http://jurnal.uf.ac.id/index.php/JEDLISH
ISSN 2809-0519 | e-ISSN 2828-7088
JEDLISH, 4 (2) (2024) 74 - 80

AN ANALYSIS OF STUDENTS' LEARNING OUTCOME OF ENGLISH FOR MATH AND SCIENCE COURSE

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ABSTRACT

This research aims to analyze the learning outcome of English language learning in higher education, particularly in the context of English for Mathematics and Science course. This research employs a qualitative case study methodology to explore students' learning outcomes and their language barriers faced by students during learning it. It also discusses the teaching materials, learning activities and teaching approaches used in EFMS courses. The subjects of this research are three classes from the sixth semester students of primary teacher education program of University of Muhammadiyah Tangerang with total amount of 78 students and one lecturer. The data collecting techniques used were observation, interview and documentation. The result found that students' learning outcome are mostly 55% got the "A - excellent" grade (43 students), 27% got the "B - good" grade (21 students), 11,5% got the "C - adequate" grade (9 students), and 6,4% got the "D - Failed" (5 students). Within this result, there were many students who performed well and can follow the course until the end of the meeting and understand the material comprehensively, but it cannot be avoided that notable language barriers that impacted their learning outcome, particularly when learning English for Mathematics and Science. These language difficulties were exacerbated by the complexity of the subject matter, as students often struggled to grasp both the technical content and the English terminology simultaneously.

Key words: English for Mathematics and Science, learning outcomes, language barriers, English terminology

INTRODUCTION

English has become an essential skill in daily life, whether in education, the workplace, or international exchange. Knowledge of English opens opportunities for individuals to access various sources of knowledge, communicate worldwide, and become more competitive in the labor market (Nur Fitria, 2022). Therefore, English proficiency at the educational level has become one of the main focuses in the education systems of various countries, including Indonesia (Zein et al., 2020).

In Indonesia, English language learning begins in primary school and continues through to university. However, the results achieved by students in learning English vary. Some make rapid progress, while others struggle to understand and master the language. This can be influenced by various factors, including the teaching methods used, student motivation, parental involvement, and the availability of supporting educational resources (Guo et al., 2024).

English language learning at higher education institutions plays a crucial role in preparing students for an increasingly interconnected world. By improving their English skills, students gain access to broader knowledge and expand career opportunities in various professional fields (Bradford et al., 2024). Therefore, effective learning methods, teacher support, and strong student motivation are essential for optimal English language learning. Good English language skills will prepare students to contribute to both the academic and professional worlds on a global scale in the future (Macaro & Han, 2020).

The primary goal of English language learning in higher education is to improve students' communication skills in English, both in academic and non-academic contexts (Martirosyan et al., 2022). In the academic world, English is used to understand course content, write scientific journals, participate in discussions, and collaborate with international researchers. In addition, English language knowledge is important in the professional environment, as many companies and international organizations require their employees to communicate effectively in English (Macaro & Han, 2020).

English language learning in higher education also aims to develop students' reading, writing, listening, and speaking skills in English. These skills are necessary not only for understanding academic documents in English but also for enhancing students' critical and analytical thinking abilities (Lasagabaster, 2022). Therefore, English language learning involves not only teaching grammar and vocabulary but also developing more complex communication skills.

The teaching of English language learning in higher education varies depending on the study program and specific goals to be achieved. Moreover, English language learning in higher education is often combined with technology, such as the use of online learning platforms, video conferences, and language learning apps (Huseinović, 2023). This technology allows students to access learning materials anytime and anywhere and interact with teachers and peers through various digital media(Mihai et al., 2022).

In the academic context, many universities offer English for Specific Purposes (ESP) programs designed to meet communication needs in particular fields, such as education, medical English, engineering, business, and law (Salmani-Nodoushan, 2020). The aim of these programs is to help students master English in a professional context and effectively handle situations related to their field of study or career.

English for Mathematics and Science is a crucial component of modern education, particularly in higher education, where it facilitates global communication, research, and academic exchange. By mastering EFMS, students not only enhance their understanding of complex mathematical and scientific concepts but also gain the language skills necessary for success in the international academic and professional area. Effective teaching of English for Mathematics and Science can ensure that students are well-equipped to thrive in a world where English dominates the language of science and technology.

Along with its sophisticated features, this English for Mathematics and Science course is quite challenging for the sixth semester students of primary teacher education program of University of Muhammadiyah Tangerang since it has complex vocabulary mastery. Many students struggled with the technical and specialized vocabulary used in mathematics and science. Moreover, the use of language of mathematical expression such as the symbolic and formulaic language of mathematics may be difficult for learners to master in English.

One of the biggest challenges for sixth semester students of primary teacher education program of University of Muhammadiyah Tangerang faced that they have different levels of English proficiency. Some students already possess a high level of English proficiency, while others have limited language skills. This can create gaps in the learning process and requires teachers to adjust their teaching methods to meet the needs of students with varying proficiency levels.

Additionally, many of sixth semester students of primary teacher education program of University of Muhammadiyah Tangerang experience anxiety, especially when learning English for Mathematics and Science. The fear of making pronunciation errors or grammatical inconsistencies often hinders students from actively participating in learning activities. Therefore, it is important for teachers to create a supportive and non-judgmental environment so that students feel comfortable learning and practicing English without fear.

Another challenge is that some students lack intrinsic motivation to learn English, especially when they do not see its relevance to their academic or career goals. English language learning in higher education must be able to demonstrate its relevance and benefits in order to motivate students to study the language.

Analyzing the results of English language learning is important to evaluate the effectiveness of the learning process, identify strengths and weaknesses in the classroom, and find solutions to improve students' English proficiency. In this context, learning outcomes can include aspects such as text comprehension, speaking, listening,

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http://jurnal.uf.ac.id/index.php/JEDLISH
ISSN 2809-0519 | e-ISSN 2828-7088

reading, and writing skills in English. By analyzing learning outcomes, educators can develop more effective learning strategies, boost student motivation, and optimize the use of relevant learning media. Therefor, this research formulates the questions to be studied: (1) How is the learning outcome of sixth semester students of primary teacher education study program in learning English for Mathematics and Science? (2) What are the language barriers faced by sixth semester students of primary teacher education study program when they learned English for Mathematics and Science?

METHODOLOGY

This research uses a qualitative approach with a case study design (Creswell, 2014). This approach was chosen because it allows the researcher to explore an in-depth understanding of the meaning individuals give to their experiences in the context of English language learning in a specific classroom.

The participants in this study consisted of active students from the sixth semester students of primary teacher education study program consisting of three classes namely 6A, 6B, and 6C who participated in learning English for Mathematics and Science in even semester using the KKNI curriculum. The selection of participants was carried out using purposive sampling technique to ensure that the selected participants had direct experience related to the phenomenon under study.

Table 1. Subject of this Research

No.	Class	Total Students	Sampling Technique
1.	6A	24	Purposive Sampling
2.	6B	26	
3.	6C	28	
Total Sample		78	

Data was collected through three main techniques: (1) In-depth Interview using semi-structured interviews were conducted with each participant to explore their views and experiences by interviewing three students in each class. The interview questions focused on the challenges, positive experiences, and strategies used by students to adapt in the English for Mathematics and Science course, (2) Participatory Observation where the researcher observed several English for Mathematics and Science classes that took place twice when students in each class were learning English of mathematics and science material. (3) Documentation where researchers collected documents that is used by lectures, such as list of final score report, syllabus, study books, students' PowerPoint presentations, and video recordings of lectures whilst teaching. These documents were analyzed to gain further understanding of the English for Math and Science course.

To ensure the validity and reliability of the research results, the researcher applied triangulation techniques, by comparing information obtained from interviews, observations, and documentation to increase the credibility of the findings (Sugiyono, 2011). In addition, the researcher also conducted member checking, where provisional findings were shared with several participants to ensure accuracy and conformity with their experiences. The researcher also maintained objectivity during the data collection process by recording personal reflections that could affect the interpretation of the data.

RESULTS AND DISCUSSION

Course Description of English for Math and Science

The general process of students learning in English for Mathematics and Science course focus on active, inquiry-based learning, demonstration, and continuous feedback to enhance students' understanding. Through a variety of evaluation techniques, students' conceptual understanding, skills, and applications are assessed to ensure that they are progressing toward mastery of key concepts both for mathematics and science materials.

English for Mathematics and Science course has a weight of 2 credits and is broken down into 14 meetings for the learning process, 1 midterm exam, and 1 final semester exam. This course is an elective course studied in even semesters, especially for students in the sixth semester. This course is one of the interesting courses to learn because students as prospective teachers in elementary schools must master various learning concepts and English language

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skills for certain topics, especially in mathematics and science lessons.

Table 2. Course Description of EFMS

Course Description	Mathematics Materials	Science Materials
This course aims to enable students to understand the concept and application of teaching English in mathematics and science. S9, KUI1, KK17	▪ Numbers ▪ Basic Operation ▪ Angles ▪ Geometric Shapes ▪ Fraction and Decimal ▪ Unit of Time, Unit of Mass and Unit of Length	▪ Parts of Human Body ▪ State of Matters ▪ Animal Classification ▪ Parts of The Plant ▪ Electrical Energy ▪ Earth Movement and Eclipses

The language interaction in English for Mathematics and Science classroom is a dynamic process where students, teachers, and the subject matter engage in continuous dialogue to foster deeper understanding and critical thinking. Below is a description of the typical interactions in such classrooms:

1. **In Mathematics Sections:**
   a. Explanation of Concepts: Teachers introduce mathematical concepts step-by-step, often using real-life examples or visual aids to make abstract ideas more tangible. For example, in materials of numbers and basic operations, a teacher may demonstrate how to solve equations by working through examples on the board.
   b. Questioning and Clarification: Teachers frequently ask questions to check for understanding, prompting students to explain their reasoning. If a student struggles, the lecturer might offer hints or guide them through a process in smaller, more manageable steps.
   c. Direct Instruction: The teacher often provides explicit explanations for new topics, like explaining the properties of geometric shapes, and guides students through examples.
2. **In Science Sections:**
   a. Demonstrations and Explanations: Teachers demonstrate scientific principles through experiments or simulations. For example, in a chemistry class, a teacher may demonstrate a reaction between chemicals, explaining the process and outcomes.
   b. Inquiry-Based Questioning: In science classrooms, teachers encourage students to ask questions about the material, leading them to hypothesize, experiment, and analyze data. The teacher facilitates discussions on the nature of scientific processes, encouraging students to think critically.
   c. Guided Investigation: When conducting experiments, teachers provide initial instructions and then allow students to work through the investigation themselves, offering support as necessary.

Learning Outcome of English for Math and Science

English learning outcomes refer to the specific skills, knowledge, and abilities that students are expected to achieve by the end of an English language learning experience, such as a lesson, unit, or course. These outcomes guide both teachers and students, providing clear goals for what should be accomplished in terms of language proficiency, communication skills, and literary understanding. Learning outcomes can vary depending on the level of the learner and the focus of the course.

Table 3. Descriptive Data of EFMS Final Score

Descriptive Statistics				
		Score_6A	Score_6B	Score_6C
N	Valid	24	26	28
Mean		80.21	75.77	77.14
Median		82.50	77.50	77.50
Mode		85	70	75
Range		35	80	60
Minimum		60	20	35
Maximum		95	100	95
Sum		1925	1970	2160

Based on the above table, the score of the three classes are varies. Score of learning outcome of 6A has a mean of 80,21 the highest among all. The second position is score of 6C

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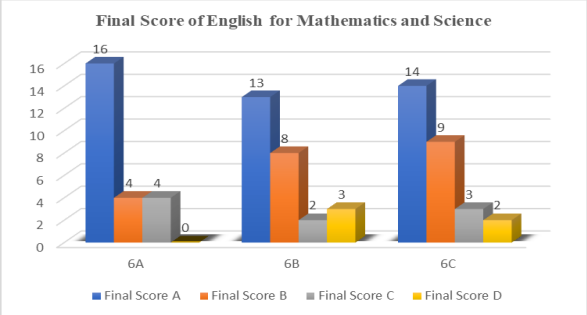
with 77,14 and third is 6B with score of 75,77. The median of 6A is 82,50, 6B is 77,50, and 6C is 77,50. The most frequent score or mode of 6A is 85, 6B is 70, and 6C is 75. The class whose got all of the final exam answers correct is 6B with 100 points. After the data from the three classes are calculated for descriptive statistics, the next step is to classify the values according to the number and letter categories. The percentage of final mark are based on several indicators namely attendance and assignment (20%), mid-test score (40%), and final result score (40%). The standardized learning outcome category applied in this course are: A (100-80), B (79-69), C (68-54), D (53-below).

Table 4. Classification of EFMS Learning Outcome

Class	Final Score			
	A	B	C	D
6A	16	4	4	0
6B	13	8	2	3
6C	14	9	3	2
Total	43	21	9	5
Percentage (%)	55,12	26,92	11,53	6,41

Based on the table 4 above, students' learning outcome are divided into four categories. In the A value letter, the are total 43 students or 55,12%, for the B value letter with the total of 21 students or 26,92%, for the C value letter with 9 students or 11,53% and for the D or failed with 5 students or 6,41%. The overall learning outcome indicated that students still can follow the course and got the good result. Students who have good learning outcomes are students that can apply and integrate the knowledge and skills gained from the teaching and learning process. Good learning outcomes can also be interpreted as students' ability to achieve certain competencies (Abedi & Sanchez, 2023).



Picture 1. Histogram of EFMS Learning Outcome

Based on the histogram above, it can be seen that class 6A has the highest score among all classes, but the remaining two classes are more diverse in score categories. The five students who were failed to pass this subject or got the D value came from both classes which were 6B and 6C.

Students' Language Barriers in English for Math and Science Course

There are several reasons why students may struggle or fail in English lessons. These can vary based on individual circumstances, learning environments, and teaching methods. First, Mathematical and Science Terminology which are hard to memorize. Mathematics and Science uses a specific set of terms that may not be familiar to students, especially those learning English as a second language. Terminology such as "quotient,", "integral,", "nominator" and "denominator", "area", "parameter", etc., can be confusing. Secondly, there are so many abstract concepts. Mathematics and Science often involves abstract ideas that are challenging to express in plain language. Students may have difficulty understanding the English terms associated with these concepts, such as "equation," "friction," or "theorem".

Another barrier comes from students who are not fluent in English may struggle to understand math problems or instructions written in English(Agustin et al., 2021). This can hinder their ability to solve problems correctly or follow explanations. Those type of students also have problems to read and understand the mathematical and science concepts. It deals with their reading comprehension (Nanda & Azmy, 2020). If students have weak reading comprehension, they may not grasp what the

question is asking, leading to incorrect answers. Lastly, lecturer may not provide enough support for students who are still mastering the English language (Capodieci et al., 2020). Without additional explanations or resources, or additional aids tailored to their needs, these students may struggle in math classes that require a strong understanding of both the language and the subject.

CONCLUSION AND SUGGESTION

To help students succeed in English for Mathematics and Science, a multi-pronged approach is necessary. Lecturer can do the following activity such as simplifying language. lecturer can simplify language, explain difficult terms, and use visual aids to support learning. In addition, lecturer and students can regularly practice with word problems alongside explicit instruction on how to break them down; it can improve students' comprehension. Lecturer also can encourage students' active participation to explain their reasoning, even in simple terms, can help build their language, mathematical and science skills simultaneously. For EFL students, providing additional language support through vocabulary building and scaffolding techniques can be crucial for success in English for Mathematics and Science class.

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