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Introduction to English for Mathematics Course: What are the Student Difficulties and Causing Factors?

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Abstract

English for Mathematics is a required university course designed to bridge the gap between general English proficiency and the specific linguistic demands of mathematics. This study aims to explore the challenges students face in adapting to this specialized curriculum, aiming to deepen our understanding of the educational hurdles posed by evolving academic requirements for graduates. Employing a descriptive qualitative research design, the research examines the experiences of 35 students enrolled in the English for Mathematics course at the Mathematics Study Program of Universitas PGRI Sumatera Barat. Data were collected through semi-structured questionnaires, revealing five principal areas of difficulty: listening, reading, writing, and speaking skills, along with comprehension of mathematical content. The study identifies several factors contributing to these challenges, including limited vocabulary, inadequate prior knowledge, misinterpretations of course material, a lack of effective learning aids, and frequent writing errors. The findings suggest that these obstacles hinder student performance and impact their engagement and satisfaction with the course. The study calls for targeted interventions by educators and curriculum designers to enhance instructional methods and learning materials, thereby improving student outcomes and making learning more engaging and effective. These insights have broader implications for curriculum development and instructional strategies in specialized English education settings.

Keywords: English for mathematics, causing factors, student difficulties.

INTRODUCTION

English for Specific Purposes (ESP) for mathematics is a specialized educational approach tailoring English language instruction to meet the specific needs of mathematics students and professionals. This approach focuses on developing linguistic skills directly relevant to mathematics, enabling learners to effectively communicate mathematical concepts (Jourdain & Sharma, 2016). The course focuses on mathematical concepts, their articulation, and discussion in English. Mulwa (2015) and Burnett (2018) emphasized that

ESP for mathematics addresses the specific language needs of mathematical discourse, aiming to equip students with the linguistic skills essential for practical expression and understanding in mathematics. Wessel (2020) and Rodrigues (2021) further explained that English for Mathematics connects the language of mathematics with the English language, ensuring students understand mathematical principles and excel in expressing and exchanging ideas within the specialized area.

Moreover, students in the English for Mathematics course develop proficiency in general English alongside the ability to articulate complex mathematical ideas in English. This method promotes integrating language skills with subject matter, boosting comprehension and communicative competence. The goal is to narrow the gap between language proficiency and specialized knowledge, enabling students to effectively manage mathematics's linguistic aspects (Ernest, 2002). Rohid (2019) confirmed that students who complete the English for Mathematics course acquire a unique skill set that enables them to precisely communicate mathematical concepts in English, preparing them for academic and professional settings where English and mathematics intersect.

However, students learning mathematics in English, especially when English is not their first language, face numerous challenges (Ekayati et al., 2022). First, the specialized and complex terminology used in mathematics can be challenging to grasp and use accurately in English, requiring both language proficiency and a deep understanding of mathematical concepts (Fritz et al., 2019; Schleppegrell, 2007; Lee et al., 2013) Additionally, the abstract nature of mathematics poses significant challenges when expressing these concepts in English, demanding precision and clarity that can be daunting for learners (Varughese, 2009; Mavuru & Ramnarain, 2020; Freeman et al., 2016). Mathematical language also has its unique syntax and structure, differing from everyday English, which complicates the arrangement of symbols, equations, and expressions. Beyond grammar, effective communication in this field requires the ability to articulate complex mathematical reasoning coherently and logically.

Other barriers include limited resources, which restrict access to materials that integrate English and mathematics effectively, and cultural and educational differences that influence how students from diverse backgrounds approach mathematical problems and language learning. Time constraints also pose a significant challenge, as integrating language learning with mathematical study within a standard academic schedule often leaves insufficient time for both areas (Zhang et al., 2020; Borysenko et al., 2023). Addressing these challenges requires a holistic approach that combines engaging, context-specific materials, supportive teaching methods, and targeted language development strategies. These measures can help students successfully manage the complexities of studying English for Mathematics.

Furthermore, several studies have explored the role of English in mathematics education. The first study analyzed mathematical problem-solving abilities in geometry at a secondary school using a quantitative approach. A descriptive method involving an essay test was used to collect data. The findings indicated that students' achievement in solving geometry problems could have been higher due to their unfamiliarity with tasks measuring problem-solving skills, difficulties recalling prior knowledge, and a lack of a problem-solving framework (Sari et al., 2017). The second study, conducted by Kayyis (2019), focused on the specific needs of students in the English learning process within a mathematics context.

Using a qualitative descriptive approach, data were gathered from interviews and documentation from third-semester students in a mathematics education department. The results emphasized the importance of English for professional needs across all fields and identified speaking and grammar as challenging areas for students. It also highlighted the importance of understanding basic mathematical laws in English to facilitate learning in mathematics courses. Lastly, a study by Jaber and Daana (2020) investigated the impact of using English in mathematics learning among Grade 7 students. This quantitative study involved a test with three-word problems, ranging from straightforward to complex calculations, to evaluate the influence of language on learning. The findings suggested that using English as the medium of mathematics instruction posed challenges for students in solving problems. Moreover, the choice of language in primary education was found to affect students' academic achievements significantly.

Several research gaps have been identified from previous studies. While earlier research primarily focused on speaking and grammar in English for Mathematics courses, this study expands the analysis to include listening, reading, and writing skills, critical for students' conceptual understanding and communication. Additionally, while previous research mainly concentrated on school settings, this study focuses on college students, offering a more comprehensive range of perspectives due to the diversity of student backgrounds and learning approaches at the university level. Therefore, this research addresses the difficulties and causal factors influencing students in the English for Mathematics course. By identifying these challenges, the study facilitates collaboration between lecturers and students to enhance learning processes and reduce classroom anxiety.

METHOD

This research was a qualitative study with a descriptive qualitative design. Starman (2013) defined descriptive qualitative research as a method suitable for the social sciences that involves collecting and analyzing data in words and human actions without attempting to quantify the data. This approach is designed to describe natural and human-made phenomena, focusing on characteristics, quality, and activity rather than numerical analysis.

Data for this study were collected using questionnaires. A questionnaire is a data collection technique where respondents are given a set of questions or statements to answer. The questions in the questionnaire were of two types: open and closed. Open questions allowed respondents to provide detailed descriptions in their own words, whereas closed questions required a brief answer, typically choosing from among multiple provided options. Closed questions were designed to elicit responses that could be categorized as nominal, ordinal, interval, or ratio data. In this study, we used closed questionnaires, requiring respondents to indicate the answer they considered correct by marking it.

Before distributing the questionnaire to students, the researcher ensured its validity with the assistance of two experts. The first expert assessed the questionnaire's content to reflect the relevant indicators and sub-indicators accurately. The second expert reviewed the language used, verifying its appropriateness and clarity. This dual expert review ensured that the questionnaire could effectively capture the true essence of the phenomenon under study. Data was collected among students enrolled in the English for Mathematics course at the Mathematics Study Program of Universitas PGRI Sumatera Barat. A total of 35 students

registered in the academic year 2022/2023 participated in this study, which took place from September to December 2022. Total sampling was employed, meaning all students in the course were included.

For the data analysis, the researcher followed the structured steps outlined by Miles et al. (2014), which guide the systematic examination of data to identify underlying themes. The first step involves data collection, where the researcher gathers information and questionnaires and compiles documentation at the research site. This is followed by data reduction, a critical process where the collected data is selected, focused, and condensed. This transformation of raw data begins in the field and continues throughout the data collection period, emphasizing narrowing down to relevant study areas. The third step is the presentation of data, where the researcher organizes the findings into categories or groups, utilizing various formats such as networks, linkages of activities, or tables to display the information. The final step is drawing conclusions, where the researcher synthesizes the data findings to formulate conclusions about the study.

FINDING AND DISCUSSION

After conducting the research, several key findings emerged regarding students' difficulties in studying English for Mathematics.

Table 1. Student's difficulties in studying English for mathematics on listening

Listening Component	Percentage Reporting Difficulties
Receiving	77%
Attending	80%
Understanding	57%
Responding	51%

Table 1 provides an overview of the listening challenges faced by students in an English for Mathematics course. The table reveals that many students struggle across various aspects of listening. Specifically, 77% of students need help to accurately receive or discern spoken mathematical terms, indicating challenges in the initial perception of language. An even higher percentage, 80%, need help maintaining focus during lectures or discussions, which is crucial for understanding complex mathematical concepts in English. Understanding the content proves problematic for 57% of the students, highlighting issues with comprehending mathematical discussions' intricate details and logical structures. Furthermore, more than half of the students, 51%, need help responding appropriately, reflecting difficulties in forming coherent replies or applying the information discussed. This comprehensive data suggests that enhancements in teaching strategies could help address these widespread difficulties, improving students' overall performance in the course.

Table 2. Student's difficulties in studying English for mathematics on speaking

Speaking Component	Percentage Reporting Difficulties
Pronunciation	57%
Fluency	60%

Table 2 outlines the speaking challenges faced by students enrolled in the English for Mathematics course. The data reveals that a significant portion of the students struggle with critical aspects of spoken communication. Specifically, 57% of students find pronunciation challenging, indicating difficulty in articulating mathematical terms accurately, which is

critical to prevent misunderstandings in complex discussions. Furthermore, 60% of students report issues with fluency, suggesting they need help maintaining a steady, uninterrupted flow of speech. This can hinder their ability to explain mathematical processes clearly and efficiently, potentially impacting their overall academic performance in the course. These statistics underscore the need for targeted interventions to enhance pronunciation and fluency, improving students' ability to communicate effectively in mathematical contexts.

Table 3. Student's difficulties in studying English for mathematics on reading

Reading Component	Percentage Reporting Difficulties
General Information	85%
Meaning of Words	80%
Language features	87%

Table 3 illustrates students' significant challenges when reading English for Mathematics, pinpointing specific areas where difficulties are most pronounced. An overwhelming 85% of students need help understanding general information, which includes grasping the overall context and main ideas presented in mathematical texts. Close behind, 80% of students need help with the meanings of specific words, particularly the specialized terminology crucial for comprehending advanced mathematical concepts. The most pronounced difficulty, however, is with language features, reported by 87% of the students. This involves navigating complex sentence structures and the formal linguistic elements commonly found in academic texts, which can hinder their ability to decode and understand detailed mathematical arguments. These statistics underscore the need for focused reading support in the curriculum aimed at improving comprehension of general content, vocabulary, and linguistic structures within mathematics.

Table 4. Student's difficulties in studying English for mathematics in writing

Writing Component	Percentage Reporting Difficulties
Content	93 %
Organization	90 %
Grammar	85 %
Vocabulary	82 %
Mechanics	73%

Table 4 provides a detailed breakdown of the challenges students face in the writing component of the English for Mathematics course. The data reveals that the highest % of students, 93%, struggle with content, indicating difficulties in effectively communicating mathematical concepts through writing. The organization follows closely, with 90% of students finding it challenging to structure their ideas logically and coherently in their written work. Grammar also poses a significant hurdle for 85% of the students, affecting the clarity and accuracy of their writing. Vocabulary is another concern, with 82% of students needing help using precise terms to discuss mathematical topics effectively. Lastly, 73% of students need help with mechanics, such as punctuation, capitalization, and spelling, which can further obscure the clarity of their written communication. These findings highlight the need for comprehensive writing support to address these areas, ensuring students can articulate mathematical ideas clearly and effectively in their written English.

Table 5. Causing factors of student's difficulties in studying English for mathematics

No	Causing Factors	Percentage

1.	Lack of Vocabularies	95 %
2.	Lack of Knowledge about English for Mathematics	85 %
3.	Wrong interpretation of the received information	80 %
4.	Lack of learning Media	80 %
5.	Many mistakes in writing the words/ English terms	71 %

The data presented highlights various factors causing difficulties for students studying English for Mathematics, as identified through a survey. The most significant issue, reported by 95% of students, is a lack of vocabulary. This high percentage indicates that students must be more adequately equipped with specific terms to understand and effectively communicate mathematical concepts in English. Following closely, 85% of students cited needing more knowledge about English for Mathematics. This suggests that students do not have a solid foundational understanding of how English is explicitly used in the context of mathematics, which hampers their ability to engage with the subject matter.

Additionally, 80% of students reported difficulties due to wrong interpretations of the information received. This indicates that misunderstandings or misinterpretations of mathematical content are standard, likely due to linguistic nuances or the complex nature of mathematical language in English. An equal 80% of respondents also pointed to a lack of learning media as a barrier. This refers to insufficient access to educational resources such as textbooks, software, or online materials tailored to learning mathematical concepts through English. Lastly, 71% of students reported making mistakes in writing words or correctly using English terms. This suggests challenges with vocabulary and applying these terms accurately in written form, further complicating their learning experience.

DISCUSSION

After conducting the research, several key insights have emerged regarding students' experiences with English for Mathematics. One of the most significant obstacles identified is the anxiety students feel, which includes fears of making mistakes, lacking vocabulary, and difficulties in comprehending information. These concerns significantly hinder their ability to study the subject, as evidenced by the questionnaire effectively. Research by Wantika and Nasution (2019) supports this finding, noting that students often feel overwhelmed and anxious when studying mathematics. The study also highlights particular areas of difficulty. While some students manage to cope with the listening and speaking components of the course, they face more significant challenges with writing, reading, and understanding the course content. Moreover, reading poses a significant challenge for students, particularly in grasping the meaning of words, which leads to understanding the material. Writing is similarly problematic, with students needing help to apply English grammar rules, specifically the specialized grammar used in mathematical contexts (Myhill, 2022; Halliday, 2014; Cesaria et al., 2022).

Furthermore, Wahyuni (2021) reports that most students need to be better acquainted with the English used in mathematics, which manifests in widespread difficulties with grasping the content of the lessons. Ayu and Viora (2018) add that factors exacerbating these challenges include limited interaction between students and lecturers and general passivity in the classroom. These findings collectively underscore the need for targeted support to address the linguistic and emotional barriers students face in learning English for Mathematics. Enhanced interactive teaching methods and more supportive learning

environments could improve understanding and reduce anxiety, enabling better engagement with the course material.

However, despite several challenges associated with studying English for Mathematics, the significant benefits of this course for students are undeniable. The course enhances communication skills by equipping students with the ability to clearly and precisely articulate mathematical concepts in English, a skill invaluable in academic settings, collaborative projects, and professional environments. As English is widely recognized as a global language, proficiency in it facilitates communication and collaboration across different linguistic and cultural backgrounds, which is particularly important in fields where mathematics serves as a universal language. Academic success is also bolstered for students pursuing advanced studies in mathematics since a strong command of English is crucial for understanding textbooks, research papers, and lectures. Moreover, the course encourages a cross-disciplinary approach by integrating language skills with mathematical knowledge, enhancing critical thinking and problem-solving abilities. Adaptability improves as well, as navigating mathematical concepts in English prepares students for various educational and professional environments in a rapidly changing global landscape. Additionally, research and publications significantly benefit from proficiency in English, the dominant language in academic research, enabling students to present their findings effectively and contribute to global academic discourse in mathematics (Cho et al., 2015; Ngansop, 2018; Zein et al., 2020).

CONCLUSION

English for Mathematics, a mandatory course in many universities in Indonesia, serves as a specialized extension of general English, focusing specifically on the language needs of mathematical disciplines. Throughout the course, students encounter several challenges that impact their learning experience. These include listening, reading, writing, and speaking difficulties, which are crucial skills for mastering the subject. Despite their efforts, students need help with their progress. Key issues include a significant lack of vocabulary, inadequate understanding of the specialized language used in mathematical contexts, and frequent misinterpretations of information, often due to carelessness.

Additionally, students need more appropriate learning media and numerous errors in writing mathematical English terms. To address these issues, lecturers and educational institutions must consider these difficulties. Enhancing the teaching approach and providing adequate resources are essential to making learning more engaging and effective for students. By addressing these challenges, we can ensure that students enjoy their study experience and achieve the desired learning outcomes in English for Mathematics.

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