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Students' Metacognitive Process in Mathematical Problem Solving Based on Cognitive Style

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ABSTRAK

Penelitian ini merupakan penelitian kualitatif dengan jenis penelitian studi literatur yang bertujuan untuk mendeskripsikan proses metakognitif siswa SMP/sederajat dalam pemecahan masalah matematis berdasarkan gaya kognitif *Field Independent* dan *Field Dependent.* Prosedur pada penelitian ini meliputi: 1) Pengumpulan data pustaka yang relevan dengan variabel dan sesuai dengan kiteria sumber data pada penelitian ini; 2) mengklasifikasikan data pustaka berdasarkan jenjang kelas dan materi pelajaran yang digunakan; 3) tahap analisis data, yaitu mengolah data yang diperoleh dari hasil klasifikasi data pustaka. Instrumen dalam penelitian ini yakni peneliti sendiri dan pedoman wawancara. Wawancara dengan guru SMP/sederjat peneliti lakukan untuk memverifikasi data dari hasil klasifikasi sumber-sumber pustaka. Hasil penelitian ini menunjukkan bahwa siswa yang memiliki gaya kognitif *Field Independent* mampu menyadari proses metakognitif dengan baik saat *planning, monitoring,* dan *evaluating* karena mampu menuliskan diketahui dan ditanyakan dengan simbol matematika, menentukan strategi yang tepat, serta mampu memperoleh dan menuliskan jawaban akhir dengan tepat. Siswa yang memiliki gaya kognitif *Field Dependent* kurang mampu menyadari proses metakognitif saat *planning, monitoring,* dan *evaluating* karena menuliskan diketahui dan ditanyakan cenderung dengan kata-kata, kesulitan menentukan strategi yang tepat, serta kesulitan dalam menemukan jawaban akhir yang tepat.

Kata Kunci: gaya kognitif, metakognitif, pemecahan masalah

ABSTRACT

This study is a qualitative literature review aimed to describe junior high school students' metacognitive process in mathematical problem solving based on field independent and field dependent cognitive style. The research was done based on these following steps: 1) Data library relevant to variable and in accordance to the data source criteria was collected; 2) the data library was classified according to the grade and the subjects; 3) the data was analyzed. The instruments used in this study were the researchers and interview. The interview was conducted to confirm the classified data. Based e this study, it can be concluded that students using field independent style, competently can employ metacognitive process in planning, monitoring, and evaluating because they can write down the known fact and the question using mathematical symbol, choose the appropriate strategy, and answer the question thoroughly. Students using field dependent style were having difficulties in writing down the known fact and the question using mathematical symbol, choosing an appropriate strategy, and answering the question thoroughly.

Keywords: cognitive style, metacognitive, problem solving

INTRODUCTION

Problem solving ability is one of the topics listed in school curriculum [1]. This ability is important to be taught since student encounter real life problem in daily life [2]. Not only in daily life, problem solving ability is important in solving mathematical questions [3]. Therefore, in mathematic learning, it is important to master and develop the ability to solve mathematical questions.

The purpose of problem-solving learning is to train students' critical and creative thinking [4]. Those thinking process can be trained maximally since in junior high school. It is because in junior high school students are in their

best operational stage, in which they are able to think more abstractly and able to relate something that have been done before [5], [6].

Various competency developments have been carried out to improve student's learning outcome [7]. However, there are difficulties in learning for students, and it result in low outcome [2], [3], [8]. Those difficulties also create inadequate study result [9]. Therefore, it is necessary for teacher to find a way so the students' results are optimal. According to the studies by Krisna and Roza, there is an improvement in the outcome when metacognitive approach is used in learning process [10], [11]. It can be concluded that one of the methods to optimize students' learning outcome is by using metacognitive approach.

According to Charles and Lester [12] there are three aspects affecting students' mathematical problem solving, which are: (1) cognitive aspect, (2) affective aspect, and (3) metacognitive aspect. From those aspects, it is significant to pay attention on metacognitive aspect because in problem solving it cannot be separated from students' awareness to control and check their own learning [13]. Thinking about something to build problem solving strategy can be called as metacognitive [14]. The metacognitive process of students in solving mathematical problem meant in this study is the exact description of the metacognitive process of mathematical problem solving by Polya. The metacognitive processes are based on Flavell theory, which are planning, monitoring, and evaluating [15].

Metacognitive helps in solving mathematical problem because it creates awareness in learning process [16], [17]. However, still there are some students who have difficulties in realizing metacognitive process. The difficulties are students who can solve the problem properly, did not realize their potentials, and in the other hand students who cannot properly solve the problem, did not realize that they were lack in it [17], [18]. Those difficulties appear because student did not correctly understand the concept, they were fixated only on the strategy that has been used, and lack in motivation from themselves and their environment [19]. Based on those difficulties, it can be seen that students' metacognitive process in solving mathematical problem is not optimal.

While learning mathematics, teacher may encounter different style in understanding the course. The difference in acquiring, understanding, and processing information are called cognitive style [20]. Different cognitive style will influence in how to response a problem [21]. According to Witkin, cognitive style is categorized into, Field Dependent (FD) and Field Independent (FI) [22]. Student with FD style is more sociable and easily influenced by their environment, while student with FI style is more individual and hardly influenced by their environment. These character differences seen as an influence for students' metacognitive process.

Heretofore, rather than focus on the process of solving the problem encountered, learning method used by teacher were focused on the result of the problem solving [23], [24]. So, by knowing and understanding the description of the metacognitive process of students in solving mathematical problem based on the Field Dependent (FD) and Field Independent (FI) cognitive styles, it is expected that teacher can choose more appropriate learning method, pay more attention and respect individual style. By applying those method, it is hoped that students can developed and get an optimal learning result. Therefore, this study is entitled *Students' Metacognitive Process in Mathematical Problem Solving Based on Cognitive Style.*

METHOD

This study is using literature review method with qualitative approach. In this study, the researchers' role is non-participant researcher, in the other word the researchers did not participate or involve in the subjects' daily life. The researcher did not directly participate because this research only analyze data from relevant data library. According to Zed, in library research, it is used not only as initial step of preparing research framework (the research design), obtain similar research information or deepen theoretical framework, but also as the data of the study [25].

The data used in this study is a secondary data, in other meaning the data were collected from text data or numerical data from books, journal, or article about the examined concept. The researchers acquired the data from relevant references based on these criteria: 1) Derived from a trusted source, namely from official national journal websites, or the official university websites; 2) contain variable in accordance with the research, namely description of junior high school students' abilities in solving mathematical problem according to Polya's steps based on FI and FD cognitive styles; 3) the data library source from the last five years; 4) the data library used junior high school student as the subjects. The data were collected multiple time so it results in more consistent data with concrete proofs. The researcher also use interview as data collection technique to strengthen the data that have been collected before. The interview was conducted by asking the mathematic teachers in MTsN 7 Bantul, Karang Tengah, Sitimulyo, Piyungan, Bantul, Special Region of Yogyakarta and SMP Negeri 2 Berbah, Sanggrahan, Tegaltirto, Berbah, Sleman, Special Region of Yogyakarta. The reason for choosing those schools as a place to conduct interviews was because the division of students in grade VII, VIII, and IX is heterogeneous. Thus, it is hoped that the interviewed teachers have more experience so that the information obtained is able to represent the real situation.

The main instrument of this research is the researcher itself. Sidiq and Choiri stated that in qualitative research, the roles of researcher as an instrument are to plan, to collect, and to analyze the data [26]. The proponent instrument is the interview sheet used to interview mathematic teachers.

In this study, to obtain the necessary data or information, the data collection techniques conducted by researcher were as follows. The first step is to collect literature sources that are used to determine and strengthen the

background and research objectives. The next step, the researcher collects relevant library data sources that are used to obtain the desired data. After that, the data library was classified according to the grade and the subjects to make it easier for researcher to carry out the analysis so that credible results are obtained. Then conducted interviews with several mathematics teachers in order to obtain more complete information about the data that has been obtained. The final step after obtaining the results of data analysis is writing the discussion so that conclusions can be drawn according to the objectives of this study.

To analyze the ability of solving mathematical problem, the researcher used FD and FI cognitive style. The cognitive style also used to analyze the interview and student metacognitive process. The metacognitive process used in this study is based on Flavell theory, which include planning, monitoring, and evaluating. Planning in this research includes awareness in knowing how to start completing a task, monitoring means awareness of what they doing, and evaluating includes awareness in decision making of the process and results achieved. The mathematical problem-solving step is based on Polya theory [27]. There are four steps, first is understanding the problem, second is planning the solution, third is execution, and last is re-checking. The data analysis technique used in this data is by Miles and Huberman [26]. The data analyzed are the ability to solve mathematical problem and the metacognitive process in solving mathematical problem.

The data validation in qualitative research is carried out to refute the allegation that qualitative research is not scientific. According to Sidiq and Choiri [26], there are several methods to guaranteed the credibility of the data. This research used data triangulation and negative case analysis. By doing negative case analysis, the researchers find contradict data from what have been acquired before. If there is none, it means the data are credible. If it there, then the researcher will furthermore analyze why it is different.

RESULTS AND DISCUSSION

The findings consist of the mathematical problem-solving ability based on Field Independent (FI) and Field Dependent (FD) cognitive style, interview data, and metacognitive process based on FI and FD cognitive style.

Mathematical Problem-Solving Ability in Student with Field Independent Style

Understanding Problem Step

Based on the analysis from relevant data sources, it can be seen that students with FI can understand problem with only once or twice time reading [28], [29]. Students with FI cognitive style students process information analytically, therefore they find important pieces in the problem [30], [31]. Students with FI cognitive style write the known information and the questions using their own world and mathematical symbol [29], [32]. Other than that, students with FI cognitive style also able to create mathematical model correctly and clearly [31], [33].

Solution Planning Step

According to the analysis from relevant data sources, students with FI cognitive style are able to analyze information, therefore they are able to find the important part that help in planning appropriate completion strategy [33], [34]. Students with FI cognitive styles are able to write a finishing steps using proper concept [29], [35]. Students with FI cognitive style students are also able to find the relationship between known and asked information with the previous situations. By knowing this, they are able to create more than one plan [34], [35]. Other than that, Students with FI cognitive styles are not fixated with used strategy or tend to plan based on their own thoughts [31], [32].

Implementation Step

Based on the analysis, it can be seen that students with FI cognitive style are able to implement the strategy which are decently, thoroughly, and completely planned [28], [34]. Student with FI cognitive styles are able to answer correctly [29], [34]. The students are also can solve the problem quickly without much difficulties [30].

Rechecking Step

According to the analysis, students with FI cognitive style are able to reexamine their plan, calculation, and result by doing rechecking or recalculation [31], [34]. Student with FI cognitive styles also able to find and revise their incorrectness [33], [34]. Students with FI cognitive styles also did not find difficulties in drawing a conclusion [29], [32].

Mathematical Problem-Solving Ability in Student with Field Dependent Style

Understanding Problem Step

Based on the analysis, it can be seen that students with FD cognitive style can understand problem after three or four times reading [28], [29]. In processing questions, students with FD cognitive style tend to think globally or absorb information as it is [30]. Student with FD cognitive styles also write what is known and the question same as it written or dictated [32], [34]. Student with FD cognitive styles also lacking in create mathematical model with the given information [30], [31].

Solution Planning Step

According to the analysis, Student with FD cognitive style find it difficult to analyze information into important parts that need attention [34], [35]. Student with FD cognitive styles are able to write down the steps that will be used but there are some steps that are not written [34], [35]. Student with FD cognitive styles also find it difficult to find the relationship between the known and asked information with the previous situations. Therefore,

they are depending on strategies that have been used before, and is easily influenced by distracting elements [28], [32].

Implementation Step

Based on the data analysis conducted by the researchers, it is known that students with FD cognitive style are less able to implement the planned strategy [29], [32]. Student with FD cognitive styles are also lacking in the implementation of the right strategy and tend to choose strategies that have been used, even though sometimes the strategies are not in accordance with the problem and result in incorrect outcome [29], [34]. Student with FD cognitive styles tend to take a long time in the completion process [30].

Rechecking Steps

Based on the data analysis, it is known that students with FD cognitive style reexamine the results intuitively [28], [35]. Student with FD cognitive styles find it difficult to find and correct mistakes they made [28], [33]. Student with FD cognitive styles also find it difficult to draw conclusions, so they tend to write conclusions briefly [32], [35]. Student with FD cognitive styles also find it difficult to find other ways to solve a problem [28], [31].

The Metacognitive Process of Field Independent Students in Mathematical Problem Solving

This part will analyze how junior high school students' metacognitive process in doing mathematical problem solving in every problem-solving steps according to Polya based on FI and FD cognitive style. The metacognitive process analyzed based on the planning, monitoring, and evaluating indicators. The analysis was done by paying detailed attention of the description of mathematical problem-solving abilities in the researchers' previous analysis. To strengthen the analysis, the researchers conducted a negative case analysis and displayed excerpt of the interview with mathematics' teachers in every step of mathematical problem-solving.

Understanding Problem Step

In this step, students with FI cognitive style while in the planning process they are consciously able to know the right way to understand the problem, namely by only reading one to two repetitions. In the monitoring process, Students with FI cognitive styles are able to consciously monitor their way of thinking to understand problems, namely by being able to think analytically, so that they know the information and conditions contained in the questions. In the evaluation process, students with FI cognitive styles are able to consciously reexamine the methods used to understand the problem by writing down the known and asked information using mathematical symbols. This is in line with research findings from Jusuf, Sili, and Argarini which show that students with FI cognitive styles are able to determine the information that is known and asked correctly [36], [37].

To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the interview with G1 teacher (MTsN 7 Bantul).

R: "How do students with FI cognitive styles write down the information they know and ask about? Are Student with FI cognitive styles able to write using mathematical symbols, Ma'am? "

G1: "Yes. So, when faced with problem, students with FI cognitive styles are able to find out what the mathematical symbols are."

The following is an excerpt from the interview with G2 teacher (SMP Negeri 2 Berbah).

P: "For Student with FI cognitive styles, how were they write the known and asked information about, ma'am?"

G2: "If the FI child answers, they can be only writing known information, and also uses mathematical symbols."

Based on the results of the interview, it can be seen that the metacognitive process of students with FI cognitive styles when understanding the problem is in accordance with the results of the data source analysis that the researcher did.

In this study, to strengthen the data obtained, the researcher conducted a negative case analysis. Researchers found a research results that revealed contradiction, done by Wulan and Anggraini where students with FI cognitive styles made mistakes in making mathematical models [34]. After the researcher conducted a more in-depth analysis, it was found that the results were different because the FI subject in the study did not conduct an in-depth study of the adequacy of the facts provided.

Solution Planning Step

In this step, students with the FI cognitive style are able to consciously know the right way to plan completion by processing information analytically. In the monitoring process, students with FI cognitive styles consciously monitor their thinking by knowing the relationship between what is known and asked about and the knowledge they have. In the evaluation process (evaluating) Student with FI cognitive styles check the steps and strategies that will be used to solve the problem by writing these steps appropriately. This is in line with the research findings of Jusuf which revealed that students with FI cognitive styles are able to know the strategies and stages that must be taken in solving questions [36]. To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the researcher interview with G1 teacher (MTsN 7 Bantul).

P: "When given similar questions, were the students with FI cognitive styles able to identify and determine an appropriate plan, Ma'am?"

G1: "Students with FI cognitive styles know which formula to use, they don't stick with strategies that have been met before."

The following is an excerpt from the researcher interview with G2 teacher (SMP Negeri 2 Berbah).

P: "How do students with FI cognitive styles determine the completion strategy, ma'am?"

G2: "Students with FI cognitive styles did not need to be explained, they can immediately answer. The steps are also in order and can relate the information obtained from their experience. "

Based on the results of the interview, it can be seen that the metacognitive process of students with FI cognitive styles when planning the completion is in accordance with the results of the data source analysis conducted by the researcher.

In this study, to strengthen the data obtained, the researcher conducted a negative case analysis. Researchers found research results that revealed contradiction, done by Suhatini where students with FI cognitive styles did not write down some completion steps, but then appear at the end of the completion [29]. After the researcher conducted a more in-depth analysis, it was found that the result was different because the FI subject in the study felt that they understood and believed in the correctness of the strategy to be used so that they were not fixated on writing down the complete completion steps.

Implementation Step

In this step, students with the FI cognitive style in the planning process are able to consciously think about using the plans that have been made to solve problems. In the monitoring process, Students with FI cognitive styles are able to consciously carry out and monitor the completion steps carried out in accordance with the plan. In the evaluation process, students with FI cognitive styles are able to consciously check the correctness of the steps taken according to the plan so that they get the correct answer. This is in line with research findings from Jusuf, Sili, and Argarini which show that students with FI cognitive styles are able to carry out plans well [36], [37]. To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the researcher interview with G1 teacher (MTsN 7 Bantul).

P: "Are students with FI cognitive styles able to consciously carry out the plan according to the plan previously planned, Ma'am?"

G1: "Yes, the FI does it systematically"

The following is an excerpt from the researcher interview with G2 teacher (SMP Negeri 2 Berbah).

P: "For students with FI cognitive styles, how do they solve problem, Ma'am?"

G2: "The FI child is already smart, so it can be done immediately."

Based on the results of the interview, it can be seen that the metacognitive process of students with FI cognitive styles when implementing the completion plan is in accordance with the results of the data source analysis that the researcher did.

In this study, to strengthen the data obtained, the researcher conducted a negative case analysis. Researchers did not find studies that revealed different results. So that it can be seen that the metacognitive process of students with FI cognitive styles in solving mathematical problems is able to carry out the completion plan according to the predetermined strategy and get the right results.

Rechecking Steps

In this step, students with the FI cognitive style in the planning process are able to think and will examine all the steps taken by recalculating. In the monitoring process, students with FI cognitive styles are able to consciously monitor the steps taken by knowing and correcting mistakes they made. In the evaluation process, students with FI cognitive styles consciously re-examine the steps used by being able to write conclusions along with the correct final answer. This is in line with research findings from Jusuf that students with FI cognitive styles are able to write conclusions accompanied by correct final answers [36]. To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the researcher interview with G1 teacher (MTsN 7 Bantul).

P: "Are students with FI cognitive styles able to write conclusions, Ma'am?"

G1: "So I actually apply the concept that if they do math problems, there must be something what is known, asked, and done. Well, so definitely write a conclusion. "

The following is an excerpt from the researcher interview with G2 teacher (SMP Negeri 2 Berbah).

P: "For students with FI cognitive styles, how do they write conclusions, Ma'am?"

G2: "Students with FI cognitive styles make conclusions, they do it smartly, so it's correct."

Based on the results of the interview, it can be seen that the metacognitive process of students with FI cognitive styles when checking again is in accordance with the results of the data source analysis that the researcher did.

In this study, to strengthen the data that has been obtained, the researcher also conducted a negative case analysis. Researchers found research results that revealed contradiction to the data before, done by Suhatini where students with FI cognitive styles do not re-examine and do not write down the final conclusion [29]. After the researcher carried out a more in-depth analysis, it was found that the result was different because the FI subject in

the study felt that they understood and believed in the correctness of the plans, calculations, and final answers obtained so that they felt no need to write conclusions on the answer sheet.

The Metacognitive Process of Field Dependent Students in Mathematical Problem Solving

Understanding Problem Step

In this step, students with a FD cognitive style in the planning process are able to consciously know the right way to understand the problem, which done by reading the questions three to four times. In the monitoring process, students with FD cognitive styles are able to consciously monitor their thinking in understanding problems by thinking thoroughly or receiving information as it is. In the evaluation process, students with FD cognitive styles were able to consciously re-examine the information obtained by writing what they knew and asked using words. This is in line with research findings from Jusuf, Sili, and Argarini which revealed that students with FD cognitive styles were able to determine information that was known and asked correctly even though they tended to write the same as what in the questions sheet written [36], [37]. To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the researcher interview with G1 teacher (MTsN 7 Bantul).

P: "How did students with FD cognitive style write down information, ma'am? Do they tend to put information in words? "

G1: "When face a problem, students with FD cognitive style written it exactly like the information. For example, the problem is asked about a distance from a place. Then it must be written like that too."

The following is an excerpt from the researcher interview with G2 teacher (SMP Negeri 2 Berbah).

P: "How students with FD cognitive styles writing down known and asked information?"

G2: "Student swith FD cognitive styles actually have no difficulty using simple math symbols."

Based on the results of the interview, it can be seen that the metacognitive process of students with FD cognitive styles when understanding the problem is in accordance with the results of the data source analysis conducted by the researcher.

In this study, to strengthen the data that has been obtained, the researcher also conducted a negative case analysis. Researchers found research results that revealed contradiction, done by Wulan and Anggraini where students with FD cognitive styles still made mistakes in writing what they knew and asked about [34]. After the researcher conducted a more in-depth analysis, it was found that the result was different because the FD subject in the study was unable to understand the problem without guidance from others, especially from the teacher. This is in accordance with the opinion of Witkin which revealed that students with an FD cognitive style tend to need extrinsic or clear reinforcement [22].

Solution Planning Step

In this step, students with FD cognitive style in the planning process are able to consciously know the right way to plan completion by processing the overall information. In the monitoring process, students with FD cognitive styles consciously monitor their way of thinking by linking previously acquired knowledge, but have difficulty linking the information that is known and asked and is easily influenced by the element of deceit. In the evaluation process (evaluating) students with FD cognitive styles did not check the steps and strategies that would be used to solve the problem because they did not realize the concepts that will be used. This is in line with research findings from Sili and Argarini which revealed that students with FD cognitive styles are less capable at the stage of planning completion [37]. To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the researcher interview with G1 teacher (MTsN 7 Bantul).

P: "When you give me a similar problem, are students with FD cognitive styles find it difficult to relate to it, ma'am?"

G1: "If the FD were given different questions, the method used still the same as before. Sometimes I am confused about this. The problem is not related but they use the previous method again."

The following is an excerpt from the researcher interview with G2 teacher (SMP Negeri 2 Berbah).

P: "How did the students with FD cognitive styles determine the strategy for completion, ma'am?"

G2: "For the FD, even the problem is the same, they can't answer. Just change the numbers, and they are confused."

Based on the results of the interview, it can be seen that the metacognitive process of students with FD cognitive styles when planning the completion is in accordance with the results of the data source analysis that the researcher did.

In this study, to strengthen the data obtained, the researcher conducted a negative case analysis. Researchers found research results that revealed contradiction to the data before, done by Wulan and Anggraini where students with FD cognitive styles did not write down the completion steps [34]. After the researcher conducted a more in-depth analysis, it was found that the result was different because the FD subjects in the study still saw the information as a whole (globally) so they felt confused to determine the appropriate concept. This is in line with the opinion of Yahya which states that students with the cognitive style of FD tend to receive information as a whole (globally) [38].

Implementation Step

In this step, students with the FD cognitive style in the planning process are able to consciously think about using the plans that have been made to solve problems. In the monitoring process, students with FD cognitive styles were unable to carry out and monitor the completion steps according to a predetermined plan because they did not know the adequacy of the information obtained. In the evaluation process students with FD cognitive styles do not know how to check the correctness of the steps taken, so they get incorrect results. This is in line with the research findings of Sili and Argarini which revealed that students with FD cognitive styles were unable to evaluate properly, so the final results were not correct [37]. To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the researcher interview with G1 teacher (MTsN 7 Bantul).

P: "Are students with FD cognitive styles able to consciously carry out the plan according to what was planned, Ma'am?"

G1: “Well, if it’s about that, they will write what known but answer differently. For example, there is a problem that is reversed, so there is a question, from it we know about the area and the base of triangle, and then they are told to find the height of the triangle. And they cannot do it"

The following is an excerpt from the researcher interview with G2 teacher (SMP Negeri 2 Berbah).

P: "How did the students with FD cognitive styles carry out the plan for completion, Ma'am?"

G2: “The FD child was lazy. Sometimes they are lazy even when completing the easy questions, how about the difficult ones? "

Based on the results of the interview, it can be seen that the metacognitive process of students with FD cognitive styles when carrying out the completion plan is in accordance with the results of the data source analysis that the researcher did.

In this study, to strengthen the data obtained, the researcher conducted a negative case analysis. Researchers found research results that revealed contradiction, done by Kaliky where students with FD cognitive styles were able to get the right results at the problem-solving stage [30]. After the researcher conducted a more in-depth analysis, it was found that the result was different because the FD subjects in the study only followed the plan that had been previously selected. Because the plan that was chosen beforehand was right, then the final answer obtained was also correct.

Rechecking Steps

In this step, students with FD cognitive style in the planning process are able to think to reexamine the steps taken in an intuitive way (prejudice). In the monitoring process, students with FD cognitive styles were unable to realize how to monitor the steps being taken because they were unable to find and correct mistakes they made. In the evaluation process (evaluating) students with FD cognitive styles were unable to re-examine the steps used so they wrote conclusions only briefly accompanied by incorrect answers. This is in line with the research findings of Jusuf, Sili and Argarini that students with FD cognitive styles are able to write down the final conclusions that are obtained [36], [37]. To verify the accuracy of the data obtained, the researchers conducted interviews with mathematics teachers at MTsN 7 Bantul and SMP Negeri 2 Berbah. The following is an excerpt from the researcher interview with G1 teacher (MTsN 7 Bantul).

P: “How did the students with FD cognitive styles write their conclusions, Ma'am? Do they write conclusions briefly? "

G1: “Wow, no. Sometimes even the conclusion is not written.”

The following is an excerpt from the researcher interview with G2 teacher (SMP Negeri 2 Berbah).

P: "Did the students with FD cognitive styles write down conclusions, Ma'am?"

G2: “If students with FD cognitive styles cannot make conclusions, they must be guided or cooperated with their friends. They also write conclusions randomly, and the answer is also inaccurate."

Based on the results of the interview, it can be seen that the metacognitive process of students with FD cognitive styles when checking again is in accordance with the results of the data source analysis that the researcher did.

In this study, to strengthen the data obtained, the researcher conducted a negative case analysis. Researchers found research results that revealed contradiction, done by Suhatini, Trapsilasiwi, and Yudianto in which students with FD cognitive styles did not re-examine and were unable to write final conclusions [29]. After the researcher conducted a more in-depth analysis, it was found that the study was different because the FD subject in the study experienced confusion when planning and re-examining the answers obtained. Therefore, they were unable to write down the final conclusion.

CONCLUSION

The study shows that there is a difference in metacognitive process between students with FI cognitive style and students with FD cognitive styles in solving mathematical problem. Student with FI cognitive style can realize metacognitive process properly when planning, monitoring, and evaluating in every step of solving mathematical problem. This because students with FI style can think analytically, reveal information with their own language,

know the relation between information, do calculation accordingly, obtain correct answer, recheck the result, and draw correct conclusion.

In the other hand, students with FD cognitive style are lacking in realizing metacognitive process when planning, monitoring, and evaluating every step of solving mathematical problem. This because students with FD style only reveal information exactly as it known, has trouble in understanding the relation between information, has problem to determine the proper strategy, fixate in a way that has been done, and do reexamination based on prejudice so they are not able to draw conclusion correctly. Based on the conclusions, the researchers suggest that alternative learning process must be provided, one of the ways is by providing variety of questions and exercise on the topic discussed, the student accustomed to solve a not routine problem.

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