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Profile of Mathematical Disposition of Junior High School Students in Mathematics Learning

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Abstrak. The success of students learning mathematics depends on their mathematical disposition. Students with a high mathematical disposition have a strong will and determination to learn. They are directly involved in the learning process so students can solve the problems they face confidently. Mathematical dispositions are not born instantly but result from long-term interactions, especially with mathematics teachers, during the learning process at school. This study aims to determine the mathematical disposition of junior high school students in the city of Banjarmasin. This type of research is survey research. The population in this study were students of class IX junior high school in the city of Banjarmasin. The sample in this study amounted to 65 students, with a sampling technique using purposive sampling. Data collection uses a mathematical disposition questionnaire containing 25 statement items. Descriptive statistical methods analyzed mathematical disposition questionnaire data. The results showed that the mathematical disposition of class IX junior high school students in Banjarmasin was 18.5% in the high category, 63.1% in the medium category, and 18.5% in the low category. As for the indicators of students' mathematical disposition, it shows that the high category is in the appreciation aspect, the medium category is on the indicators of flexibility, curiosity, metacognition, and application, while the indicators of self-confidence and persistence are in the low category.

Key words: the profile, mathematical disposition of students, learning mathematics

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INTRODUCTION

Nowadays, students will face new demands for mathematical proficiency, which concerns school mathematics (Findell, 2002). The teacher's success in fulfilling these skills depends on the student's high or low mathematical disposition. A mathematical disposition will prepare students for lifelong learning to meet proficiency in the 21st century (Buckingham Shum & Deakin Crick, 2016). Disposition is considered a habit of the mind, a tendency to respond to situations in a certain way (Carr, M., & Claxton, G., 2002). In addition, the mathematical disposition is a combination of mathematical self-efficacy and mathematical enjoyment (Adelson & McCoach, 2011). Students with high mathematical dispositions are strongly willing and determined to learn and are directly involved in the learning process. The challenges faced can be solved with total confidence. According to Jeremy Kilpatrick and Jane Swafford (2001), a mathematical disposition is the main factor determining learning success. Mathematical disposition refers to attitudes and the tendency to think and act positively (NCTM, 1989; Zan, 2007; Tsao; 2014). Students have an interest and confidence in learning mathematics, exploring alternatives and enduring when solving mathematical problems, and a willingness to reflect on thoughts when learning mathematics. Effective learners realize the importance of reflecting on thinking and learning from mistakes. Students should see the difficulty of complex mathematical investigations as a practical challenge rather than a reason to give up. Even when a math task is difficult, it can be exciting and rewarding. When students work hard to solve difficult problems or understand complex ideas, they experience a unique feeling of accomplishment, which leads to a willingness to continue and expand their involvement with mathematics. The mathematical disposition indicators, according to NCTM (1989), consist of; (1) being confident in communicating ideas and providing reasons for solving mathematical problems; (2) having flexibility in exploring ideas/methods/strategies to find alternative solutions; (3) a solid determination to find answers; (4) an interest/curiosity in learning mathematics; (5) tend to monitor and reflect on thought processes and self-performance; (6) applying the application of mathematics in other fields in everyday life; and (7) appreciating the role of mathematics in culture and values, both as a tool and a language. As for other opinions, indicators of mathematical disposition include (1) self-confidence; (2) flexible; (3) diligently

doing tasks; (4) having interest and curiosity; (5) reflecting on their reasoning (Hendriana & Soemarmo, 2010) and (6) appreciating the role of mathematics (Yaniawati et al., 2019). The terms used are slightly different from the above indicators, but their meanings are the same, each consisting of seven indicators.

Several research results have shown that students with a high mathematical disposition can understand mathematics (Syaban, 2009; Widyasari, 2016; Mandur, 2016) and solve mathematical problems compared to students with a low mathematical disposition (Mahmudi, 2010; Pangesti & Soro, 2021; Sarifah et al., 2018; Yuliani et al., 2021). However, facts in the field show that during the mathematics learning process in several junior high schools in Banjarmasin city, most students are still reluctant when asked by their teachers to practice, and easy questions give up when encountering difficulties in solving mathematical problems. Based on these observations, it is crucial to know the mathematical disposition profile of junior high school students in Banjarmasin to provide an accurate picture of the mathematical disposition profile of students, especially class IX junior high school in Banjarmasin city. Therefore, this research was conducted as an initial exploration to conduct further research on student mathematical dispositions and provide information to mathematics teachers about their students' mathematical dispositions.

METHODS

This research is a type of survey research. The population in the study was grade IX junior high school students in the city of Banjarmasin. The sample in the study was 65 students with sampling techniques using purposive sampling—data collection techniques through student mathematical disposition questionnaires. Adaptation mathematical disposition instruments from Code et al., (2016) those containing seven indicators, namely (1) self-confidence; (2) flexibility; (3) perseverance; (4) curiosity; (5) metacognition; (6) application; and (7) appreciation (NCTM, 1989). The mathematical disposition questionnaire contains 25 items of revelation in the form of positive and negative statements. The instruments used have met the criteria of being valid and reliable. The Likert scale used in the questionnaire by containing five categories, namely strongly agree (SS), agree (S), doubt (R), disagree (TS), and strongly disagree (STS). The score for each item of positive statements from strongly agreed (SS) to strongly agreed (STS) options in order starting from 5 (five) to 1 (one). In contrast, for negative statements, the opposite applies.

The research data analysis technique uses descriptive statistics with the stages of the results of the student's mathematical disposition questionnaire in the form of letters converted first to the format of numbers. Then the next step is to calculate the average score of each student's mathematical disposition score, determine the maximum value and minimum value, as well as standard deviation with calculations using Ms.excel. As for providing the categorization of students' mathematical disposition scores, researchers will use the reference in Table 1 below:

Table 1. Distribution of Student Mathematical Dispositions

No.	Score	Interpretation
1	$N \geq \bar{x} + 1SD$	High
2	$\bar{x} - 1SD \leq N < \bar{x} + 1SD$	Medium
3	$N < \bar{x} - 1SD$	Low

(Azwar, 2013)

captions:

$\bar{x}$ = Average student score

SD = Standard Deviation

N = student questionnaire scores

RESULTS AND DISCUSSION

A total of 65 grade IX junior high school students in Banjarmasin city have filled out a mathematical disposition questionnaire through a google form. Through excel calculations, the mathematical disposition score is 78.2, and the standard deviation is 11.44. The categorization of the student mathematical disposition questionnaire exists in Table 2 below.

Table 2. Students' Level of Mathematical Disposition

No.	Score	f	Interpretation
1	$X \geq 89.4$	12	High
2	$66{,}56 \leq X < 89.4$	41	Medium
3	$X < 66.56$	12	Low
$\sum$		65	

Further from Table 2 will be made the percentage of mathematical disposition of students will be as follows:

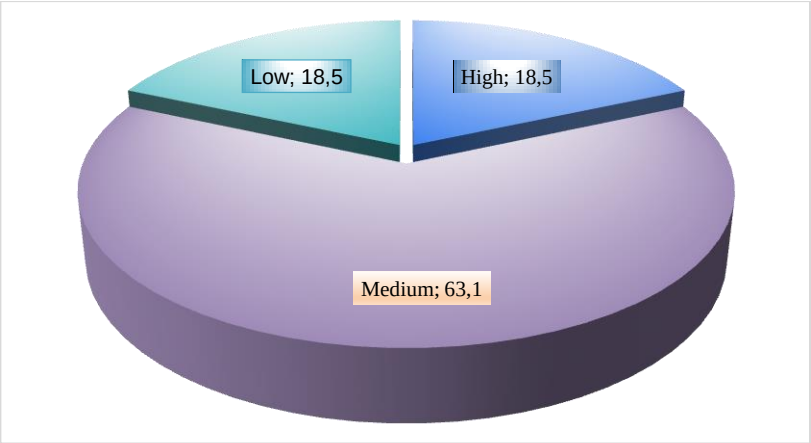

Figure 1. Percentage of Student Mathematical Disposition Categories

According to Table 1 and Figure 1, exist 12 students or 18.5% with the high mathematical disposition category, 41 students or 63.1% with the medium mathematical disposition category, and 12 students or 18.5% with the low mathematical disposition category. The results show that students' dominant mathematical disposition ability is in the moderate category. The findings came from Maciejewski et al. (2022), where students significantly have a poor disposition in mathematics. Students with less mathematical dispositions often show low performance and do not seek to achieve higher results in mathematics (Boaler, 2014). Knowing the average score of each student's mathematical disposition indicator will be depicted in Chart 2.

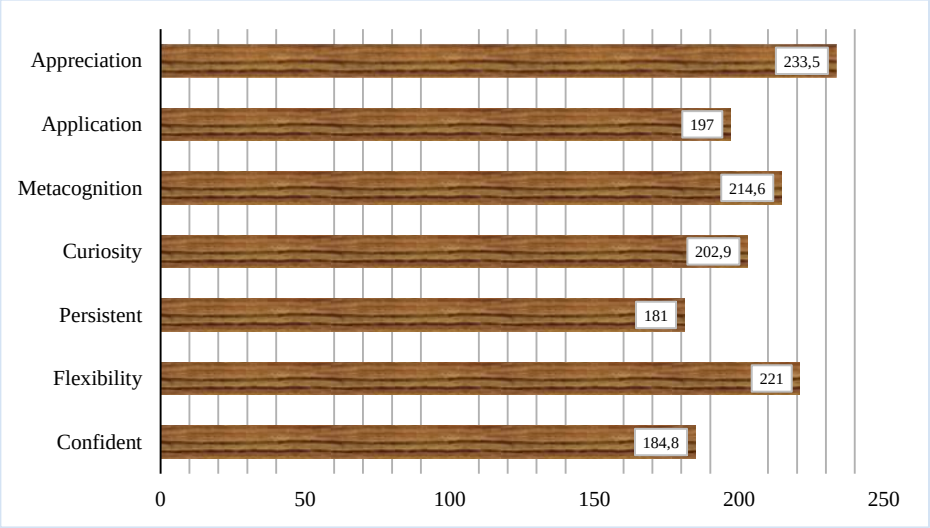

Figure 2. Average Student Mathematical Disposition Indicator Score

Based on Chart 2, a means of 205, a standard deviation (SD) of 17.78. Therefore, in Table 1, the average score of the student's mathematical disposition indicators can be categorized as score follows.

Captions:
I= Mathematical disposition indicator

Table 3. Distribution of Student Mathematical Disposition Indicators

No.	Score	Interpretation
1	$I \geq 223$	High
2	$187 \leq I < 223$	Medium
3	$I < 187$	Low

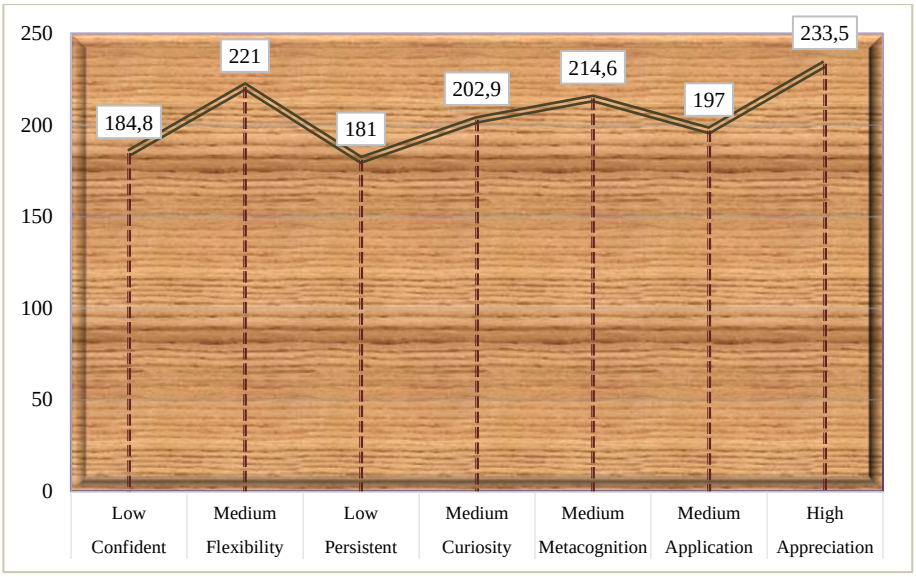

Figure 3. Categorization of Student Mathematical Disposition Indicators

Figure 3 shows that the indicators of students' mathematical disposition with high categories are only found in the reward aspect, while flexibility, curiosity, metacognition, and application are still in the medium category. As for self-confidence and persistence, it is in the low variety. The results of the TIMSS study (2012) also revealed that as many as 41% of students' self-confidence was in a low category, 52% of students' self-confidence was in the medium class, and only 3% in the high self-confidence category. Thus, mathematics learning should emphasize integrating mathematical knowledge, skills, and ideas into daily life to improve students' self-confidence (Ferme, 2014). According to Merz (2009), the teacher's role is always crucial to pay attention to and develop the mathematical disposition of students. The persistent indicators are also in the low category; these results indicate a relationship between persistence or diligence and students' self-confidence in learning mathematics. According to Bettinger et al., (2018), when students are confident in their abilities, students will be persistent or diligent in learning mathematics.

CONCLUSION

The study results have shown that the mathematical disposition of grade IX junior high school students in Banjarmasin city is 18.5% in the high category, 63.1% in the medium category, and 18.5% in the low category.

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