

Personality Type In Mathematical Problem Solving

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Abstract. This study aims to analyze students' mathematical problem-solving skills on the Pattern Number material in terms of Florence Littauer's personality type. The data obtained through questionnaires, tests, and interviews were analyzed quantitatively and descriptively. The results of the analysis show that the percentage of problem-solving abilities at each stage starting from understanding the problem, making plans, implementing plans, to re-examining, for each personality type, which is Sanguines Personality Type students, the percentages are: 60%, 97 %, 90%, and 41%, Choleric Personality Type students: 74%, 70%, 80%, 52%, Melancholy Personality Type students: 100%, 83%, 83%, 73%, Phlegmatics Personality Type students: 79%, 69%, 85%, and 53%. While the overall percentage of students' problem-solving abilities for each personality type, which is Sanguines, Choleric, Melancholy, and Phlegmatics Personality Types, the percentages are: 72%, 69%, 85%, and 72%.

Background

Mathematics is a compulsory subject at every level of formal education from elementary to high school, even tertiary institutions. Moreover, mathematics is one of the subjects tested nationally and one of the entrance exams for universities. The National Council of Teacher Mathematics (NCTM) as quoted by Juliansa, Kartinah, and Purwosetiyono [1] states students will acquire five process skills through the study of mathematics, which include: (1) problem-solving; (2) reasoning and proving; (3) communication; (4) connection; and (5) representative. This is supported by Fauziah's opinion [2] which states that these abilities are mathematical powers, or called math skills (doing math).

Furthermore, these mathematical abilities need to be developed in students to achieve the mathematics learning objectives. One of the mathematical skills that need to be developed is problem-solving ability. According to [3] p, problem-solving is a very important component in mathematics education. Problem-solving is an activity in completing a task in which the way to solve it is not known with certainty beforehand. Problem-solving [4] is an effort made to overcome the difficulties encountered in achieving a goal. Solving problems in mathematics can be in the form of solving non-routine questions, applying mathematics in everyday life, or other conditions.

Mathematical problem-solving is an ability that students need to master because humans will never be separated from problems in everyday life. According to Utama, Sofia, and [5], in carrying out our daily activities we cannot escape problems. Problem-solving activities need to be trained from an early age so that students become accustomed to dealing with every problem and can develop themselves so that in the future any problems that will be faced can be handled properly by finding the best solution.

Although problem-solving is important, not everyone can master it. Based on pre-research studies through interviews with class VIII mathematics teachers at MTs Negeri 1 Boalemo, students tend to focus on the results obtained without knowing how the process was carried out in obtaining these results. Students use more formulas or fast methods that are commonly used rather than using the completion steps according to the procedure for solving mathematical problems. This shows that students' mathematical problem-solving abilities are still relatively low and efforts are needed to develop them.

The low problem-solving ability of students is an important task that must be considered by the teacher. Each math problem must be taught and guided through systematic stages by the teacher. According to Polya, there are four stages that can be used in problem-solving [6], namely understanding the problem, devising a plan, solving the problem according to the plan (carrying out the plan), and re-examine the results that have been obtained (looking back).

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According to Razak, Sutrisno, and [7], each student in each class has their own way or strategy for solving problems. These differences can actually be observed from the aspects of the behavior shown. Some students are able to catch problems quickly, but the results are not correct, while other students working work but the results are correct. On the other hand, some students answered the questions coherently according to the problem-solving algorithm, whereas other students answered in an uncoordinated manner, but both of them got the same and correct answers according to the answer key.

The difference in abilities possessed by each student will determine how the student solves the problem at hand. This different understanding between individuals will make a difference in solving the problems faced. One of these differences is based on various personality types. Psychologists differ on the definition of personality. They develop a theory of personality from their point of view. Most of them agree that personality comes from the Latin word *persona* which refers to the meaning of the mask [8]. Personality is an essential attitude that is inherent in humans as a result of formations that originate from the surrounding environment or are innate from birth which are distinctive and make a difference between one human being and another. In essence, humans have different characteristics, both in attitude, mindset, and personality, as well as students. According to Florence Littauer [9], human personality is divided into 4, namely Sanguine, Choleric, Melancholic, and Phlegmatic Personality Types. These personality differences also affect thinking profiles, especially students' problem-solving abilities when solving a mathematical problem.

Theoretically, various personality types will cause students' mathematical problem-solving abilities to vary, because in solving mathematical problems, each student has his own way of absorbing information, processing it, and choosing a solution strategy. By knowing student personality types, teachers can design better learning that accommodates student personality types.

Method

This research is a quantitative descriptive research that aims to analyze students' mathematical problem-solving skills in solving Number Pattern material based on Florence Littauer's personality type. The instrument used consisted of a Florence Littauer personality type questionnaire to see whether students tended to belong to Sanguine, Choleric, Melancholy, or Phlegmatic personality types. Furthermore, the number pattern material problem-solving test instrument is used to analyze the stages of student problem-solving, in the form of a description test (essay) which is analyzed using a

problem-solving rubric. Meanwhile, to obtain more accurate information regarding the stages of solving student problems, use an interview guide instrument.

This research began by determining the research subjects, namely 23 students from class VIII-1. The next step is to prepare research instruments, namely personality type questioning problem-solving test questions, and interview guidelines. Before being used, the instrument was tested for validity by experts, then repaired according to suggestions from the validator, and continued with testing the validity of the test items using the Product Moment Correlation formula and reliability testing using the Alpha Cronbach Correlation formula.

Research Result And Discussion

The Florence Littauer personality type questionnaire was given to all 23 students in class VIII-1. Based on the results of data analysis, among the 23 students who filled out the questionnaire, 3 of them had mixed personalities. Because this research focuses more on students with a single personality, only 20 students will be analyzed in this study. The twenty students consisted of 4 Sanguine Personality Type students, 7 Choleric students, 5 Melancholic students, and 4 Phlegmatic students. Table 1 presents an analysis of the percentage of mathematical problem-solving abilities of Sanguine Personality Type students.

Table 1. Analysis of Sanguine Personality Type Students' Problem-Solving Ability

| Indicators /questions | Respondent | | | | Total |
|-----------------------|------------|-----|-------|-------|-------|
| | 1 | 2 | 3 | 4 | |
| Understanding problem | | | | | |
| 1 | 0 | 3 | 2 | 3 | 8 |
| 2 | 0 | 3 | 3 | 3 | 9 |
| 3 | 0 | 3 | 0 | 3 | 6 |
| 4 | 0 | 3 | 0 | 3 | 6 |
| Total | 0 | 12 | 5 | 12 | 29 |
| % | 0 | 100 | 41,67 | 100 | 60,42 |
| Making plan | | | | | |
| 1 | 2 | 2 | 2 | 1 | 7 |
| 2 | 2 | 2 | 2 | 2 | 8 |
| 3 | 2 | 2 | 2 | 2 | 8 |
| 4 | 2 | 2 | 2 | 2 | 8 |
| Total | 8 | 8 | 8 | 7 | 31 |
| % | 100 | 100 | 100 | 87,50 | 96,88 |
| Execute the plan | | | | | |
| 1 | 2 | 3 | 2 | 2 | 9 |
| 2 | 3 | 3 | 3 | 2 | 11 |
| 3 | 3 | 3 | 3 | 3 | 12 |
| 4 | 3 | 3 | 3 | 2 | 11 |
| Total | 11 | 12 | 11 | 9 | 43 |
| % | 91,67 | 100 | 91,67 | 75,00 | 89,58 |

| Checking again | | | | | |
|----------------|-------|------|-------|-------|-------|
| 1 | 2 | 0 | 0 | 0 | 2 |
| 2 | 2 | 0 | 0 | 1 | 3 |
| 3 | 2 | 0 | 2 | 0 | 4 |
| 4 | 2 | 0 | 2 | 0 | 4 |
| Total | 8 | 0 | 4 | 1 | 13 |
| % | 100,0 | 0,00 | 50,00 | 12,50 | 40,63 |
| Total | | | | | 116 |
| % | | | | | 71,88 |

Furthermore, in Table 2, an analysis of the percentage of mathematical problem-solving abilities of Choleric Personality Type students is presented.

Table 2 Analysis of Problem-Solving Ability of Choleric Personality Type Students

| Indicators | Respondent | | | | | | | Total |
|-----------------------|------------|-------|-------|-------|------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Understanding problem | | | | | | | | |
| 1 | 3 | 0 | 3 | 3 | 0 | 3 | 2 | 14 |
| 2 | 3 | 0 | 3 | 3 | 3 | 3 | 3 | 18 |
| 3 | 3 | 0 | 3 | 3 | 0 | 3 | 3 | 15 |
| 4 | 3 | 0 | 3 | 3 | 0 | 3 | 3 | 15 |
| Total | 12 | 0 | 12 | 12 | 3 | 12 | 11 | 62 |
| % | 100 | 0 | 100 | 100 | 25 | 100 | 91,67 | 73,81 |
| Making plan | | | | | | | | |
| 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 11 |
| 2 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 11 |
| 3 | 0 | 2 | 0 | 2 | 0 | 2 | 2 | 8 |
| 4 | 2 | 2 | 1 | 2 | 0 | 1 | 1 | 9 |
| Total | 5 | 7 | 4 | 7 | 4 | 7 | 5 | 39 |
| % | 62,5 | 87,5 | 50,0 | 87,5 | 50 | 87,5 | 62,50 | 69,64 |
| Execute the plan | | | | | | | | |
| 1 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 15 |
| 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 17 |
| 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 19 |
| 4 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 16 |
| Total | 9 | 10 | 9 | 10 | 1 | 10 | 8 | 67 |
| % | 75 | 83,3 | 75 | 83,3 | 91,6 | 83,3 | 66,7 | 79,7 |
| Checking again | | | | | | | | |
| 1 | 0 | 2 | 0 | 0 | 1 | 2 | 0 | 5 |
| 2 | 1 | 2 | 0 | 1 | 2 | 2 | 0 | 8 |
| 3 | 1 | 2 | 0 | 2 | 2 | 2 | 0 | 9 |
| 4 | 0 | 1 | 1 | 2 | 2 | 1 | 0 | 7 |
| Total | 2 | 7 | 1 | 5 | 7 | 7 | 0 | 29 |
| % | 25,00 | 87,50 | 12,50 | 62,50 | 87,5 | 87,50 | 0 | 51,79 |
| Total | | | | | | | | 197 |
| % | | | | | | | | 68,75 |

Table 3 below presents an analysis of the percentage of mathematical problem-solving abilities of Melancholic Personality Type students.

Table 3 Analysis of Problem-Solving Ability of Melancholic Personality Type Students

| Indicators | Respondent | | | | | Total |
|-----------------------|------------|-------|-----|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | |
| Understanding problem | | | | | | |
| 1 | 3 | 3 | 3 | 3 | 3 | 15 |
| 2 | 3 | 3 | 3 | 3 | 3 | 15 |
| 3 | 3 | 3 | 3 | 3 | 3 | 15 |
| 4 | 3 | 3 | 3 | 3 | 3 | 15 |
| Total | 12 | 12 | 12 | 12 | 12 | 60 |
| % | 100 | 100 | 100 | 100 | 100 | 100 |
| Making plan | | | | | | |
| 1 | 2 | 1 | 2 | 1 | 2 | 8 |
| 2 | 1 | 2 | 2 | 1 | 2 | 8 |
| 3 | 2 | 2 | 2 | 2 | 2 | 10 |
| 4 | 2 | 1 | 2 | 1 | 1 | 7 |
| Total | 7 | 6 | 8 | 5 | 7 | 33 |
| % | 87,5 | 75 | 100 | 62,5 | 87,5 | 82,5 |
| Execute the plan | | | | | | |
| 1 | 2 | 2 | 3 | 2 | 3 | 12 |
| 2 | 2 | 2 | 3 | 2 | 3 | 12 |
| 3 | 3 | 3 | 3 | 3 | 3 | 15 |
| 4 | 2 | 2 | 3 | 2 | 2 | 11 |
| Total | 9 | 9 | 12 | 9 | 11 | 50 |
| % | 75 | 75 | 100 | 75 | 91,67 | 83,33 |
| Checking again | | | | | | |
| 1 | 0 | 1 | 2 | 1 | 2 | 6 |
| 2 | 1 | 1 | 2 | 1 | 2 | 7 |
| 3 | 2 | 2 | 2 | 2 | 2 | 10 |
| 4 | 1 | 1 | 2 | 1 | 1 | 6 |
| Total | 4 | 5 | 8 | 5 | 7 | 29 |
| % | 50 | 62,50 | 100 | 62,50 | 87,50 | 72,50 |
| Total | | | | | | 172 |
| % | | | | | | 84,58 |

Furthermore, in Table 4, an analysis of the percentage of mathematical problem-solving abilities of Phlegmatic Personality Type students is presented.

Table 4 Analysis of Problem-Solving Ability of Phlegmatic Personality Type Students

| Indicators | Respondent | | | | Total |
|-----------------------|------------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | |
| Understanding problem | | | | | |
| 1 | 3 | 2 | 3 | 1 | 9 |
| 2 | 3 | 3 | 2 | 3 | 11 |
| 3 | 0 | 3 | 3 | 3 | 9 |
| 4 | 0 | 3 | 3 | 3 | 9 |
| Total | 6 | 11 | 11 | 10 | 38 |
| % | 50,00 | 91,67 | 91,67 | 83,33 | 79,17 |
| Making plan | | | | | |
| 1 | 2 | 2 | 0 | 2 | 6 |

| | | | | | |
|------------------|-------|-------|-------|-------|-------|
| 2 | 2 | 1 | 1 | 1 | 5 |
| 3 | 2 | 2 | 0 | 2 | 6 |
| 4 | 2 | 1 | 0 | 2 | 5 |
| Total | 8 | 6 | 1 | 7 | 22 |
| % | 100,0 | 75,00 | 12,50 | 87,50 | 68,75 |
| Execute the plan | | | | | |
| 1 | 3 | 2 | 2 | 2 | 9 |
| 2 | 3 | 2 | 2 | 2 | 9 |
| 3 | 3 | 3 | 3 | 3 | 12 |
| 4 | 3 | 2 | 3 | 3 | 11 |
| Total | 12 | 9 | 10 | 10 | 41 |
| % | 100,0 | 75,00 | 83,33 | 83,33 | 85,42 |
| Checking again | | | | | |
| 1 | 0 | 1 | 1 | 1 | 3 |
| 2 | 0 | 1 | 1 | 1 | 3 |
| 3 | 0 | 2 | 2 | 2 | 6 |
| 4 | 0 | 1 | 2 | 2 | 5 |
| Total | 0 | 5 | 6 | 6 | 17 |
| % | 0,00 | 62,50 | 75,00 | 75,00 | 53,13 |
| Total | | | | | 118 |
| % | | | | | 71,61 |

Furthermore, the results of data analysis of students who get the highest scores on the solving tests analyzed for each personality type show that Sanguine students are not yet able to carry out problem-solving procedures based on the stages of problem-solving according to Polya. This is shown from the work of Sanguine students who are only able to solve the problems given starting from the stage of understanding the problem, making plans, to carrying out the plan. But in the last step, namely re-examining the results of the work and making conclusions, the Sanguine students did not carry it out. This is in line with the results of research by Amalia and Isnani [10] that students with the Sanguine Type are able to plan solutions but cannot complete them properly because they are careless, careless, and forgetful. It's just that when interviewed to see more clearly the stages of problem-solving, Sanguin Type students are able to explain well, enthusiastically, and confidently express conclusions from the results they get. This is also supported by research conducted by [11], that Sanguine students tend to be untidy in writing answers, but are able to explain well, enthusiastically, and confidently when interviewed. In addition, this is also following the opinion of [9] which states that people who have a Sanguine personality tend to like to talk, and are active, but are not orderly and less thorough in their work.

Students with Choleric personalities are already able to solve the given problems well and have no difficulty. The stages of problem-solving, starting from the stage of understanding the problem to check again, have been carried out in detail and precisely according to the questions given. Although

in some cases errors still occur in the calculation algorithm. This is supported by Littauer's statement [9] that Choleric students tend to be hasty in making decisions (impatient), but are also resourceful, quick to decide, strong-willed, and put more emphasis on results. Meanwhile, Kamilia's, et. al research [12] states that if they cannot solve a problem, the Choleric student will try to solve the problem to the extent of his understanding and ensure that the answer given is correct.

In Kamilia's research, et al [12], students with melancholic personalities misinterpreted the meaning of the questions and tended to be less thorough in solving problems. This is contrary to the results obtained in this study because Melancholic students in this study tended to be orderly and neat in writing their work, starting from the stage of understanding the problem, making plans, and carrying out plans until checking again. This result is in line with the research of [13] that melancholic students always write answers in a systematic, neat, and structured manner. Likewise, Littauer's opinion [9] which states that a Melancholic personality is a personality that is perfectionist, schedule-oriented, orderly and organized, detailed and organized.

Students with phlegmatic personalities in some cases are able to carry out all stages of problem solving in a coherent and precise manner. However, in some cases also, Phlegmatic students did not write down what elements were known and what was asked of the problem and did not write down what strategies would be used to work on the problem, but immediately wrote down the solution to the problem. This is also supported by research by [12] that phlegmatic students tend to work on questions they believe are correct and prefer not to work on these questions if they feel unable to complete them. In addition, according to Littauer's statement [9] that phlegmatic students have weaknesses including lack of motivation, tend to be ignorant, and do not want to be difficult, lazy, and not enthusiastic.

Conclusion

This study confirms that personality types contribute to students' mathematical problem-solving abilities. This is illustrated by the characteristics of students' answers to answering the questions/problems given. Problem-solving abilities of students in Number Pattern material, when associated with the personality type of Florence Littauer, students with Melancholic personality types demonstrate systematic, structured, and complete behavior according to the stages of Polya's problem solving starting from understanding the problem, making plans, carrying out the plan, checking again, with 85% problem-solving ability. This is somewhat different from students of other personality types, namely Sanguine Personality Types 72%, Choleric 69%, and Phlegmatic 72%.

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