube videos, podcasts, TED Talks, and educational videos on social networking platforms such as Instagram and TikTok was evidenced by nearly all participants. These were seen to be natural English input sources representing the usage of the language in the natural academic/professional domains. Students noted that these type of material would allow them to study not just pronunciation and vocabulary but to observe academic presentation styles and expressions. YouTube was again and again referred to as the material students study independently to watch presenters talk about science topics or deliver formal English speeches.

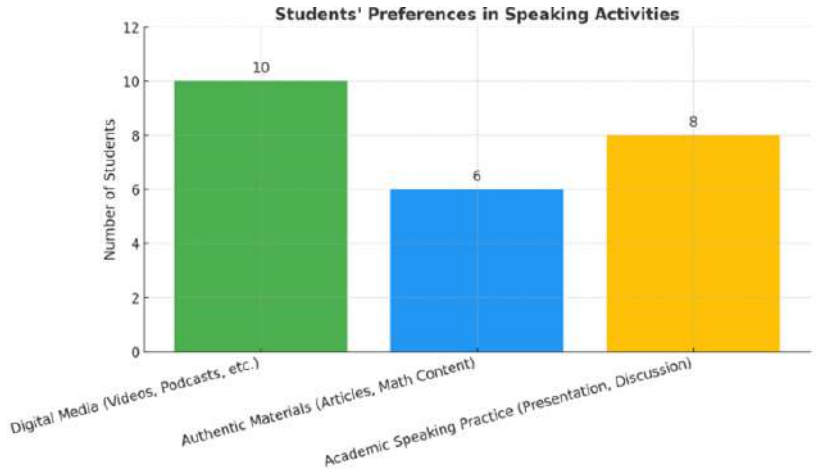

Figure 3. Students want.

In addition to computer-generated input, students were invariably eager for subject-related English activities. Students signalled they would like to hear study-related texts, watch videos for math/science, and carry out issue-based oral activities straight corresponding to the language they

would use in future academic/professional communication. Such activities became more motivating and relevant because they linked the acquisition of the language to the major field of study. Students believed this would help them use English in more practical forms and learn more specialized vocabulary.

In addition to this, the students also informed the requirement for more in-the-field academic speaking practice. The students were more interested in structured speaking activities such as presentation, discussions of journal articles, and group discussions where they could practice actual academic situations. The activities were found to be effective for the acquisition of fluency, confidence, and preparedness for authentic academic speaking activities such as seminars or research presentation. The students' interest in general suggested the profound need for ESP-motivated speaking training incorporating digital means, profession-related material, and authentic academic communication activities. The students were interested in experiencing the process of learning in the sense where the process directly relates to the academic life and the future profession-related communication practice.

How students of Mathematics Education have to improve in terms of English-speaking skills

The learning needs were categorized in four categories based on the interview outcomes: input, procedure, setting, and learner's role.

Input

Students reported several types of input media that they found helpful in improving their English-speaking skills. The most frequent source was YouTube at 40%, with TED Talks and academic presentations being the most valuable because these participants thought they helped them understand formal expressions, pronunciation, and academic speaking styles. Social media platforms like Instagram and TikTok were chosen by 20% of students, who saw them as useful for informal yet practical exposure to English. Another 20% mentioned podcasts as helpful for intonation, pronunciation, and listening to natural sentence flow. A smaller number of students selected books and films (10% each), mainly for vocabulary enrichment and contextual learning.

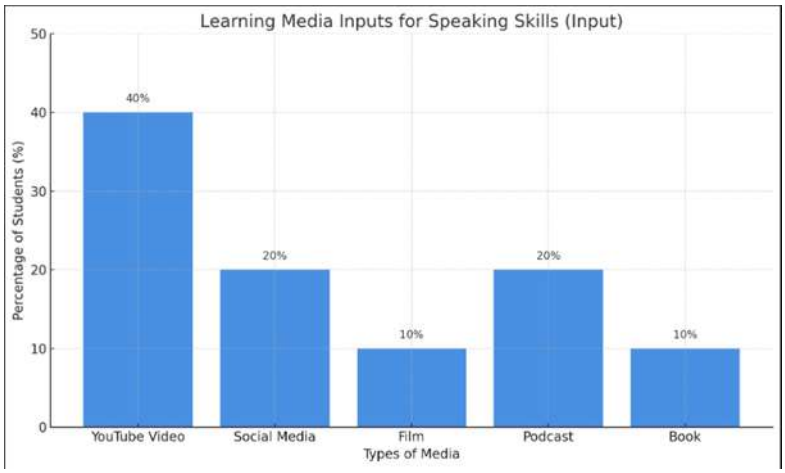

Figure 4. Learning media input

These findings reflect students' preference for **authentic and multimodal resources** that offer real-life examples of how English is used in both formal and informal settings.

Procedure

When asked about preferred speaking activities, students identified presentations as the most effective method for improving their speaking skills. All participants (100%) selected presentations, citing their relevance to academic responsibilities such as thesis defences, project reports, and classroom explanations.

Conversations were the next most preferred activity (70%), as they provided opportunities for spontaneous speaking and critical thinking. Storytelling and role-playing were each chosen by 40%, with students noting that these activities helped with creativity, fluency, and simulating real-world

scenarios. Lastly, debate was selected by 30%, valued for developing argumentation and structured speaking under pressure.

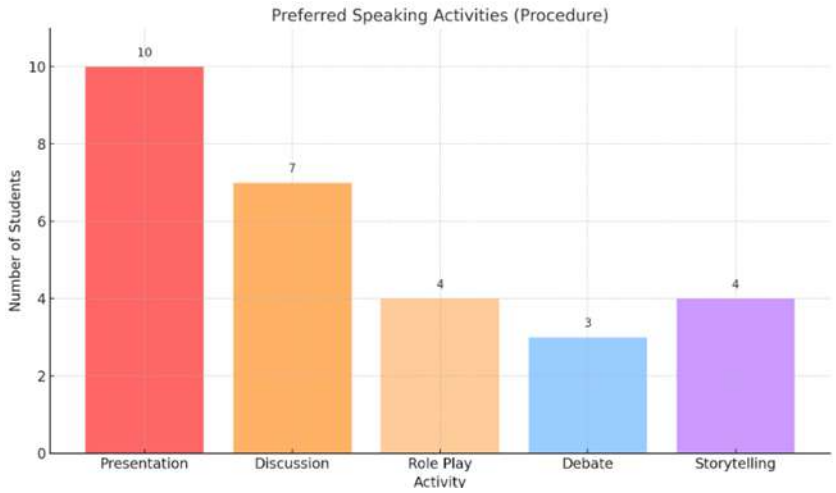

Figure 5. Types of speaking activities

The findings show that students favour interactive and academically aligned speaking tasks, especially those that prepare them for real academic discourse and build communication confidence.

Setting

Students showed diverse preferences regarding the most effective classroom settings for improving their English-speaking skills. The most preferred learning environments where group work and pair work, each selected by 4 students. They appreciated the collaborative nature of these formats, which allowed for mutual feedback and reduced speaking anxiety.

Individual learning was chosen by 3 students, who preferred to rehearse and reflect privately. Meanwhile, whole-class discussions were preferred by another 3 students, especially for activities like debates or full-class presentations that encouraged broader engagement.

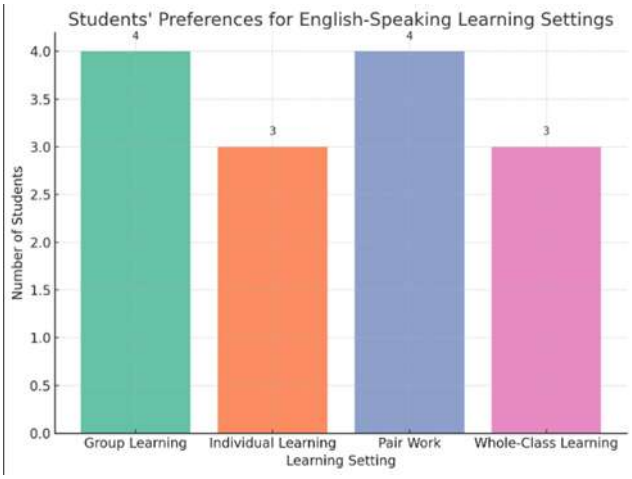

Figure 6. Learning Settings

These findings indicate that there is no one type of setting that suits all learners and that if we are going to provide a variety of interaction formats to accommodate the needs of different students and personalities, then encouraging task variation is useful.

Learner's Role

Students identified different roles they assume when participating in English-speaking activities. The most common was reflective observer, selected by 3 students, who preferred to observe and process

information before speaking. Another 3 students described themselves as active communicators, confidently participating in discussions and presentations.

Two participants saw themselves as problem solvers who liked challenging task that required higher order thinking skills when speaking, while the other 2 participants were active listeners who were concerned about receiving oral input as well as observing the use of language rather than producing the language.

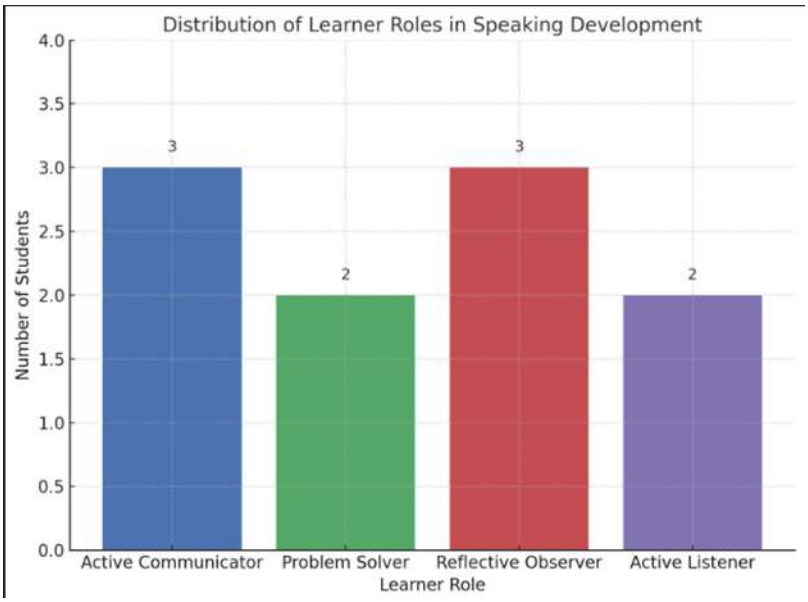

Figure 7. Learner's role

The variations in the different roles of learners illustrates varied levels of confidence, speaking style, and learning strategies, supporting differentiated speaking instruction.

DISCUSSIONS

The discussion of the findings of this study will focus on the English-speaking needs of the Mathematics Education students, along with the implications for appropriate instructional design component to meet those needs. Anchored in the theoretical foundations of English for Specific Purposes (ESP), learner-cantered curriculum development, and prior empirical studies, this section interprets the data by exploring how students' necessities, lacks, and wants to inform the structure of effective speaking instruction. In doing so, it reflects on how these findings align with or diverge from existing literature within both Indonesian and global ESP contexts.

Interpreting Target Needs through the Lens of ESP

The results show that speaking in English is not a peripheral skill but a central component of academic competence for students in Mathematics Education. Participants in this study highlighted their need to deliver class presentations, engage in academic discussions, attend seminars, and explain mathematical concepts orally. These tasks represent what Hutchinson and Waters (1987) define as "necessities"—the core activities students must perform in English within their academic environments. In line with Basturkmen (2010), these necessities demonstrate that ESP instruction must move beyond general language instruction and be tailored to discipline-specific communication needs as cited in Mišić-Ilić & Đorđević (2022).

These needs are also supported by empirical evidence. Phan and Bui (2022) observed that university students increasingly face speaking challenges in academic settings, particularly during online presentations, while Sunarti (2024) and Daud et al., (2020) argued that mini-seminar activities effectively foster academic speaking fluency. However, most previous studies focus on general EFL or English majors, whereas this study specifically addresses Mathematics Education students, whose communication challenges are often underestimated in curriculum design. This underscores the novelty of the present study, which broadens the scope of ESP by including students in mathematically driven programs who face their own unique set of communicative tasks.

Although the students in this research appreciated the worth of speaking, they diagnosed some key impediments. Inaccuracy in grammar was revealed to be the most regular difficulty, trailed by difficulty in pronunciation, lack of fluency, and lack of confidence. The outcomes were consistent with those from the study by Helmanda et al. (2018) and Sihite et al. (2024), whose study found that grammar inefficiencies were the common causes of speaking anxiety and interruption to oral expression. Various writings have established the fact that weak-speaking students will normally feel tensed and inhibited in being compelled to talk in class (Damayanti & Listyani, 2020; Badriyah & Novita, 2022; Akhmad et al., 2023). The present study corroborates the same impediments, but the study introduces its context in addition – these impediments persist even in the major Mathematic Education, in which the students normally should explain complex concepts in clear terms but never undergo enough speech training.

Furthermore, the interest of students in studying from digital resources--more precisely from YouTube videos, TED Talks, and podcasts--signifies the shift in the perception of where students anticipate acquiring and working with language (Toleuzhan et al., 2022; Phillips, 2017; Nezhyva, 2023). Arulchelvan and Yunus (2020), and Bashori et al. (2022), in return, uncovered the encouraging effect of digital resources on the acquisition of vocabulary and pronunciation awareness in the speaking exercises. The study adds the following finding: students were not only motivated by the convenience value or entertainment value of digital resources, but by its functionality for the illustration of authentic speech in the academic domain. The latter places in the forefront the contribution in the selection of digital input authentic and relevant to the purposes of academic success for the students.

Besides the preference for the kind of input, the students revealed a strong preference for challenging and structured speaking exercises mirroring authentic academic experience. These include giving presentation, article discussion, role-plays, and storytelling. These echo the same sentiments as Purnami (2024), who claims that academic presentation allows for the progressive development of fluency, logical sequencing, and confidence at public speaking for the student. Role-plays and storytelling were also revealed to be effective even for technical-major-major students like mathematics, revealing the increasingly maturing perception of the value of challenging, contextual, and reflexive speaking exercises beyond the traditional realm of disciplines (Oktaviani et al., 2024). The interest in pragmatic and academic-speaking task usability reflects the clear realization by the students of the kind of communication they have to carry out in academic life. Rather than demanding abstract grammar practice or mindless drills, they revealed the imperative to practice structured speaking in the modes mirroring the academic experience they undergo. This raises the relevant question: ESP speaking teaching for non-English majors must be purposeful, situative, and in line with the intended academic objectives of communication (Dung & NJvat, 2024). It must bridge the chasm between what gets done in academic life in the class room and what the students must do in academic discourse at home and abroad (Ekayati et al., 2020).

Learning Needs and Learner-centred Design

Addressing the second research question, the adaptation of Nunan's framework (2004)—input, procedure, setting, and learner role—to the analysis of the needs of the students reveals how indispensable it is to provide individualized, flexible ESP practice in speaking. Students' interest in multimodal input aligns with the tendency in ESP to converge toward computer-mediated communication in the international environment. Previous works by Wulan (2018), Alfa (2020), and Sudrajat and Febriani (2025) indicated the potential role of YouTube and audio blogs to advance the listening and speaking competence. The study corroborates the same tendency, the added insight being math students value input in the form of authentic academic speech and authentic pronunciation and discourse structures.

In terms of procedures, 100% of students preferred presentation-based tasks, reinforcing the importance of performance-driven speaking. This supports Purnami (2024) and Oktaviani et al. (2024), who found that structured speaking tasks like presentations and discussions enhance fluency and confidence. Interestingly, this study also found that storytelling and role-playing activities traditionally used in more creative, or language arts contexts were valued even by math students (An, 2023). This may indicate a shift toward interdisciplinary learning preferences, where even technical students recognize the value of narrative and simulation for developing speaking skills (Altun, 2019).

Classroom settings were diverse: while group and pair work were favoured, several students preferred individual or full-class activities. These results match findings by (Novitasari, 2019) and

(Kaweera et al., 2019), who noted that collaborative settings support speaking confidence, but some learners still benefit from independent practice. This variety underscores Basturkmen's (2010) call for adaptive ESP course design that accommodates different learner types and participation levels.

Regarding learner roles, students identified themselves across four categories: active communicator, problem solver, reflective observer, and listener. This typology offers deeper insight into how students engage with speaking tasks. Similar roles have been indirectly identified in studies by Aubrey et al. (2020) and Rouf and Sultana (2018), who emphasized that scaffolding and varied participation opportunities are essential for bringing hesitant or reflective learners into active communication. The current study formalizes these roles, contributing to a more nuanced understanding of learner diversity in ESP speaking contexts.

Curriculum Implications for ESP in the Indonesian Context

The conclusions from this research have some important consequences for the development of English for Specific Purposes (ESP) courses in non-English majors in Indonesia, and for those majoring in Math Education in general. Perhaps the most important finding is the incompatibility between the students' existing communicative needs and the available ESP curriculum where the predominant emphasis continues to be the acquisition of grammar mastery and reading comprehension (Mahmood, 2017). Cited by Alapati et al. (2023), the traditional approach has the tendency to downplay the speaking activities even as the need for speaking proficiency in the academic and professional domains continues to rise. The respondents in this research were adamant in calling for the acquisition of practical competence in speaking, especially in areas such as academic presentation, seminar proceedings, and thesis defences. The activities in question constitute the ability to present complex mathematical concepts persuasively and effectively an ability where the existing ESP courses poorly prepare the students (Zechia, 2017).

In response to these gaps, this study suggests the urgent need to shift from generic EAP-style instruction toward more tailored, discipline-specific ESP curricula. The uniform structure of many university ESP programs in Indonesia fails to recognize the unique linguistic challenges faced by students in fields such as mathematics, engineering, or science (Yoestara, 2017). For example, students in this study voiced a preference for learning activities that allow them to explain formulas in English, respond to questions during academic forums, or present project findings tasks that demand both fluency and familiarity with technical discourse. Such needs cannot be addressed by one-size-fits-all language programs. According to Richards and Rodgers (2014) as cited from (Kerr, 2022) advocate through the Content-Based Instruction (CBI) model, the integration of subject-specific content into language instruction is essential to foster learner motivation, relevance, and cognitive engagement. Without this contextualization, ESP courses risk being perceived as detached from students' academic realities (Mišić-Ilić & Đorđević ,2022).

Moreover, the strong student preference for digital learning tools such as YouTube, TED Talks, and podcasts indicates that ESP instruction must also evolve to align with contemporary learning cultures. These platforms provide authentic, multimodal input that reflects how academic language is used in real-world communication (Toleuzhan et al., 2022). But the effective use of these resources is more than simply revealing them it requires the design of instruction to embed them in purposeful speaking activities, for example, in the form of video response, article commentaries, or project-based presentations (Purnami, 2024). Media-based input, according to Vanderplank (2016), enhances the perception of rhythm, tone, and rhetorical formulae only if purposeful speaking goals take the lead. Hence, in this regard, the ESP teacher must be educated not only in terms of disciplines but also in terms of digital competence and pedagogical malleability in order to create important learning opportunities (Maharani and Yunita, 2023). Institutions themselves must keep pace with this transformation by infusing technology access, by redesigning assessment practice, and by providing professional education to ensure the ESP curriculum is not only disciplinarily sound but also responsive to the academic identities of the students and to future career opportunities.

Global Perspectives and Theoretical Contributions

International, the study also affirms the newly emerging trend by which ESP cannot be created independently of the disciplinary demands of the users, communicative goals, and educational environments. The study authenticates the position of Agzamovna (2024), according to whom ESP must go beyond language programs and act as mediator between language teaching and the academic identities of the users. While many ESP studies focus on widely researched domains like medicine,

business, or tourism (Gai, 2018), this study draws attention to Mathematics Education students a group rarely foregrounded in ESP discourse. This gap is addressed here by offering empirical evidence on their speaking challenges, preferences, and roles, thus expanding the scope of ESP research.

Moreover, by combining target needs analysis (Hutchinson & Waters, 1987) and learning needs analysis (Nunan, 2004), this study presents a model of integrated ESP design. The typology of learner roles communicator, problem solver, observer, and listener add an original contribution to ESP learner profiling. These roles can guide instructors in scaffolding participation and matching tasks to learner readiness, ultimately promoting equity in speaking opportunities (Hung & Nguyen, 2022).

CONCLUSION

This research employs a qualitative descriptive approach in analysing the English-speaking needs of mathematics education students in academic environments. This work aimed to investigate difficulties and preferences of students when using English in academic work through interviews and document analysis with a total of 10 undergraduate students in an Indonesian setting. Speaking skills, an important aspect necessary for taking part in seminars, journal article discussions, and academic presentations—activities all part of their academic experience—were specifically highlighted.

Based on findings, students identified several areas of difficulty with their English-speaking abilities. The principal hindrances to effective communication in scholastic situations were grammatical accuracy, fluency of speech, and confidence. These areas indicate that it is a very difficult task for them to articulate themselves in a clear and concise manner, and it may have a negative effect on their performance in academic work and activity in scholastic pursuits. The study emphasizes how serious it is to pay special heed to these areas in teaching the English language to enable them to overcome their speech barriers.

Regarding learning styles, it was discovered in this study that student preferred to use real academic materials concerning their course of study in conjunction with digital sources like YouTube and podcasts. By exposing students to scholarly debates in real contexts, such sources enable them to use material pertaining to their area of study. Students' preference for online sources also shows their preference for self-learning and integration of technology into areas of study, which can be beneficial to them in modeling their language in easy and flexible ways. Even so, it was found in this research in student comments that they preferred interactive, functional oral activity like presentation, role-plays, and discussion. In involving students in the use of spoken language in real contexts, these activities guarantee use and engagement of language skills. The students also preferred autonomous learning spaces like group and pair work, which promote collaboration and diminish fear of speaking in public. This also serves to complement the necessity of having an encouraging and provoking environment in the class for the sake of ensuring practice through verbal means.

The research calls for English instruction personalization in mathematics education students based on their respective academic requirements in response to these findings. This entails utilization of subject-specific materials like electronic materials and provision of multiple learning styles to promote oral practice and confidence among students. Through the application of these steps, instructors can develop more effective ESP courses and address the unique needs of non-English majors in the classroom. Ultimately, this can enhance the speech fluency of students and enable them to apply English in academic and professional environments.

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