Research Article

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Mathematics Students' Ability in Understanding Text

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Abstract

This study aims to obtain a description of the students' ability in understanding text. To achieve the objective, the study selected 216 mathematics students in a proportionate stratified random sampling. The students were asked to answer questions from a text that was designed and validated by a linguist. The samples were asked to fill out a questionnaire. The results show that there was a relationship between the length of studying mathematics (semester level) and the student's ability to understand the idea of a text, the ability to determine conclusions from the given text, and the student's ability to determine the relationships of paragraphs. This study also found that factors such as Grade Point Average (GPA), reading habits, and reading preferences cannot be assumed to have correlations with students' ability to understand texts.

Keywords: *Mathematics Students, Text, Text Comprehension*

1. Introduction

Language is a medium for communicating, thinking, analyzing, and reasoning (Baber, 2011). As a medium of communication, language in general differs from the language of mathematics in three ways, namely the language of mathematics does not contain elements of time (past, medium, or future) and emotional elements. The language of mathematics also contains a level of absolute accuracy because it does not contain elements ambiguity (Jamison, 2000). However, mathematics, like language in general, has grammar, syntax, vocabulary, word order, synonyms, negation, conventions, idioms, abbreviations, sentence structure, and paragraph structure (Moursund, 2005).

Language and mathematics are two related entities. Language is a verbal expression of mathematics; and mathematics is a symbolic expression of language (Hapipi, Azmi, Sripatmi, & Amrullah, 2017). Greabell (in Fite, 2002) states that reading and mathematics are similar in that both are abstract, involve symbols, require cognitive processes, and both require knowledge of the interaction of various discrete skills. Moursund (2005) also asserts that although they are separate, mathematics, and language are closely related. Numbers and other mathematical symbols are part of words in writing and speaking.

Both language and mathematics, as stated by MacGregor and Price (in Fite, 2002), require cognitive abilities to process and understand the symbols used. The ability to understand symbols is the basis for understanding language and mathematics. Furthermore, Khisty and MacGregor (in Wiest, 2003) also emphasize that although language and mathematics are different in expressing their concepts, it needs to be realized that every mathematics lesson is also a language lesson. Fang and Chapman (2020) state that reading can be a way to help students get ideas, build background knowledge, seek explanations, develop motivation, and improve math competence. Moreover, writing activities, which are related to language, have a positive impact on the language of mathematics (Atasoy & Baki, 2020).

Text is a script in the form of original words from an author; or written materials for the basis of giving lessons, giving speeches, etc. Text can also be written discourse (KBBI, 2021). Therefore, structured texts follow standard language rules. Mahsun (2013) states that text is a complete expression of the human mind in which there is a situation and context. It can be said that each text is arranged in the thinking pattern and structure of each individual.

Furthermore, Bergqvist, Theens, and Österholm (2018) reveal that the reading ability or the ability of students to understand text is needed to work on and complete math tasks. This is reinforced by the findings of Jordan, Kaplan, and Hanich (2002) from their research that reading ability affects the development of children's mathematical abilities. Moreover, reading comprehension skills, according to (Andanik & Fitrianawati, 2018)Andanik and Fitrianawati (2018) have a positive effect or have a strong correlation to the ability to solve math word problems. Several studies also show the same thing, that language skills are related to one's math skills (Chow & Ekholm, 2018; Purpura & Ganley, 2014; Vukovic & Lesaux, 2013).

Ramelan (2008) states that a person can identify the main idea of a text well if it is supported by the ability to reason logically and the ability to draw logical inferences from available information. Therefore, it can be said that a person's ability to understand texts is determined by the ability to reason, think logically, and systematically, all of which are closely related to mathematical abilities.

Hapipi et al. (2017) also found that there is a relationship between people who study mathematics and their ability to understand texts. These findings are based on a study of the comparison of the ability of mathematics students with non-mathematics students in understanding texts. It was found that the ability of mathematics students was better in terms of making inferences and determining relationships between paragraphs than non-mathematics students. However, because the study compared various backgrounds, a sample of mathematics students was taken with the assumption of uniformity. Therefore, a more detailed study, one of which is by looking at the length of study (semester level), is very open to being explored.

2. Method

The data were collected from mathematics students in Mataram of West Nusa Tenggara, Indonesia. The students are majoring in mathematics education. They are prospective high school teachers. The students were of semesters 1, 3, 5, and 7. The sample of students was taken using proportionate stratified random sampling technique, considering the diverse and tiered population conditions. This refers to the opinion of Sugiyono (2008), which states that this sampling technique is used when the population has members/elements that are not homogeneous and proportionally stratified. The number of samples in this study was 216 students with the following distribution.

Table 1: Semester Distribution and Number of Respondents

Semester	Total
1	52
3	59
5	53
7	52
Total	216

Respondents were then given a reading test package that contained text and questions. The test package was developed and validated by a linguist. The questions measure five main points: (1) the ability to determine the idea of a paragraph; (2) the ability to determine the relationship between paragraphs; (3) the ability to draw conclusions from a text; (4) the ability to determine the title of a text; and (5) the ability to predict the content of the next paragraph should the text be continued. In addition to a reading test package, respondents were also asked to fill out a questionnaire that were generally categorized into three main issues: (1) in terms of time spent, how intensively students read; (2) the type or type of books they enjoy reading; and (3) report on their academic progress shown by the GPA. The data is then processed and analyzed using analyzer software.

3. Results and Discussion

The findings related to students 'ability to understand text are presented in four categories: (1) semester level, (2) cumulative Grade Point Average (GPA) correlation data, (3) daily reading time correlation, and (4) the correlation of types of books read with students' understanding scores of texts. The four data are presented in the following sequence.

3.1 Text Comprehension Based on Semester Level

The semester level is intended to determine the ability of students to understand the text based on the depth level of the mathematics material they have studied and how long they have struggled and studied Mathematics. Unquestionably, students of 7^{th} semester have studied mathematics longer, more intensively, and more deeply compared to students in lower semesters. Students of 7^{th} semester have taken at least 92 credits (Pendidikan Matematika FKIP Unram, 2015) for about 3.5 years. The students of semester 1 have only taken 10 credits with a duration of about 0.5 years. Based on the results of data analysis, it is revealed that in general, the semester has a great impact to their ability to understand texts.

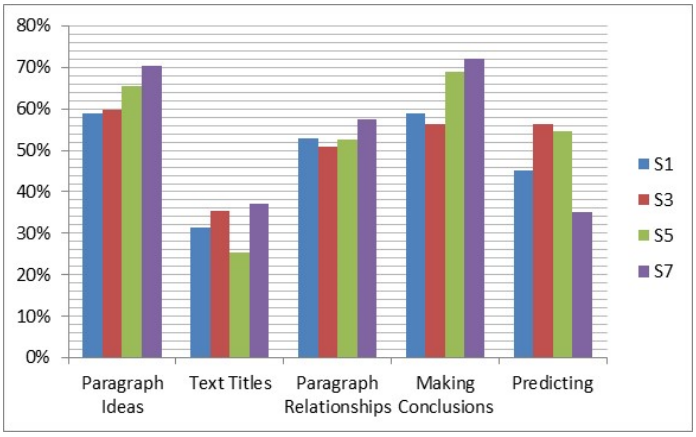

Figure 1: Students' Ability to Understand Text Based on Semester Level

The graph above shows that there is a percentage variation of students answering correctly for the five categories of questions. In the first four categories (the ability to determine paragraph ideas, the ability to determine text titles, the ability to determine relationships between paragraphs, and the ability to make conclusions), the students of 7th semester were the highest. On the ability to determine the main idea of paragraphs in a text, they are also better than that of students of 5th, 3rd, and 1st semesters.

Similarly, in ability to make conclusions from a text, the students of 7th semester have abilities that are better than the other. In terms of the ability to determine the relationship between paragraphs, the profile of the mathematics students' ability patterns is also relatively similar.

According to (Norfolk, 2003), mathematics builds logic and pattern recognition in brain. A person can have the skills of organizing problems and solving them through mathematical structures. The importance of the position of mathematics in helping to train humans to be able to think in stages and good systematics is one of the main bases, why humans must study mathematics (Hapipi et al., 2017).

According to Hapipi et al. (2017), the ability of mathematics students in the three components as described above was better than students from non-mathematics majors. This is also in line with research by Ramelan (2008) that the ability to understand texts is correlated with a person's deductive thinking ability, where the ability to think deductively is an ability needed in mathematics. Österholm (2005) also found that students who had studied mathematics more had better reading comprehension skills than students who had studied mathematics less.

In addition to learning math topics, studying mathematics is an activity of pattern recognition, observing structures, and testing them. This is as stated by Jarrett (1997) that learning mathematics is a process that involves observing patterns, testing predictions, and estimating results. Therefore, a systematic mathematical structure can train a person to actively recognize and understand any given text pattern and structure.

Although the ability to determine the title of a text and the ability to predict the next paragraph idea do not form a conclusive pattern, in the graph above it appears that there is an increase in students' ability to determine paragraph main ideas based on the comparison among semesters. Likewise, it appears in the ability to make conclusions and the ability to determine relationships between paragraphs. At this point, it is reasonable to state that there is a relationship between learning mathematics and students' ability to understand texts.

The opposite condition also applies, where the ability to read helps students in learning mathematics. Laily (2014) states that the ability to understand reading can affect a person's ability to solve math problems, which are usually packaged in the form of story problems. Jordan and Hanich (2003) also revealed that good reading and language skills help students understand certain topics in mathematics. Likewise, Pala and Narlı (2020) emphasized that students' ability to prove is also determined by their language skills.

3.2 Text Comprehension Based on The Academic Achievement Index

Grade Point Average (GPA) is often a measure of a student's ability in the field they are studying, so that the higher a person's GPA, it indicates that the student is better at mastering the material being studied. However, this GPA level did not show any relationship with the level of students' ability to understand the text. This is as shown in the following analysis results.

Correlations

		GPA	Texts Understanding
GPA	Pearson Correlation	1	.131
	Sig. (2-tailed)		.094
	N	164	164
Texts Understanding	Pearson Correlation	.131	1
	Sig. (2-tailed)	.094	
	N	164	164

Figure 2: Correlation between GPA and the Ability to Understand Text

From the chart above, it can be seen that the significance value of the results of the two-variable correlation analysis is 0.94 which is much greater than the set value, namely 0.05, so that means there is no correlation between GPA and the ability of mathematics students to understand text. This is in accordance with Prijana and Rohman (2016), who found that students' GPAs were not related to their understanding of a text. The GPA data analysis was carried out on 164 samples because 52 students of semester 1 were not analyzed since at the time data collection was carried out, their scores did not exist.

3.3 Text Comprehension Based on the Average Daily Reading Time

It is generally understood that a person's ability to understand text is also influenced by how usual/how long the person does reading activities. The longer or the more accustomed a person is in reading, the easier it will be for him to understand the text being read. Frank Hatt (in Prijana & Rohman, 2016) states that the time spent learning by reading is a determining factor in understanding reading. Tantri (2016) also revealed that the more accustomed students to reading, the easier it will be to understand a reading.

However, this does not seem to be the case for mathematics students. The results of the following analysis indicate that the length of time to read per day is unrelated to the student's ability to understand the text. Data analysis was performed using Spearman analysis for categorical data with ordinal scale (non-parametric correlation). Therefore, before being analyzed, the data of the students' ability to understand the text were first modified into an ordinal scale.

Correlations

			Texts Understanding	Time for Reading Daily
Spearman's rho	Texts Understanding	Correlation Coefficient	1.000	-.066
		Sig. (2-tailed)	.	.334
		N	216	216
	Time for Reading Daily	Correlation Coefficient	-.066	1.000
		Sig. (2-tailed)	.334	.
		N	216	216

Figure 3: Correlation of Daily Reading Time with Ability to Understand Text

The results above indicate that the value of the data correlation significance is 0.334 which is greater than 0.05, so this means it cannot be said that the length of daily reading time has a relationship with the ability of mathematics students to understand text.

3.4 Text Comprehension Based on The Book-Type Preferences

Another factor that was explored in this study was the type of books students usually read. Does the habit of reading books with certain types/genres affect the students' ability to understand text. There is an assumption that the type of reading that is usually read affects the structure of one's thinking. This is consistent with what Shofiah (2017) stated that the choice of reading text or type of reading will affect one's cognitive development.

In addition, the type of reading also affects a person's reading speed and the understanding of written content. In some conditions, a person can read quickly to understand the essence of a reading, in which case the type of reading also affects (BBC News Indonesia, 2019). Amalia (2017) also reveals that the reading speed of students depends on the type of reading and the level of difficulty of the text.

However, the findings of this study indicate that the type/genre of books that are commonly read is not related to the ability of mathematics students to understand the text. Data analysis was performed using Spearman correlation analysis for categorical data, as shown below.

Correlations

			Texts Understanding	Books Type
Spearman's rho	Texts Understanding	Correlation Coefficient	1.000	.034
		Sig. (2-tailed)	.	.619
		N	216	216
	Books Type	Correlation Coefficient	.034	1.000
		Sig. (2-tailed)	.619	.
		N	216	216

Figure 4: Correlation of Book-Types and Ability to Understand Text

From the results above, it can be seen that the significance value of the correlation between the types of books commonly read and the mathematics students' ability to understand text is 0.619, which is greater than 0.05, it, can be concluded that the two variables have no correlations.

4. Conclusion

There are some conclusions based on the results of this study. Firstly, there is a relationship between learning mathematics and students' ability to understand texts. The longer and deeper students study mathematics, the better their ability to determine paragraph ideas, the ability to determine relationships between paragraphs, and the ability to make conclusions in a text. However, this does not apply to the ability to determine the title of a text, as well as the ability to make content predictions for the next paragraph. On the other hand, the GPA and reading habits were not related to the level of students' ability to understand texts. Likewise, the type of books students read had no relationship with their ability to understand texts.

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