Journal of Mathematics and Mathematics Education
https://jurnal.uns.ac.id/jmme

p-ISSN 2089-8878; e-ISSN 2715-8276
Vol. 14, No. 01, June 2024

ANALYSIS OF STUDENTS' MATHEMATICAL PROBLEM-SOLVING ABILITIES IN REVIEW OF INTROVERT AND EXTROVERT PERSONALITY TYPES

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Abstrak: Tujuan penelitian ini adalah untuk mendeskripsikan kemampuan pemecahan masalah matematika siswa ditinjau dari tipe kepribadian introvert dan extrovert. Jenis penelitian yang digunakan yaitu penelitian deskriptif dengan pendekatan kualitatif. Metode pemilihan subjek yang digunakan adalah purposive sampling dengan melibatkan total 4 siswa, terdiri dari 2 siswa dengan tipe kepribadian introvert dan 2 siswa dengan tipe kepribadian extrovert. Teknik analisis data yaitu kondensasi data, penyajian data, dan penarikan kesimpulan/verifikasi. Hasil penelitian menunjukkan bahwa (1) Siswa kelas XI di SMAN 5 Wajo yang memiliki tipe kepribadian introvert menunjukkan tingkat kemampuan pemecahan masalah matematika yang tinggi. Mereka mampu memenuhi semua indikator, yaitu: a) pemahaman tahap masalah, b) penyusunan rencana, c) pelaksanaan rencana, dan d) penelusuran kembali pada tahap pemecahan masalah tersebut. (2) Siswa kelas XI SMAN 5 Wajo dengan tipe kepribadian extrovert memiliki kemampuan pemecahan masalah matematika rendah dimana siswa mampu memenuhi dua indikator yaitu: a) tahap memahami masalah, b) tahap menyusun rencana, c) tidak mampu tahap melaksanakan; dan d) tidak mampu tahap menelusuri kembali.

Kata kunci : *Pemecahan Masalah, Tipe Kepribadian.*

Abstract: The objective of this research is to delineate the mathematical problem-solving skills of students based on their introverted and extroverted personality types. The research methodology employed is descriptive research, utilizing a qualitative approach. The subject selection technique used was purposive sampling, which was as many as 4 students, specifically, the study involves 2 students with introverted personality types and 2 with extroverted personality types. Data analysis involves techniques such as data condensation, data presentation, and conclusion/verification. The findings indicated that (1) Class XI students of SMAN 5 Wajo with introverted personality types have high mathematical problem solving skills where students are able to meet all indicators, namely: a) the stage of understanding the problem, b) the stage of devising a plan, c) the stage of carry out the plan; and d) able to looking back. (2) Grade XI students of SMAN 5 Wajo with extroverted personality type have low mathematical problem-solving skills where students are able to meet two indicators, namely: a) the stage of understanding the problem, b) the stage of devising a plan, c) unable to carry out the plan; and d) unable to looking back.

Keywords: *Problem-Solving, Personality types.*

Accepted: december 28, 2023 Approved: June 01, 2024 Published: June 31, 2024
DOI: https://doi.org/10.20961/jmme.v14i1.82545

p-ISSN 2089-8878; e-ISSN 2715-8276

INTRODUCTION

Each individual is expected to be able to solve or solve problems, including in student education (Hadi et al, 2023). The stages of problem solving can be used to solve problems with a high level of difficulty (Lestari & Juandi, 2023). The significance of problem-solving skills is evident in the fundamental competencies outlined in Permendikbud number 21 of 2016. One of these competencies emphasizes that students should demonstrate a logical, critical, analytical, careful, thorough, responsible, responsive, and persistent attitude when faced with problem-solving situations (Kemendikbud, 2016). The process standards highlight five essential skills that students should develop through mathematics learning, including: (1) Problem-solving; (2) Reasoning and proof; (3) Communication; (4) Connection; and (5) Representation (National Council of Teachers of Mathematics [NCTM], 2000).

Mathematics subjects aim so that students possess the capability to comprehend concepts, engage in reasoning, tackle problems, articulate ideas, and cultivate an attitude that recognizes the practicality of mathematics in real-life situations (BSNP, 2006). It is evident that problem-solving holds significant importance focus in mathematics learning so that it is clearly contained in the curriculum of mathematics subjects from elementary school to high school.

Problem solving skills should be possessed by every student, through mathematics learning students can develop The capacity to think critically, creatively, systematically, logically, attentively, effectively, and efficiently is crucial in the process of problem-solving.. Thus, through learning mathematics students can be equipped with problem-solving skills (BSNP, 2006).

When solving math problems, each student may have a different way of thinking. This is as a result of the differences in traits that each individual has differently. (Pimta et al., 2009), states that the factors that impact the capacity to resolve mathematical problems are direct factors and indirect factors. Indirect influencing factors are self-motivation and ability. Self-motivation and ability are factors that originate in students so that they can be influenced by the characteristics they have. These characteristics can be said to be the personality type of students. While according to (Dewiyani & Sagirani, 2012), “every personality types had different thinking process profil in problem solving.” Students with different personality types, will have different thought processes in solving problems. This is also supported by statements from (Okike & Amoo, 2014) dan (Isroil et al., 2017), which states that with the differences in personality that a person has, they are unlikely to solve problems with the same approach and decision making. This is supported by research (Satya et al., 2022), Students with extroverted personality traits excel in three problem-solving indicators—understanding problems, planning, and resolution. However, they have not yet achieved proficiency in the re-examination stage. Conversely,

students with introverted personality types showcase the ability to meet all problem-solving indicators across stages, including understanding problems, planning, problem resolution, and re-examination.

Based on the results of initial observations at SMA Negeri 5 Wajo, students still have difficulty solving a math problem. Students cannot understand the problem and how to solve it and students still have difficulty in developing the solutions they get to math problems. The teacher's knowledge of students' ability to solve math problems is important. By knowing the process / steps taken by students in solving problems, teachers can track the location and type of mistakes made by students. The problem-solving thought processes of students, as influenced by their personality types that have been grouped into 2, namely introverted personality types and extroverted personality types. To find out a student's thoughts about his work on certain problems, of course, is not seen from his behavior but specifically from the results of student work. To be able to find out the thoughts of a student, one of them can be done by inviting students to discuss with the teacher so that students are willing to say what is in their thoughts when working on certain problems.

Based on the background above, students' mathematical problem solving skills that are still lacking need to be studied further. Therefore, researchers want to analyze personality types that are grouped into 2 personality types, namely introverted personality and extroverted personality and directed at the Polya problem solving step.

RESEARCH METHOD

The research methodology employed is qualitative and descriptive in nature. Its purpose is to provide a detailed description of mathematical problem-solving abilities of the student based on the problem-solving ability indicators proposed by Polya. This research was conducted in the 2022/2023 school year. The study was conducted at SMA Negeri 5 Wajo, with four Grade XI students selected purposively as the subjects, categorized based on the results of personality type questionnaires which were then given a mathematical problem solving test regarding a three-variable linear equation system. Grouping personality types as follows:

Table 1. Personality Type Categories

Personality Type	**score**
Extrovert	≥ 12
Introvert	< 12

(Lestari, 2016)

p-ISSN 2089-8878; e-ISSN 2715-8276

The categories of students' math problem-solving ability are categorized as follows:

Table 2. Categories Troubleshooting Capabilities

Categories Troubleshooting Capabilities	Score
High	$80 \leq skor < 100$
Medium	$65 \leq skor < 80$
Low	$0 \leq skor < 65$

(Jedaus et al., 2019)

To analyze the answer results of the student problem-solving ability test is carried out with percentage calculations as follows: (Fatmala et al., 2022):

$$P = \frac{n}{N} \times 100\%$$

Explanation:

P = Assess students' problem-solving abilities

n = Student score

N = Ideal score

The data collection technique is implemented through three stages. The first stage is data collection using personality type questionnaires, then a problem-solving ability test is carried out followed by interviews using test instruments and interview guidelines. Personality type questionnaires were given to all students in one class who were then selected by four students to be given problem-solving ability tests. Then, Derived from the outcomes of the problem-solving assessments conducted on the four students, they were analyzed and interviewed further.

There are two research instruments, namely, the primary instrument, along with supporting tools, involves the researcher acting as the main instrument that will interact directly and extract information from the subject to collect the necessary data and supporting instruments consist of personality type questionnaires and problem-solving ability tests. The personality type questionnaire knows how students' personalities are based on *introverts* and *extroverts*. The problem-solving ability test is given material on a system of linear equations with three variables, following the stages outlined by Polya. Interview guidelines are used as a reference in conducting interviews with research subjects after completing personality type questionnaires and mathematical problem solving tests given. These interview guidelines are semistructured. Because interviews are semi-structured, there are some

questions that are replaced or added outside the interview guidelines that are in accordance with the results of the students' work to extract more information from students.

The data validation technique employed in this study is source triangulation, which is utilized to compare data obtained from different sources to ensure consistency. The data analysis methods applied include data condensation, data presentation, and drawing conclusions.

RESULTS AND DISCUSSION

In determining the research subject, researchers used data obtained from the results of giving personality type questionnaires given to grade XI students. Students who are classified as having *introverted* and *extroverted* personality types can be seen from the results of the personality type questionnaire given. Furthermore, two students were selected each who had an *introverted and* an *extroverted personality type*. As for the details of each selected subject, it is presented in the following table.

Table 3. Determination of the subject of research

No	Student Initials	Initial Capability Categorization	Student Code
1	AK	*Introvert*	SKI-1
2	MFAH	*Introvert*	SKI-2
3	M	*Extrovert*	SKE-1
4	A	*Extrovert*	SKE-2

The four selected subjects were then given mathematical problem solving problems for a three-variable linear equation system. After the subject completes the question, an interview is then conducted regarding the subject's answer.

Table 4. Data Recapitulation of Subject's Problem-Solving Ability with Introvert and Extrovert Personality Type Categories

Question Number	**Indicator**	**SKI-1**	**SKI-2**	**SKE-1**	**SKE-2**
1	Comprehending the problem involves identifying known information and understanding the specific inquiries or requirements.	√	√	√	√
	Develop a plan by estimating the strategies to be used in solving problems and making examples into mathematical models.	√	√	√	√

p-ISSN 2089-8878; e-ISSN 2715-8276

	Implement the plan by solving problems using strategies that have been compiled, carry out every calculation, and get the solution correctly.	√	√	×	×
	Tracing back by making conclusions and checking the correctness of the results obtained.	√	√	×	×
2	Comprehending the problem involves identifying known information and understanding the specific inquiries or requirements.	√	√	√	√
	Develop a plan by estimating the strategies to be used in solving problems and making examples into mathematical models	√	√	√	√
	Implement the plan by solving problems using strategies that have been compiled, carry out every calculation, and get the solution correctly.	√	√	×	×
	Tracing back by making conclusions and checking the correctness of the results obtained.	√	√	×	×

On the indicator understand the problem of subject SKI1 and subject SKI2. Able to meet indicators where SKI1 subjects and SKI2 subjects can understand the problem thoroughly, list all the given information and clearly articulate what is known and what is being asked in the question.

On the indicators draw up a plan of subject SKI1 and subject SKI2. Capable of fulfilling the criteria for devising a plan where subject SKI1 and subject SKI2 make equations and mathematical models from the information that the subject has obtained and can determine the method used to solve a given problem.

On the indicator carry out the plan subject SKI1 and subject SKI2. Able to meet the indicators of implementing the plan where the subject SKI1 and subject SKI2 can use the appropriate method that has been planned and is able to solve the problem to the end.

On the indicator retrace subject SKI1 and subject SKI2. Able to meet the retrace indicator where subject SKI1 and subject SKI2 can write down the conclusions that have been obtained. However, subject SKI1 and subject SKI2 cannot verify the correctness of the answers that have been obtained whether the answers obtained are solutions to the problem or not.

On the indicator understand the problem of SKE1 subject and SKE2 subject. Able to meet indicators where SKE1 Subjects and SKE2 Subjects can understand the problem thoroughly, list all the given information and clearly articulate what is known and what is being asked in the question.

On the indicators draw up a plan of the subject SKE1 and the subject of SKE2. Able to meet indicators Develop a plan where SKE1 subjects and SKE2 subjects create equations and mathematical

models from the information that the subject has obtained and can determine the methods used to solve given problems.

On the indicators carry out the plan of the subject SKE1 and the subject SKE2. Unable to meet the indicators of implementing the plan where SKE1 subjects and SKE2 subjects do not solve the problem by the end using the planned steps and methods.

From the provided description, one can infer that students with introverted personality types exhibit superior problem-solving abilities in comparison to students with extroverted personality types. Where subjects with *introverted personality types can meet all problem-solving indicators and subjects with* extroverted personality types *meet only two problem-solving indicators, This aligns with findings from the research conducted by* (Putri & Masriyah, 2020) dan (Zuniana & Rahaju, 2019) which states that introverted personality type *students have high problem-solving abilities compared to students who have* extroverted personalities . (Zuniana & Rahaju, 2019) Introverted *students are more careful because they are afraid of making mistakes but tend to lack confidence in their understanding while* extroverted *students* have high self-confidence, but tend not to be thorough and hasty in solving problems. Therefore, *introverted* students can solve given problems compared to *extroverted students.*

CONCLUSIONS AND SUGGESTIONS

Grade XI students of SMAN 5 Wajo Students characterized by introverted personality types excel in the realm of mathematical problem-solving skills where in solving mathematical problems execute all phases of the problem-solving process in Polya problems well, namely: the stage of understanding problems by being capable of recognizing the known and requested elements in a given context, the stage of making plans by being able to determine the strategies and formulas used to solve problems appropriately, executing the plan involves solving the problem through the application of designated strategies and formulas and obtaining the right solution, and the stage of retracing by being able to make conclusions but, students do not check the results and the process of solving and do not verify the correctness of the results obtained whether it is a solution to the problem given.

Grade XI students of SMAN 5 Wajo Students with extroverted personality types show diminished proficiency in mathematical problem-solving. Specifically, they engage in only two stages of solving Polya problems: understanding the problem by identifying known and asked elements, the stage of making plans by being able to determine the strategies and formulas used to solve the problem appropriately, unable to carry out the stage and unable to stage Retrace.

p-ISSN 2089-8878; e-ISSN 2715-8276

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