



The Effect of Learning Interest on Students' Ability to Solve Exponential Problems

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ABSTRACT

This study was motivated by the low ability of students in solving exponential problems, which is one of the fundamental materials in high school mathematics. In addition to cognitive factors, affective aspects, such as interest in learning, play an important role in determining student learning outcomes. Therefore, this study aims to analyze the effect of interest in learning on students' ability to solve exponential problems. This study uses a descriptive approach with a correlational method. The instruments used in this study are a learning interest questionnaire and an exponent ability test that have undergone validity and reliability tests. The data were analyzed using simple linear regression tests with the help of SPSS version 26. The results showed that learning interest had a positive and significant effect on students' ability to solve exponent problems. These findings emphasize the importance of teachers' efforts to stimulate and foster students' interest in learning through interactive, contextual, and student-centered learning.

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INTRODUCTION

Education is essentially a planned and systematic process designed to help learners develop their full potential. This is in line with the mandate of Article 3 of Law Number 20 of 2003 concerning the National Education System, which emphasizes that education aims to shape faithful individuals, pious, possess noble character, are creative, independent, responsible, and capable of optimally developing their potential. In this context, mathematics is one of the subjects that plays a strategic role in fostering logical, critical, creative, and systematic thinking, as well as problem-solving abilities. Mastery of mathematics not only supports academic success but also an individual's ability to adapt and make appropriate decisions in various life contexts [1].

Nevertheless, various facts in the field indicate that mathematics is still perceived as a challenging subject by most students. This is reflected in the large number of learners who experience difficulties in studying mathematics and even feel unsuccessful in the learning process. One indicator of this failure is the low mathematics learning outcomes achieved by students at various levels of education [2].

One topic that often becomes a source of difficulty for senior high school students is exponents. Exponents, or powers, are a fundamental concept in algebra that serves as the basis for several advanced topics, such as logarithms, exponential equations, radicals, exponential growth and decay, as well as various applications in science and economics, for example, compound interest

calculations and population growth. A solid understanding of exponent concepts is crucial so that students can master these subsequent topics more easily and meaningfully. However, several studies show that students still experience difficulties in understanding basic exponent concepts, including zero exponents, negative exponents, fractional exponents, and the application of exponentiation rules. Three common forms of difficulty namely difficulties in understanding concepts, difficulties in applying principles, and difficulties in performing calculations [3]. These three forms of difficulty indicate that some students do not yet have a mature conceptual understanding, which makes it difficult for them to solve exponent problems that require accuracy and mathematical reasoning.

In addition to cognitive factors, students' success in learning mathematics is also strongly influenced by affective factors, one of which is learning interest. Learning interest can be defined as an individual's tendency or inclination to be continuously involved in a learning activity. Learning interest plays an important role in increasing students' attention, concentration, and absorption of learning material [4]. Students who have high learning interest tend to participate enthusiastically in learning, show high curiosity, and have a greater willingness to solve problems. Conversely, students with low learning interest generally display passive attitudes, become bored quickly, lack focus, and tend to be reluctant to make serious efforts to understand the material, which in turn impacts low learning outcomes.

Several previous studies have found that learning interest has a positive relationship with mathematics learning outcomes. Learning interest and motivation significantly influence students' mathematics achievement [5]. Meanwhile, the study by [6] on students at SMA St. Arnoldus Jansen Kupang showed that students' learning interest in exponent material was in the low category, amounting to only 10.82%, and students' mathematical reasoning ability was also in the low category (51.66%). This condition indicates the existence of problems not only in the cognitive aspect but also in the affective aspect of students, particularly learning interest, which can affect their ability to understand and solve exponent problems.

Previous research indicates that learning interest influences students' mathematical abilities. For example, [7] found that learning interest contributes significantly to the understanding of mathematical concepts, although its influence on problem-solving ability is not very strong. Similar findings were reported by [8], who emphasized that an increase in learning interest has an impact on improving the quality of mathematics learning outcomes. However, these studies focused on mathematical abilities in general and did not examine the influence of learning interest on specific mathematics topics that have particular conceptual and procedural characteristics.

On the other hand, various studies show that exponents are one of the most difficult topics for students. Many students experience significant difficulties in solving exponent problems, with the level of difficulty in problem-solving reaching 43.75% [9].

Although difficulties in exponents have been widely studied, no research has been found that links learning interest with the ability to solve exponent problems, including in the context of learning in Kupang City. Therefore, there remains a research gap that needs to be addressed, namely, a study that specifically analyzes the extent to which learning interest affects students' ability to solve exponent problems.

This research gap is important to clarify because the ability to solve exponent problems is not merely part of curriculum achievement but is also an important indicator of mastery of broader algebraic concepts. By examining the influence of learning interest on students' ability to solve exponent problems, this study can provide a more specific and in-depth empirical picture of the

relationship between affective factors and cognitive abilities in the context of mathematics learning. In addition, the results of this study are expected to serve as a relevant reference for teachers, schools, and future researchers in developing learning strategies that can increase learning interest and ultimately improve students' mathematical abilities.

The problem of low learning interest and low student ability in solving exponent problems is are two interrelated aspects that cannot be viewed separately. Students with low learning interest tend not to have internal motivation to understand the material deeply, making the abstract nature of exponent concepts even more difficult to grasp. This is in line with the findings of [10], who stated that a lack of student interest greatly affects the learning process, and students who do not have an interest in mathematics tend not to be serious in receiving lessons. In addition, low mathematics learning outcomes are also largely caused by students' low interest in the subject. Conversely, students with high learning interest are more motivated to explore the material, complete exercises, and ask questions when they encounter difficulties. Therefore, it is important to examine whether learning interest truly has a significant influence on students' ability to solve exponent problems, particularly in educational environments with characteristics such as those in one of the senior high schools in Kupang.

Based on this background, this study is expected to fill the gaps in previous research and provide more directed empirical evidence regarding the relationship between learning interest and the ability to solve exponent problems. Thus, the results of this study can serve as a basis for teachers in designing learning activities that facilitate the enhancement of students' learning interest. In addition, the findings of this study can also contribute to the development of school policies related to improving the quality of mathematics learning. Therefore, this study aims to quantitatively analyze the effect of learning interest on students' ability to solve exponent problems at the senior high school level.

METHODS

This study employed a quantitative approach with a correlational research design. The quantitative approach was chosen because the data collected consisted of numerical scores obtained from the learning interest questionnaire and the exponent ability test, which could be statistically analyzed to obtain an objective description of the relationships among variables [11]. The correlational method was used because the main objective of this study was to empirically determine the relationship and influence of learning interest as the independent variable on students' ability to solve exponent problems as the dependent variable, without providing any specific treatment to the research subjects. Therefore, a correlational design was considered the most appropriate to address the research problem.

The study was conducted at one senior high school in Kupang during the odd semester of the 2025/2026 academic year. This school was selected because, based on a preliminary study and previous research, problems related to low learning interest and students' mathematical abilities in exponent material were identified. The population of this study consisted of all tenth-grade students of SMA St. Arnoldus Jansen Kupang in that academic year. The research sample was determined using purposive sampling, namely by selecting a class that had received and studied exponent material in the mathematics curriculum. Based on these considerations, class X B was designated as the research sample, consisting of 35 students [12]. The use of purposive sampling was based on the consideration that only classes that had learned exponent material were relevant for accurately measuring the ability to solve exponent problems.

The research instruments consisted of two types: a learning interest questionnaire and an exponent ability test. The learning interest questionnaire was designed to measure students' level of interest in learning mathematics, particularly in exponent material. The questionnaire employed a Likert scale with five response categories, namely 1 for "strongly disagree," 2 for "disagree," 3 for "neutral," 4 for "agree," and 5 for "strongly agree." The total learning interest score was obtained by summing all item scores completed by the respondents. The higher the score obtained, the higher the student's level of learning interest. The questionnaire items were constructed based on indicators proposed by [4], namely enjoyment of the subject, attention to the material being learned, interest in participating in learning activities, and active involvement in the mathematics learning process. These indicators were then elaborated into several positive and negative statements reflecting students' attitudes toward mathematics lessons and exponent material. The exponent ability test was used to measure students' ability to solve exponent problems covering various aspects of mathematical competence.

The data collection procedure was carried out through several structured stages. The first stage was the preparation stage, which included designing the research plan, developing the blueprint and draft of the instruments, and obtaining research permission from the school. The researcher submitted an official permission letter to the principal of the senior high school in Kupang and coordinated with the mathematics teacher to determine the schedule for administering the questionnaire and the test. At this stage, the researcher also explained the purpose of the study, the implementation procedures, and ensured the confidentiality of students' and the school's identities as part of fulfilling educational research ethics.

The second stage was the administration of the learning interest questionnaire. The questionnaire was distributed to all students in the sample class during the agreed mathematics lesson time. Before students completed the questionnaire, the researcher provided a brief explanation regarding the completion procedures, the meaning of each Likert scale category, and emphasized that there were no "right" or "wrong" answers, only the extent to which each statement corresponded to their personal condition. Students were instructed to complete the questionnaire honestly and independently without discussing it with peers.

The third stage was the administration of the exponent ability test. The test was conducted after students completed the questionnaire and after the exponent material had been taught by the teacher in accordance with the applicable curriculum, so that the measured abilities reflected students' understanding after the learning process. The time allocated for completing the test was adjusted to the number and level of difficulty of the questions, and the classroom teacher assisted in supervising the test to maintain a conducive atmosphere. Students' answer sheets were then collected and scored using a previously prepared rubric.

The fourth stage involved collecting supporting data through documentation. The documentation data included students' mathematics score lists, the school profile, and relevant general data such as the number of students in the class and information about the curriculum used. These data were used to provide contextual information for the study and, if necessary, as material for triangulation with the main analysis results.

Before data analysis, both research instruments were first tested for validity and reliability. Item validity was examined using the Pearson Product-Moment correlation coefficient between item scores and total scores, with the criterion that an item was considered valid if the calculated r value was greater than the r table value at a certain significance level. Reliability testing was conducted using

Cronbach's Alpha coefficient to assess the internal consistency of the instrument. An instrument was declared reliable if the α value was ≥ 0.60 , indicating that the instrument had an acceptable level of consistency for educational research. Only items that met the validity criteria and instruments that were declared reliable were used in the main data collection.

Data analysis was conducted with the assistance of SPSS version 26. The first step was to perform prerequisite tests, including normality and homogeneity tests. Normality was tested using the Kolmogorov–Smirnov and Shapiro–Wilk tests to determine whether the distribution of learning interest scores and exponent ability scores followed a normal distribution. Homogeneity was tested using Levene's Test to examine the equality of variances among the analyzed data groups. If the significance value (Sig.) in both tests was greater than 0.05, the data were considered normally distributed and homogeneous, thus meeting the requirements for parametric statistical analysis.

After the assumptions were met, the main analysis was conducted using simple linear regression to determine the effect of learning interest (variable X) on students' ability to solve exponent problems (variable Y). Through regression analysis, the regression coefficient, coefficient of determination (R^2), and significance value (Sig.) were obtained. The decision-making criteria were established as follows: if the Sig. value was ≤ 0.05 , then H_0 was rejected and there was a significant effect of learning interest on the ability to solve exponent problems; conversely, if the Sig. value was > 0.05 , then H_0 was accepted, and there was no significant effect between the two variables. The results of this analysis formed the basis for answering the research questions and testing the research hypothesis.

RESULTS AND DISCUSSION

The results of the simple linear regression analysis indicate that learning interest has a significant effect on students' ability to solve exponent problems. A positive regression coefficient with a significance value of $p < 0.05$ indicates that an increase in learning interest is followed by an improvement in the ability to solve exponent problems. This finding reinforces the role of affective aspects in mathematics learning, particularly that interest contributes to enhancing the quality of students' cognitive processes. As explained by [13], learning interest is an internal factor that contributes substantially to success in learning mathematics, because students with high interest generally demonstrate greater attention, perseverance, and readiness in participating in the mathematics learning process. In addition, [14] also emphasizes that learning interest has a positive and significant influence on mathematics learning outcomes, whereby interested students tend to be more active, more diligent in completing assignments, and exhibit better learning discipline compared to students with low interest. In other words, students who show high interest tend to be more engaged in learning, more persistent, and better prepared to face conceptual difficulties related to exponent material.

The coefficient of determination (R^2) of 0.262 indicates that learning interest explains approximately 26.2% of the variance in students' ability to solve exponent problems. This value illustrates that although learning interest makes a meaningful contribution, there are still various other factors that influence students' abilities. In the context of mathematics education, this condition is reasonable because learning outcomes are influenced by multiple components, such as mastery of prerequisite knowledge that forms the basis for understanding the material, learning strategies applied by students in managing and implementing their learning processes, as well as the quality of material presentation and instructional strategies used by teachers, which play an important role in stimulating

students' learning potential [15], [16], [17]. In addition, mathematical ability is also influenced by internal and external factors, including physical and psychological conditions, family, school, and students' social environment [17]. Thus, the relatively modest R^2 value underscores that mathematical ability is multidimensional; no single factor works dominantly, but rather it is the result of a combination of cognitive, affective, and pedagogical factors.

Nevertheless, the R^2 value of 0.262 still demonstrates a substantive contribution. In the context of the class under study, learning interest is one of the factors influencing students' ability to understand exponent material. This means that increasing learning interest can be a relevant strategy to support improvements in mathematical ability, although it cannot stand alone without the support of other learning factors. This is consistent with findings that the development of interest in learning mathematics depends on a combination of internal factors, such as self-confidence, and external factors, such as appreciation, reinforcement, and instructional strategies implemented by teachers. The combination of these factors provides a stronger contribution to building interest and improving students' learning performance [18]. Thus, these results confirm that affective aspects such as learning interest work synergistically with other factors in determining students' mathematics achievement.

Qualitative analysis obtained through field observations provides a picture that supports these quantitative results. Students with high interest scores tended to exhibit more proactive learning behaviors. They more frequently asked questions, engaged in group discussions, and actively participated in practice exercises. Conversely, students with lower interest showed more passive participation and tended to lack confidence when dealing with exponent problems that require logical reasoning or deeper algebraic reasoning. This condition indicates that learning interest not only affects students' internal motivation but also influences the learning strategies they choose. This reinforces the view that effective mathematics learning cannot focus solely on cognitive aspects but must also consider affective aspects as an essential part of a holistic learning process [19].

Exponent material itself is one of the essential topics in the mathematics curriculum, requiring students to understand the relationships between exponent concepts and algebraic operations. Students with higher interest are usually more committed to seeking patterns and relationships among concepts, making it easier for them to understand exponent rules such as the properties of exponent operations, zero exponents, negative exponents, and the application of exponents in problem solving. The findings of this study indicate that learning interest helps students manage the cognitive difficulties that arise when solving exponent problems, such as errors in applying exponent rules or misunderstandings of operations involving exponents.

To optimize the influence of learning interest on students' abilities, the instructional strategies used by teachers play an important role. Teachers can utilize learning approaches that increase student engagement, strengthen real-world contexts in exponent problems, or employ interactive media that can foster curiosity. Varied, innovative, and enjoyable approaches have been shown to create higher learning activity and motivation, thereby encouraging the emergence of stronger learning interest. In addition, the use of project-based learning can make students active participants, as this approach stimulates curiosity and provides more meaningful learning experiences [20]. Furthermore, teachers need to provide diagnostic and constructive feedback, especially when students experience misconceptions in applying exponent concepts.

Although learning interest has a positive contribution, the results of this study also indicate that most of the variance in exponent ability is determined by other factors. This characteristic suggests the need for further studies to identify other factors that can strengthen student achievement, such

as prerequisite abilities, mathematical self-efficacy, parental support, or forms of student interaction with learning resources. More in-depth studies using multivariate analysis or longitudinal research designs can provide a more detailed understanding of how these factors interact and influence mathematics learning outcomes.

In addition, the learning interest questionnaire used in this study was tested for reliability and met the minimum standard, with a Cronbach's α value greater than 0.60. This indicates that the instrument was consistent in measuring students' learning interest. However, further research needs to consider the development of more comprehensive instruments to measure students' affective aspects in greater depth. Likewise, the exponent ability test requires further development to better capture students' abilities in problem-solving strategies and mathematical reasoning.

The results of this study reinforce the importance of learning interest as one of the factors contributing to students' ability to solve exponent problems. However, mathematics learning will be more effective if instructional approaches do not only emphasize increasing interest but also consider strengthening conceptual understanding, varying teaching methods, and designing activities that can stimulate deeper understanding. Further investigations into other contributing factors will provide greater contributions to the development of more holistic instructional designs in mathematics education.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the simple linear regression analysis, this study concludes that learning interest has a positive and significant effect on students' ability to solve exponent problems. An increase in learning interest is accompanied by an improvement in students' ability to understand concepts and apply exponent rules. This indicates that learning interest is one of the internal factors contributing to variations in students' exponent abilities.

The coefficient of determination shows that learning interest contributes 26.2% to students' ability to solve exponent problems, while the remaining variance is influenced by other factors beyond the scope of this study. Thus, this research confirms that affective aspects, particularly learning interest, play an important role in supporting the achievement of mathematics learning outcomes in exponent material.

Based on the findings of this study, enhancing learning interest should become an important focus in the mathematics learning process. Teachers are expected to implement instructional strategies that can foster students' interest and engagement in mathematics, especially in exponent topics. Furthermore, the results of this study also open opportunities for future research to examine other factors that may influence students' mathematical abilities, such as prerequisite knowledge, mathematical self-confidence, or specific instructional strategies. Overall, this study provides empirical evidence that strengthening affective aspects is an essential component in efforts to improve the quality of mathematics education in schools.

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