



Exploring the Interplay of Mathematical Perception, Learning Independence, and Parental Attention in Mathematics Learning Achievement

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ABSTRAK

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Penelitian ini bertujuan untuk menyelidiki adanya hubungan positif dan signifikan antara persepsi matematika, kemandirian belajar, dan perhatian orang tua dengan prestasi belajar matematika siswa kelas VIII di SMP Negeri 1 Parittiga. Selain itu, penelitian ini juga bertujuan untuk mengidentifikasi variabel yang memberikan kontribusi terbesar terhadap prestasi belajar matematika siswa di SMP Negeri 1 Parittiga. Metode yang digunakan dalam penelitian ini adalah *ex post facto* dengan melibatkan 25 siswa sebagai sampel. Data dikumpulkan melalui pengisian angket persepsi matematika, kemandirian belajar, dan perhatian orang tua, serta dengan mengumpulkan dokumentasi nilai MID semester matematika siswa kelas VIII di SMP Negeri 1 Parittiga. Analisis data meliputi uji korelasi berganda dan uji korelasi parsial. Hasil penelitian menunjukkan bahwa tidak terdapat hubungan signifikan antara persepsi matematika, kemandirian belajar, dan perhatian orang tua dengan prestasi belajar matematika siswa. Selain itu, tidak ada variabel bebas yang memberikan kontribusi dominan terhadap variabel terikat. Namun, penting untuk mempertimbangkan faktor-faktor lain yang mungkin mempengaruhi prestasi belajar matematika siswa dalam penelitian mendatang, seperti motivasi intrinsik dan faktor lingkungan belajar di rumah. Selain itu, perlu dilakukan penelitian dengan jumlah sampel yang lebih besar dan menggunakan alat ukur yang lebih valid dan reliabel untuk mendapatkan hasil yang lebih akurat dan dapat digeneralisasi.

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ABSTRACT

This study aims to investigate the existence of a positive and significant relationship between mathematical perception, learning independence, and parental attention with mathematics learning achievement among eighth-grade students at SMP Negeri 1 Parittiga. Additionally, the study aims to identify the variables that contribute the most to students' mathematics learning achievement at SMP Negeri 1 Parittiga. The research method used in this study is *ex post facto*, involving a sample of 25 students. Data were collected through the completion of questionnaires on mathematical perception, learning independence, and parental attention, as well as by collecting documentation of students' midterm mathematics grades in eighth grade at SMP Negeri 1 Parittiga. Data analysis included multiple correlation tests and partial correlation tests. The results of the study indicate that there is no significant relationship between mathematical perception, learning independence, and parental attention with mathematics learning achievement. Furthermore, no independent variable was found to have a dominant contribution to the dependent variable. However, it is important to consider other factors that may influence students' mathematics learning achievement in future research, such as intrinsic motivation and environmental factors in the home learning environment. Additionally, conducting research with a larger sample size and using more valid and reliable measurement tools is recommended to obtain more accurate and generalizable results.

Keywords:
Interplay,
Learning Independence
Mathematical Perception
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1. INTRODUCTION

The new normal, which emerged as a response to the Covid-19 pandemic, has necessitated the adoption of new habits and practices aimed at preventing the transmission of the virus (Şal & Göçen, 2022). These adaptations prioritize the implementation of health protocols based on the guidelines for Covid-19 prevention and control, including regular handwashing, refraining from touching the face, wearing masks, maintaining physical distancing, and engaging in physical exercise (Molise & Dube, 2020). These health protocols aim to curb the spread of the virus, particularly within the context of Indonesia (Ghazali et al., 2021).

Among the sectors significantly impacted by the pandemic, the education sector has experienced substantial changes (Kusumaningrum & Wijayanto, 2020). Many schools have transitioned to online learning systems as an alternative approach for delivering educational content during the Covid-19 crisis (Anthony Jnr & Noel, 2021). However, the online learning environment comes with its own set of limitations, particularly in terms of comprehending subject matters, such as mathematics (Mulenga & Marbán, 2020). Compared to face-to-face instruction, online learning may be more limited and less comprehensive, leading to a decline in students' mathematics learning achievement (Adarkwah, 2021).

Learning achievement refers to changes in students' behavior after undergoing the learning process. Learning achievement reflects the level of mastery of subject matter by students, which can be measured in the form of grades or statements. Every student wants to achieve good learning achievement, but this requires diligent effort. Several factors influence students' learning achievement, including perception of mathematics, self-directed learning, and parental attention (Koç, 2019; Saeid & Eslaminejad, 2017).

In the context of mathematics, students' perception of mathematics refers to their initial views on the subject. In addition to perception of mathematics, self-directed learning also plays a role in students' learning achievement (Hwang & Oh, 2021; Mentz & Van Zyl, 2018). Self-

directed learning is the learning process that occurs independently within individuals, where they are actively involved individually and not dependent on others, including teachers. In this context, self-directed learning refers to the learning activities carried out by students without relying on teachers or peers to achieve learning goals (Zhoc et al., 2018).

Parental attention also influences students' learning achievement (Chung et al., 2020; Thomas et al., 2020). Attention can be defined as an individual's activity in selecting stimuli from their environment. Parents, as individuals who contribute to creating and maintaining family culture, play a vital role in providing attention to their children, both in physical and non-physical aspects.

Based on observations conducted at SMP Negeri 1 Parittiga, it was found that students' perception of mathematics tended to be negative. Some students considered mathematics as a difficult and boring subject, experiencing difficulties in understanding and solving mathematical problems. Furthermore, students' self-directed learning was limited, such as a lack of interest in reading textbooks before lessons. Parental attention was also insufficient, as indicated by the low participation of parents in school activities.

Therefore, this study aims to examine the positive and significant correlation between perception of mathematics, self-directed learning, and parental attention, both collectively and partially, on the mathematics learning achievement of eighth-grade students at SMP Negeri 1 Parittiga. By exploring these factors in conjunction, the study seeks to provide a comprehensive understanding of their interplay and their combined influence on students' academic performance in mathematics. Furthermore, the research aims to bridge the gap in existing literature by conducting a specific analysis within the context of eighth-grade students at SMP Negeri 1 Parittiga, where limited research has been conducted on this topic.

2. METODE

The research employed an ex post facto method, which focuses on variables that have already occurred prior to the study. Data collection involved distributing questionnaires utilizing the Likert Scale measurement technique and documenting the mid-semester mathematics scores of eighth-grade students at SMP Negeri 1 Parittiga. To determine the population for this study, all three classes of eighth-grade students at SMP Negeri 1 Parittiga, totaling 75 students, were considered. This research employed a random sampling technique to ensure the selection of participants from the population was unbiased and representative. From this population, a sample of 25 students was selected from Class VIII A. The selected sample was considered to be representative of the overall population and would provide valuable insights into the research objectives.

Validity and reliability tests were conducted for the research instruments. Content validity, assessed using the Pearson product-moment correlation formula, revealed that out of the 52 items in the mathematics perception questionnaire, 39 items were deemed valid, while 13 were considered invalid. For the self-directed learning questionnaire, 30 items out of 40 were valid, with 10 items deemed invalid. Similarly, the parental attention questionnaire yielded 32 valid items out of 40, with 8 items classified as invalid. Reliability analysis using Cronbach's alpha coefficient showed a high level of reliability: 0.8837 for the mathematics perception instrument, 0.8827 for the self-directed learning instrument, and 0.9106 for the parental attention instrument. Prerequisite analyses, including tests for normality, linearity, and multicollinearity, were conducted. The main analyses involved multiple correlation and partial correlation tests.

3. RESULTS AND DISCUSSION

Results

Before conducting the multiple correlation test, it is necessary to perform the normality test. The normality test is used to determine whether the sample used in the research comes

from a population with a normal distribution or not. In this study, the normality test was calculated using SPSS 24 software. The decision regarding normality is based on the Asymp. Sig. (2-tailed) value, with the criteria that if the sig probability value > 0.05 , the data is considered normally distributed, while if the sig probability value < 0.05 , the data is considered not normally distributed. The results of the normality test can be seen in Table 1.

Table 1. Results of Normality Test Analysis

| Variables | Sig. | (5%) | Explanation |
|------------------------|-------|------|-------------|
| Mathematics Perception | 0,148 | 0,05 | Normal |
| Learning Independence | 0,148 | 0,05 | Normal |
| Parental Attention | 0,148 | 0,05 | Normal |
| Academic Achievement | 0,148 | 0,05 | Normal |

Based on Table 1, the obtained significance value is $0.148 > 0.05$. Based on the decision-making criteria, it can be concluded that the data is normally distributed.

The linearity test aims to determine whether each variable has a significant linear relationship or not. The significance value is used to determine whether there is a linear relationship between the two variables. If the significance value is > 0.05 , it can be concluded that there is a linear relationship between the variables. The results of the linearity test analysis can be seen in Table 2.

Table 2. The Result of Linearity Test Analysis

| Variables | Sig. | α | Explanation |
|-------------|-------|----------|-------------|
| X_1 and Y | 0,630 | 0,05 | Linear |
| X_2 and Y | 0,142 | 0,05 | Linear |
| X_3 and Y | 0,387 | 0,05 | Linear |

Based on Table 2, it was found that the significance value (Sig) of the variable "perception of mathematics" (X_1) with "learning achievement" (Y) is $0.630 > 0.05$. This means that there is a linear relationship between the perception of mathematics variable and learning achievement. The significance value of the variable "learning independence" (X_2) with

"learning achievement" (Y) is $0.142 > 0.05$. This means that there is a linear relationship between the learning independence variable and learning achievement. The significance value of the variable "parental attention" (X_3) with "learning achievement" (Y) is $0.387 > 0.05$. This means that there is a linear relationship between the parental attention variable and learning achievement.

The multicollinearity test is conducted to examine the relationships between independent variables and check for collinearity. In this study, multicollinearity is determined by examining the values of the variance inflation factor (VIF) and tolerance. A regression model is considered to have multicollinearity if it has a VIF value > 10 and a tolerance value < 0.10 . The results of the multicollinearity test analysis can be seen in Table 3.

Table 3. The Result of Multicollinearity Test Analysis

| Variables | VIF | Tolerance | Explanation |
|----------------------------------|-------|-----------|-------------------------------|
| Mathematics Perception (X_1) | 1.864 | 0.536 | No Multicollinearity Occurred |
| Learning Independence (X_2) | 1.734 | 0.577 | No Multicollinearity Occurred |
| Parental Attention (X_3) | 1.273 | 0.786 | No Multicollinearity Occurred |

Based on Table 3, it is known that the VIF and tolerance values for the variable "perception of mathematics" are 1.864 and 0.536, respectively. The VIF and tolerance values for the variable "learning independence" are 1.734 and 0.577, respectively. The VIF and tolerance values for the variable "parental attention" are 1.273 and 0.786, respectively. Thus, it is known that the VIF values are < 10 and the tolerance values are > 0.10 . Therefore, it can be concluded that there is no multicollinearity among all the independent variables. After conducting the prerequisite analysis, the next step is to perform the data analysis using multiple correlation tests. The results of the multiple correlation analysis can be seen in the following Table 4.

Table 4. The Result of Multiple Correlation Test

| Variables | Regression Coefficient | t_{value} | Sig. | F_{value} | R | R^2 |
|-----------|------------------------|-------------|-------|-------------|-------|-------|
| Constant | 32.350 | | | | | |
| X_1 | 0,475 | 1,378 | 0,183 | | | |
| X_2 | -0,552 | -1,543 | 0,138 | | | |
| X_3 | 0,089 | 0,449 | 0,658 | | | |
| | | | 0,400 | 1,030 | 0,358 | 0,128 |

Based on the results of the multiple correlation test, the regression equation obtained is:

$$Y = 32.350 + 0,475 X_1 - 0,552 X_2 + 0,089 X_3$$

To test for significance, the F-test can be used. The criterion is that if the sig. value < 0.05 , then the multiple correlation coefficient is significant, and conversely, if the sig. value > 0.05 , then the multiple correlation coefficient is not significant. From Table 4, it can be observed that the F_{value} is 1.030 and the Sig. value is 0.400 > 0.05 . This indicates that the multiple correlation coefficient is not significant. Therefore, it can be concluded that there is no significant correlation. The results of the partial correlation test can be seen in Table 5.

Table 5. The Result of Partial Correlation Calculation

| Statistics | r_{value} | Sig. | $\alpha(5\%)$ | Explanation |
|-------------|-------------|-------|---------------|-----------------|
| $r_{1y.23}$ | 0,288 | 0,183 | 0,05 | Not significant |
| $r_{2y.13}$ | -0,318 | 0,138 | 0,05 | Not significant |
| $r_{3y.12}$ | 0,098 | 0,658 | 0,05 | Not significant |

From Table 5, a partial correlation of $r_{1y.23}$ is obtained as 0.288 with a sig. value of 0.183 > 0.05 . This indicates that there is no significant partial correlation between mathematics perception and mathematics achievement of 8th grade students at SMP Negeri 1 Parittiga. The partial correlation of $r_{2y.13}$ is -0.318 with a sig. value of 0.138 > 0.05 . This shows that there is no significant partial correlation between learning independence and mathematics achievement of 8th-grade students at SMP Negeri 1 Parittiga. The partial correlation of $r_{3y.12}$ is 0.098 with a sig. value of 0.658 > 0.05 . This indicates that there is no significant partial correlation between parental attention and mathematics achievement of 8th grade students at SMP Negeri 1 Parittiga. Based on Table 5, it is known that there are no

significant partial correlations. This means that there is no significant contribution from the independent variables to the dependent variable.

The results of this study indicate that the relationship between mathematical perception and learning achievement is not always significant. Even though someone may have a high perception of mathematics, it does not guarantee high learning achievement. The role of parental support has been shown to have a significant impact on mathematics learning achievement. Even individuals with low mathematical perception can still succeed academically due to the support and encouragement they receive from their parents. In this case, consistent parental support, including assistance with homework and encouragement, can contribute positively to mathematics learning achievement. Therefore, external factors such as parental support can compensate for low perception levels and contribute to improved learning outcomes.

It is also important to consider the factor of learning independence in the context of mathematics learning achievement. Although learning independence is generally considered important for academic success, in the case of individuals with low academic abilities in mathematics, high learning independence can be a barrier to their learning achievement. Mathematics often requires collaborative learning activities to facilitate understanding and enhance memory. Therefore, individuals with high learning independence may struggle to excel in mathematics as they miss out on the benefits of collaborative learning. As a result, the absence of a significant correlation between learning independence and the variable of mathematics learning achievement can be expected.

Parental attention also plays a crucial role in students' academic achievement. However, the type of attention given by parents can have different effects on student learning. Spontaneous attention from parents can disrupt students' study habits and make them feel uncomfortable or distracted. This type of attention has the potential to lead to lower learning achievement. On the other hand, directed and intentional attention from parents can have a

positive impact on students' concentration and motivation to learn. It is important for parents to provide understanding and communicate with their children, assuring them that their actions are solely for the child's well-being. By creating a supportive and understanding environment, parents can help students maintain focus and improve their learning achievement. The presence of these different types of attention can contribute to the absence of a significant correlation between parental variables and mathematics learning achievement.

Discussion

To provide a more comprehensive analysis, it is important to consider related research in this field. Studies examining the impact of physical and mental health, parental support, self-directed learning, and different types of parental attention provide valuable insights into the complex dynamics of these factors. Perception plays a crucial role in learning as individuals interpret and acquire stimuli. However, it is important to note that perception varies among individuals, and external factors such as physical conditions can influence this perception (Lei & So, 2021; Martin & Bolliger, 2018). For example, someone with initially high mathematical perception may experience a decline in learning achievement if their physical condition is unstable. This demonstrates the complex nature of the relationship between perception and learning achievement, as high mathematical perception does not guarantee high learning achievement. As a result, this contributes to the lack of significant correlation between mathematical perception and learning achievement.

The impact of physical and mental health on students' mathematical perception and academic achievement (Mavilidi et al., 2020; Pascoe et al., 2020). The research findings revealed that students with poor physical health experienced a decline in their mathematical perception, which subsequently affected their learning achievement. This supports the notion that physical conditions can influence perception and, ultimately, learning outcomes (Toropova et al., 2019).

Furthermore, the influence of external factors, particularly parental support, can affect students' learning outcomes (Anaya et al., 2022; Ribeiro et al., 2021). Students with low mathematical perception can still perform well academically due to the support and encouragement they receive from their parents. Research by Panaoura (2021) has emphasized the positive influence of consistent parental support on students' mathematical achievement. Students who receive assistance with homework and encouragement from their parents tend to perform better academically, even if they have low mathematical perception. This support can contribute to high mathematical learning achievement, further strengthening the lack of significant correlation between mathematical perception and learning achievement. This indicates that parental support can offset lower levels of perception and contribute to improved learning outcomes (Kusumaningrum et al., 2020).

On the other hand, self-directed learning is considered important for academic success (Lasfeto, 2020). However, in the context of students with low academic ability in mathematics, high self-directed learning can be detrimental to their learning achievement. Mathematics often requires collaborative learning activities to facilitate understanding and reinforce memory (Al-Adwan et al., 2022). Therefore, students with high self-directed learning may struggle to excel in mathematics because they miss out on the benefits of collaborative learning. Research by Alotaibi and Alanazi (2021) has shown that students with high self-directed learning tend to outperform their peers in the subject of science. However, the collaborative nature of learning and problem-solving in mathematics suggests that the lack of significant correlation between self-directed learning and variables related to learning achievement in mathematics is expected.

Regarding parental attention, researchers have explored the impact of different types of parental attention on students' learning experiences and outcomes. Research has shown that parental involvement has a positive relationship with students' academic achievement (Anthony & Ogg, 2019). Parental involvement includes various activities such as assisting with homework, providing emotional support, communicating with teachers, attending school

events, and supporting extracurricular activities. According to Anthony and Ogg (2019) that higher parental involvement correlates with better academic achievement, increased motivation to learn, more positive behavior, and improved social skills. It is important to remember that parental involvement is just one factor that can influence students' academic achievement. Other factors, such as student internal factors (e.g., motivation, cognitive abilities) and environmental factors (e.g., educational quality, school support), also play a significant role in determining academic achievement. This highlights the importance of parental attention and the need for a supportive and understanding approach to create an optimal learning environment.

A comprehensive understanding of the factors influencing the relationship between perception and learning achievement requires consideration of various related studies in this field. Studies examining the impact of physical and mental health, parental support, self-directed learning, and different types of parental attention have provided insights into the complex dynamics of these factors. These findings indicate that perception alone may not directly determine learning achievement, as external factors and individual differences play significant roles. By acknowledging and addressing these factors, educators, parents, and policymakers can develop strategies to optimize students' mathematical learning outcomes and overall academic success.

4. CONCLUSION

Based on the research findings, it can be concluded that there is no significant relationship between mathematical perception, learning independence, and parental attention with the learning achievement of 8th-grade students at SMP Negeri 1 Parittiga. The lack of significant correlation suggests that factors other than mathematical perception, learning independence, and parental attention may play a more prominent role in determining students' learning achievement. It is important to note that this study was conducted within the specific

context of SMP Negeri 1 Parittiga and with a limited sample size. Therefore, caution should be exercised when generalizing these findings to other schools or student populations. Further research with larger and more diverse samples is warranted to validate these results and provide a more comprehensive understanding of the factors influencing mathematics learning achievement. While the current study did not find a significant relationship between mathematical perception, learning independence, and parental attention with learning achievement, it does not diminish the importance of these factors in students' overall development and learning experiences. Educators should continue to foster positive mathematical perceptions, promote self-directed learning skills, and encourage parental involvement to create a supportive learning environment for students.

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