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Mathematics Interest and Reading Comprehension as Correlates of Elementary Students' Mathematics Problem-Solving Skills

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ABSTRACT
In the rapidly changing global landscape, adaptability to new challenges is essential. Mathematics, recognized as a key contributor to problem-solving skills, holds significant importance in navigating unfamiliar situations. This study delves into the correlation between mathematics interest, reading comprehension, and mathematical problem-solving abilities among elementary school students. Employers and academic institutions increasingly emphasize the application of mathematical knowledge in diverse scenarios, prompting educational reforms prioritizing problem-solving skills.The investigation involved 76 elementary students in Majalengka Regency, Indonesia, exploring mathematics interest, reading comprehension, and problem-solving skills using questionnaires and tests. Findings unveiled a noteworthy positive correlation between reading comprehension and mathematical problem-solving, surpassing the correlation with mathematics interest. Regression analysis reinforced this, highlighting the collective substantial impact of mathematics interest and reading comprehension on students' problem-solving proficiency.This study underscores the crucial role of reading comprehension in interpreting narrative-based mathematical problems. Understanding textual content significantly influences problem-solving strategies. Moreover, affective abilities, particularly mathematics interest, contribute significantly to problem-solving skills. A heightened interest in mathematics enhances motivation, encourages deeper conceptual learning, and fosters creativity in problem-solving.These results underscore the necessity of a holistic approach to mathematics education. Addressing not only cognitive aspects but also affective and reading proficiency facets can substantially enhance students' mathematical problem-solving abilities. Understanding the interrelationship among mathematics interest, reading comprehension, and affective abilities can pave the way for more effective teaching methodologies and improved academic outcomes in mathematics.
Keywords: *mathematics interest;reading comprehension;problem solving skill;*

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1. INTRODUCTION

The contemporary world demands societal adaptability to its swift and evolving nature (Guven & Cabakcor, 2013). This dynamism has given rise to novel challenges previously unencountered, necessitating adept problem-solving skills. Mathematics stands as a foundational discipline fostering such problem-solving capabilities (Pimta et al., 2009; Stehle & Peters-Burton, 2019). Employers and educational institutions increasingly expect graduates to proficiently apply their knowledge, particularly in mathematics, across diverse and unfamiliar scenarios (Jones et al., 2015). Consequently, many nations have undertaken extensive reforms, prioritizing problem-solving within their national mathematics curricula (Fülöp, 2021; Guven & Cabakcor, 2013; Liljedahl et al., 2016; OECD, 2010; Prendergast et al., 2018). This proficiency holds significance across various facets of daily life (Aljaberi & Gheith, 2016; Gurat, 2018; Saunders et al., 2018; Simsek et al., 2020). Hence, mathematical learning activities ought to prepare

students for real-life applications, establishing a conducive learning atmosphere enabling effective problem-solving (Gokbulut & Kus, 2019). Fundamental quantitative skills, encompassing adeptness in basic arithmetic operations and employing diverse problem-solving strategies fluently, constitute pivotal elements for children's future academic triumphs (Clements & Sarama, 2011; Geary, 2013; Star & Rittle-Johnson, 2009).

Problem-solving occupies a paramount position in education (Rott, 2020), evolving into the primary objective of mathematical learning within schools (NCTM, 2000), assuming a pivotal role within the domain of mathematical education (Li et al., 2020; Peng et al., 2020; Smith & Mancy, 2018; Wilson et al., 2011). It involves the ability to sift through extraneous information, devise strategies, execute essential steps, translate word problems into equations, and apply computational methods to resolve problems (Flores et al., 2016; Jitendra et al., 1998). Problem-solving entails the application of mathematical concepts (Ofsted, 2012; Williams & Williams, 2021) to tackle unfamiliar predicaments (Krulik & Rudnick, 1998), where individuals do not possess immediate access to the correct solution or strategy (Isam, 2020; Kojo et al., 2018). Ergo, resolving problems necessitates the utilization of non-standard methodologies (Schoenfeld, 2013) or a fusion of diverse problem-solving strategies (Ramirez et al., 2016).

Numerous studies have investigated the relationship between problem-solving and various variables. These inquiries have unveiled the pivotal role of reading comprehension in influencing problem-solving (Hadianto et al., 2021; Harangus, 2019; Nicolas & Emata, 2018; Ulu, 2017; Vilenius-Tuohimaa et al., 2008). Boonen et al. (2016) demonstrated that individuals with superior reading comprehension skills exhibited heightened proficiency in solving word problems, indicating a positive correlation between reading comprehension and problem-solving.

Beyond reading comprehension, affective abilities, while not directly influencing problem-solving, impact an individual's mental disposition during problem-solving endeavors. Weak affective abilities can instill a sense of incapability, impeding problem-solving efforts. Subsequently, deficiencies in affective skills can intertwine with cognitive skills such as reading comprehension, thereby affecting students' problem-solving prowess (Öztürk et al., 2020). Several studies have explored the association between problem-solving abilities and affective aspects encompassing self-efficacy (Evans et al., 2021; Hoffman, 2010; Hunt et al., 2012; Çam et al., 2020), mathematics attitude (Demirel et al., 2015; Marchiş, 2013; Öztürk et al., 2020), mathematics anxiety (Grežo & Sarmány-Schuller, 2018; Irfan, 2017; Jiang et al., 2021; Karasel et al., 2010; Lai et al., 2015), and beliefs (Kurniawati et al., 2022; Nasrullah et al., 2019; Ozturk & Guven, 2016; Soesanto & Dirgantoro, 2021).

Building upon prior research findings, this study endeavors to explore the relationship between reading comprehension and mathematical problem-solving abilities. Notably, within Polya's problem-solving framework (2004), comprehension of mathematical problems stands as a crucial stage necessitating reading comprehension skills. Reading comprehension denotes the set of abilities individuals employ to construct a mental representation of text, sufficiently coherent and comprehensive to facilitate understanding (Soto et al., 2019). This proficiency becomes indispensable during problem comprehension and dealing with intricate problems (Lau, 2006). When faced with a problem, students' initial step involves grasping its essence, an essential precursor to its resolution (Özdemir & Sertsöz, 2006).

Moreover, given the research outcomes on the correlation between problem-solving abilities and affective abilities, this study also aims to uncover the relationship between reading comprehension and mathematical problem-solving abilities. Consequently, exploring additional affective aspects impacting mathematical problem-solving becomes imperative, with mathematics interest being a focal point. Interest has demonstrated significance in students' cognitive development and learning (Krapp & Prenzel,

2011; Rotgans & Schmidt, 2017). Specifically, mathematics interest emerges as a critical factor in achieving success in the subject (Fomina, 2017), exhibiting a positive influence on mathematics achievement (Zhang & Wang, 2020). Hence, examining the association between mathematics interest and mathematical problem-solving abilities assumes importance.

This study endeavors to investigate mathematics interest and reading comprehension skills and their correlation with students' problem-solving abilities. While prior research has suggested that mathematics interest can predict problem-solving, there is a dearth of studies comparing the relationship between math problem-solving skills and reading comprehension skills among elementary school students in Indonesia. Furthermore, there remains a gap in research that compares problem-solving skills with mathematics interest.

2. METHODS

Type and Design

This study uses a quantitative research design with correlational research methods. Correlation is defined as a relationship that exists between phenomena or things or between two variables that tend to vary, are related, or occur together in a way that is not expected by chance alone (Akoglu, 2018). The relationships were analyzed comprehensively, and the odds of predicting between the predictor variables and the criteria were examined. This method provides information about the degree of relationship that occurs, not about the presence or absence of the effect of one variable on another variable (Fraenkel, J.R. et al., 2012; McMillan & Schumacher, 2014).

Data and Data Sources

The participants in this study were 76 students from an elementary school in Majalengka Regency, Indonesia. In this study, the participants participated voluntarily. They are informed about this research and ensure that their personal information will not be shared with anyone.

Data collection technique

In this study, data collection used questionnaires and tests. To measure mathematics interest, we used a questionnaire. This questionnaire contains 25 statement items with 5 alternative answers from "1-strongly disagree" to "5-strongly agree". Some examples of statement items in the questionnaire are "I enjoy learning mathematics in class", "I try to use my spare time to study mathematics", and "I always focus on learning mathematics in class". To measure reading comprehension skills using a test. The test is given to students in the form of a short text along with questions related to the text. To measure the variable of problem-solving ability using a test that contains 5 non-routine math problems with flat-shaped material.

Data analysis

In this study, descriptive and inferential statistics were employed to analyze the data. To summarize the data, descriptive statistics were employed. These figures must be interpreted in terms of quantitative research. The association between problem-solving ability, math interest, and reading comprehension skills was investigated using inferential statistics. Pearson correlation analysis is used to calculate this inferential statistic.

3. RESULTS AND DISCUSSION

The primary objective of this study is to investigate the correlation between mathematics interest, reading comprehension skills, and problem-solving abilities. The research data underwent analysis employing both descriptive and inferential statistical methods via SPSS 20 software. Descriptive

information pertaining to the variables of Mathematics problem-solving skills, mathematics interests, and reading comprehension skills is presented in Table 1.

Table 1. Descriptive statistics of research variable test data

Variables	Mean	Std. Deviation
Math Interest	91.32	10.809
Reading Comprehension	74.13	8.781
Problem Solving	69.89	9.015

Based on the data presented in Table 1, the Mathematics Interest variable displays an average score of 91.32, accompanied by a standard deviation of approximately 10.809. This signifies an overall high level of interest in mathematics among the respondents, with notable variability in scores across the respondents. Conversely, the Reading Comprehension variable shows an average score of 74.13, with a standard deviation of about 8.781. This suggests that, in general, respondents tend to have lower levels of comprehension in reading compared to their interest in mathematics, albeit within an acceptable range. The variability among respondent scores in reading comprehension is moderately observable.

In contrast, the Problem Solving variable indicates an average score of 69.89, accompanied by a standard deviation of around 9.015. These findings indicate that respondents exhibit comparatively lower levels of proficiency in problem-solving skills in comparison to their levels of interest in mathematics and reading comprehension. Furthermore, there exists noticeable variability among respondent scores concerning their problem-solving abilities.

Tabel 2. Results of correlations between variables

Variables		Math Interest	Reading Comprehension	Problem Solving
Math Interest	Correlation	1	0.686**	0.706**
	Sig. (2-tailed)		0.000	0.000
Reading Comprehension	Correlation	0.686**	1	0.792**
	Sig. (2-tailed)	0.000		0.000
Problem Solving	Correlation	0.706**	0.792**	1
	Sig. (2-tailed)	0.000	0.000	

Examining Table 2, correlations between the variables are evident. The correlation coefficient between Mathematics Interest and Reading Comprehension stands at approximately 0.686, indicating a strong and positive relationship between the two. A correlation value approaching 1 signifies a substantial tendency where higher interest in mathematics aligns with elevated levels of reading comprehension, and vice versa. Similarly, the correlation between Mathematics Interest and Problem Solving is approximately 0.706, also depicting a strong and positive relationship. This suggests that individuals demonstrating a strong interest in mathematics tend to display improved problem-solving abilities, and conversely. Additionally, the correlation between Reading Comprehension and Problem Solving is approximately 0.792, indicating a robust and positive association between reading comprehension abilities and problem-solving skills. All these correlation coefficients exhibit high statistical significance (as evidenced by $p < 0.001$), suggesting that the observed relationships between these variables are unlikely to occur by mere chance.

To comprehend the concurrent relationship between mathematics interest, reading comprehension skills, and mathematical problem-solving abilities, Table 3 presents the detailed data.

Table 3. Results of regression

Variables	R	R Square	Change Statistics		
			df1	df2	Sig. F Change
problem solving, math interests, and reading comprehension skills	0.823[a]	0.678	2	73	0.000

Examining Table 3, R Square serves as a measure of how well the variability in the dependent variable (Problem Solving) can be explained by the independent variables (Mathematics Interest and Reading Comprehension) within the regression model. The R Square value of 0.678 indicates that approximately 67.8% of the variability in Problem Solving can be accounted for by the variables Mathematics Interest and Reading Comprehension within this model. The value of R, which is 0.823, indicates the strength of the relationship between the dependent variable (Problem Solving) and the independent variables (Mathematics Interest and Reading Comprehension). This R value falls between 0 and 1, signifying a strong relationship between the independent and dependent variables.

Change Statistics provide information about the alteration in the regression model by adding two independent variables (Mathematics Interest and Reading Comprehension) to explain the dependent variable (Problem Solving). The low Significance F Change value (0.000) indicates that the addition of these variables significantly enhances the model's ability to explain variability in Problem Solving.

Therefore, the regression analysis results indicate that a model employing Mathematics Interest and Reading Comprehension as predictors can significantly account for the variability in Problem Solving, with approximately 67.8% of the variability in Problem Solving being explained by these two independent variables within the model. This also confirms a strong relationship among these variables within the regression model.

Discussions

This study aimed to investigate the factors influencing elementary school students' mathematical problem-solving abilities. Mathematics interest and reading comprehension were hypothesized as predictors of mathematical problem-solving abilities. The study's findings revealed a positive and significant association between elementary students' reading comprehension skills and their proficiency in mathematical problem-solving. Notably, reading comprehension exhibited a stronger correlation than mathematics interest, which can be rationalized by Polya (2004), who emphasized understanding as the pivotal first step in the problem-solving process. Effective comprehension facilitates subsequent stages, whereas failure to grasp the problem situation impedes successful problem resolution (Cho & Kim, 2020). Several researchers have also established a positive and significant relationship between reading comprehension skills and problem-solving abilities (Boonen et al., 2016; Hadianto et al., 2021; Harangus, 2019; Nicolas & Emata, 2018; Ulu, 2017; Vilenius-Tuohimaa et al., 2008).

Mathematical problems, particularly in examinations or assessments, are frequently presented in narrative or textual formats. Proficiency in reading and comprehending information embedded within mathematical problems is a crucial preliminary step before attempting to solve the problems themselves (Szabo et al., 2020; Verschaffel et al., 2020). A comprehensive understanding of the text aids in interpreting the problem's requirements. Good reading comprehension assists an individual in dissecting and comprehending mathematical problems more effectively. When one can grasp instructions, questions, or mathematical information within a text or problem accurately, they tend to formulate appropriate problem-solving strategies. Furthermore, reading materials often furnish contexts or situations related to mathematical concepts. Understanding the correlation between textual contexts and

mathematical concepts enables students to determine suitable mathematical procedures for resolving problems (Genc & Erbas, 2019; Miller, 2019).

Moreover, a strong grasp of the text empowers students to craft precise problem-solving strategies. Reading skills also facilitate one's understanding of complex mathematical problems, recognition of relevant information, and extraction of necessary data required to resolve problems (Di Leo et al., 2019). The ability to infer information from mathematical texts and apply it in the context of problem-solving is also highly significant. By identifying essential information and comprehending the requisites, students can develop effective approaches to solving mathematical problems. In numerous instances, critical information essential for solving mathematical problems is embedded within the text. Sufficient comprehension of the text enables students to identify pertinent data, relationships, or clues necessary to devise appropriate problem-solving approaches (Huang et al., 2020). Conversely, inadequate comprehension risks misinterpreting the provided information, leading to errors in formulating mathematical problems or selecting incorrect problem-solving approaches. Therefore, meticulous reading skills, comprehension of information, and the ability to transform textual information into precise mathematical operations are fundamental aspects in solving narrative-based mathematical problems. When students do not comprehend the reading material well, there is a risk of misinterpreting the provided information. This could lead to errors in formulating mathematical problems or selecting incorrect approaches to solve them. A solid understanding of the reading material can enable students to devise appropriate problem-solving strategies (Brevik, 2019). By identifying crucial information and comprehending the requirements, students can develop effective approaches to solve mathematical problems.

A good comprehension of the reading material constitutes a vital initial step in solving mathematical problems. The ability to interpret information, recognize connections with mathematical concepts, and formulate suitable problem-solving strategies heavily relies on the capability to comprehend texts or narratives accompanying mathematical problems. Hence, the skill of reading attentively and understanding the context of the text is exceedingly crucial for success in resolving mathematical problems.

Another contributing factor influencing problem-solving abilities is affective ability. This study demonstrated that mathematics interest, as an affective ability, significantly correlates positively with problem-solving skills. Affective ability indirectly affects individuals' mental conditions when confronted with mathematical problems. Students lacking adequate affective skills might perceive an inability to solve mathematical problems (Öztürk et al., 2020). This study's findings align with prior research indicating a strong relationship between problem-solving skills and other affective abilities, such as self-efficacy, mathematics attitude, mathematics anxiety, and beliefs (Evans et al., 2021; Hoffman, 2010; Hunt et al., 2012; Çam et al., 2020; Demirel et al., 2015; Marchiş, 2013; Hidayat & Ayudia, 2019; Irfan, 2017; Jiang et al., 2021; Nasrullah et al., 2019; Ozturk & Guven, 2016; Soesanto & Dirgantoro, 2021).

A strong interest in mathematics can significantly impact an individual's motivation to comprehend and grasp mathematical concepts. Elevated motivation encourages individuals to persistently engage with mathematical problems, even when faced with challenges (Riyanto & Mariani, 2019; Yuniawati et al., 2019). Students who harbor a deep interest in mathematics often display a heightened inclination to explore more complex mathematical concepts (Russo et al., 2021). They tend to seek additional information from diverse sources or employ various methodologies to solve mathematical problems. Moreover, a strong interest in mathematics fosters creativity in seeking solutions to mathematical problems (Catarino et al., 2019). Students who hold a keen interest in mathematics may explore different approaches or strategies when encountering problems. This enthusiasm propels

students to consistently practice and solve mathematical problems, thereby enhancing their abilities to analyze, formulate, and solve mathematical problems more efficiently.

Individuals with a strong interest in mathematics also tend to approach challenging mathematical problems with heightened motivation. The more motivated and engaged the learner, the more likely the material will be learned successfully, and the less time it will take learners to understand new material (Daly et al., 2019). Their enthusiasm often drives them to tackle difficult or complex mathematical problems as they derive satisfaction from the problem-solving process itself. Furthermore, a high level of mathematical interest can significantly influence one's attitude towards tackling challenging mathematical problems. Those with a strong interest in mathematics are often more motivated to solve difficult or complex problems as they enjoy the problem-solving process itself.

High interest in mathematics can also stimulate creativity in finding solutions to mathematical problems (Ozkan & Umdu Topsakal, 2021). Students who enjoy mathematics may be more inclined to try various approaches or different strategies in solving a problem. Interest in mathematics can help enhance problem-solving abilities because it motivates students to continually practice and tackle mathematical problems, aiding in the development of skills to analyze, formulate, and solve mathematical problems more efficiently. When students have a high interest in mathematics, they tend to have a strong internal drive to keep learning and understanding mathematical concepts. This can be a highly positive factor in solving complex or challenging mathematical problems, as this interest can serve as a source of motivation and satisfaction when finding solutions to given mathematical issues.

4. CONCLUSION

This study demonstrates a positive and significant relationship between mathematics interest, reading comprehension, and mathematical problem-solving abilities. This is evidenced by the significant correlation values among the variables of mathematics interest, reading comprehension, and mathematical problem-solving abilities. Notably, reading comprehension exhibits a stronger association with mathematical problem-solving skills compared to mathematics interest. This is understandable as understanding textual content is crucial for interpreting narrative-based mathematical problems. Regression analysis results indicate a robust relationship between mathematics interest and reading comprehension simultaneously affecting mathematical problem-solving abilities. Both variables significantly contribute together to students' proficiency in solving mathematical problems. The findings of this research carry significant implications in the context of mathematics education. They underscore the importance of not only focusing on cognitive aspects (such as understanding mathematical concepts) but also addressing affective aspects and reading proficiency to enhance students' mathematical problem-solving abilities. The study's outcomes confirm that mathematics interest, reading comprehension, and affective abilities like self-efficacy, attitude, and mathematics anxiety are significantly interrelated with students' competence in mathematical problem-solving. This emphasizes that a comprehensive approach to mathematics education, considering these aspects, has the potential to elevate students' achievements in mathematics.

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