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Profil of Students' Mathematical Literacy in Solving AKM Task in Terms of Personality Types

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ABSTRACT

Mathematical literacy is an individual's ability to formulate, employ, and interpret mathematics in various contexts. AKM is one of the government's efforts to measure students' mathematical literacy. This research is a descriptive research with a qualitative approach that aims to describe the profile of students' mathematical literacy in solving AKM in terms of the melancholic, choleric, phlegmatic, and sanguine personality types. The instrument used are personality type questionnaire, mathematical literacy test, and interview guidelines. The results showed that (1) melancholic students wrote complete information, construct mathematical models, used efficient and structured strategies, performed calculations correctly, interpreted and double-checked answers as a whole; (2) choleric students wrote complete information, did not make mathematical models, used structured strategies, performed calculations correctly, interpreted and re-checked answers, but were less careful so the units used were not appropriate; (3) phlegmatic students wrote complete information, construct mathematical models, used quick strategies, interpreted and re-checked calculations, but were less careful so the calculations were not accurate; (4) Sanguine students did not write down known information, did not make mathematical models, used quick strategies, interpreted solutions, but did not re-check answers so the calculations were inaccurate. Therefore, personality type is one of the factors that cause differences in mathematical literacy.

Keywords: *mathematical literacy, AKM, personality type.*

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INTRODUCTION

The development of science and technology in the 21st century creates new challenges in all aspects of life (OECD, 2018). The low quality of Indonesian education is an example of a challenge that must be overcome (Rosita, 2018; Rusmining et al., 2014). One of the indicators in measuring the quality of education in a country is through international assessments such as PISA (Rusmining et al., 2014). However, based on the results of the PISA study in the period 2003 to 2018, Indonesia's PISA score is below the average PISA score of other countries (OECD, n.d.). Understanding the theory without knowing its usefulness is one of the causes. Improving the younger generation's skills so that they are able to apply knowledge to solve problems in various real-world contexts is one of the effort that can e done (Sutisna et al., 2018).

All forms of human activity will not be separated from mathematical concepts (Masriyah and Firmansyah, 2018). However, many people think that mathematics is an abstract and complicated. This is because mathematics learning in Indonesia gives students a heavy learning load (Umbara and Suryadi, 2019). Most of the types of questions given are in the form of abstract questions, not contextual questions related to applying mathematical concepts in real-world problems. As a result, students do not know the real benefits of learning mathematics. Whereas mathematics learning should be able to make students have the ability to understand, reason, solve problems, and apply mathematical concepts in everyday life (Nizham et al., 2017). The ability to apply mathematical concepts in everyday life is called mathematical literacy (OECD, 2018, p. 9; Ojose, 2011; Suharta and Suarjana, 2018).

Based on the OECD (2018), mathematical literacy is the ability of an individual to formulate, employ, and interpret mathematics in various contexts. This includes mathematical reasoning and the use of mathematical procedures, facts, concepts, and tools to describe and predict a phenomenon that helps one understand mathematics's role in making informed decisions (OECD, 2010, 2017, 2018, 2019). Mathematical literacy emphasizes honing students' abilities in solving problems in life than only understanding concepts and theorems (Sutisna et al., 2018). When students have good mathematical literacy, they do not only consider mathematics lessons as counting activities but also solve problems in the real world using reasoning and the application of mathematical concepts. Mathematical literacy provides students with awareness and understanding of the role of mathematics in real life (Genc and Erbas, 2019).

Based on the definition of mathematical literacy, there are 3 words, namely formulate, employ, and interpret as a mathematical process that describes the activities one must do in connecting the context of problems and mathematical concepts and how to solve them (OECD, 2010, 2017 , 2018, 2019). Based on the OECD (2018), (1) formulate in the definition of mathematical literacy shows how effective an individual is in

identifying opportunities in utilizing mathematical concepts, then determining the model needed to convert contextual problems into mathematical form, (2) applying (employ) in the sense of mathematical literacy shows how well an individual performs calculations and manipulations and applies concepts and facts to solve problems formulated mathematically to obtain mathematical conclusions, (3) interpret (and evaluate) used in the definition of mathematical literacy indicates how effective an individual is in reflecting on mathematical solutions and then interpreting them into real-life contexts, and determining which solutions make sense and are useful. Therefore, it can be formulated related to mathematical literacy indicators in Table 1.

Table 1. Indicator of Mathematical Literacy

Mathematical Process	Indicators	Indicator Code
Formulate	1. Explaining the information contained in the given problem	F1
	2. Constructing a mathematical model of the given problem	F2
Employ	1. Determining the appropriate strategy in solving the given problem	E1
	2. Do calculations in solving problems given simply	E2
Interpret	1. Interpreting the solution obtained	I1
	2. Evaluate the solution into the problem context	I2

One of the Indonesian government's efforts to improve students' mathematical literacy is the Minimum Competency Assessment (AKM). AKM is one of the government programs to measure students' mathematical literacy. This AKM aims to explore information related to basic competencies that students have achieved, which teachers can then use as a benchmark for determining appropriate learning strategies to improve student achievement (Mendikbud, 2020).

AKM is one of the three components of the National Assessment, which is used as a lieu for the National Examination. AKM aims to measure students' mathematical literacy. The AKM starts to b eimplemented in the 2021 academic year. According to the Mendikbud (2020), the AKM has measured two basic competencies: reading and mathematical literacy. However, the term mathematical literacy in Indonesia is better known as numeration, which is the ability to use mathematical procedures, tools, facts and concepts in various contexts (Kemendikbud, 2020). The measured mathematical literacy consists of 5 learning levels, where each level is used to measure students' mathematical literacy in certain educational units and classes, namely level 1 for class 2, level 2 for class 4, level 3 for class 6, level 4 for class 8, and level 5 for class 10. However, in practice, AKM participants are only intended for grades 5, 8 and 11. This is because students grades 5, 8, and 11 are representatives of each educational unit that has gone through the learning process and is expected to know the improvement of the learning process in the same educational unit in the next class (Center for Assessment and

Learning and Research and Development of the Ministry of Education and Culture of the Republic of Indonesia, 2021). Several types of questions are presented in the AKM, namely short entry, multiple-choice, matchmaking, complex multiple-choice, and description.

The AKM questions contain three components, namely content, context, and cognitive level. Content is material related to AKM questions, consisting of numbers, measurements and geometry, data and uncertainty, and algebra. The context in the AKM questions is the student's closest environment that describes the AKM questions, consisting of personal, socio-cultural, and scientific contexts (Kemendikbud, 2020). Personal context relates to a person's activities and his family environment. The scientific context relates to the application of mathematics in the fields of science and technology. The socio-cultural context relates to activities in the community. The cognitive level describes the abilities billed on the AKM questions, which consist of understanding, application, and reasoning. The level of understanding asks for understanding related to mathematical processes, procedures, concepts, and facts. The level of the application asks for the ability to apply concepts. The level of reasoning asks for the ability to apply concepts in non-routine situations (Mendikbud, 2020).

According to research conducted by Cahyanovianty and Wahidin (2020), differences in initial knowledge affect students' mathematical literacy in solving AKM questions. The study of Sari et al. (2021) found that caused students' low mathematical literacy because students were not familiar with the AKM questions. In addition, the research of Fauziah et al. (2021) found that teacher knowledge related to AKM is also still low.

Many factors influence the difference in mathematical literacy of each individual. Identity is the dominant factor that affects students' mathematical literacy (Pakpahan, 2016). It is because no two people are born equal (Littauere, 2011). When several people sit in a seminar with the same speaker simultaneously, it can lead to different levels of understanding. This shows that each student can gain a different understanding in teaching and learning activities with the same teacher, material, and time. Students' motivation, learning, and academic achievement are influenced by their personality type (Rashedi and Abolmaali, 2014). Suharta and Suarjana (2017) say that mathematical literacy is the core of learning mathematics. Therefore, it can be concluded that personality type affects students' mathematical literacy.

Table 2. Basic Characters of Each Personality Types

Personality Types	Basic Characters
Melancholic	Introvert, thinker, and pessimist
Choleric	Extrovert, doer, and optimist
Phlegmatic	Introvert, observer and pessimist
Sanguine	Extrovert, speaker, and optimist

Hippocrates' Personality Theory divides personality types into four types: Melancholic, Choleric, Phlegmatic, and Sanguine (Littauere, 2011). Each personality type has the strengths that it must develop and the weaknesses it must overcome. Some of the basic characteristics of these personality types are described in Table 2.

According to Littauere (2011), a Melancholic personality is always schedule-oriented. Everything will be designed in detail, orderly, and neatly. It has an organized nature to complete every work in an orderly manner. He will finish what he started. He can also easily see a problem and arrange a short way to solve it. He is a perfectionist and has high standards. He also likes graphs, tables, pictures, and diagrams. A Choleric personality is target-oriented. He can see the whole concept of a problem. He tends to solve problems quickly and practically. He tends to emphasize results, so he often makes targets in every job he does that is well organized (Littauere, 2011). A person with a phlegmatic personality is a capable person. He loves peace and doesn't like to argue, so he often agrees with other people's solutions. He can solve a problem using an easier strategy. He also has good administrative skills (Littauere, 2011). A Sanguine personality often volunteers to complete tasks. He looks great from the outside because he is creative and innovative. A high level of enthusiasm allows him to start a job with a bright idea (Littauere, 2011).

Based on previous research conducted by Rusmining et al. (2014), the students' characters produced different mathematical literacy scores. In study of Masriyah and Firmansyah's (2018), differences in personality types based on Keirsey's Personality Theory produce different mathematical literacy. In addition, the research of Sugiarto et.al. (2020) found differences in students' mathematical literacy with Choleric and Sanguine personality types.

Based on the description above, conducted the research was to answer the research question, how is the profile of students' mathematical literacy in solving AKM task in terms of their personality type.

METHOD

This research is descriptive research using a qualitative approach. The purpose of the research was to describe the profile of students' mathematical literacy in solving AKM task in terms of personality types according to Hippocrates' personality theory, namely melancholic, choleric, phlegmatic, and sanguine.

The research subjects were four VIII grade SMP Negeri 1 Krian with different personality types selected using the purposive sampling technique. The subjects of this study were selected based on the results of a personality type questionnaire to classify subjects based on their personality types, namely melancholic, choleric, phlegmatic, and sanguine personality types. These subjects have equal mathematical abilities because all four of them are superior grade students who were selected based on the results of the personality type test, as well as the

considerations of their teacher. The data collection instrument used in this study was the researcher as the main instrument of qualitative research and several supporting instruments, namely personality type questionnaires, mathematical literacy tests, and interview guidelines.

The personality type questionnaire used is an adaptation of the Personality Plus book by Florence Littauere, which is guided by Hippocrates' personality theory. The personality type questionnaire aims to determine the student's personality type, namely Melancholic, Choleric personality. Phlegmatic, or Sanguine. The personality type questionnaire is divided into two parts, namely "Strengths", which contains positive characters, and "Weaknesses", which contains negative characters. Each section consists of 20 questions containing four characters that must be chosen according to each student's personality. Based on the results of filling out the questionnaire, there were four students with different personality types as research subjects.

The research subjects were given a mathematical literacy test in the form of AKM questions in a description of the material that the students had previously studied. The description question was chosen because it requires students to express ideas in writing, making it easier to analyze. The questions tested are equivalent to AKM level 4 questions that are in accordance with the abilities of class VIII students. The question contains measurement and geometry content with (1) personal context regarding the sale of hand sanitiser with the cognitive level of applying, (2) scientific about cucumber plant support wood with the cognitive level of reasoning, and (3) socio-cultural regarding damar kurung with the cognitive level of applying. Measurement and geometry content was chosen because based on the results of the 2012 PISA study on geometry content, around 70% of Indonesian students are at level 1, which means their ability is still in solving routine problems (Fachrudin et al., 2019). This test aims to determine students' mathematical literacy in solving AKM task.

After the subject completed the mathematical literacy test, the researcher conducted interviews to dig deeper into the students' mathematical literacy based on the results of the mathematical literacy test that had been done previously. The interview guide was made based on indicators of mathematical literacy. Data analysis carried out is data reduction, data presentation, and concluding. to facilitate the presentation of interview data, the researchers provided the code presented in Table 3.

Table 3. Description of Interview Result Codes

Code	Description
Px-y	Questions posed by researchers to research subjects related to number x in the y-th order. For example: P1-1 is a question asked by the researcher to the research subject for question number 1 in the 1st order.
SAx-y	Information provided by research subjects with personality type A related to number x in the y-order. For example: SM1-1 is information given by research subjects with melancholic personality types (SM) related to question number 1 in the 1st order.

RESULTS AND DISCUSSIONS

Result

Based on the results of the classification of personality types conducted on 33 grade VIII students of SMP Negeri 1 Krian. Four research subjects were selected, namely one student each from the melancholic, choleric, phlegmatic, and sanguine personality types. The data from the classification of personality types and research subjects are described in Table 4.

Table 4. Personality Type Questionnaire Results Data and Research Subjects

No.	Personality Types	Total Students	Name of Subject	Code
1	Melancholic	10	RPY	SM
2	Choleric	3	RDM	SK
3	Phlegmatic	13	VD	SP
4	Sanguine	7	RZR	SS

The following is an analysis of the results of the mathematical literacy test in the form of AKM questions and interviews with each research subject.

Data Analysis of The Results of The Mathematical Literacy Test of Subject With A Melancholic Personality Type (SM) in Solving AKM Task

Formulate

The following presents the interview results with the SM subject with the F1 indicator in question number 1.

P1-5 : Was all the information you mentioned used to answer the problem?

SM1-5 : No, because the height of the bottle and the height of the box are the same, so it's not used, Miss.

Q1-6 : If the bottle's height and the box's height are different, how will it affect the number of bottles in the box?

SM1-6 : If the height is different, then the position of the boxes must be reversed, Miss. So the number of bottles loaded will likely change.

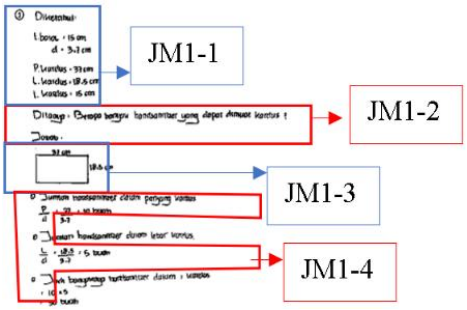

Figure 1. SM Subject Answers on AKM Question Number 1

In question number 1, with indicators explaining the information contained in the given problem (F1), the SM subject wrote down the information contained in the question correctly and completely, which was shown in the answer code JM1-1. During the interview, the SM subject also stated that there was information that did not used to answer the questions shown in the results of the SM1-5 code interview. SM subjects wrote down the problems asked in the questions shown in the answer code JM1-2. In the indicator of constructing a mathematical model of the given problem (F2), the subject of SM determines the mathematical concept used, namely the external common tangent line of two circles. SM subject makes the mathematical model shown in the answer code JM1-4. However, the mathematical model contains several variables that have not been defined.

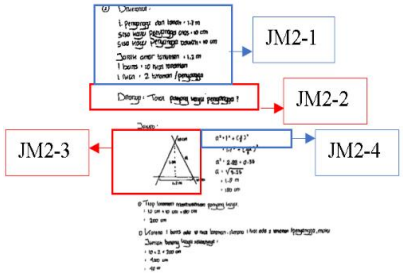

Figure 2. SM Subject Answers on AKM Question Number 2

In question number 2, with indicators explaining the information contained in the given problem (F1), the SM subject wrote down the information contained in the question correctly and completely, which was shown in the answer code JM2-1. The SM subject also stated that he used all the information to answer questions during the interview. SM subjects wrote down the problems asked in the questions shown in the answer code JM2-2. In the indicator of constructing a mathematical model of the given problem (F2), the SM subject determines the mathematical concept used, namely the Pythagorean theorem. SM subject connstructed the mathematical model shown in the answer code JM2-4. However, the mathematical model contains several variables that have not been defined.

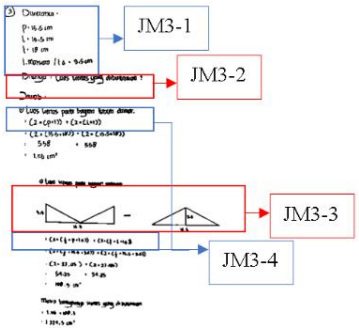

Figure 3. SM Subject Answers on AKM Question Number 3

In question number 3, with indicators explaining the information contained in the given problem (F1), the SM subject wrote the information contained in the question correctly and completely as shown in the answer code JM3-1. During the interview, the SM subject also stated that the information was used to answer questions. The SM subject wrote the problem that was asked in the question indicated in the answer code JM3-2. In the indicator of constructing a mathematical model of the given problem (F2), the subject of SM determines the mathematical concept used, namely the surface area of the space. SM subject constructed the mathematical model shown in the answer code JM3-4. However, the mathematical model contains several variables that have not been defined.

Employ

The following presents the interview results with the SM subject with the E1 indicator in question number 1.

P1-10 : Have you used other strategies before?

SM1-10 : I first thought about using the cardboard volume divided by the volume cylinder. But the bottle is not in the form of a cylinder, Miss. After all, the cardboard there must still be a cavity if the bottle is filled. So it seems wrong.

In question number 1, with indicators determining the appropriate strategy in solving the given problem (E1), the subject of SM illustrates the problem in the form of the image indicated by the answer code JM1-3. SM subject counts the number of bottles in one row by length and one row by column, then multiply the results which are obtained. During the interview, SM's subject stated that he had tried strategy. Another strategy is to divide the volume of the cardboard by the bottle's volume. But he said that This strategy is wrong because the bottle is not a cylinder. On the indicator do calculations in solving

problems given simply (E2), the subject SM substitutes the number corresponding to the variable in the mathematical model. SM subjects perform calculations coherently and accurately.

In question number 2, with indicators determining the appropriate strategy in solving the problem given problem (E1), the subject of SM illustrates the problem in the form of the image indicated by the answer code JM2-3. SM subject counts the length of the center of the wood using the Pythagorean theorem, calculate the length of the wood for one plant, then multiply by the number of plants in a row. When interviewing, SM subject stated that he did not use any other strategy. On the indicator do calculations in solving problems given simply (E2), the subject SM substitutes the number corresponding to the variable in the mathematical model. SM subjects perform calculations accurately.

In question number 3, with indicators determining the appropriate strategy in solving the problem given problem (E1), the subject of SM illustrates the problem in the form of the image indicated by the answer code JM3-3. SM subject calculates the area of the paper for the body part, while the paper area for the crown is calculated by combining the two triangles on each side into one triangle. After that, the body and crown parts are added up in the paper area. During the interview, SM's subject stated that he did not use other strategies. On indicators perform calculations in solving a simple problem (E2), the subject of SM substitutes the number corresponding to the variables in the mathematical model. SM subject does the calculations coherently and accurately.

Interpret

In question number 1, with indicators interpreting the solution obtained (I1), the SM subject mentioned several factors that affect the amount of hand sanitizer in cardboard, namely the diameter of the bottle, the length and width of the cardboard. If the diameter of the bottle is increased, then less payload. On indicators evaluate completion into context problem (I2), the subject of SM is sure of the answer obtained because he has checked to start from the given problem, the compiled mathematical model, to the calculation. The SM subject stated that the solution obtained could solve other problems, such as writing a description on the cardboard regarding the number of bottles sanitizer in it to facilitate distribution.

In question number 2, with indicators interpreting the solution obtained (I1), the SM subject stated that the wider the distance between the plants, the more wood needed to get longer. If the height between the bond to the soil is higher, then the wood that is it takes longer too. On indicators evaluate solution into context problem (I2), the subject of SM is sure of the answer obtained because he has checked to start from the given problem, the compiled mathematical model, to the calculation. The SM subject stated that the solution obtained could be used to solve other problems, namely preparing the length of the wood as needed.

In question number 3 with indicators interpreting the solution obtained (I1), SM subject stated that problem number 3 could not be solved using the area formula beam surface in general because the dammar kurung do not have a base a roof, but have a crown. The subject of SM also stated that the height of the crown of the damar kurung was increasing. The higher the paper area, the wider the paper needed. On indicators evaluate solution into the context of the problem (I2), the subject of SM is sure of the correct answer obtained because he has rechecked starting from the given problem, model compiled mathematics, to calculations. The SM subject stated that the solution obtained can solve other problems, namely preparing the area of paper to be purchased to minimize accommodation costs.

Data Analysis of The Results of The Mathematical Literacy Test of Subject With A Choleric Personality Type (SK) in Solving AKM Task

Formulate

In question number 1, with indicators explaining the information contained in the given the problem (F1), the subject of the SK writes the information contained in the question exactly and completely indicated in the answer code JK1-1. When interviewing, The subject SK also stated that all the information was used to answer the questions. The subject of the SK writes down the problems asked in the questions shown in the answer code JK1-2. In the indicators constructing a mathematical model of the problem given (F2), the subject of the SK determines the mathematical concept used, namely the line the external common tangent of the two circles. SK subject converts known information to the variable shown in the answer code JK1-3. But the created variable is not defined yet. SK subjects also constructed the mathematical model shown in answer code JK1-4.

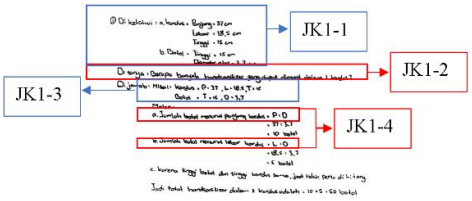

Figure 4. SK Subject Answers on AKM Question Number 1

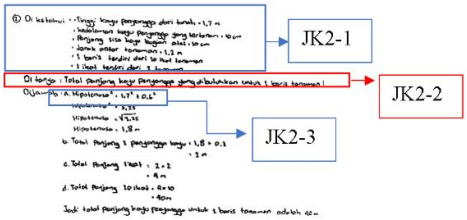

Figure 5. SK Subject Answers on AKM Question Number 2

In question number 2, with indicators explaining the information contained in the given the problem (F1), the subject of the SK writes the information contained in the question exactly and completely indicated in the answer code JK2-1. When interviewing, The subject SK also stated that all the information was used to answer the questions. The subject SK writes down the problem asked in the questions shown in the answer code JK2-2. In the indicators constructing a mathematical model of the problemgiven (F2), the subject of the SK determines the mathematical concept used, namely the

Pythagoras Theorem. SK subjects did not construct a mathematical model but directly do it number substitution shown in the answer code JK2-3.

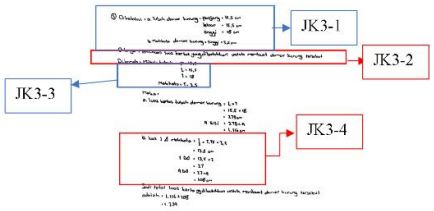

Figure 6. SK Subject Answers on AKM Question Number 3

In question number 3, with indicators explaining the information contained in the given the problem (F1), the subject of the SK writes the information contained in the question exactly and completely indicated in the answer code JK3-1. When interviewing, The subject SK also stated that all the information was used to answer the questions. The subject of the SK writes down the problems asked in the questions shown in the answer code JK3-2. In the indicators constructing a mathematical model of the problem given (F2), the subject of the SK determines the mathematical concept used, namely area surface. The subject of the SK changes the known information into the form of variables that can be used indicated in the answer code JK3-3. However, the created variable has not been defined. SK subjects also did not construct mathematical models but directly substituting the number indicated in the answer code JK3-4.

Employ

The following presents the interview results with the SK subject with the E1 indicator in question number 1.

Q1-10 : Have you used other strategies before?
SK1-10 : Yes, I was thinking because the heights are the same, so it's just a matter of calculating the base area. So the area of the cardboard base is divided by the area of the circle. But I doubt, it is because of the base is a circle, while the cardboard base is rectangular.

In question number 1, with indicators determining the appropriate strategy in solving given the problem (E1), the subject of SK looked at the height of the bottle and the height of the cardboard box has the same length. SK subject counts the number of bottles in a row according to the length and width, and then multiply the result. During the interview, the subject SK stated that he tried another strategy for problem number 1, which was to divide the area of the cardboard base with the area of the base of the bottle. However, the subject of SK is doubtful about the strategy shown in SK1-10 code interview results. On indicators perform calculations in solving a simple problem (E2), the subject SK substitutes the number corresponding to the variables in the mathematical model. SK subjects do the calculations coherently and accurately.

In question number 2 with indicators determine the appropriate strategy in solving the problem given the problem (E1), the subject SK calculates the hypotenuse namely the length of the wood the center, calculates the length of one log, multiply by the number of plants in one knot, then multiply by the number of ties in a row. When interviewing, SK's subject stated that he had not tried other strategies. On the indicator do calculations in solving problems given simply

(E2), the subject SK substitutes the number corresponding to the variable in the mathematical model. SK subjects perform calculations accurately.

In question number 3, with indicators determining the appropriate strategy in solving the problem given (E1), the subject SK calculates the area of the paper for the body and crown, then multiply by 4 according to the number of sides. After that, add up the results both of them. During the interview, the subject of SK stated that he had not tried other strategies. The indicators perform calculations in solving the given problems simply (E2), the subject SK substitutes the number corresponding to the variable on mathematical models. SK subjects perform calculations coherently and accurately.

Interpret

In question number 1, with indicators interpreting the solution obtained (I1), the subject SK stated that several factors affect the number of hand sanitizers in cardboard, namely the size of the cardboard and the diameter of the bottle. If the diameter of the hand sanitizer bottle is getting bigger, the number of hand sanitizers accommodated is less. On indicators evaluate solution into the context of the problem (I2), the subject of the SK is sure of the correct answer obtained because he had re-checked the calculations he did. SK subject stated that the solutions obtained could solve other problems, such as calculating the hand sanitiser seller's expenses in distributing his wares.

In question number 2, with indicators interpreting the solution obtained (I1), the subject SK stated that if the distance between plants is getting further away, then the supporting wood will be getting longer. If the height of the bond to the ground is higher, then the wood will also support it getting longer. On indicators evaluate the solution into the context of the problem (I2), the subject of SK is sure of the answer obtained because he has double-checked the calculations he had done. The subject SK stated that farmers could use the solution brought to prepare the required length of wood.

The following presents the interview results with the SK subject with the I2 indicator in question number 3.

P3-13 : Are you sure about the answer? Does your answer make sense?
SK3-13 : It makes sense, but I wrote the unit wrong, Miss.

In question number 3, with indicators interpreting the solution that has been obtained (I1), the subject of the SK stated that the solution to this problem could not be obtained using a formula for the surface area of a cuboid in general because the resin kurung have no base and roof. If the height of the crown of the damar kurung is higher, then the paper area needed is also increasingly widespread. In the indicator evaluating the solution into the context of the problem (I2), the subject of the SK has re-checked the calculations he did, but because he was not careful, the unit was used incorrectly. The subject SK stated that the solution obtained could be used to solve other problems such as minimizing paper waste that is not used.

Data Analysis of The Results of The Mathematical Literacy Test of Subject With A Phlegmatic Personality Type (SP) in Solving AKM Task

Formulate

In question number 1, with indicators explaining the information contained in the given problem (F1), the subject SP writes the information contained in the problem exactly and completely indicated in the answer code JP1-1. The SP subject also stated that the information was used to answer questions when interviewing. Subject SP writes down the problems asked in the questions shown in the code answers JP1-2. In the indicator of constructing a mathematical model of the given problem (F2), SP subjects determine the mathematical concepts used, namely common tangents outside the two circles. SP subjects also constructed the mathematical model shown in answer code JP1-4. However, it gave no information regarding what was calculated.

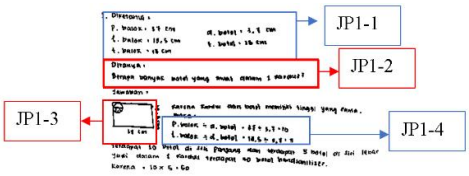

Figure 7. SP Subject Answers on AKM Question Number 1

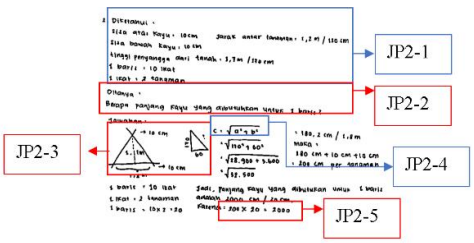

Figure 8. SP Subject Answers on AKM Question Number 2

The following presents the interview results with the SP subject with the F1 indicator in question number 2.

P2-6 : Is there a difficult part for you to understand in this question?

SP2-6 : Confused about 1.7 m, I thought it was the length of the middle wood, so I just add them all, Miss.. But I hesitate because it's too easy to add up.

In question number 2, with indicators explaining the information contained in the given the problem (F1), the subject SP wrote the information contained in the problem exactly and completely indicated in the answer code JP2-1. When interviewing, SP subject also stated that all the information was used to answer questions, but he had a hard time understanding the information shown in the results interview code SP2-6. SP subjects also write down the problems asked in the questions shown in the answer code JP2-2. On the indicator make a mathematical model of given the problem (F2), the subject of SP determines the mathematical concept used the Pythagorean theorem. SP subjects also made the mathematical model shown in answer code JP2-4. However, the model created contains variables that have not been defined.

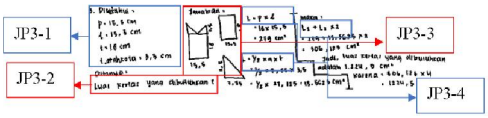

Figure 9. SP Subject Answers on AKM Question Number 3

In question number 3, with indicators explaining the information contained in the given the problem (F1),

the subject SP writes the information contained in the problem exactly and completely indicated in the answer code JP3-1. When interviewing, SP subject also stated that all the information was used to answer the questions. The SP subject also wrote down the problems that were asked in the question shown in the answer code JP3-2. In the indicators constructing a mathematical model of the problem given (F2), the subject of SP determines the mathematical concept used surface area build a flat side room. SP subjects also constructed the mathematical model shown in answer code JP3-4. However, the model created contains variables that have not been defined.

Employ

The following presents the interview results with the SP subject with the E1 indicator in question number 1.

Q1-10 : Have you used other strategies before?

SP1-10 : It's just too late, Miss. Previously look for the volume first. The volume of cuboid divided by volume cylinder. But there might be a piece of cardboard left because the bottle is cylinder and cardboard is cuboids, Miss.

In question number 1, with indicators determining the appropriate strategy in solving given the problem (E1), the subject of SP illustrates the problem in the form of the image indicated by the answer with code JP1-3. SP subject counts the number of bottles in a row on the front and back, then multiply the results obtained. During the interview, the SP subject stated that he had tried another strategy, namely dividing the volume of the cardboard by the volume of the bottle. However, the subject of SP is doubtful about this strategy. The indicators perform calculations in solving the given problems simply (E2), the subject SP substitutes the number corresponding to the variable on mathematical models. SP subjects perform calculations coherently and accurately.

In question number 2, with indicators determining the appropriate strategy in solving the problem given (E1), the subject of SP illustrates the problem in the form of the image indicated by the answer with code JP2-3. SP subjects calculate the hypotenuse, namely the length of the middle wood, then calculate the length of the wood per plant. They were then multiplied by the number of plants in a row. During the interview, the subject of SP stated that he had used another strategy, as he thought that 1.7 meters are the length of the middle support. On the indicator, perform calculations in solving the problems given simply (E2), the subject of SP substituting the number corresponding to the variable in the mathematical model. However, the calculation is not accurate, as shown in the answer code JP2-5.

In question number 3, with indicators determining the appropriate strategy in solving the problem given (E1), the subject of SP illustrates the problem in the form of the image indicated by the answer with code JP3-3. SP subject calculates paper area rectangular and triangular. Then

calculate the area of the paper for one side and multiply the result according to the number of sides. During the interview, the subject of SP stated that he didn't try any other strategy. On the indicator perform calculations to solve the problem given simply (E2), the subject of SP substitutes the number corresponding to the variable in the mathematical model. SP subjects calculate accurately.

Interpret

In question number 1, with indicators interpreting the solution obtained (I1), the subject of SP stated that the diameter of the bottle is one of the factors that affect the amount of hand sanitizer in the box. If the diameter of the hand sanitizer bottle is getting smaller, the number of hand sanitizer that is accommodated will increase. In question number 1, with the indicator evaluating a solution to the context of the problem (I2), the subject of SP is confident with the answers obtained because he has re-checked the answers obtained. The subject SP stated that the solution obtained could be used to solve other problems, such as determining the selling price of hand sanitizer in one box.

The following presents the interview results with the SP subject with the I2 indicator in question number 2.

P2-13 : Are you sure about the answer? Does your answer make sense?

SP2-13 : I'm sure the method, but the result is wrong because it's not accurate. It should be 4000 cm or 40 m.

In question number 2, with indicators interpreting the solution obtained (I1), the subject of SP stated that if the distance between plants is getting further away, then the supporting wood will be longer. If the height of the bond to the ground is higher, then the supporting wood is also getting longer. In the indicator evaluating the solution into the context of the problem (I2), the SP subject initially believed in the answers obtained because he had re-checked the answers, but the SP subjects only realized that there was a miscalculation. The subject of SP stated that the solution obtained could be used to solve other problems, such as preparing the required length of wood when planting.

In question number 3, with indicators interpreting the solution obtained (I1), the subject of SP stated that the solution to problem number 3 could not be obtained using the general formula for the surface area of the beam because the nets are different. The subject of SP also stated that the higher the height of the crown of the damar kurung, the wider the paper area needed. In the indicator evaluating the solution into context problem (I2), the subject SP is confident with the answers obtained because he has re-checked the answers that have been obtained. The subject of SP stated that the solution obtained can solve other problems, such as preparing how much paper is needed for the Damar kurung festival.

Data Analysis of The Results of The Mathematical Literacy Test of Subject With A Sanguine Personality Type (SS) in Solving AKM Task

Formulate

The following presents the interview results with the SS subject with the F1 indicator in question number 1.

P1-3 : Explain the problem in the question!
SS1-3 : One cardboard contains how many bottles of hand sanitizer
Q1-4 : What information do you know about the questions?
SS1-4 : The height of the bottle is 15 cm, the diameter of the bottom of the bottle is 3.7 cm, the height of the box is 15 cm, the length of the box is 37 cm, the width of the box is 18.5 cm.

In question number 1, with indicators explaining the information contained in the given problem (F1), the SS subject did not write down the information or problems asked in the question. However, during the interview, the SS subject mentioned all known information and stated they were used to answer questions according to the code SS1-4. SS subjects also did not write down the questions asked. However, during the interview, he explained that the problem asked in the question was to count the number of hand sanitizers in one box according to the code SS1-3. In the indicator of constructing a mathematical model of the given problem (F2), the SS subject determines the mathematical concept used, namely the external common tangent line of two circles. However, SS subjects did not construct mathematical models.

The following presents the interview results with the SS subject with the F1 indicator in question number 2.

P2-3 : Explain the problem in the question!
SS2-3 : Asked to find the length of the wood for a row of cucumber gardens. One row contains ten bundles, and one bundle includes two.
P2-4 : What information is known in the question?
SS2-4 : The length of the top residue is 10 cm, the bottom wood is 10 cm, the height of the wood bond is 1.7 m, and the distance between plants is 1.2 m.

In question number 2, with indicators explaining the information contained in the given problem (F1), the SS subject did not write down the information or problems asked in the question. However, during the interview, the SS subject mentioned all known information and stated that he used them to answer questions according to the SS2-4 code. SS subjects also did not write down the questions asked. However, during the interview, he explained that the problem was to calculate the length of support wood for one row of plants according to the code SS2-3. In the indicator of constructing a mathematical model of the given problem (F2), the SS subject determines the mathematical concept used, namely the Pythagorean theorem. SS subjects also made the mathematical model shown in code JS2-1. However, the model created contains variables that have not been defined.

The following presents the interview results with the SS subject with the F1 indicator in question number 3.

P3-3 : Explain the problem in the question!
SS3-3 : Asked to calculate the area of the paper lantern. The paper is on the sides only, and there is no top and bottom.

P3-4 : What information is known in the question?

SS3-4 : Body length is 15.5 cm, body width is also 15.5 cm, body height is 18 cm, and crown height is 3.5 cm.

In question number 3, with indicators explaining the information contained in the given problem (F1), the SS subject did not write down the information or problems asked in the question. However, during the interview, the SS subject mentioned all known information and stated that he used them to answer questions according to the SS3-4 code. The subject SS also explained that the problem asked in the question was to calculate the area of the paper to make resin kurung according to the code SS3-3. In the indicator of constructing a mathematical model of the given problem (F2), the SS subject determines the mathematical concept used, namely the surface area of the space. However, SS subjects did not construct mathematical models.

Employ

In question number 1, with the indicator determining the appropriate strategy in solving the given problem (E1), the SS subject looked at the height of the bottle and the height of the cardboard, which were the same length, counted the number of bottles according to their length and width, then multiplied the results obtained. The SS subject stated that he had not tried other strategies during the interview. In the indicator of performing calculations in solving problems given simply (E2), SS subjects perform calculations accurately.

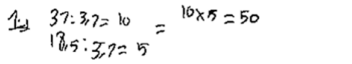

Figure 10. SS Subject Answers on AKM Question Number 1

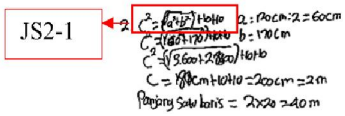

Figure 11. SS Subject Answers on AKM Question Number 2

In question number 2, with the indicator determining the appropriate strategy in solving the given problem (E1), the SS subject calculates the length of wood needed for one plant, then multiplies it by the number of plants in one row. The SS subject stated that he had not tried other strategies during the interview. In the indicator of performing calculations in solving problems given simply (E2), SS subjects perform calculations accurately.

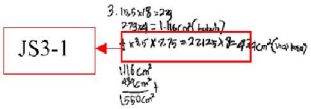

Figure 12. SS Subject Answers on AKM Question Number 3

In question number 3, with the indicator determining the appropriate strategy in solving the given problem (E1), the SS subject calculates the area of the paper for the rectangular and triangular sections, and it multiplies the results obtained according to the number in the damar kurung. The SS subject stated that he had not tried other strategies during the interview. In the indicator of performing calculations in solving problems given simply (E2), the calculations made by the SS subject are not accurate as indicated by the answer code JS3-1.

Interpret

In question number 1, with indicators interpreting the solution obtained (I1), the subject SS stated that many factors influenced the amount of hand sanitizer in the box, namely the length, width, and height of the cardboard, as well as the diameter and height of the bottle. SS subject also emphasized that the bottle's height and the cardboard's height are important because if the height is not the same, the bottle may not be enough to fit into the box. If the diameter of the handsanitiser bottle is getting smaller, the number of handsanitizer that will be accommodated is more. In the indicator evaluating the solution into the context of the problem (I2), the SS subject is confident in the answer obtained without re-checking, so the SS subject does not write down the correct unit in the answer. Subject SS stated that the solution obtained could be used to solve other problems, such as knowing the number of hand sanitisers sold in one box.

In question number 2, with indicators interpreting the solution obtained (I1), the subject of SS stated that if the distance between plants is getting further away, the wood needed is also getting longer. In addition, the higher the distance between the bonds to the ground, the longer the required wood. In the indicator evaluating the solution into the context of the problem (I2), the SS subject is confident in the answers obtained without re-checking. SS subjects stated that he could use the solution brought to solve other problems, such as preparing the required length of wood in a field consisting of many rows of plants.

In question number 3, with indicators interpreting the solution obtained (I1), the subject of SS stated that he could not solve the problem with the general surface area formula because the damar kurung did not have an upper and lower side. The subject of SS also stated that if the height of the crown of the damar kurung is higher, the area of paper needed will also be wider. In the indicator evaluating the solution into the context of the problem (I2), the SS subject is confident in the answers obtained without re-checking. It causes the calculation results to be wrong. SS subject stated that the solution obtained can solve other problems, such as preparing how much paper is needed to make damar kurung.

Discussion

Based on the research data described above, the following discussion is obtained.

Profile of Students' Mathematical Literacy in Solving AKM Questions in Terms of Melancholic Personality Type

In formulating, process, students with the melancholic personality type write down the information they know about the questions correctly and completely and understand the use of the information as a whole. Students also pay attention to the problems that must be solved and write them on the answer sheet. It is also following the melancholic character who easily catches a problem (Littauere, 2011). Melancholic students change the problems given into variables and make mathematical models appropriately, even though the variables used have not been defined.

In employing process, students with melancholic personality types illustrate problems in pictures and their sizes in detail. It follows the melancholic character who designs things in detail and likes pictures showing problems (Littauere, 2011). The strategy used is also different from other students, namely by combining two small triangles into one large triangle to shorten the calculation shown in the answer to question number 3. Students with melancholic personality types perform calculations accurately.

In interpreting process, students with a melancholic personality type interpret the solution by mentioning the factors that influence the solution and the impact when the conditions change. Students evaluate the solutions obtained by re-checking the problem until it is resolved. Students also mention other problems that can be solved using the obtained solutions, which show that students know the use of mathematics in everyday life.

Profile of Students' Mathematical Literacy in Solving AKM Questions in Terms of Choleric Personality Type

In formulating process, students with the choleric personality type write down information that is known correctly, completely, and understands it as a whole. In question number 1, students understand the use of the bottle's height and the cardboard's height to determine which side of the cardboard is used as a base. It is in accordance with the results of research by Sugiarto et al. (2020) that students with choleric personalities can think broadly to relate their knowledge to the context of the problem. Students also write down the problem on the answer sheet, change the given problem into a variable form, but do not make a mathematical model, but make substitutions. It is following the choleric character who wants to solve problems quickly (Littauere, 2011; Sugiarto et al., 2020).

In employing process, students with a choleric personality type never illustrate problems in the form of pictures. It is following the practical choleric character (Littauere, 2011). The strategies used by students with choleric personality are well organized because they know what to find and what steps to take to solve a problem. It is following the target-oriented choleric character (Littauere, 2011). Students perform calculations accurately.

In interpreting process, students with choleric personality types interpret the solution by mentioning the influencing factors and the impact if the conditions change. In addition, students evaluate the solutions obtained by re-checking the calculations carried out, but there are still errors in writing units. Students also mention other problems that can be solved using the solutions obtained. It shows that students know the use of mathematics in everyday life.

Profile of Students' Mathematical Literacy in Solving AKM Questions in Terms of Phlegmatic Personality Type

In formulating process, students with the phlegmatic personality type write down all the information they know about the questions correctly and completely. However, students had

doubts in digesting the data and were reluctant to ask. It shows the character of a phlegmatic who likes to avoid conflict and debate (Littauere, 2011). Students also write down the problems asked and make mathematical models that contain variables. However, students do not define the variables they use.

In employing process, students with a phlegmatic personality type illustrate problems in the form of pictures that are equipped with clear measurements. The strategies used by students with phlegmatic personalities tend to be shorter, but incomplete in writing descriptions. In addition, students are less careful in doing calculations.

In interpreting process, students with the phlegmatic personality type interpret the solution, mentioning the factors that influence the solution he gets, as well as the impact if the conditions change. However, during the interview, it was seen that the students were not sure of the answer. This is indicated by the frequent use of the word "maybe" during the interview. This is in accordance with the character of a phlegmatic who is unsure and full of doubts (Littauere, 2011). In addition, students evaluate the solutions obtained by re-checking the solutions obtained, but there are still calculation errors. Students also mention other problems that can be solved using the solutions they have obtained. It shows that students understand the use of mathematics in everyday life.

Profile of Students' Mathematical Literacy in Solving AKM Questions in Terms of Sanguine Personality Type

In formulating process, students with the sanguine personality type did not write down the known information. However, the students mentioned and understood all the information completely during the interview. In question number 1, students considered the information related to the height of the bottle and the height of the cardboard to be useful to ensure that he cpould load the bottle into the box. Students also do not write down the questions asked on the answer sheet. However, during interviews, students explained the problems asked. It follows the sanguine character who prefers to speak compared to writing in detail (Littauere, 2011). In addition, students also do not make mathematical models using variables, but directly perform calculations.

In employing process, students with the sanguine personality type never illustrate problems in the form of pictures. The strategies used by sanguine students are the shortest, but often do not comply with the rules. In question number 2, students write that which is not in accordance with the Pythagorean theorem, even though the results obtained are correct. Students actually understand the operation, but are not disciplined in writing mathematical models. This is in accordance with the undisciplined character of sanguins (Littauere, 2011). Students are also not careful in doing calculations. This is in accordance with the research of Sugiarto et al., (2020) that students with sanguine

personality have characters who are easy to forget and are not careful.

In interpreting process, students with the sanguine personality type interpret the solutions obtained by mentioning the factors influencing the solution, as well as the impact if the conditions change. Students are fluent in explaining arguments in accordance with the research of Sugiarto et al., (2020) that sanguine students have the ability to express explanations related to their interpretations. However, students do not evaluate the solutions obtained, so they often experience calculation errors and do not write down units. Students also mention other problems that can be solved using the solutions obtained. This shows that students know the use of mathematics in everyday life.

Comparison of Students' Mathematical Literacy Profiles in Solving AKM Questions in Terms of Personality Types

Based on the discussion related to students' mathematical literacy profiles in solving AKM questions for each of the personality types above, table 5 below compares students' mathematical literacy profiles from each personality type.

Table 5. Comparison Students' Mathematical Literacy Profiles from Each Personality Type

Indicator Code	Personality Types			
	Melancholic	Choleric	Phlegmatic	Sanguine
F1	- Understand and write down known information and problems asked - Understand the meaning of the information in the question	- Understand and write down known information and problems asked - Understand the meaning of the information in the question	- Understand and write down known information and problems asked - Does not understand the meaning of the information in the question	- Understands but does not write down known information and the problems asked - Understand the meaning of the information in the question
F2	- Determine the concept used - Create a model that contains variables, but has not been defined	- Determine the concept used - Converting the problem into a variable form, but often directly performs number substitution without constructing a mathematical model	- Determine the concept used - Create a model that contains variables, but has not been defined	- Determine the concept used - Does not create a model and variables
E1	- The initial strategy always illustrates the problem into a picture - Efficient and structured solution	- Never illustrates the problem into a picture - Structured solution but incomplete	- The initial strategy always illustrates the problem into a picture - Short and incomplete solution	- Never illustrates the problem into a picture - Short and incomplete solution
E2	- Perform calculations accurately	- Perform calculations accurately	- Perform calculations inaccurately	- Perform calculations inaccurately
I1	- Integret the solution by mentioning the influencing factors, as well as the impact that will occur if the situation changes	- - Interpret the solution by mentioning the influencing factors, as well as the impact that will occur if the situation changes	- - Interpret the solution by mentioning the influencing factors, as well as the impact that will occur if the situation changes, but there is hesitation	- - Interpret the solution by mentioning the influencing factors, as well as the impact that will occur if the situation changes
I2	- Re-checking starting from problems, mathematical models, to calculations - Mention the use of the solution in real life	- Re-checking the calculations, but not being careful enough so that the units used are less precise - Mention the use of the solution in real life	- Re-checking the calculation, but less thorough so the calculation is not accurate - Mention the use of the solution in real life	- Not re-checking the answers so the calculations are not accurate - Mention the use of the solution in real life

Based on Table 5 above, the difference in mathematical literacy between personality types at the formulating stage is that sanguine students do not write down the information that is known and the problems asked like students with other personality types. Sanguine students prefer to explain it orally compared to writing it in detail (Littauere, 2011). At the implementing stage, the difference that arises is that melancholic students use strategies that are more efficient than other personality types (Littauere, 2011). Choleric students change the given problem into the form of a variable, but it is not used in constructing the model, but directly makes substitutions. This is in accordance with the choleric character who wants to solve a problem quickly (Littauere, 2011; Sugiarto et al., 2020). Phlegmatic students can find simple ways to solve problems (Littauere, 2011). In addition, the initial strategy of melancholic and phlegmatic students is to illustrate problems in the form of pictures (Littauere, 2011). Sanguine students are not disciplined in writing formulas, even though the correct final results are obtained (Littauere, 2011). Sanguine students also miscalculated and did not write down units because students did not re-check the answers at the interpreting stage. This is in accordance with the research of Sugiarto, et al. that students with sanguine personality have characters who are easy to forget and are not careful (Sugiarto et al., 2020).

CONCLUSION AND SUGGESTION

Conclusion

Based on the analysis and discussion of the data obtained the following conclusions.

In formulating process, melancholic students write down the known information and the problems asked, and understand them as a whole. Melancholic students also make mathematical models that contain variables, but the variables used have not been defined. In employing process, melancholic students use strategies, namely determining the concepts used; illustrate the problem in the form of pictures; solve problems efficiently and structured; perform calculations accurately; and write down the units correctly. In interpreting process, melancholic students interpret (interpret), solutions, and evaluate starting from problems, mathematical models, to calculations.

In formulating process, choleric students write down the known information and the problems asked, and understand them as a whole. Choleric students also convert problems into variables, but these variables are often not used in mathematical models, but instead make direct substitutions. In employing process, choleric students use strategies, namely determining the concepts used, solving problems in a structured but incomplete manner, and performing calculations accurately. In interpreting process, choleric students interpret and evaluate the solutions obtained, but are less precise so that the units written are less precise.

In formulating process, phlegmatic students write down information that is known and the problems asked, but students do not understand it as a whole. Phlegmatic students also make mathematical models that contain variables, but the variables used have not been defined. In employing process, phlegmatic students use strategies, namely determining the concepts used; illustrate the problem in the form of pictures; solve problems briefly; but the calculations are less accurate. In interpreting process, phlegmatic students interpret and evaluate the solutions obtained, but because they are not thorough, the calculations made are inaccurate.

In formulating process, sanguine students do not write down the information that is known and the problems asked, but during the interview students can mention and understand it as a whole. Sanguine students also do not make mathematical models. In employing process, sanguine students use strategies, namely determining the concepts used, solving problems briefly but not accurately, not doing calculations accurately, and not writing down units. In interpreting process, sanguine students interpret the solution obtained, but do not evaluate it so that the calculation is less accurate.

Suggestion

Based on the conclusions related to the mathematical literacy profile of students in solving AKM questions in terms of their personality type, the following suggestions were given by the researchers, namely (1) melancholic students are expected to explore things more deeply, don't take things lightly,

and don't hesitate in conveying arguments, (2) choleric students are expected to make a mathematical model in advance of the variables that have been formed, avoid solving by substituting numbers directly, and be more thorough in evaluating the solutions obtained, (3) phlegmatic students are expected to write in a more structured and complete manner, more thoroughly in evaluating the solutions obtained, as well as being more confident in presenting arguments, (4) sanguine students are expected to write down known information, the problems asked, and the solutions obtained in a more structured and complete manner, as well as evaluate the solutions made to minimize the problem. minimize inaccuracies in answers, (5) teachers are expected to pay attention to the personality types of students who have the advantages and disadvantages of each personality type, so that teachers can assist students in honing their strengths and overcoming the shortcomings of these students, and (6) other researchers can use instruments in the form of questions. AKM with different content, because in this study using instruments that are limited to measurement and geometry content.

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