MaPan : Jurnal Matematika dan Pembelajaran
p-ISSN: 2354-6883 ; e-ISSN: 2581-172X
Volume 10, No 2, Dec 2022 (395-412)
DOI: https://doi.org/10.24252/mapan.2022v8n2a10

STUDENTS' THINKING PROCESS IN SOLVING MATHEMATICS PROBLEMS REVIEWING FROM COGNITIVE STYLE

Rahmi Yuliana M.[1)], Hartini[2)],
[1,2]Department of Mathematics Education, STKIP Paris Barantai
[1,2]Jl. Veteran Km.02. No. 15 B Kotabaru, Indonesia
Email: rahmiyuliana10@gmail.com[1)], tinitobo21@gmail.com[2)]

Received Novembar 11, 2022; Revised December 06, 2022; Accepted December 09, 2022

Abstract:
This research aims to identify and describe the thinking process of students in solving mathematical problems, both students who have a field-independent type of cognitive style (GK-FI) and students who have a field-dependent type of cognitive style (GK-FD). The subjects of this study were eight people, consisting of four GK-FI students and four GK-FD students. Data was collected using the Group Embedded Figure Test (GEFT). The process of selecting subjects was carried out in stages (a) determining the class to be the subject of the study, (b) giving the GEFT test, (c) analyzing the results of the GEFT test, (d) determining the research subjects, each consisting of 4 students. The research process follows the stages: (a) reviewing theory and conducting an initial survey, (b) preparing research instruments, (c) collecting research data both written data and interview data, (d) validating data using triangulation techniques, (e) analyzing data on mathematical problems to get an overview of the procedures used by students in solving mathematical problems, and (f) revealing students' thinking processes in solving mathematical problems based on students' cognitive styles. The thinking processes of GK-FI and GK-FD subjects in solving mathematical problems are as follows: (1) In the process of forming an understanding, the GK-FI subject receives and parses based on its parts, then makes a problem-solving plan, while the GK-FD subject does not parse based on its parts. (2) In the process of forming opinions, the subject of GK-FI performs with an analytical process while the subject of GK-FD performs with a process of trial and error and matching. (3) In the process of drawing conclusions, the GK-FI subject conducts an examination or checks the results first, while the GK-FD subject does not do.

Keywords: Thinking Process, Mathematics Problems, Cognitive Style

PROSES BERPIKIR SISWA DALAM MENYELESAIKAN MASALAH MATEMATIKA DITINJAU DARI GAYA KOGNITIF

Abstrak:
Penelitian ini bertujuan untuk mengetahui dan mendeskripsikan proses berpikir siswa dalam menyelesaikan masalah matematika, baik siswa yang mempunyai gaya kognitif tipe field-independent (GK-FI) maupun siswa yang mempunyai gaya kognitif tipe field-dependent (GK-FD). Subjek penelitian ini sebanyak delapan orang, terdiri dari empat siswa GK-FI dan empat siswa GK-FD. Pengumpulan data

dilakukan dengan Group Embedded Figures Test (GEFT). Proses pemilihan subyek dilakukan dengan tahapan (a) penetapan kelas untuk menjadi subyek penelitian, (b) pemberian tes GEFT, (c) analisis hasil tes GEFT, (d) penetapan subyek penelitian yang masing terdiri dari 4 siswa. Proses penelitian mengikuti tahap-tahap: (a) mengkaji teori dan melakukan survey awal, (b) mempersiapkan instrumen penelitian, (c) melakukan pengumpulan data penelitian baik data tertulis maupun data wawancara, (d) melakukan validasi data dengan menggunakan cara triangulasi teknik, (e) melakukan analisis data masalah matematika untuk mendapatkan gambaran prosedur yang digunakan siswa dalam menyelesaikan masalah matematika, dan (f) mengungkap proses berpikir siswa dalam menyelesaikan masalah matematika berdasarkan gaya kognitif siswa. Proses berpikir subjek GK-FI dan GK-FD dalam memecahkan masalah matematika adalah sebagai berikut: (1) Pada proses pembentukan pengertian, subjek GK-FI menerima dan mengurai berdasarkan bagian-bagiannya, kemudian membuat rencana penyelesaian masalah, sedangkan subjek GK-FD tidak mengurai berdasarkan bagian-bagiannya. (2) Pada proses pembentukan pendapat, subjek GK-FI melakukan dengan proses analitik sedangkan subjek GK-FD melakukan dengan proses coba-coba dan mencocokkan. (3) Pada proses penarikan kesimpulan, subjek GK-FI melakukan pemeriksaan atau pengecekan hasil terlebih dahulu, sedangkan subjek GK-FD tidak melakukan.

Kata Kunci: Proses Berpikir, Masalah Matematika, Gaya Kognitif

How to Cite: Yuliana, R., & Hartini. (2022). Students' Thinking Process in Solving Mathematics Problems Reviewing from Cognitive Style. *MaPan: Jurnal Matematika dan Pembelajaran*, *10*(2), 395-412. https://doi.org/10.24252/mapan.2022v10n2a10.

INTRODUCTION

Education is a human effort to grow and develop innate potentials both physically and spiritually in accordance with the values that exist in society and culture, thus discussing education involves many things. Because education includes all human behavior that is carried out in order to obtain continuity, defense, and improvement of life.

Realizing the importance of education, various efforts have been made to improve the quality of education. Such as changes and improvements to the curriculum, procurement, and improvement of educational facilities and infrastructure, as well as increasing teacher qualifications and competencies through education and training. These efforts are expected to have a significant impact on every component involved in the education system, especially teachers, students, and educational institutions.

Mathematics is one of the subjects taught to students from elementary to secondary level. Mathematics is a structured, organized, and tiered learning, meaning that one material and other materials are interrelated. In learning mathematics, problem solving is very important even as the heart of mathematics. According to Yetik, Yetik, and Keser (2012), people face lots and problems in their everyday lives and try to solve as a thinking problem. According to Gagne (in Widyastuti, Usodo, & Riyadi, 2013), problem-solving as a thinking process by which the learner discovers a combination of previously learned rules that he can apply to solve a novel problem whereas. According to Zhu (in Hidayat, Sa'dijah, & Sulandra, 2019), a Mathematical problem solver not only required cognitive abilities to understand and represent a problem situation, to create algorithms to the problem, to process different types of information, and to execute the computation but also had to be able to identify and manage a set of appropriate (techniques, short cuts, etc) to solve the problem. From this opinion, it can be said that problem-solving is a thinking process carried out by students to solve or find a way out of the problem or problem being faced by using the knowledge or skills they have previously possessed.

The results of observations in several state junior high schools in Kotabaru Regency regarding the process of learning mathematics carried out by teachers, the authors found the general conditions of learning including: (1) Learning is done conventionally, starting with explaining the theory, giving examples of questions, and ending with practice questions. Performed classically with the main method. This kind of procedure will make students acquire knowledge solely procedurally acquiring quite a knowledge conceptually is also necessary. (2) Some teachers at school have not provided opportunities for students to discover the concepts being taught on their own, so learning is still teacher-centered, but the 2013 curriculum requires student-centered learning as an implementation of constructivism. (3) Teachers are not optimal in utilizing the environment around students as a learning tool so that the concepts taught are still abstract in nature, but desired contextual and realistic.

In teaching and learning activities the teacher needs to take appropriate steps or actions to make the process of learning mathematics or the process of solving a math problem in class a place and opportunity where students can improve their abilities or thinking skills. Training students' thinking skills can be done by confronting students with problems that challenge students, or in

other words making students good problem solvers. Mathematical questions or problems that are challenging in nature will provide opportunities for students to empower all abilities they have or use higher-order thinking skills. Facing a problem, the wise action is to face the problem and try to solve it. Besides that, psychological factors related to teaching have not received much attention from teachers, for example, the level of students' intellectual development and students' cognitive styles. In this study, students' cognitive style became one of the focuses of attention.

The need for teachers to pay attention to students' cognitive styles in the learning process is expected to help students to achieve maximum learning goals. But in this case, it is rare that even teachers have never conducted learning in class by paying attention to students' cognitive styles, hat learning by paying attention to students' cognitive styles is one of the teacher's tasks that has been neglected so far.

According to Conney (in Yuliana, 2022), teaching problem-solving to students allows students to be more analytical in making decisions in their lives. To solve the problem one must master the things that have been learned before and then use them in new situations. Students' problem-solving abilities are more emphasized in thinking about how to solve problems and process mathematical information. Kennedy (in Strajhar, Schmid, Liakoni, Dolder, Rentsch, Kratschmar, Odermatt, & Liechti, 2016), suggests a four-step process for solving problems, namely understanding the problem, designing problem-solving, carrying out problem-solving, and checking again. Based on this, it can be concluded that problem-solving ability is a cognitive understanding of parsing and explaining all ideas, information, and thought processes that a person has when solving a problem. In addition, Polya (Widyastuti, Usodo, & Riyadi, 2013) suggests steps that are practical and systematically arranged in solving problems so that it can make it easier for students to solve math problems. The steps in solving a problem according to Polya consist of 4 steps, namely understanding the problem, devising a plan, carrying out the plan, and looking back.

A person can solve or solve math problems, it requires a thought process. Finding out the thinking process of students in solving problems can be seen in the results of their work. This is in accordance with the opinion of Helbert (Masfingatin, 2013), namely: to find out the thinking process students can observe it through the process of how to express the test and the results are written sequentially and added in-depth interviews about how it works.

This opinion will be used as a guideline in this research so that the student's answers in the worksheet as an illustration of their thinking process and to find out the actual process is revealed during the interview.

Cognitive style is a person's distinctive way of learning related to receiving, processing, storing, and using the information to respond to a problem Doyle (Hidayat, Sa'dijah, & Sulandra, 2019). Cognitive style is part of individual differences that shows a person's character in receiving, thinking about, managing, storing, and abusing the e information to respond to various tasks in various situations (Ahmadzade & Shojae, 2013). Cognitive style refers to the way people obtain information and use strategies for responding to an assignment. It is known as style and not as ability, because it refers to how people process information and solve problems, and does not refer to the best method (Messick, 1984; Waber, 1989; Mulbar, Rahman, & Ahmar, 2017).

Several studies in the field of psychology have found types of cognitive styles, namely Field Independent Cognitive Style (GK-FI) and Field Dependent Cognitive Style (FD). According to Witkin (Hidayat, Sa'dijah, & Sulandra, 2019), the GK-FI type sees a problem separately. GK-FI has strong analytical skills, initiative, responsible, and control thinks for himself, stays away from other people, and is not influenced by the environment. It is better if the GK-FD type considers the situation as a whole, works well in groups, ad emphasizes social relationships. The basic characteristics of GK-FD and GK-FI are suitable to be applied in research involving thinking processes in solving mathematical problems. People who have a field-independent cognitive style are more analytical, and they can choose the stimulus based on the situation/information (Witkin, 1973; Witkin, Moore, Goodenough, & Cox, 1977).

Regarding solving mathematical problems in terms of cognitive style, (Ulya, 2015) revealed a relationship between cognitive style and mathematical problem-solving abilities whose results showed a positive correlation at a high level between students' cognitive styles and students' mathematical problem-solving abilities. In addition Sasongko and Siswoyo (2013) revealed that Field-Independent subjects tended to be able to pose new math problems smoothly and flexibly so they were classified as very creative. Whereas Field-Dependent subjects tend not to be able to pose new and flexible math problems smoothly so they are classified as less creative or not creative. Meanwhile Santia (2015) reveals that subjects with field dependent cognitive style rely heavily on pictures in problem-solving while subjects with the independent field

cognitive style do not always use pictures and a good variety of symbolic representations.

Based on the description above, it can be seen that research on cognitive style has been carried out a lot, so this research was conducted to know and describe the thinking processes of students at SMP Negeri 1 Kotabaru in solving mathematical problems, both students who have a field-independent cognitive style or a cognitive style. Field-dependent cognitive so that teachers can design learning strategies that describe solving mathematical problems by paying attention to students' cognitive styles.

METHODS

This research is a qualitative descriptive study. This research was conducted at SMP Negeri 1 Kotabaru by selecting 8 class VIII students as research subjects. The determination of the research subject was based on several considerations, namely: (1) Grade VIII students who had studied teaching materials for a system of two-variable linear equations, (2) Already had a sufficient learning experience, so it is hoped that it will be easier to be interviewed and the data obtained is accurate for this study. In addition, the determination of research subjects was carried out based on the Group Embedded Figures (GEFT) cognitive style test. Based on the results of the cognitive style test, the research subjects were determined as many as 4 students representing each of the FI and FD groups.

Collecting data in this study using the main instrument, namely the researchers themselves, needs to be objective and neutral. However, apart from the main instrument, this research also used supporting instruments, namely; a Mathematical problem test instrument consisting of a collection of mathematical problems composed of two-variable linear equation system material, and an interview guide based oPolyaya steps, namely (1) how do students understand the problem, (2) make or develop a plan solving problems, (3) implementing plans and (4) re-examining processes and answers. Activities in data analysis in this study include (1) data reduction, (2) data presentation, and (3) conclusion. Testing the validity of the data in this study was used to test the credibility of the data using triangulation. The triangulation used in this research is method triangulation. The use of these research instruments in collecting research data, both written and oral in nature in order to answer the problems in this research, in outline can be seen in the following scheme:

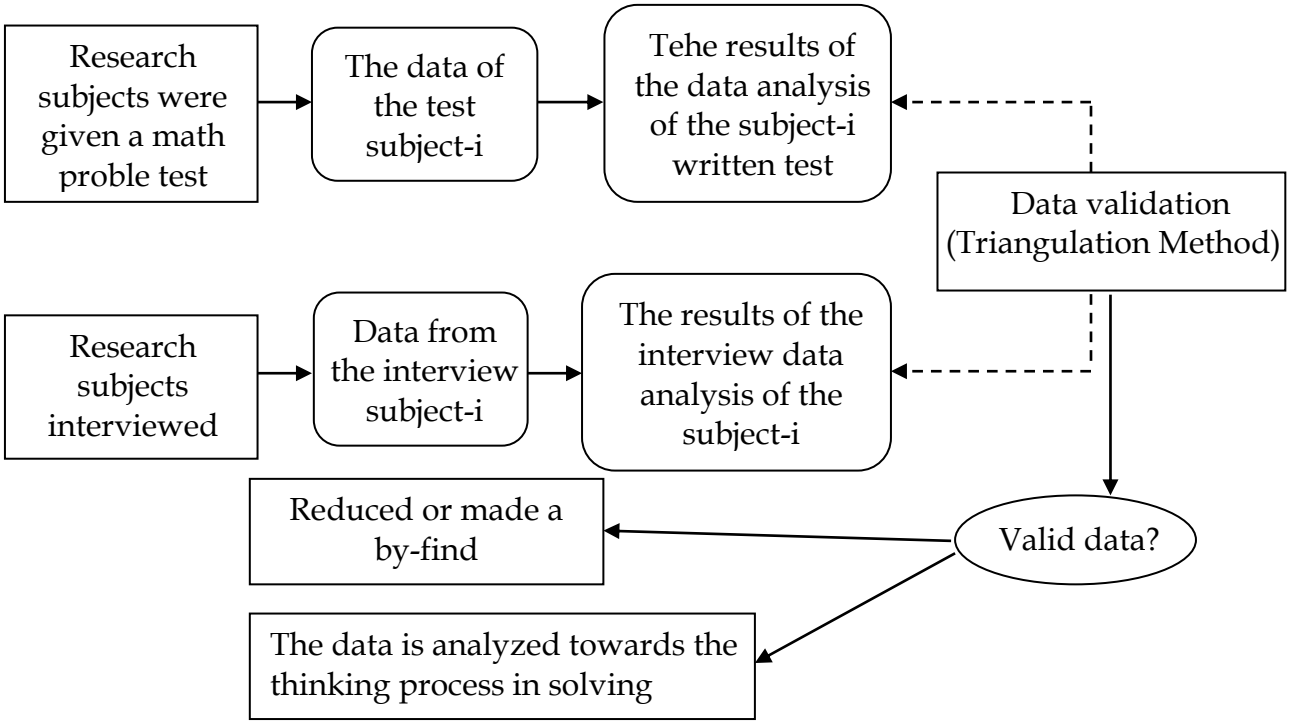

Figure1. Data collection process flow

RESULTS AND DISCUSSION

Collecting data in the study using tests of students' cognitive style and math problems, as well as interview guidelines. The results of the cognitive style test of students in this study were needed to classify students based on their cognitive style, namely groups of students with field-independent (FI) and field-dependent (FD) cognitive styles. Mathematical problems and interview data are used in addition to revealing students' thinking processes in solving math problems as well as validating data.

1. Description of students' cognitive style

The student's cognitive style data in this study were obtained from the results of cognitive style tests for students in grades VIII.A and VIIIB of SMP Negeri 1 Kotabaru. Based on the results of the cognitive style test, data were obtained as shown in the following table.

Table 1. Description of students' cognitive style by class.

Class	Cognitive Style		Total
	FI	FD	
VIII. A	32	9	41
VIII. B	36	6	42
Total	68	15	83
Percentage	81,92	18,08	100

Description : FI = Field-independent; FD = Field-dependent

Based on table 1, it is found that of the 83 students who took the cognitive style test, there were 68 (81.92%) students belonged to the field-independent (FI) cognitive style group, and 15 (18.08%) students belonged to the style group. field-dependent cognitive (FD), from this grouping, 8 students were selected as research subjects which were divided into two groups, namely, 4 students from the FI group and 4 students from the FD group.

2. Analysis of mathematical problem-solving data

This section presents a detailed analysis of the description of the characteristics of solving mathematical problems based on their cognitive style. The analysis is based on the results of written tests and interviews, as shown in the following summary:

a. Description of the characteristics of students' mathematical problem-solving with the Independent Field Cognitive Style (GK-FI).

Problem 1

Problem 1 in this research is:

"The price of 3 apples and 2 mangoes is IDR 8,000.00. The price of 2 apples and 3 mangoes is IDR 7,000.00. What is the price of 5 apples and 5 mangoes?".

In the syntactic analysis, problem 1 contains assignment propositions because the sentence structure contains direct orders to be resolved. Problem 1 only requires the ability to understand the SPLDV concept with simple calculations.

Problem 1 is in the context of understanding, including instrumental understanding. Instrumental understanding as stated by Skemp (Pollatsek et al, 1981) is characterized by the ability to (1) memorize concepts/principles without any connection with others, (2) apply formulas in simple calculations, and (3) perform algorithmic calculations.

Furthermore, it was argued that this ability belongs to the ability to think mathematics at a low level.

In solving problem 1, the GK-FI subject stated that there were no difficulties, the GK-FI subject immediately understood the problem and had an overview of solving the problem with only one reading of the problem. GK-FI subjects generally use a complete combination of elimination and substitution methods starting from statements, and examples to final statements of answers.

The GK-FI subject in solving problem 1 begins with an understanding of what is known and asked about the problem, then formulates a solution plan, then implements the plan. To ensure the correctness of the answers, the GK-FI subject was checked by counting again.

Problem 2

Problem 2 in this research is:

"In a rectangle, the length is 10 cm longer than the width. Find the length and width if the perimeter of the rectangle is 80 cm?"

Problem 2 in the syntactic analysis contains an element of the relationship because it contains the connection of several concepts/principles to be resolved. To solve problem 2, it is necessary to understand the relationship between length and width and the relationship between length and width and the perimeter of the rectangle.

Problem 2 in the context of understanding, including rational understanding. Rational understanding as stated by Skemp (Pollatsek et al, 1981) is characterized by the ability to associate a concept/principle with other concepts/principles. Furthermore, it was argued that this ability belongs to the ability to think at a higher level of mathematics.

In solving problem 2, GK-FI subjects said that they had difficulty, so they had to read it two to three times to be able to understand the problem and have an idea of solving the problem. GK-FI subjects demonstrated the ability to understand problems through disclosing known or asked elements and GK-FI subjects were able to formulate appropriate mathematical sentences.

In solving the problem, the GK-FI subject writes down step by step using the elimination method or a combination of elimination and substitution correctly.

Problem 3

Problem 3 in this study is:

"In 2005, Hery was ten years less than twice Susan's age. Five years later, Hery is eight years older than Susan. Determine the year Hery and Susan were born?".

Problem 3 in the syntactic analysis contains elements of relationships because it contains the connection of several concepts/principles to be resolved. To solve problem 3, it is necessary to understand the relationship between the ages of Hery and Susan in 2005 and five years later, based on these results, it is then linked to their respective birth years.

Problem 3 in the context of understanding, including rational understanding. Rational understanding as stated by Skemp (Pollatsek et al, 1981) is characterized by the ability to associate a concept/principle with other concepts/principles. Furthermore, it was argued that this ability belongs to the ability to think at a higher level of mathematics.

In solving problem 3, GK-FI subjects said that they had difficulty, so they had to read three to five times to be able to understand the problem and have an idea of solving the problem. GK-FI subjects demonstrated the ability to understand problems through disclosing known or asked elements and GK-FI subjects were able to formulate appropriate mathematical sentences.

In solving problem 3, GK-FI subjects carried out procedures for understanding problems, planning solutions, and implementing plans.

b. Description of the characteristics of students' mathematical problem-solving with Field Dependent Cognitive Style (GK-FD).

Problem 1

In solving problem 1, the GK-FD subject said that there were no difficulties. The GK-FD group subjects immediately understood the problem and had an overview of solving the problem by only reading the problem once. GK-FD subjects generally use the elimination method without any statements of examples and statements of final answers.

The GK-FD subject in solving problem 1 begins with an understanding of what is known and asked about the problem, then formulates a settlement plan, then implements the plan. To ensure the correctness of the answers, the GK-FD subject was checked by counting again.

Problem 2

In solving problem 2, the GK FD subject said that he had difficulty, so he had to read two to three times to be able to understand the problem and have an idea of solving the problem. GK-FD subjects demonstrated the ability to understand problems by disclosing elements that were known or asked, and GK-FD subjects formulated mathematical sentences that were not appropriate but were still in the context of the problem.

In solving the problem, the GK-FD subject uses the method of elimination and trial and error. In using the elimination method the GK-FD subject correctly understood the procedure but because the mathematical sentence formulated was wrong, the final answer was also wrong. Likewise, subjects who used the trial and error method did not understand how to check the correctness of their answers, so they were unable to calculate other possible answers.

Problem 3

In solving problem 3, GK-FD subjects said that they had difficulty, so they had to read three to five times to be able to understand the problem and have an idea of solving the problem. The GK-FD subjects demonstrated the ability to understand problems by disclosing elements that were known or asked and the GK-FD subjects formulated inappropriate mathematical sentences.

In solving problem 3, the GK-FD subjects developed their problem-solving procedures.

3. Thinking process in solving math problems

In this section, the student's thinking processes in solving mathematical problems from each cognitive style group are shown based on the problems/issues given.

The syntactic analysis in this study includes (1) propositions containing orders in the form of assignments, (2) containing orders in the form of relationships, or (3) containing orders in the form of presuppositions. The assignment proposition is the sentence structure of the problem/question containing direct orders to be solved, the relationship proposition is the sentence structure of the problem/issue containing the connection of several

facts to be resolved, and the presuppositional proposition is the sentence structure of the problem/issue that conditions a fact to be able to solve.

a. Thinking process of CS-FI and CS-FD students in solving problems 1

The description of the thinking process of each cognitive style group in solving problem 1 is as follows.

Table 2. Thinking process based on the cognitive style in solving problems 1

Description of thought process flow			
The formation of understanding		Opinion formation	Conclusion
Receive data/information from outside students	Processing data and storing in memory	Calling back from memory	Cultivating next
Given a question/problem 1			
CS-FI Group • Have a solution picture	CS-FI Group • Write and understand the known elements of the problem • Formulate a mathematical model that fits the problem	CS-FI Group • Solve problems correctly based on understanding and understanding with the same method of completion as what the teacher has delivered	CS-FI Group • Do and understand how to check the correctness of answers
CS-FD Group • Have a solution picture	CS-FD Group • Understanding but not writing down the elements that are known • Formulate a mathematical model that fits the problem	CS-FD Group • Solve problems correctly based on understanding and understanding with the same method of completion as what the teacher has delivered	CS-FD Group • Tidak ada pemeriksaan kebenaran jawaban

b. Thinking process of GK-FI and GK-FD students in solving problems 2

The description of the thinking process of each cognitive style group in solving problem 2 is as follows.

Table 3. Thinking Process Based on The Cognitive Style in Solving Problems 2

Description of thought process flow			
The formation of understanding		Opinion formation	Conclusion
Receive data/information from outside students	Processing data and storing in memory	Calling back from memory	Cultivating next
Given a question/problem 2			
CS-FI Group • Have a solution picture	CS-FI Group • Understanding the known elements of the problem • Formulate a mathematical model that fits the problem	CS-FI Group • Solve questions correctly based on understanding and understanding with the same method of completion as what the teacher has given	CS-FI Group • Do and understand how to check the correctness of answers
CS-FD Group • Have a solution picture	CS-FD Group • Understand the known elements of the problem • There is no mathematical model formula	CS-FD Group • Solve questions using the method of choosing certain values and matching the results with the information about the questions	CS-FD Group • No answer correctness check

c. Thinking process of GK-FI and GK-FD students in solving problems 3

The description of the thinking process of each cognitive style group in solving problem 3 is as follows.

Table 3. Thinking Process Based on The Cognitive Style in Solving Problems 3

Description of thought process flow			
The formation of understanding		Opinion formation	Conclusion
Receive data/information from outside students	Processing data and storing in memory	Calling back from memory	Cultivating next
Given a question/problem 3			
CS-FI Group • Have a solution picture	CS-FI-Ba Group • Understanding the known elements of the problem • Formulate a mathematical model that fits the problem	CS-FI-Ba Group • Solve problems correctly based on understanding and understanding by developing their method of solving.	CS-FI-Ba Group • Do and understand how to check the correctness of answers
	CS-FI-Bb Group • Understand the known elements of the problem • Formulate a mathematical model, but it doesn't fit the problem	CS-FI-Bb Group • Solve problems based on understanding and understanding by developing their method of solving	CS-FI-Bb Group • No answer correctness check
CS-FD Group • Don't have a solution picture	CS-FD Group • There is no understanding of the question	CS-FD Group • The mind developed to solve the problem is not relevant to the problem	CS-FD Group • No answer correctness check

The thinking process has three steps, namely forming an understanding, forming opinions, and drawing conclusions and the process starts with finding information (from outside or from within students), processing, storing, and recalling that information in memory.

From this understanding, in this study the thinking process of students is associated with the process of solving problems so that it is identified as

follows: (1) the formation of understanding is marked by the process of finding and processing information, its relation to problem-solving is the understanding of the elements of the problem and the formulation of a mathematical model of given questions/problems, (2) opinion formation is characterized by the process of recalling information in memory, its relation to problem-solving is the method used in finding answers to problems, (3) concluding is characterized by re-processing, its relation to problem-solving re-examination process and result.

About solving mathematical problems with thinking processes, GK-FI and GK-FD subjects in the process of receiving data/information from outside the student's self (in this case the questions/problems posed) have a picture of the solution. However, the more propositions involved in the problem, the higher the intensity of effort to understand it (maybe it is necessary to read the problem over and over again to get an overview of the solution).

Regarding data processing, GK-FI subjects always identify the supporting data from the questions, by writing down and/or understanding the elements that are known and asked. The ability to identify elements that are known to be related to the ability to formulate a mathematical model that is relevant to the problem. The more propositions are involved in the problem, the identification ability will increasingly determine whether or not it is possible to formulate a mathematical model that is relevant to the problem. GK-FD for simple questions understands the known elements and has difficulty formulating appropriate mathematical models for complex questions.

In the process of recalling knowledge from memory, in this case, implemented in the form of methods used in solving problems, GK-FI subjects use inductive analytic solutions while GK-FD subjects use trial and error solutions without understanding, especially for complex mathematical problems.

In the next process. For problem-solving implemented in the form of evaluating answers, the GK-FI subject checked the answers while the GK-FD subject did not.

Based on the description above, it can be concluded that the thinking processes of GK-FI and GK-FD subjects in solving mathematical problems are as follows: (1) In the process of forming an understanding. The GK-FI subject accepts and breaks it down based on its parts, then makes a problem-solving plan, while the GK-FD subject does not break it down based on the parts. (2) In

the process of forming opinions. The GK-FI subject did it with an analytic process while the GK-FD subject did it with a trial and error process. (3) In the process of concluding. The GK-FI subject first checks or checks the results, while the GK-FD subject does not.

This is in line with the opinion of Sasongko and Siswoyo (2013) stated that Field-Independent subjects tended to be able to pose new math problems smoothly and flexibly so they were classified as very creative. Whereas field-dependent subjects tend not to be able to pose new and flexible math problems smoothly so they are classified as less creative or not creative. Meanwhile, Santia (2015) states that subjects with field dependent cognitive style rely heavily on pictures in problem-solving, while subjects with Field Independent cognitive style do not always use pictures and have a fairly good variety of symbol representations.

CONCLUSION

Based on the results of the analysis and discussion above, the following conclusions are obtained: (1) Subjects of GK-FI perform thought processes in solving mathematical problems; for the process of forming an understanding of the subject GK-FI accepts and parses it based on its parts, then make a problem-solving plan; in the process of forming the GK-FI subject's opinion with an analytical process; and in the process of concluding the subject of GK-FI first checks or checks the results. (2) GK-FD subjects carry out thought processes in solving mathematical problems; for the process of forming the understanding of the subject of the GK-FD it does not break it down based on its parts; in the process of forming the opinion of the GK-FD subjects, they carried out a trial and error process; and in the process of concluding the GK-FD subject did not conclude.

Based on the conclusions above, it is suggested to mathematics teachers that to improve students' ability to solve mathematical problems, in the learning process teachers need to familiarize students with solving mathematical problems by giving questions in the form of mathematical problems. One form of the question that can develop students' ability to solve problems is description questions or story questions because solving them requires the ability to understand the problem, make a settlement plan, implement the plan, and re-check the answers obtained. For researchers and observers of education and teaching to follow up The findings in this study, especially matters related to students' thinking processes turned out to be

different for solving mathematical problems between field-independent andfield-dependentt cognitive styles.

ACKNOWLEDGMENT

We would like to thank Junior High School State 1 of Kotabaru for funding the implementation of this research activity. In addition, thanks to those who have helped so that this research can run well.

REFERENCES

Ahmadzade, L., & Shojae, M. (2013). Investigating the relationship between cognitive style (filed dependence/independence) and academic achievement in male and female students of behbahan islamic azad university. *Journal of Life Science and Biomedicine*, *3*(3), 245–249.

Hidayat, A., Sa'dijah, C., & Sulandra, I. M. (2019). Proses berpikir siswa field dependent dalam menyelesaikan masalah geometri berdasarkan tahapan polya. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *4*(7), 923. https://doi.org/10.17977/jptpp.v4i7.12634.

Masfingatin, T. (2013). Proses berpikir siswa sekolah menengah pertama dalam memecahkan masalah matematika ditinjau dari adversity quotient. *Jurnal Ilmiah Pendidikan Indonesia*, *2*(1), 1–8. https://doi.org/10.25273/jipm.v2i1.491.

Messick, S. (1984). The nature of cognitive styles: problems and promise in educational practice. *Educational Psychologist*, *19*(2), 59–74. https://doi.org/10.1080/00461528409529283.

Mulbar, U., Rahman, A., & Ahmar, A. (2017). Analysis of the ability in mathematical problem-solving based on SOLO taxonomy and cognitive style. *World Transactions on Engineering and Technology Education*, *15*(1). Retrieved from https://ssrn.com/abstract=2940939.

Santia, I. (2015). Representasi siswa SMA dalam memecahkan masalah matematika berdasarkan gaya kognitif. *JIPM (Jurnal Ilmiah Pendidikan Matematika)*, *3*(2), 365–381. https://doi.org/10.25273/jipm.v3i2.505.

Sasongko, D. F., & Siswoyo, T. Y. E. (2013). Kreativitas siswa dalam pengajuan soal matematika ditinjau dari gaya kognitif field-independent (Fi) dan field-dependent (Fd). *MATHEdunesa*, *2*(1), 1–8. https://doi.org/10.26740/mathedunesa.v2n1.p%25p.

Strajhar, P., Schmid, Y., Liakoni, E., Dolder, P. C., Rentsch, K. M., Kratschmar, D. V., Odermatt, A., & Liechti, M. E. (2016). Acute effects of lysergic acid diethylamide on circulating steroid levels in healthy subjects. *Nature Methods*, *7*(6). https://doi.org/10.1111/jne.12374.

Ulya, H. (2015). Hubungan gaya kognitif dengan kemampuan pemecahan masalah matematika siswa. *Jurnal Konseling Gusjigang*, *1*(2). https://doi.org/10.24176/jkg.v1i2.410.

Waber, D. (1989). The biological boundaries of cognitive styles: a neuropsychological analysis. *Cognitive Style and Cognitive Development*, 11–35.

Widyastuti, R., Usodo, B., & Riyadi. (2013). Proses berpikir siswa SMP dalam menyelesaikan masalah matematika berdasarkan langkah- langkah polya ditinjau dari adversity quotient. *Jurmal Pembelajaran Matematika*, *1*(3), 239–249. https://doi.org/10.24042/ajpm.v6i2.48.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. *Review of Educational Research*, *47*(1), 1–64. https://doi.org/10.3102/00346543047001001.

Witkin, Herman A. (1973). The role of cognitive style in academic performance and in teacher-student relations. *ETS Research Bulletin Series*, *1973*(1), 1–58. https://doi.org/10.1002/j.2333-8504.1973.tb00450.x.

Yetik, S. S., Akyuz, H. I., & Keser, H. (2012). Preservice teachers' perceptions about their problem solving skills in the scenario based blended learning environment. *Turkish Online Journal of Distance Education*, *13*(2), 158–168. https://dergipark.org.tr/en/pub/tojde/issue/16900/176151.

Yuliana, R. (2022). *Metakognisi dalam memecahkan masalah penerapan integral pada mata kuliah kalkulus ditinjau dari tipe perilaku disc*. *11*(1), 21–39. https://doi.org/10.22487/aksioma.v11i1.1903.