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Positive Factors of Student Learning Orientation in Improving Student Understanding and Learning Outcomes

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ABSTRAK

Rendahnya hasil belajar matematika dari tahun ke tahun menimbulkan anggapan siswa bahwa matematika merupakan pelajaran yang sulit. Hal ini perlu diteliti untuk menganalisa hubungan antara sikap belajar matematika, kecemasan, kebiasaan, dan mengevaluasi hasil belajar matematika tambahan. Metode penelitian kuantitatif dengan pendekatan survei. Subjek penelitian berjumlah 253 orang secara random sampling. Teknik pengumpulan data menggunakan instrumen yang diadaptasi dari Orientasi Pembelajaran yang meliputi sikap, perhatian, dan kebiasaan belajar yang berjumlah 52 item. Teknik analisis menggunakan korelasi dan regresi dengan software SPSS versi 26.0. Hasil penelitian menunjukkan bahwa sikap, kebiasaan, dan kecemasan berhubungan positif dan signifikan terhadap pembelajaran. Kecemasan belajar mempunyai hubungan sedang, sedangkan sikap dan kebiasaan belajar mempunyai hubungan lemah terhadap penambahan prestasi belajar. Temuan lainnya adalah hubungan kecemasan belajar merupakan prediktor utama materi tambahan, dibandingkan dengan sikap dan kebiasaan belajar. Kesimpulannya orientasi belajar merupakan salah satu faktor yang sangat berperan dalam menentukan tingkat prestasi belajar siswa. Kontribusi tersebut memberikan informasi bahwa siswa yang memiliki sikap positif dalam pembelajaran menunjukkan kebiasaan belajar yang baik, oleh karena itu diperlukan peran guru untuk membangun sikap positif.

ABSTRACT

The low results of learning mathematics from year to year give rise to students' perception that mathematics is a difficult subject. This needs to be researched to analyze the relationship between mathematics learning attitudes, anxiety, and habits, and evaluate additional mathematics learning outcomes. Quantitative research method with a survey approach. The research subjects were 253 people using random sampling. The data collection technique uses an instrument adapted from Learning Orientation which includes attitudes, attention, and study habits totaling 52 items. The analysis technique uses correlation and regression with SPSS version 26.0 software. The research results show that attitudes, habits, and anxiety are positively and significantly related to learning. Learning anxiety has a moderate relationship, while attitudes and study habits have a weak relationship with increasing learning achievement. Another finding is that learning anxiety is the main predictor of additional material, compared to attitudes and study habits. In conclusion, learning orientation is one of the factors that plays a very important role in determining the level of student learning achievement. This contribution provides information that students who have a positive attitude in learning show good study habits, therefore the teacher's role is needed to build a positive attitude.

1. INTRODUCTION

Introduction the effectiveness of learning is very important in determining students' academic success. Different human concepts and ideas in learning are normal, honorable, and beneficial for individuals (Ryan & Deci, 2020; Namoun & Alshanqiti, 2021; MacCann et al., 2019). According to previous study learning orientation is an individual quality that influences students' ability to obtain information so they can communicate with peers and teachers during the learning process (Jowsey et al., 2020). In theory, non-cognitive abilities are also important in determining students' success in learning, especially in the mathematics learning process (Zynuddin et al., 2023; Avanesian et al., 2022). Meanwhile, non-cognitive abilities are also known as affective abilities which are realized through Learning Orientation in Mathematics which is viewed from attitudes, attention, habits, problem-solving behavior, and students' learning environment in mathematics (Hwang et al., 2021; Thanon et al., 2020; Viera Valencia & Garcia

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Giraldo, 2019). In general, in mathematics, there are three affective abilities, namely attitude, anxiety, and additional habits of learning mathematics.

The relationship between affective abilities and cognitive abilities can be observed in the ARoS model. This model describes the influence of students' affective variables on the mathematics learning process. Previous study found that attitude, attention, and habits act as important affective abilities in mathematics learning (Behnamnia et al., 2020). Affective abilities act as a trigger to create feelings of wanting to learn mathematics, then encourage cognitive abilities to stimulate students to solve mathematical problems. Good and effective mathematical problem-solving allows students to demonstrate high achievement in mathematics. A student's affective abilities function as memory triggers which directly influence cognitive abilities thereby increasing mathematics learning achievement. The issue of student academic success is at the center of attention and is the subject of heated debate among parents, teachers, and society as a whole. The measure of success of an educational organization is based on the success of students in the academic field. Student success in general examinations is an indicator of the effectiveness of the management of an educational organization. Success in mathematics is exciting and very important in high school (Hillmayr et al., 2020; Zeineddine et al., 2021). Achievement in mathematics is often considered a key factor in ensuring student success in the learning process at school.

So far, student learning outcomes in mathematics are at both disappointing and encouraging levels. The results of government observations are 60:40, which shows that 60% of students in senior high schools are still low. In 2022, the number of students in the Science (Mishra, 2020; Velazco et al., 2022) Mathematics, and Technology pathway will be 43.18%, indicating that students still fail to master mathematics well, and this has an impact on science and technology abilities, considering that the selection requirements for the Science and Technology pathway require a good foundation in mathematics. In previous research students were found in surveys to have low learning outcomes in mathematics learning motivation (Lumbantoruan & Manalu, 2024). The ability to master mathematics requires learning techniques, knowledge, and determination. Mathematics has an abstract nature that leads many students, not only in Indonesia but all over the world, to view it as a difficult and intimidating subject. Another fact, data from the Regional Education Forum shows that the results of Indonesian students' learning exams in mathematics are still far from what was expected. This data is recorded in table 1 below which shows very good results (1A and 2A) in advanced mathematics experienced percentage fluctuations with an average result of 16.30% while failure (9G) was 24.24%. In comparison, excellent performance was found to be lower than failure (Ivorra et al., 2020; Staddon, 2022).

In previous research, attitudes toward learning mathematics showed that there was a positive relationship between attitude, motivation, and mathematics achievement. Learning attitudes are related to feelings toward mathematics and influence students' motivation, expectations, and interest in mathematics (Primi et al., 2020). Meanwhile, other study interest refers to enjoyment, self-confidence, talent, and the lifelong benefits of learning mathematics (Sugiman et al., 2020). Other study found that a positive attitude toward learning had a strong impact on student motivation (Sahin & Yilmaz, 2020). There is also study stated that students who have a positive attitude toward mathematics have a positive perception of the importance of mathematics (Vidergor & Ben-Amram, 2020). Other research, also found that there was a positive relationship between students' attitudes and their mathematics performance (Yin et al., 2020). Previous study also found that a positive attitude towards mathematics was an important and important factor in determining the mathematics achievement of 8th-grade students in Jordan (Maamin et al., 2021). Motivation level is one of the factors that cause students to perform differently in mathematics classes.

Mathematics anxiety is a feeling of uncertainty due to the inability to answer mathematical questions. Define mathematics anxiety as a combination of debilitating test pressure, low self-confidence, fear of failure, and negative attitudes toward regard to learning mathematics. Students who did not have math anxiety were highly motivated to learn compared to students who had high math anxiety (Datzberger, 2018; Zhang & Wang, 2020). This shows that an increase in math anxiety leads to a decrease in achievement. These results are supported by research by students who have high mathematics anxiety have low motivation and that conversely, students who have low mathematics anxiety have high motivation (Mohamed et al., 2020; Wang et al., 2020). Moreover, the willingness to do mathematics exercises systematically determines the extent or limits of expressing a particular mathematics learning attitude for mathematics learning habits. Since learning attitudes determine study habits, mathematics study habits can influence students' mathematics learning outcomes (Büchele, 2020; Burić & Kim, 2020; Ibáñez et al., 2020). Attitudes, motivation, anxiety, habits, and self-concept are very important affective variables. Several previous studies have shown that affective factors such as attitudes, anxiety, and habits are the main factors that influence students' learning and subsequent mathematics achievement (Ching et al., 2020; Hwang et al., 2020; Papadopoulos, 2020). A conceptual framework was created to examine the relationship between OPM and incremental mathematics achievement, as shown. This conceptual framework involves three

dependent variables, namely attitude, attention, and supplemental habits d learning mathematics. The dependent variable refers to additional results in mathematics (Ömeroğulları et al., 2020; Radianti et al., 2020).

At the same time, any activity aimed at obtaining knowledge and using it is closely related to the direction of learning. Furthermore, by applying the knowledge gained, it is hoped that it can produce behavioral changes and useful experiences. Before carrying out the teaching and learning process, teachers generally have to pay attention to the level of students' learning readiness (Ayanwale et al., 2022; Elfadil & Ibrahim, 2022). Willingness to learn is one of the factors that influence learning. Preparing lessons is essential to ensure that students benefit from what they learn, readiness for learning is the level of mental development required to benefit from experience (Patricia Aguilera-Hermida, 2020; Radianti et al., 2020). This means that students cannot understand a concept if their level of thinking has not reached the desired level. Motivation is the willingness to focus, time, energy, and perseverance to learn (Kanat-Maymon et al., 2020; Ulia & Kusmaryono, 2021). Anticipation refers to meaningful mathematics learning, such as understanding concepts, knowing theorems and formulas, as well as solving strategies and techniques in the hope of excelling in a math test or exam with additional information (Kudinov et al., 2020; Rossiter et al., 2023). According to previous study mathematics anxiety is calculated as a general attitude toward mathematics (Zhang & Wang, 2020). Characterizes of attitudes are anxiety, self-confidence, frustration, and dissatisfaction. Math anxiety is also often referred to as the discomfort a person may feel when asked to perform math-related activities or feelings of stress, feelings of inability, and difficulties unexpected thoughts to manipulate numbers and shapes (Kaskens et al., 2020; Maloney & Retanal, 2020). Mathematics anxiety is defined as an expression of worry about situations involving mathematics as a threat to self-confidence. If a person's self-confidence level is high, then their anxiety can be controlled. Mathematics study habits refer to something that can be learned, consistent and effective study methods and habits (such as the willingness to practice past exam questions and work on popular mathematics problems) (Álvarez et al., 2020; Lindsay & Evans, 2022). Preparing students is not only about acquiring certain aspects of mathematics but also about studying theorems, rules, and definitions carefully and working on mathematical tasks in a focused manner.

Considering that there is a gap in opinion between theory, previous research findings, expectations, and reality in the field, the novelty of this study is focus on the influence of affective variables on students' learning outcomes and mathematics learning achievement by excluding cognitive and non-intellectual variables. In the concept of learning, learning is understood as an orientation that brings change to each individual, whether in the form of changes in behavior, acquisition of new knowledge, or increased understanding. A student will gain knowledge by thinking about something he doesn't know after attending a learning orientation. Therefore, it is urgent to carry out this research to analyze the relationship between mathematical attitudes, anxiety, and study habits with improving student mathematics learning outcomes, as well as find out the variables attitude, anxiety, and study habits which are the best predictors of improving learning outcomes.

2. METHOD

This research uses quantitative methods with a survey approach (Baas et al., 2020). The survey was carried out by compiling instruments according to research indicators. The OPM learning instrument is used to measure student behavior related to other aspects of mathematics achievement. In this research, only three variables were used, namely the attitude variable in learning mathematics, the doubt variable in learning mathematics, and the behavioral variable in learning mathematics. This research instrument is based on the OPM research questions of the study (Hill et al., 2020). The number of instruments for each inductor element of the three OPM variables is shown in Table 1.

Table 1: OPM Research Questions

Number	OPM Change Tool	Number. items
1.	Attitudes in the study of mathematics	20
2.	Worried about studying math	16
3.	The habit of studying mathematics	16
	Amount	**52**

The subjects in this research were elementary school students. The population in this study were all fourth-grade elementary school students from five different schools. Where each school has two classes, for students who are in fourth grade. The total population of the five schools is 655. Meanwhile, the sample in this study was 253 people. Samples were chosen randomly without paying attention to the order. Samples

were selected from five schools with the same number of students. From the validation test of this research instrument, it was discovered that 251 random students found it easy to answer the questions. Students who answered easily consisted of 160 men (63.7%) and 91 women (36.3%). Based on the validation test, the instrument used to measure OPM mathematics learning is valid and appropriate. The students' profiles by gender is show in **Figure 1**.

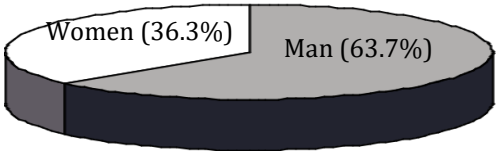

Figure 1. Students ' Profiles by Gender

The data collection procedure in this research is by survey. The instrument was prepared based on OPM mathematics learning research indicators. OPM data was obtained from fourth-grade elementary school students who were collected in special classrooms. Students receive information regarding research questions that are circulating and then collected by the researchers themselves. Meanwhile, information on the results of the mid-semester exams in the mathematics subject, addition material, was collected from 2018 to 2022, obtained from teachers through efforts to collect exam results for each school which are still stored in the mathematics teacher summary data. Meanwhile, the questions in this research instrument use a Likert scale with four choices. Choice 1 (very wrong), choice 2 (not true), choice 3 (true), and choice 4 (very true). The OPM measurement instrument consists of three variables with a total of 51 items. Meanwhile, the mathematics passing score is based on the minimum completeness criteria set by the teacher in mathematics lessons, namely a score of 70.

This research analyzes data using the Statistical Package for Social Science (SPSS) version 26. Okagbue et al., (2021) software by looking at the average, t-test, standard deviation, and quartiles and looking at the significance of the results of the data that has been collected. In addition, the data that has been collected was analyzed with descriptive statistics using SPSS version 26 with remeasurement, Pearson correlation, and simple regression tests.

3. RESULT AND DISCUSSION

Result

Qualitative descriptive analysis data regarding the abilities of elementary school teacher education The results of this research found a relationship between changing attitudes, doubts and students' habits in the learning process as in Table 2.

Table 2. Min, Standard Analysis, and Pearson Correlation can Change Attitudes, Doubts, and Habits

	Change Activation Tool	Min.	Skillful apart	1	2	3	4
1	Attitude	55.13	6.03	1.00	−0.41	0.68	0.19
2	Anxiety	43.22	6.78		1.00	−0.46	−0.31
3	Habits	42.82	5.78			1.00	0.20
4	Realization	6.57	2.38				1.00

p< 0.01 (2-sided)

Table 2 shows the relationship between attitude modifiers, doubts, and habits. The relationship between attitude and doubt is a significant negative relationship (p < 0.01). This means that the higher the attitude towards learning mathematics, the lower the level of doubt in studying mathematics; conversely, the lower the attitude, the higher the level of doubt. The relationship between attitude and simple doubt is −0.41. At the same time, the relationship between attitudes and habits is also positive and significant (p < 0.01). This shows that the higher the attitude in learning mathematics, the higher the behavior in learning mathematics, and conversely, the lower the attitude in learning mathematics, the lower the attitude in learning mathematics. Weak mathematics learning. The relationship between mathematics learning attitudes and mathematics learning behavior has a high correlation value, namely 0.68. The relationship between hesitation and behavior is negative and significant (p < 0.01). This shows that the higher the level of doubt in studying mathematics, the lower the behavior in studying mathematics and vice versa. The relationship between doubts about learning simple mathematics and attitudes towards learning mathematics is −0.46. Multiple regression analysis result is show in Table 3.

Table 3. Multiple Regression Analysis can Change Attitudes, Doubts, and Habits in Favor of Additional Mathematics Achievement

Lean Modifier (Success)					
Change Activation Tool		**Additional Student Mathematics Achievement Score**			
Not to bend over	**Beta no qualified**	**No mistake qualified**	**Beta qualified**	**t-statistics**	**Sig.**
Forager	31.87	13.07		2.44	0.02
Habits	0.11	0.21	0.05	0.53	0.60
Anxiety	−0.58	0.17	−0.27	−3.94	0.00
Attitude	0.11	0.20	0.05	0.56	0.57
F-value			9.36		0.00

Multiple regression analysis was carried out to see the contribution of changing attitudes, doubts, and habits in studying mathematics to students' incremental achievement in mathematics. Table 3 shows the results of a multiple regression analysis with additional mathematics achievement variables. The regression model has a simple R_2 determinant coefficient of 0.10 with an adjusted R_2 of 0.09. This shows that an additional 9% of the variance in mathematics achievement can be jointly explained by the three variables, namely attitudes, doubts, and habits in studying mathematics. The statistical results show that the F value of 9.36 is significant ($p < 0.05$) for this regression model. This means that at least one regression coefficient in each regression model is significantly different from zero. The t-statistics tests revealed that the regression model had only one independent variable, namely doubt significant ($p < 0.05$), while attitude and behavior were not significant ($p > 0.05$) with the student's additional math results. The results of this study show that hesitation to study mathematics is the main contributor, or 10%, to additional mathematics achievement. According to Table 5, the appropriate regression equation model to use to predict incremental mathematics achievement is: Additional math achievement = 31.87 + 0.11 (attitude) − 0.58 (anxiety) + 0.11 (character) + e (0.56) *(−3.94) (0.53). ***p*< 0.05, R_2 = 10%. In mathematics learning, OPM modifiers are effective modifiers that are very important in realizing students' willingness to participate in mathematics learning, directly or indirectly.

Discussion

The relationship between possible changes in attitudes, concerns, and habits and additional mathematical outcomes. The results of the study show that the three variables of OPM, namely attitude, doubt, and behavior, have a significant positive and negative relationship with additional mathematics achievement. First, the possibility of changing attitude in the study of mathematics has a positive correlation and is found to be significant with additional mathematics achievement. The importance and role of attitudes in the study of mathematics influencing achievement are consistent with the studies who state that students who have a low attitude in studying mathematics are associated with low achievement, while students who have a high attitude in learning mathematics perform well and perform well in mathematics (Habók et al., 2020; Maamin et al., 2020; Veas et al., 2019; Zhang & Wang, 2020). Attitude has a relationship with learning motivation which leads to increased achievement. This is consistent with other study that state students who have a positive attitude are highly motivated to learn and perform well (Primi et al., 2020). In this study, attitude was the second most influential variable in incremental mathematics achievement. The mathematics study anxiety variable showed a negative correlation and was found to be significant for achievement. High math doubt is associated with low math achievement, while low math doubt indicates high math achievement. The results of this study are consistent with the studies (Baas et al., 2020). A meta-analysis conducted by other study also suggests that there is a negative relationship between mathematics anxiety and mathematics achievement (Zhang & Wang, 2020). Calculation and solving mathematical problems, particularly in the manipulation of numbers and shapes (Blaabæk, 2020; Hidayati et al., 2020).

The ability to change behavior when studying mathematics showed a positive correlation and was found to be significant in improving mathematics achievement. This result is consistent with the results who showed that the habit of studying mathematics has a significant positive relationship with mathematics achievement (Zhou et al., 2020). Factors such as attitudes, doubts, and mathematics learning habits play a very important role in students' effective mathematics learning and can indirectly improve their mathematical understanding and achievement (Zanden et al., 2020; Thomson et al., 2020). The focus on learning is important so that students are emotionally ready before participating in mathematics learning. Students' emotional willingness is important so that the mathematics learning they participate in is memorable and they understand what is being learned. This can indirectly help students improve their level of achievement in mathematics in any test or exam. Previous study states that a student's willingness to learn can lead to satisfaction with learning and subsequent mastery (Ryan & Deci, 2020). This desire to learn mathematics encourages students to perform mathematical activities more effectively.

Largest contributor to additional mathematical achievements/multiple regression analysis of the three OPM variables, namely attitudes, doubts, and habits controlled collectively. The results of the analysis of each variable show that the probability of changing anxiety is the highest, namely 9.30% in explaining the variance of additional mathematical achievement, followed by the probability of changing behavior (3.70 %) and the probability of changing attitude (3.10%). This means that anxiety is the main contributor or predictor of further mathematical achievement. The regression analysis for the three variables shows that 9% (adjusted R2 = 0.09) of the variance in mathematics achievement further comes from the variables of attitude, doubt, and mathematics learning habits. This means that 91% of the variance in results is due to other factors. The results of the analysis also revealed that only the anxiety variable was significant for achievement with a value of t = –3.94. This suggests that anxiety contributes greatly to incremental mathematical achievement. However, changing attitudes and habits always contributes to success, even in a small way. Thus, the multiple regression model for additional mathematics achievement is –3.94 (undecided). The results of this study are consistent with the studies where indecision showed a negative relationship with mathematics achievement (Xie et al., 2020). Students who have a high level of uncertainty in learning mathematics show low achievement, while students who have a low level of doubt show high achievement.

The implication of this research is that the results of this research mean that mathematics teachers are increasingly sensitive and pay serious attention to affective skills before implementing additional mathematics teaching aimed at improving students' mathematics achievement. Another implication is that teachers who teach additional mathematics try to increase OPM, especially students' attitudes towards additional mathematics. Students who have a positive attitude in learning mathematics show good study habits. Research suggests that teachers should 1) Create an environment where students feel comfortable and do not feel threatened; 2) Use cooperative learning strategies. This helps students understand any problems and solve them together; 3) Teach slowly. This can help students fully understand what is being taught, and 4) Organize additional learning sessions to increase understanding of learning. All these positive efforts can reduce levels of mathematical uncertainty and subsequently improve student performance and outcomes. Teachers must also try to reduce the level of students' doubts about mathematics. To create students who have positive attitudes and habits and a low level of doubt about learning mathematics to improve their learning achievement, teachers must design effective teaching and learning strategies that can encourage students to develop concepts and master skills while applying them in everyday life.

4. CONCLUSION

A study among fourth-grade technical students in technical secondary schools in Kelantan State showed that there was a significant positive or negative relationship between changes in mathematics learning, namely attitudes, doubts, and habits of learning mathematics, towards additional achievements in mathematics. The ability to change attitudes and habits shows a positive relationship with achievement, while indecision shows a negative relationship with achievement. Multiple regression analysis showed that indecision was the main factor contributing to improved mathematics achievement. With this, it can be formulated that the orientation of learning mathematics is one of the factors that play a very important role in determining the level of further achievement in mathematics of students, whether they are brilliant, satisfactory, or failed.

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