J. Pijar MIPA, Vol. 17 No.4, July 2022: 507-514 ISSN 1907-1744 (Print)
DOI: 10.29303/jpm.v17i4.3390 ISSN 2460-1500 (Online)

ANALYSIS OF MATHEMATICAL INVESTIGATION ABILITY REVIEWED FROM PERSONALITY TYPES IN JUNIOR HIGH SCHOOL

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Received: February 17, 2022. Accepted: April 2, 2022. Published: July 31, 2022

Abstract: Mathematical investigative ability is one of the skills that need to be honed in every student to improve problem-solving skills and develop thinking skills. A mathematical investigation has four stages: specialization, conjecture, justification, and generalization. This paper aims to describe the mathematical investigative abilities of extroverted and introverted personality students. This study was conducted qualitatively on Junior High School 1 Mataram students in grades IX-F, selected by a simple random sampling technique. Based on the mathematical investigation test results and personality type, 6 students were selected to be interviewed. The results showed that extrovert students were alert, independent, and outward-looking or oriented when doing mathematical investigation tests, such as directly working on questions deftly and trying out their ideas. Therefore, students with extrovert personalities mostly succeeded in going through three stages of an investigation, namely: specialization, conjecture, and justification. Introvert personality students, when doing mathematical investigations, are thorough, detailed, focused, and think deeply, such as checking answers by doing one more time, then rereading the answers in detail, and focusing on thinking deeply at the generalization stage. Therefore, most introverted students passed three stages of mathematical investigation: specialization, conjecture, and justification. However, some introverted students also made it through the fourth stage.

Keywords: *Mathematics Investigation, Personality, Extrovert and Introvert.*

INTRODUCTION

In learning mathematics, students must be stimulated to search for themselves, carry out their investigation, do proof of a conjecture that they make themselves, and find answers to questions from friends or teachers [1]. The linguistic investigation is an investigation by recording or recording facts, reviews, experiments, and so on to obtain answers to questions (about events, properties, the efficacy of a substance, and so on) [2].

A mathematical investigation is an important activity to improve problem-solving skills and is beneficial for students in developing their thinking skills optimally [3]. Integrating mathematical investigations in mathematics classrooms is one way to encourage schools to focus on students' reasoning, communication, skills, and problem-solving processes [4].

Another common use of the term 'investigation' is in educational research. Education research involves examining a particular subject or problem, formulating and testing conjectures, and arriving at conclusions [5]. A mathematical investigation is an activity that can encourage an experimental activity (expression), collect data, make observations, identify a pattern, make and test conclusions/conjectures (conjecture) and make generalizations. With mathematical investigations, students are encouraged to construct their mathematical knowledge and skills, dare to take steps in solving problems, accept the risk of errors that can occur during work, and develop and generate ideas during the problem-solving process. Meanwhile, the teacher acts as a facilitator so that the investigation process carried out by students goes well, as well as directs and guides if there are difficulties for students.

The cognitive process in a mathematical investigation is the mental activity in one's mind in solving problems (attack), including specialization, conjecturing, justifying, and generalizing [6]. Specialization means selecting samples that are carried out randomly to study or understand the appropriate questions systematically in preparing the basis for generalization and testing them. The selected examples are specific examples of the more general situation in the question. Picking random examples is a good way to get an idea of what's involved in the question and see if the question or guess might be correct. Specialization collects evidence on which to base generalizations [7]. Conjecture is another activity of making guesses/ estimates/ patterns/ conjectures that will be used for investigation [6]. A conjecture is a statement that appears, but the truth is not necessarily true. In other words, its veracity is still in doubt, and it is not known whether it contradicts the selected specific examples or not, nor is it known whether it has other consequences, namely generating false assumptions [7]. After being formulated, the conjecture is investigated to decide whether it can be justified immediately or must be modified and corrected again. Justification is done by looking for reasons that can be used to justify the allegations that have been obtained. A reason is sought in the justification stage because that reason relates to the information

known to the allegations obtained at the previous guess stage [7]. Justification is an activity to prove the truth of the allegations/ estimates/ patterns/ conjectures that have been proposed [6]. Generalization is the activity of making inferences from patterns or regularities that have been found and have been tested for truth. In this activity, students can make general formulations or formulas, change the representation if needed, and test the general formulas they have made with some special cases they have worked on [6].

Aspects of cognitive knowledge, application, and reasoning are needed from students to working on the task of mathematical investigations [6]. These aspects are the initial foundation of mathematical investigative abilities and are tested in the TIMSS and PISA tests. Based on the 2018 PISA results, it was concluded that the 2018 PISA score for mathematical ability, Indonesia was ranked 72nd out of 78 countries with a total score of 379. China achieved first place with a total score of 591. The student's initial foundation to carry out investigative tasks is generally relatively low.

Based on the explanation above, the students' investigative abilities will be classified as low because the initial foundation needed to complete the investigative task is low. Mathematical investigation activities that require students to collect a lot of information, connect the information obtained, make conjectures, test conjectures, make conclusions, and generalize have not been carried out optimally [3].

The results of an interview with one of the mathematics teachers of Junior High School 1 Mataram show that research related to mathematical investigations has been carried out before. The difficulties are that students do not fully understand the concepts related to the material being tested. They are afraid and reluctant when working on questions, especially if they are faced with difficult questions. The higher the stage of an investigation, the fewer students succeed in completing it, so mathematical investigation questions are not done to completion. In addition to previous research that has been done, the teacher conducts learning according to the concept of a mathematical investigation by applying four stages of investigation during the learning process on the number pattern material. Students are asked to come to the front of the class and practice directly in the case of a handshake. Students find how many handshakes occur between 2 students, 3 students, 4 students, and so on. Based on the results obtained, a pattern is starting to form. The problem is even more generalized by finding the number of handshakes that occur if there are n students in the class. Students carry out four stages of investigation under the teacher's guidance during learning and based on the results of the teacher's narrative, the higher the stage of an investigation. These fewer students succeed in answering the questions.

Amin et al.'s research results also support the statement regarding students' low investigative abilities, showing that the investigative test given to the pre-action activities of students' mathematical investigative abilities in class XI IPA 1 SMA Negeri 2 Watampone is still very low. The 40 students were research subjects, the highest score was 29, and the lowest was 11. In general, students did not meet the indicators of identifying problems, especially making predictions or conjectures for problem-solving, but when solving problems, students immediately made problem-solving. In the indicators of drawing conclusions and interpreting the investigation results, none of the students met these two aspects [8].

Probability is a material close to everyday experience because it uses many examples in contexts already known to students [9]. Based on this statement, the probability is one of the materials that are suitable to be applied to mathematical investigations. It is easier to take contextual examples to be applied to mathematical investigations, solve mathematical probabilities according to the four stages of the thinking process in mathematical investigations, and train student reasoning.

As explained above, mathematical investigations train many students' mathematical abilities, one of which is reasoning. It aligns with the probability material that can help students' reasoning skills. The probability material contains certain patterns, so reasoning is needed to understand it. To make it easier for students to understand the material, a lesson that directs students to reason is needed to obtain a complete understanding [10].

Human personality is a combination of various traits and self-concepts of people [11]. Personality is relatively stable. The notion of stability here does not mean that the personality is fixed and does not change. In human life, from childhood to adulthood, personality is always developing and changing. However, in this change, certain patterns remain. The more mature the person, the clearer the pattern, and the more pronounced the stability [12].

Carl Gustav Jung divided the term personality type into two categories: extrovert and introvert. Based on the conclusions obtained by Carl Gustav Jung after doing research for years, an extrovert type is a person who likes to work and practice has a healthy mind and has a view of life that follows reality, while the second type is an introvert type. The introverted type is the type of person whose adjustment is directed to themself, has a quiet attitude, and their inner atmosphere is difficult to understand [13].

Each personality has its character or characteristics, including learning styles. Students with extrovert personalities learn better in groups than alone because they socialize better than introverts. Students with introverted personalities have different ways of learning [14]. Learning for students with introverted personality types is better to

prioritize learning with introspection and deep concentration because introverted students are usually indifferent to the surrounding environment and choose to focus on solving the problems given [15]. The study results of the mathematics learning outcomes of students in class XI MIPA 3 SMA 1 Rajagaluh showed differences in the learning outcomes of extroverted and introverted students, namely extroverted students who excelled in the psychomotor domain. In contrast, introverted students excelled in the cognitive domain with average learning and effective outcomes. It is evidenced by the average mathematics learning outcomes in the psychomotor domain of extroverted students of 68.75 and introverted students of 60.833. The average mathematics learning outcomes in the cognitive realm of extroverted students are 66.40, and for introverted students is 75.3750. And lastly, the average mathematics learning outcome in the affective domain for extrovert students is 64.50 and for introverted students is 70.9375 [16].

Based on the results of interviews with mathematics teachers at Junior High School 1 Mataram, it was stated that in the class, there were two types of students who usually dominated, namely active students and passive students. Students who are active during learning are not always able to solve the problems given by the teacher to complete. On the contrary, students who are quiet or passive are the ones who manage to answer them. Quiet or passive students solve the questions the teacher gives better than active students.

Through the explanation above, it can be seen that there are differences in the abilities of extroverted and introverted students. It can be concluded that the differences in learning styles in each personality are related to and have an impact on how students solve mathematical problems or problems and are automatically related to how they complete mathematical investigation tasks in mathematics probability material.

Based on the description above, it can be concluded that mathematical investigations can help students to construct mathematical knowledge and develop their thinking processes optimally. However, in reality, based on an interview with one of the mathematics teachers at Junior High School 1 Mataram, students have not optimally completed assignments or mathematical investigations according to the stages and processes. It prompted researchers to conduct this research to learn more about students' mathematical investigative abilities to solve probability material problems at Junior High School 1 Mataram. The focus of this research is to analyze the ability of mathematical investigations on the material of probability in terms of the extrovert-introvert personality type at Junior High School 1 Mataram.

RESEARCH METHODS

This type of research is descriptive and qualitative. Descriptive research is research that seeks to describe a symptom, event, or event that exists at present. In other words, descriptive research takes problems or focuses attention on actual problems as they were at the time the research was carried out [17]. Qualitative methods are used to examine the condition of natural objects, where the researcher is the key instrument, and data collection techniques are used by triangulation (combined observation, interviews, and documentation) [18]. This research is implemented in the odd semester of the 2021/2022 academic year, namely 18 October 2021-23 November 2021, and is carried out at Junior High School 1 Mataram. The subject in this study is one of the classes in class IX, namely class IX-F of Junior High School 1 Mataram. The method of taking research subjects was done using simple random sampling. This sampling technique was used based on the homogeneity test of the mathematics report card scores of even semester students for the 2020/2021 academic year, and homogeneous results were obtained. Furthermore, 6 students were taken from research subjects distinguished based on extrovert-introvert personality types to be interviewed. Interview research subjects were selected based on the results of personality type questionnaires and mathematical investigation tests to obtain unclear information during the study.

Sources of data in the form of primary data and secondary data. In this study, the primary data sources were Junior High School 1 Mataram students. Secondary data in this study is data obtained to support primary data.

The data collection procedure is a systematic and standard procedure to obtain the required data [21]. There are 4 data collection methods in this study: documentation, questionnaires, investigative tests, and interviews. First, documentation. First, documentation is a record of events that have passed. Documents can be in the form of writing, pictures, or monumental works of someone [22]. In this study, documentation is in the form of the names of students in the research class, the number of students, and other data that will be used for research purposes at SMPN 1 Mataram in the even semester of 2021/2022.

Second, the questionnaires given refer to Eysenck's Theory called the Eysenck Personality Inventory (EPI), which measures the tendency of extrovert and introvert personality types [19]. The test tool was made to measure the extraversion dimension, which consisted of 24 questions, neuroticism, 24 questions, and lies, 9 questions. Extraversion is a personality type that leads to objective experiences, focuses attention on the outside world, tends to interact with people around, is active, friendly, and optimistic, and his behavior is determined by his environment [23]. Neuroticism is a personality characterized by a feeling of being easy

to experience negative emotions such as fear, anxiety, irritability, depression, and feelings of discomfort that have an impact on the inability to adjust [24]. In this study, the focus is on knowing the personality of extroverted and introverted students, so the questions used are questions with extraversion dimensions only. In this questionnaire, students are asked to answer questions by including a cross (√) under the answer choices "Yes" or "No" in the answer column provided by the personality test. For scoring the Eysenck Personality Inventory (EPI) test, it is done by giving a score of 1 for each question answered according to the answer key that has been set and a score of 0 for each question that is answered not according to the answer key that has been set. The higher the score obtained by students, the more individuals tend to lead to the extroverted personality type. Conversely, the lower the score, the more individuals tend to lead to the introverted personality type. [25]. The determining criteria can be seen in Table 1.

Table 1. Personality Type Score

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

Third, this study conducted an investigative test to determine the students' mathematical investigative abilities in solving problems by following the four stages of mathematical investigations. The form of the test used in this study was a description test.

Fourth, an interview is a conversation with a specific purpose, carried out by two parties, namely the interviewer who asks questions and the interviewee who answers the questions [26]. The interview in this study aimed at 6 subjects distinguished based on extrovert-introvert personality. Interviews were conducted to obtain unclear information during the study. What difficulties are faced by students while doing the test, the reasons students can be wrong when calculating, students' doubts when answering questions, and other things that will be asked during interviews to deepen information related to research that has been done?

The instruments used in this study were mathematical investigation tests and interview guidelines, first tested for validity by two experts. Validity (validity) is the accuracy of a test against what will be measured. After the questions are prepared, the question points are reviewed using certain criteria by a competent person in the relevant field [27]. It is done to see the suitability of the question items with the stages of mathematical investigation. These experts will provide their opinions regarding the questions that are compiled, which can be used directly without repairs, if there are improvements or completely overhauled. The instrument obtained valid results after revision.

Data analysis is the process of systematically searching and compiling data obtained from interviews, field notes, and documentation by organizing the data into categories, breaking them down into units, synthesizing them, arranging them into patterns, and choosing what is important and what is important. That will be studied and make conclusions so that they are easily understood by themselves and others [22]. The data analysis technique used in this research is qualitative data analysis. Qualitative data analysis using the model developed by Miles and Huberman. In this model, several things must be carried out in data analysis: data reduction, data presentation, and verification.

RESULT AND DISCUSSION

Data retrieval starts from documentation in the form of students' math scores throughout the class, names of students in the research class, and the number of students. After that, students filled out a personality type questionnaire to find out the personality of each student and divided it based on extrovert and introvert personalities. Students took mathematical investigation tests, divided the results of students' mathematical investigation tests according to extrovert-introvert personality types, and conducted interviews with respondents who were selected based on the results of mathematical investigative tests and personality types. Based on the data that has been taken, information is obtained that the number of students in class IX-F is 32 students. Due to the Covid'19 pandemic conditions, the placement of the class is divided into two, namely classes IX-F_1 and IX-F_2.

First, the results of the student personality type questionnaire. Through the questionnaire results on the personality types of students, it can be seen that of all students in class IX-F of Junior High School 1 Mataram, there are 32 students, 18 of them are extroverted, and 14 are introverted. When presented, it can be seen in Figure 1.

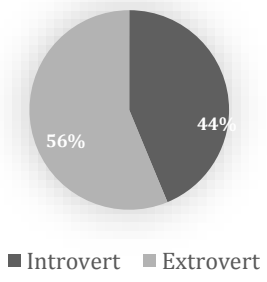

Figure 1. Percentage of Personality of Class IX-F Students

Figure 1 indicates that students with extroverted personalities reach 56%, and students with introverted personalities reach 44%. Therefore, it can be concluded that students with extroverted personalities dominate more than students with introverted personalities.

Second, the results of the mathematical investigation test. The results of the mathematical investigation tests carried out by students can be seen in Table 2.

Table 2. Investigation Test Results for Class IX-F Students

Question	Step	Number of Students	Percentage
1	Specialization	5	15.63%
	Conjecture	6	18.75%
	Justification	3	9.38%
	Generalization	0	0.00%
	Justification of Generalization	0	0.00%
2	Specialization	1	3.13%
	Conjecture	1	3.13%
	Justification	0	0.00%
	Generalization	1	3.13%
	Justification of Generalization	2	6.25%

Table 3. Extrovert Personality Student Investigation Test Results

Question	Step	Number of Students	Percentage
1	Specialization	3	16.67%
	Conjecture	3	16.67%
	Justification	2	11.11%
	Generalization	0	0.00%
	Justification of Generalization	0	0.00%
2	Specialization	1	5.56%
	Conjecture	1	5.56%
	Justification	0	0.00%
	Generalization	0	0.00%
	Justification of Generalization	1	5,56%

Table 2 shows that from the results of the answers, students have not been able to optimally complete all stages of mathematical investigations. Each stage has a varying percentage, and only a small number of students can complete it. Even in question number 1, no student has succeeded in going through the generalization and justification stages of generalization. In question number 2, the number of students who succeeded in going through the investigation stage was less than in question 1.

Third, after the students took the mathematical investigation test and filled out the personality questionnaire, the results of the investigation test were grouped according to the student's personality. The results of the mathematical investigation of extroverted personality students can be seen in table 3, and the results of the mathematical investigation of introverted personality students can be seen in table 4.

Table 4. Introvert Personality Student Investigation Test Result

Question	Step	Number of Students	Percentage
1	Specialization	2	14.29%
	Conjecture	3	21.43%
	Justification	1	7.14%
	Generalization	0	0.00%
	Justification of Generalization	0	0.00%
2	Specialization	0	0.00%
	Conjecture	0	0.00%
	Justification	0	0.00%
	Generalization	1	7.14%
	Justification of Generalization	1	7.14%

Through table 3 and table 4, information is obtained that the mathematical investigative abilities of extroverted and introverted personality students are different. Question number 1, at the specialization stage, more extroverted personality students could pass it than introverted personality students. In the conjecture stage, the extrovert and introvert personality students who managed to pass it were equally. In the justification stage, extroverted personality students managed to get through it, while introverted students did not get through it. None of the students succeeded in going through the generalization stage and generalization justification. Question number 2, extroverted personality students are superior because some have successfully passed it from the specialization to conjecture stages to introverted personality students who none of them can go through these stages. At the justification stage, neither extroverted nor introverted personality students could go through it. However, at the stage of generalization and justification of generalization, introverted students are superior because they can go through it while extrovert students are not able to go through it.

Fourth, interviews with respondents. In this case, 6 students were selected as respondents who were divided according to the extrovert-introvert personality. The 6 students are S_8/Extrovert, S_{15}/Extrovert, S_{21}/Extrovert, S_1/Introvert, S_{25}/Introvert, and S_{28}/Introvert. After conducting

interviews and aligning with the results of the mathematical investigation test, information was obtained regarding the mathematical investigative abilities of the 6 respondents concerned.

The subject of S_8 succeeded in going through the stages of specialization, conjecture, and justification in question 1. In question number 2, S_8 did not succeed in going through any stage of mathematical investigation. The subject of S_1 did not succeed in going through any stage of the mathematical investigation, both in question 1 and question 2. S_{15} had already worked on these 2 questions, but from the start, the subject's answer was wrong, so it impacted the work results afterward. Therefore, the answer written is wrong. S_{21} succeeded in going through 3 stages of mathematical investigation, namely specialization, conjecture, and justification in question number 1, while in question number 2, only able to go through 2 stages: specialization and conjecture. The three subjects with extroverted personalities could not generalize and justify generalizations. It is due to several reasons: students who do not fully understand the meaning of the questions, students who do not understand the probability material that has been taught, and students who do not feel confident when answering questions.

The subject of S_1 succeeded in going through the stages of specialization, conjecture, and justification in question number 1, while in question number 2 the subject did not answer it. It is because students do not understand the probability material, so they do not know how to solve the given problem and when they want to answer it, the working time is over. The subject of S_{25} did not work on question number 1, and in question number 2 S_{25} did not succeed through the stages of specialization, conjecture, and justification, but the subject managed to complete the stages of generalization and justification for generalization. S_{25} finishes first according to his ability and only then understands the question's meaning towards the end of the working time. S_{25} completed the generalization and justification stages but could not work on question number 1 and corrected the answer in question number 2 because the processing time was over. Therefore, based on the interview results, it was concluded that S_{25} succeeded in going through the stages of specialization, conjecture, justification, and generalization. The subject of S_{28} did not go through any stages of the mathematical investigation in number 1 or number 2. However, through the interview results with S_{28}, information was obtained that the subject managed to understand some of the questions given. The idea put forward was a little wrong. The subject knew how to draw illustrations at the specialization stage. The subject found patterns in the conjecture stage and completed the justification with illustrations and in the specialization stage. Therefore, based on the interview results, it was concluded that S_{28} was successful through specialization, conjecture, and justification.

Based on the results of data analysis related to mathematical investigation tests and interviews, information can be obtained that most extroverted students have succeeded in going through 3 stages of an investigation, namely: specialization, conjecture, and justification. Students succeeded in drawing illustrations by following under those exemplified in the problem, finding patterns at the conjecture points, and proving the patterns and hypotheses they obtained at the justification stage.

Extroverted individuals generally have the characteristics of being outward-looking or oriented, free, socially open, interested in diversity, and alert [11]. This opinion is in line with students with extroverted personalities. Before students work on questions, students first prepare themselves by recalling lessons on probability material that they have studied before. After that, extroverted students act swiftly by immediately working on these questions deftly and trying their ideas or ideas to solve the problem. Extroverted students are outgoing and free-minded, so these two things are applied to express themselves through the ideas they put forward before producing the correct answer.

However, there are obstacles experienced by extroverted students, namely not successfully completing the generalization stage and justification for generalization. Extroverted students are impatient in dealing with slow work and can become impatient with long tasks that require more concentration [11]&[15]. The last stage of mathematical investigation, namely generalization, is the most difficult stage that students must face. This stage requires students to think harder. In this activity, students can make important formulas. It requires higher reasoning than before [6]. Extroverted students find it difficult when they have to complete the generalization stage. As has been explained, extroverted students do not understand optimally and forget the probability material. Extroverted students try to do their best. However, because they did not understand the meaning of the questions and get answers, in the end, they were only able to do the generalization stage as best they could even though most extroverted students passed that stage.

Other problems occur in extroverted students: most of them do not find patterns at the conjecture stage. Through interviews, information was obtained that the way extroverted students complete the conjecture stage is to go directly to the justification stage and answer it according to the method at the specialization stage so that when the results have been obtained, they write them down at the conjecture stage.

Based on the analysis of the mathematical investigation test data and interviews, information can be obtained that most introverted students go through 3 stages of mathematical investigations, specialization, conjecture, and justification.

However, introverted students managed to go through the generalization stage. Although lacking in communication, someone with an introverted personality tends to have a more thorough way of thinking than extroverts [20]. It can be seen from how introverted students answer questions during interviews that introverted students tend to be calmer and more careful when answering questions. Through the results of interviews conducted, information was obtained that introverted students were quite thorough because after doing the investigative tests, they checked in detail from the beginning to the end. Even introverted students decided to rework to confirm their answers and read until they were sure.

Students with introverted personalities will usually ignore what is happening around them and complete the given task with full concentration, think deeply about the steps that must be taken, then take action to complete the task [15]. It is in line with introverted students who are research subjects. During investigative tests, they concentrate on understanding in advance the intent of the questions given in a focused manner, so it takes longer than extroverted students to start working on them. Through these actions, introverted students went through the stages of the investigation until they found a general formula or formula and passed the generalization stage well.

However, there are obstacles experienced by introverted students during their investigative tests. Introverted students know how to complete the stages of mathematical investigations from specialization to generalization but cannot complete and write down the correct answers because of the time that has been completed and the wrong ideas or ideas they wrote on the answer sheet for the mathematical investigation test. In addition, there are also introverted students who, although they have gone through the conjecture stage, do not go through it perfectly because they do not find the desired pattern. Introverted students complete the conjecture stage is to going directly to the justification stage and answering it according to the method at the specialization stage so that when the results have been obtained, they write them down at the conjecture stage.

The explanation above shows three differences between extroverted and introverted personality students when working on questions. First, when a mathematical investigation test is given, extroverted students immediately work on it based on the ideas that they have found after understanding them. They try these ideas until they get the right answer, while introverted students take longer than extroverted students to understand the questions in depth until they find an answer they think they are sure of, then start working on it. Second, extroverted students feel bored quickly if they have to dwell on questions that make them think hard and deeply, in contrast to introverted students who deal with them calmly and focus on working until they get the desired results. Third, introverted students are more thorough than extroverted students because when they finish answering the questions. Introverted students examine them in detail and detail by reworking once again and then reading the answers again for the last time until they are sure, in contrast to extroverted personality students who only read and repeat the answer.

The mathematical investigative abilities of extroverted and introverted students are also different. Extroverted students excel in the early stages of an investigation: specialization, conjecture, and justification. Introvert students excel at the final stage of the investigation, namely generalization. But overall, introverted students' mathematical investigative abilities were superior because they had completed 4 stages of an investigation, while extroverted students could only reach 3 stages of an investigation.

CONCLUSION

Based on the analysis and discussion of the mathematical investigative abilities of class IX-F students of Junior High School 1 Mataram on the material of probability in terms of the extrovert-introvert personality type, it can be concluded. The mathematical investigative abilities of extroverted students are mostly successful through 3 stages of an investigation, namely: specialization, conjecture, and justification. Students with extroverted personalities are alert, free, and outward-looking or oriented when doing mathematical investigation tests, such as directly working on these questions deftly and trying out their ideas or ideas to solve the problem. Most introverted students have successfully passed 3 stages of mathematical investigation: specialization, conjecture, and justification. Yet introverted students also made it through the generalization stage. When doing mathematical investigations, introverted personality students are thorough, detailed, focused, and think deeply. Introverted students check the answers they have written by doing it again, then rereading them until they are sure that their answers are correct. Introverted students spend a long time thinking about the generalization stage with a focus until they complete the stage.

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