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Numeracy Problem-Solving Skills Based on DISC Personality Type

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Abstract. Differences in personality types significantly influence learning processes and outcomes, including problem-solving skills. This research aims to describe numeracy problem-solving skills among eleventh-grade students in the science group, focusing on the DISC personality types. The study, conducted in Kediri, West Java, Indonesia, involves two representatives for each personality type. The research utilizes the DISC personality test by William Moulton Marston, a numeracy problem-solving assessment consisting of three problems, and an interview guideline. Data accuracy is ensured through source and technique triangulation, along with member-checking to validate interview results. The findings reveal that students with dominance personality types generally follow a four-step numeracy problem-solving process, occasionally skipping the re-checking step for specific questions. Influence personality types also exhibit a four-step approach to numeracy problem-solving. In contrast, students with steadiness personalities accurately describe four levels of problem-solving to achieve correct results. Compliance personality types, while adhering to a four-step process, encounter inaccuracies in certain problem solutions. In summary, students with different personality types consistently undergo a four-step numeracy problem-solving process, but variations arise in the final outcomes of problem-solving.

Keywords: *DISC Personality; Numeracy; Problem Solving Skill; Student Personality*

Abstrak. Perbedaan tipe kepribadian berpengaruh signifikan terhadap proses dan hasil belajar, termasuk keterampilan pemecahan masalah. Penelitian ini bertujuan untuk mendeskripsikan keterampilan pemecahan masalah numerasi pada siswa kelas XI kelompok IPA dengan fokus pada tipe kepribadian DISC. Penelitian yang dilakukan di Kediri, Jawa Barat, Indonesia ini melibatkan dua perwakilan untuk setiap tipe kepribadian. Penelitian ini menggunakan tes kepribadian DISC oleh William Moulton Marston, penilaian pemecahan masalah numerasi yang terdiri dari tiga soal, dan pedoman wawancara. Keakuratan data dipastikan melalui triangulasi sumber dan teknik, serta *member-checking* untuk memvalidasi hasil wawancara. Temuan mengungkapkan bahwa siswa dengan tipe kepribadian *dominance* umumnya mengikuti proses pemecahan masalah numerasi empat langkah, walau kadang-kadang melewatkan langkah memeriksa kembali pada soal tertentu. Tipe kepribadian yang *influence* juga menunjukkan pendekatan empat langkah untuk pemecahan masalah numerasi. Sebaliknya, siswa dengan kepribadian *steadiness* secara akurat menggambarkan empat tingkat pemecahan masalah untuk mencapai hasil yang benar. Tipe kepribadian *complaince*, meskipun mengikuti proses empat langkah, menghadapi ketidakakuratan dalam solusi masalah tertentu. Ringkasnya, siswa dengan tipe kepribadian berbeda secara konsisten menjalani proses pemecahan masalah numerasi empat langkah, namun variasi muncul dalam hasil akhir pemecahan masalah.

Kata kunci: Kemampuan Pemecahan Masalah; Numerasi; Kepribadian DISC; Kepribadian Siswa

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INTRODUCTION

One of the skills students must have is problem solving (National Council of Teachers of Mathematics [NCTM], 2000). The problem-solving skill can be of use in everyday life (Ilmiyana, 2018). In mathematics, problem solving skills that are closely related to daily life are called student numeracy skills (Pangesti, 2018). Kurniawati & Kurniasari (2019) mentioned in their research that one of the measures of the quality of education in a country is the numeracy skills of its students. Therefore, the skill that students must have is numeracy problem solving skill.

Masfufah & Afriansyah (2021) said that the level of students' numeracy skills was in the low category. The reason for the low level of numeracy skills is because students are not accustomed to problems related to daily life and contain mathematical elements (Luritawaty, 2018). Problem solving skill is influenced by attitude toward mathematics (Davita & Pujiastuti, 2020). From this explanation, attitude is a factor in problem solving skill.

The definition of attitude is a feeling and response to an object, and is a component of personality (Suharyat, 2009). Personality is the whole attitude or behavior of a person with a certain tendency to respond to something that happens (Kusmayadi, 2011). In this view, personality is a way of thinking and behaving in a particular environment, and every person has a different personality.

The research studies that have been conducted by Ilmiyana (2018) on the analysis of students' mathematical problem solving skill in terms of personality type using MBTI which found that the rational personality type has a higher level of problem solving than the guardian, artisan and idealist personality types. Besides *MBTI,* Marston divides personality types into 4 namely *Dominance, Influence, Steadiness, Compliance (DISC)* (Paul et al., 1928). Rahayu (2022) mentioned in her research that students who have the DISC personality type have different levels of mathematical creative thinking skill. The diversity of personality types also affects the capacity to solve problems.

The Dominance personality type can solve problems quickly, but does not pay attention to the details of the problem and lacks strong commitment, so there are many errors in solving a problem (Septevani, 2017). Influence personality types tend to be less thorough in solving a problem (Rohati, 2014). Steadiness personality types can work well together but are introverted and reserved (Syafimen, 2013). Compliance personality type students can process data systematically (Kurniasari, 2012). The DISC personality type has its own characteristics and is quite influential in the process of students' cognitive abilities, according to some of these studies.

The learning process is influenced by an individual's personality types (Prambanan et al., 2023) Similarly, Blickle (1996) proposes that learning strategies can be tailored to suit an individual's personality traits, serving as a bridge between personality and learning outcomes. Ginevra et al. (2014) conducted research on the relationship between personality type, problem-solving skill, and

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learning strategies. The results indicate that personality type is related to problem-solving skill in students.

However, there is no research that discusses the analysis of numeracy problem solving skills in terms of DISC personality type. Whereas there is a relationship between the traits possessed by the DISC personality type and the skill of students in problem solving. Therefore, the problem solving skills of numeracy need to be studied further to be able to facilitate learning based on personality adaptations.

METHOD

This research is a descriptive qualitative research. The study involved seventh-grade of science group students of a Senior High School in Kediri, East Java, Indonesia. Then 2 students representing each personality type were selected to become participants. The selection of research subjects used purposive sampling technique. Deliberate sampling involves sampling using certain considerations in accordance with the desired criteria so that it can be determined that the number of samples to be studied is called purposive sampling (Sugiyono, 2016). The criteria used in this study are based on personality types, namely dominance, influence, steadiness, and compliance.

There are 3 research instruments used in this study, namely the DISC personality type test, numeracy problem solving test and interview guidelines. DISC personality type test, created by William Moulton Marston. The instruments used in this study were taken from the book The DISC Codes (Shin, 2013). This test contains statements that describe a person's self. Participants are asked to choose statements that better describe themselves and that do not describe themselves. There are 4 statements in each column and 24 columns to be filled in by the participants. Since this test is already standardized, it does not need to be validated. Here the DISC instruments and analysis tools: https://shorturl.at/tzAHN.

The personality type test was given to 36 students of eleventh-grade of science group. The results of the personality type test can be seen in Figure 1.

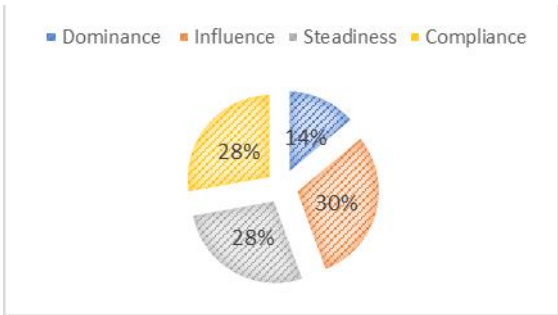

Figure 1. The Difference of Students' Personality Type

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Figure 1 shows that out of 36 students, 14% were Dominant, 28% were Influencing, 28% were Steady, and 30% were Compliant. Then, from the data grouping, 2 participants of each personality type were selected in each category according to the teacher's instruction who have good communication skills.

Table 1. Research Subjects

No.	Student Name	Participant Code	Personality Type
1.	BSU	D1	*Dominance*
2.	NFA	D2	*Dominance*
3.	AM	I1	*Influence*
4.	PMF	I2	*Influence*
5.	AVO	S1	*Steadiness*
6.	RFSP	S2	*Steadiness*
7.	NLA	C1	*Compliance*
8.	FNA	C2	*Compliance*

While the numeracy test and the interview guidelines were validated by 1 mathematics teacher and 2 mathematics education lecturers before they were given to the participants. The numeracy test adapted from PISA questions.

> *Bayu has a savings of Rp300,000. He wants to buy a shirt and pants at Mentari Store. The trousers are sold at Rp250,000 with a 40% discount. The shirt is priced at Rp120,000 with a 15% discount. The sales tax on pants and shirts is 5%. From this statement, how much money should Bayu spend to buy pants and clothes?*

In addition, the interview guide was used to confirm the numeracy problem solving test with the participants. The levels of problem solving skill used in this study were based on the theory proposed by Polya. The stages of problem solving skills according to Polya's theory in Purba et al. (2021) include: (1) understanding the problem; (2) planning the problem solving; (3) implementing the problem solving; (4) checking the results. The interview grids utilised in this study are available here: https://shorturl.at/iDKN0.

To produce valid data, researchers used source and technique triangulation. Source triangulation in this study compared data from eight different students. Technique triangulation in this study compared data from numeracy problem solving scores with the results of interviews that were conducted. In this study, the researchers also used member-checking to determine the accuracy of the research results by confirming them with the participants.

The data collected in the field are then reduced. Reducing data means summarizing and selecting the main points according to the data needed in the research. The data reduced in this way provides a sharper and easier picture for researchers. Then, after data reduction, conclusions are

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drawn from the data obtained. The conclusions drawn from the data presentation are intended to draw conclusions about the skill to solve math problems according to the personality type possessed by the research participants.

RESULTS AND DISCUSSION

From the results of the data analysis, it can be seen that there are differences in the skill to solve numerical problems based on DISC personality type in eleventh-grade.

Numeracy Problem Solving Skill Based on Dominance Personality Type

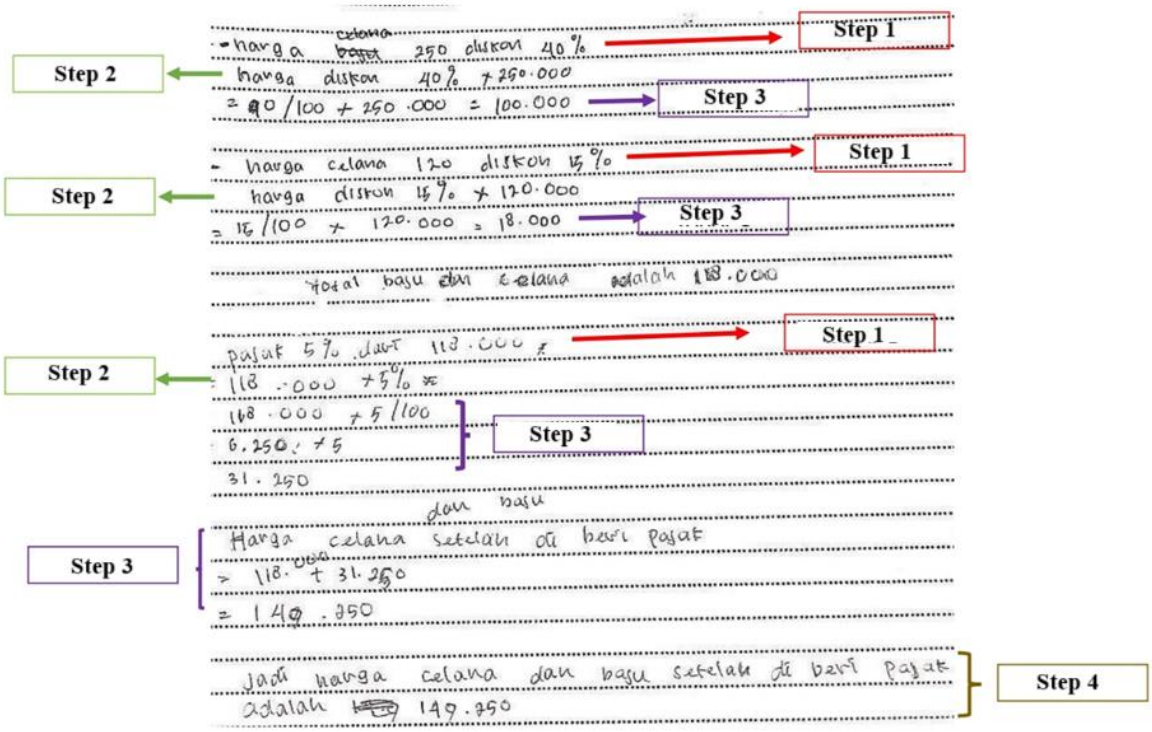

Figure 2. Dominant Participants' Problem-Solving Results

It can be seen based on Figure 2 that students D1 with dominance personality type go through 4 stages even though they do not write them systematically and get less precise results. The results of the analysis of interviews and problem work can be seen in Table 2.

Table 2. Dominance Personality Type Results

Problem Solving Skills	**Dominance Personality Type**	
	Participant D1	**Participant D2**
Understanding the Problem	• Students can understand the problem well • Students can write and state what is known, but not systematically, but in their understanding students have their own way of solving it with the aim of making it easier to work. • - Students do not write what is asked because they want to solve the problem	• Student can understand the problem well. • Student can write and refer to what is known, but does not write it systematically. • The student can mention what is asked in the problem but does not write it down because he/she already knows the content of the problem and can easily remember and solve the problem immediately.

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Problem Solving Skills	**Dominance Personality Type**	
	Participant D1	**Participant D2**
	immediately, feel time-consuming and already understand. But can refer to what is asked in the question.	
Planning the Solution	● Students are able to mention the plan used well. ● Students did not write the plan systematically ● Students have inappropriate planning because they find it quite difficult to think of a way to solve the problem.	● Student is able to mention the plan used well. ● Student did not write the plan systematically ● There was an error in the solution planning, so the planning was not correct.
Implementing Solution Planning	● Students are able to write the calculation process well according to the plan ● There is an error in solving the problem because the planning is not correct	● Students do not write the calculation process systematically but can mention it well according to the plan. ● There is an error in solving the problem because the planning is not correct
Checking Back	● student goes through the re-examination process well, writing down the conclusion	● students go through the back-checking process well, writing down the conclusion.

Understanding the Problem of the Dominant Personality Type

Participants who have a dominance personality type can write and mention what is known but do not write it systematically. In the research conducted by Septevani (2017) dominance personality type students write what is known incompletely and incorrectly. Can mention what is asked in the question but does not write it down, on the grounds that they want to do it directly, it is time-consuming and they feel they understand, they can remember it easily. This is in accordance with what was stated by Sari (2021) dominance personality type students work directly. In line with research conducted by Herlinda et al. (2020) students with dominance personality did not write down the information asked because they were in a hurry and forgot to write it down.

Planning the Solution of the Dominance Personality Type

At the problem-solving planning stage, students with dominance personality type are able to mention the plan to be used correctly. However, they did not write the plan systematically and wrote it in their own way. In line with research conducted by Kurniasari (2012) hat the dominance personality type likes something different, not writing the usual way. And there is less precise planning with the reason that it is quite difficult to think of a solution. In accordance with what is described in Septevani's research (2017) that the dominance personality type experienced planning errors.

Implementing the Solution Plan of the Dominance Personality Type

At the next step, the implementation of the solution plan, this personality type, although less systematic, may be able to articulate the plan. And because there is an error in the planning step, there is also an error in this step. Dominance personality type in the research of Septevani (2017) made an error in the implementation of the solution because it was wrong in the next step. Completion

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produces results that are less precise. And also research conducted by Herlinda et al. (2020) that students with dominance personality type are unable to solve problems appropriately.

Checking Back of the Dominance Personality Type

Based on the previous data description, students who have dominance personality type go through the re-examination step well. But not all problems, there is the last problem where this personality type does not do the double-check step. Because the working time has run out and also feel that they have calculated it correctly. In line with the results of research conducted by Sari (2021) that students with dominance personality type do not review the formula or calculations that have been made.

Numeracy Problem Solving Skill Based on *Influence* Personality Type

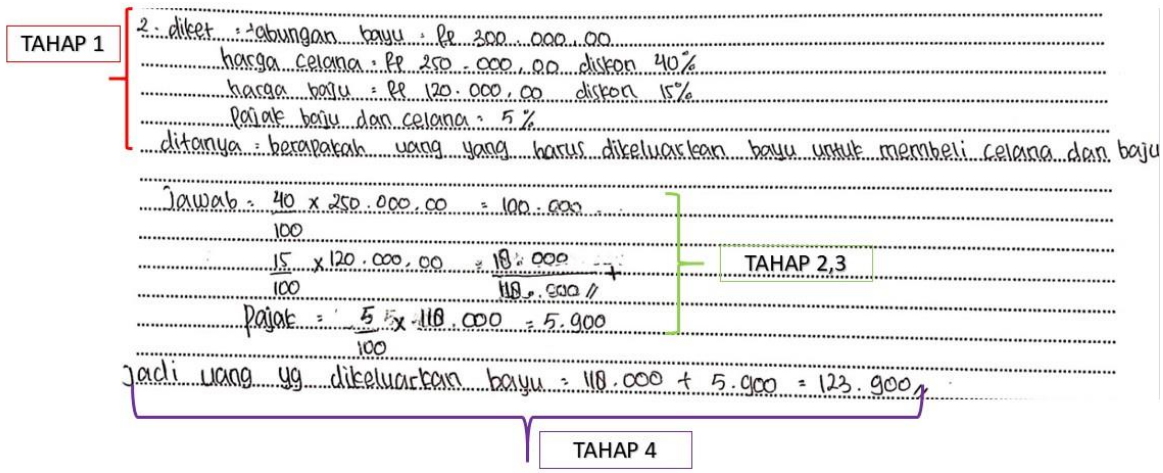

Figure 3. Results of Problem-Solving for Influence Type (above) and The translation 1 (below)

Based on Figure 3, it can be seen that students I2 with influence personality type go through 4 stages ven though they do not write them systematically and get less precise results. The results of the analysis of interviews and problem solving can be seen in Table 3.

Tabel 3. Influence Personality Type Results

Problem Solving Skills	***Influence Personality Type***	
	Participant I1	**Participant I2**
Understanding the Problem	● Can understand the problem well. ● Can mention what is asked and known in the case. ● Inconsistent in writing what is known and asked because he immediately wrote it down, lack of knowledge and confusion in mathematical writing.	● Can understand the problem well ● Can write and refer to what is known and write it systematically ● Can name and write exactly what is needed
Planning the Solution	● Able to mention the plan used well. ● Did not write the plan systematically ● There is inappropriate planning	● Able to mention the plan used well. ● Did not write the plan systematically ● But there are errors in the solution planning, so the planning is not correct
Implementing Solution Planning	● Able to write the calculation process according to the plan.	● Able to write the calculation process systematically but can mention it well according to the plan

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Problem Solving Skills	***Influence Personality Type***	
	Participant I1	**Participant I2**
	● There were errors in solving the problem due to improper planning and errors in calculations.	● There is an error in solving the problem because the planning is not correct
Checking Back	●Go through the re-examination process well, writing conclusions and double-checking	●Go through the proofreading process well, checking from beginning to end

Understanding the Problem of the Influence Personality Type

Based on the results of data analysis of students with influence personality types, they can clearly understand the problem and state what is known. In accordance with the research of Sari (2021) that influence personality type students can mention what is known in the task. Also research that has been done by Gifsihartini (2020) where students who have an influence personality type are able to write what is known and asked in the problem. Although in this study students with influence personality type in the step of understanding the problem did not write it systematically. The reason for not writing it systematically is because they want to do it right away, feel less understanding and confused about their mathematical writing. And the influence personality type has a tendency to be indifferent and underestimate some things (Islami & Kartika, 2016) which may affect the writing he does, skipping some things.

Planning the Solution of the Influence Personality Type

Based on the results of data analysis at the problem-solving planning stage, students of influence personality types can refer to the plan to be used correctly. This is in accordance with the findings of Sari (2021) that students with influence personality types can develop a problem-solving plan without much effort. They do not write it systematically and have plans that are not chosen carefully, hence there are errors in the planning process. In line with Winingsih's research (2018), students with influence personality types write incomplete steps. And there is also research from Herlinda et al. (2020) that students with influential personality types do not write down steps to deal with them but can refer to them.

Implementing the Solution Plan of the Influence Personality Type

The next step in solving problems based on Polya's theory is to implement the solution plan. Influential personality types are able to write well-planned calculation procedures. This is in accordance with research by Herlinda et al. (2020) that students with influence personality types are able to solve problems following pre-planned steps. However, some problems get wrong results due to scheduling errors. And research conducted by Gifsihartini (2020) that influence personality types can solve problems to get the final answer.

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Students with influence personality type go through the step of checking back well, this is in accordance with the data presented previously. According to Sari's (2021) research, students with an influential personality type tend to check their work by reviewing and recalculating. In the same study, these students wrote conclusions and reviewed their work from start to finish. However, Gifsihartini's (2020) research found that students with this personality type did not review their work due to time constraints.

Numeracy Problem Solving Skill Based on *Steadiness* Personality Type

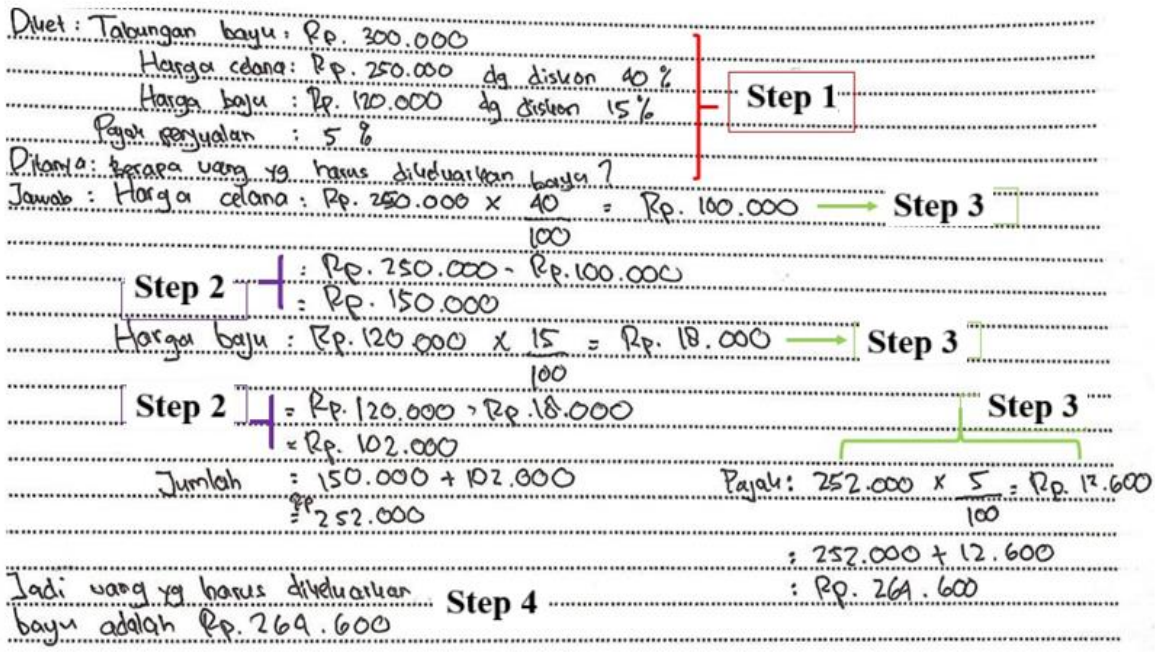

Figure 4. Results of Problem-Solving for Ssteadiness Type

It can be seen based on Figure 4 that students (S1) with steadiness personality type go through 4 stages and write it down systematically and get the right final result. The results of the analysis of the interview and problem work can be seen in Table 4.

Tabel 4. *"Steadiness Personality Type Results"*

Problem Solving Skills	**Tipe Kepribadian *Steadiness***	
	Partisipan S1	**Partisipan S2**
Understanding the Problem	• Can fully understand the problem • Can write and refer to what is known, writing it systematically • Can write correctly and accurately what is being asked	• Can fully understand the problem • Can write and refer to what is known, writing it systematically • Can write correctly and accurately what is being asked
Planning the Solution	• Able to write plans consistently and accurately • Able to write plans systematically well and correctly.	• Can write plans consistently and accurately • Able to write plans systematically well and correctly.

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Problem Solving Skills	**Tipe Kepribadian *Steadiness***	
	Partisipan S1	**Partisipan S2**
Implementing Solution Planning	●Can write the correct calculation procedure as planned, giving the correct result.	●Can write the correct calculation procedure as planned, giving the correct result.
Checking Back	●Go through the re-examination process well, by counting it twice, writing the conclusion at the end.	●Go through the re-examination process well, by writing the conclusion at the end and recalculating,

Understanding the Problem of the Steadiness Personality Type

The first step in problem-solving skill based on Polya's theory is understanding the problem. Based on the results of data analysis conducted by participants with a steadiness personality type, they can understand the problem well. This is in accordance with research conducted by Sari (2021) that students with a steadiness personality can understand the problem well. Can write what is needed and what is known. The results of Syafimen's research (2013), he results showed that students with a steadiness personality knew what information was known in the problem. And in this study, students with steadiness personality wrote consistently, clearly, and accurately. According to research conducted by Kurniasari (2012), steadiness personality type prefers to do things systematically and orderly.

Planning the Solution of the Steadiness Personality Type

From the results of data analysis at the problem-solving planning stage, students with steadiness personality can mention the plan to be used appropriately and accurately. According to Sari's research (2021), students with steadiness personality can write a good solution plan. And write a good plan and the chosen plan is correct. This is in accordance with Syafimen's research (2013) that students with a steadiness personality can develop problem solving plans and think about the strategies to be used. And there is also research by Yuliana (2022) that students with a steadiness personality can choose the right strategy to solve problems.

Implementing the Solution Plan of the Steadiness Personality Type

The next step is to implement the solution plan, this personality type can accurately write the calculation procedure according to the chosen plan. Calculations are done in detail to get consistent final results. In line with Kurniasari's research (2012), the steadiness personality type emphasizes more on accuracy, thoroughness and focus on the process. And also according to Jannah's research (2022) that the steadiness personality type is characterized by logical, systematic thinking and does not like to jump around. As well as Yuliana's research (2022) that students with a steadiness personality can solve problems consistently.

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The last stage of problem solving based on Polya's theory is checking back. In this stage, students with a steadiness personality type go through checking back well. In line with research conducted by Sari (2021) students double-check their answers. Also, Yuliana (2022) explained in her research that students with the steadiness personality type do the checking back step well. By counting twice, and writing conclusions at the end of the work. In accordance with the results of research conducted by Syafimen (2013) that students can write conclusions and check each step that has been done..

Numeracy Problem Solving Skill Based on *Compliance* Personality Type

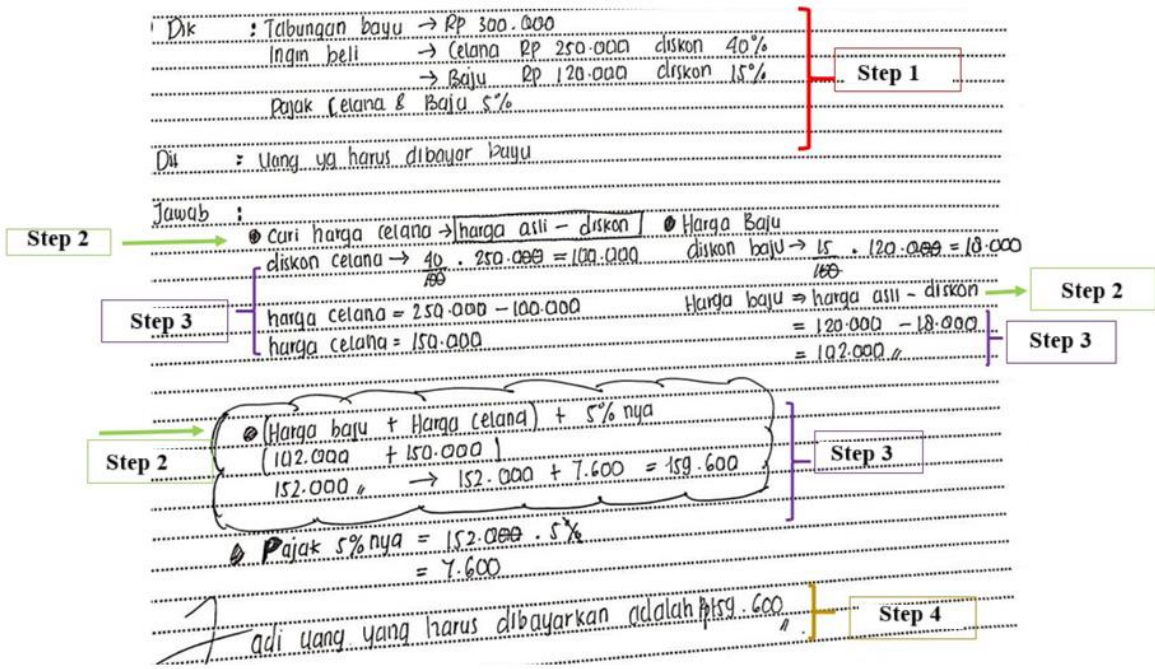

Figure 5. Compliance Personality Type Results

It can be seen from Figure 5 that students with the Compliance (C1) personality type go through 4 stages and write them down systematically, but the final result is less precise.

The results of the analysis of interviews and problem work can be seen in Table 5.

Table 5. Compliance Personality Type Result

Problem Solving Skills	**Tipe Kepribadian *Compliance***	
	Partisipan C1	**Partisipan C2**
Understanding the Problem	• Can understand the problem well • Can write and refer to what is known, writing it systematically • Can write correctly and accurately what is asked	• Can understand the problem well • Can write and refer to what is known, writing it systematically • Can write correctly and accurately what is asked
Planning the Solution	• Able to mention the plan used well and correctly. • Able to write the plan systematically well and correctly	• Can mention the plan used well. • However, there were errors in planning the solution, so the planning was not correct

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Problem Solving Skills	**Tipe Kepribadian *Compliance***	
	Partisipan C1	**Partisipan C2**
Implementing Solution Planning	● Able to write the calculation process well according to the plan, but there is one problem with incorrect results due to calculation errors..	● Able to write the calculation process systematically and can mention it well according to the plan ● There is an error in solving the problem because the planning is not correct
Checking Back	● Go through the rechecking process well, by writing the conclusion at the end, rechecking, recalculating.	● Go through the process of checking back well, by rechecking, recalculating,

Understanding the Problem of the Compliance Personality Type

The results of the data analysis conducted by students with compliance personality are able to understand the problem well. Can write and mention what is known precisely and correctly. Can write and state exactly what is needed. According to Yuliana's research (2022), students already know what is known and what is asked in the problem. And also, Sari (2021) that students with compliance personality type can write down the points known in math problems, writing consistently, clearly, and accurately. Compliance personality types are known for their attention to detail and adherence to procedures (Shin, 2013; Satriani, 2020).

Planning the Solution of the Compliance Personality Type

According to the results of data analysis on the step of planning problem solving, students with compliance personality type are able to mention the plan that will be used properly and systematically. In line with research conducted by Sari (2021) that students with compliance personality can make problem solving plans directly and write down formulas. However, there are errors in the solution planning due to errors in understanding in the selection of problem-solving plans. In accordance with research conducted by Prambanan et al. (2023) hat students with compliance personality experience errors in choosing strategies to solve problems. However, research conducted by Yuliana (2022) obtained results that were able to choose the right strategy in solving problems.

Implementing the Solution Plan of the Compliance Personality Type

In the next stage, namely implementing the solution plan, this personality type is able to write the calculation process well and in great detail. In line with research conducted by Khamndiniyati (2019) that the compliance personality type has detailed, systematic, and detailed characteristics. Also, research conducted by Yuliana (2022) that students with compliance personality type can complete the steps coherently. However, there are calculation errors and also planning errors in the previous steps that make the final result in solving the problem less precise. This is in accordance with research conducted by Satriani et al. (2020) that students go through mistakes because in the previous stage they also had errors.

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Students who have a compliance personality type go through the steps of checking back well. This is in accordance with research conducted by Yuliana (2022) that students with compliance personality type can recheck the steps that have been written. In this study, students with compliance personality type can check back, namely by writing conclusions at the end, rechecking and recalculating In line with research conducted by Sari (2021) that the compliance personality type is able to take the step of checking back by rearranging to write the answers that have been written whether they are correct.

CONCLUSION

The Dominance personality type typically follows a four-step process for numerical problem-solving, although some problems may not require the Checking Back stage. The Influence personality type also typically follows a four-stage process for numeracy problem-solving. The Steadiness personality type typically follows a four-step process for problem-solving to ensure accurate and correct results. The Compliance personality type typically follows the four steps of numeracy problem-solving, even when a solution exists that may yield less accurate results. Furthermore, this study has successfully identified a relationship between numeracy problem-solving skill and DISC personality type in grade XI students. The results indicate that all personality types (Dominance, Influence, Steadiness, and Compliance) were able to complete the four steps of numeracy problem-solving. However, there were differences in the final results achieved by each personality type. Dominance and Influence types are generally more efficient at problem-solving, while Steadiness and Compliance types tend to be more accurate, although they may produce less precise solutions.

This study has several limitations. Firstly, the sample size was limited to only two students per personality type, which may not accurately reflect the entire population of grade XI students. Secondly, it may not be comprehensive enough to measure numeracy problem-solving skill by using only three numeracy problems. Additionally, this study only focuses on DISC personality types and does not consider other factors, such as educational background or social environment that may affect numeracy problem-solving skill.

To improve this study, future research could broaden the sample to include students from diverse backgrounds and education levels. Additionally, including a wider range of numeracy problems would provide a more comprehensive understanding of how personality type impacts problem-solving skill. Integrating other factors such as learning motivation, educational environment, and social support could also offer greater insight into this topic.

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This research contributes significantly to the fields of mathematics education. By identifying how different DISC personality types affect students' approaches to solving numeracy problems, educators can gain a better understanding of students' individual needs and adjust their teaching methods accordingly. It also facilitates the development of personalised learning strategies, which can enhance the effectiveness of mathematics teaching. Mathematics teachers can utilise the results of this study to develop teaching methods that are better suited to students' personality types. For instance, students with the Dominance personality type may be better suited to challenging and result-oriented learning methods, whereas students with the Steadiness type may perform better with a more structured and gradual approach. Therefore, this research offers not only theoretical insights but also practical applications in mathematics education.

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