

Mathematical Problem Solving Ability Based on KOLB Learning Style in Creative Problem-Solving Learning Models

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Article Info

History Articles

Received:
August 2019
Accepted:
September 2019
Published:
August 2021

Keywords:

*creative problem-solving,
learning styles,
KOLB models,
problem-solving,
problem-solving skills*

DOI

<https://doi.org/10.15294/jpe.v10i2.34309>

Abstract

The purpose of this study was to determine the quality of learning of the CPS learning model on the ability to solve math problems in fifth-grade students and describe the patterns of students' mathematical problem-solving abilities in terms of learning styles. This research is a qualitative descriptive study with the subject of fifth-grade students at Public Elementary School 1 Kalibawang, Wonosobo consisting of 18 students. The instruments used in this study were test and interview instruments. Data analysis includes reduction, presentation of data, and conclusion. The results showed the quality of learning with the CPS learning model on the ability to solve mathematical problems in both categories. It is shown with the results of the validation of proper learning tools, good quality learning, and the average score of students completing. Students with convergent learning styles can solve problems until the stage of re-checking, but at the stage of planning problem-solving lacks detail. Students with divergent learning styles can solve problems up to the stage of checking back, and can solve them well. Students with an assimilation learning style can solve problem until the re-checking stage, but at the planning stage of problem-solving are not perfect. Students with accommodation learning style can solve problem until re-checking stage, but at the stage of carrying out problem solving are not complete.

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[p-ISSN 2252-6404](#)

[e-ISSN 2502-4515](#)

INTRODUCTION

Education is an essential in the current of globalization era. Education is the main key to the progress of a nation, one of which is to form human resources that can compete with other nations. Education is expected to improve the quality of human resources who can compete, can create people who believe in God Almighty, capable, and creative. The quality of education in Indonesia is quite low if compared to other countries. This is indicated in the Education for All Development Index (EDI), in 2014, Indonesia was ranked 57 out of 115 countries. Junaedi (2012) states the results of international research related to the performance of students in Indonesia in solving the problem description (problem-solving) is still not satisfactory. In line with Junaedi statement, the results of observations of ten elementary schools in Kalibawang Subdistrict, Wonosobo Regency, more than 50% of students had difficulty in solving mathematical problems. These difficulties are characterized by low semester test scores and school exam scores. According to several teachers in the Kalibawang district teacher working group, there are still many students who have difficulty in learning mathematics. How to learn mathematics in students only by reading the subject, even though it takes routine practice to be able to solve mathematical problems.

Students at Public Elementary School 1 Kalibawang still have difficulties. This is triggered by inappropriate learning methods, only by reading the subject, whereas in learning mathematics, it is necessary to practice solving various kinds of problems. Improving the quality of learning is a must so that it can always be up to date in receiving rapidly advancing technological advancements. Learning done in class must be able to equip students to become strong human beings, and be ready to face the competition to come, to improve the quality of learning, it is necessary to use an innovative learning model that is used by teachers to help students to analyze the thinking processes, so students can be creative in solving problems in learning activity. Hendriani, Masrukan, and Junaedi (2017) state

that the ability to solve problems for students needs to be pursued, so students can find solutions to problems in learning mathematics.

One innovative learning model that can be used to improve problem-solving skills is the creative problem-solving learning model. According to Nursiam and Soeprodjo (2015) learning models using creative problem-solving are useful in learning outcomes. The results also showed that the creative problem-solving model significantly affected problem-solving ability. According to Ciptaningtyas (2016) research, creative problem-solving models have a positive impact on student learning outcomes and get positive responses from students. The results of Utami, Kartono, and Waluya (2015); Purwati (2015) research stated that the ability to solve mathematical problems using creative problem-solving models is better than that of using expository models. Learning with a creative problem-solving model will require students to be able to think critically, creatively, think of all possibilities that can be passed to achieve the goal. Syazali (2015) also states that the best learning model to improve students' mathematical problem-solving abilities is the application of creative problem-solving learning models and assisted with Maple 11 media.

Learning with a creative problem-solving model will help students learn to solve problems gradually, and creatively, so students will be trained in solving problems. However, not all students can easily accept learning subject that demands problem-solving, because in learning subject students have different ways of learning. The way students learn is called learning style. Different learning styles of each student cause and are not understood by the teacher resulting in the planting of the material to be less than the maximum. Therefore, knowledge of student learning styles is needed, so that a teacher can determine the best learning design so that the potential of students can be maximized.

Knowledge of learning styles must be possessed by a teacher to determine the way of learning that is suitable for students' learning styles. Hidayat (2015) research results state that using David Kolb learning style can improve

understanding of mathematical concepts. Research on the Kolb Model learning style is expected to be able to determine the learning styles of students, to improve the ability to solve mathematical problems. Xu (2011) Learning style is preferred way for a student to learn. Hidayat (2015) learning style is a way of learning students to process, know, and represent information with learning methods that he likes by using stimulants in the learning process. Karim (2014) states learning style is a way for someone to absorb, organize, and process information subject or learning subject. Pritchard (2009) states that learning styles are habits, strategies, or mental behaviors that are commonly used when learning, especially learning in education, as a person's appearance. Nurmalasary (2018) says that there is an influence between learning styles on mathematics learning achievement. Student learning styles are obtained based on the Kolb Model questionnaire. The results of filling out the learning style questionnaire found that the Kolb learning style converged by 17% of students, divergent learning styles by 44% of students, assimilation learning styles by 28% of students, and accommodation learning styles by 11% of students.

The purpose of this study is to obtain a description of the quality of learning using creative problem-solving models of the ability to solve math problems in fifth-grade students and receive a description of the pattern of mathematical problem-solving abilities of fifth-grade students in Public Elementary School 1 Kalibawang in terms of learning styles.

METHODS

This research is a qualitative descriptive study. The research design used in this study is qualitative. This research was conducted at Public Elementary School 1 Kalibawang, Kalibawang District, Wonosobo Regency, Central Java in the even semester of 2018/2019. The subjects were grade V students at Kalibawang Public Elementary School 1, which were observed in their ability to solve a problem creatively.

Data sources used to determine the quality of the learning process are obtained based on learning tools that include syllabi, lesson plans, worksheets, practice sheets, and problem-solving ability tests, also by using learning observation sheets with creative problem-solving learning models. The pattern of students' problem-solving abilities was obtained from the results of solving mathematical problems carried out at the time of the test by each learning style, while data on obstacles in solving problems were obtained from interviews with the subject of the Kolb Model learning style.

Analysis of the validity of the learning device is used to determine the validity of the learning device. The validity of the learning kit includes syllabus, lesson plans, student worksheets, and problem-solving skills. Validation of learning tools is done by asking for an expert opinion. The assessment results on the validation sheet by each validator on the learning kit are analyzed based on the average score. The average score is included in the category of not good, less good, good, and very good.

Good quality learning process when there is an interaction between students and teachers, through learning resources in the learning environment. The quality of the learning process is assessed by learning planning, learning implementation, and assessment. The value of learning planning is obtained from the validation results by an expert validator of three people. The value of the implementation of learning is obtained from observations of the application of learning using creative problem-solving learning models. The value of the assessment can be seen from the results of the test of problem-solving ability after the learning has been carried out.

The pattern of students' problem-solving abilities is known by giving questions in the form of problem descriptions in the lowest common multiple (LCM) subject. Researchers provide problem descriptions to be solved following the steps of solving the problem. Polya's problem-solving steps assess the problem-solving process of students. The pattern of problem-solving abilities discussed in this study is based on learning styles.

RESULTS AND DISCUSSION

Quality of Learning

The quality measured in this study includes planning, implementing, and evaluating. In the planning stage, syllabus, lesson plans, worksheets, and problem-solving ability (TKPM) preparations are prepared. The device created was validated by an expert validator. There were three expert validators in this study. The assessment of learning tools assessed by the validator is presented in Table 1.

Table 1. Validation of Learning Devices

Device type	Category	Category
Silabus	Good	Can be used
RPP	Good	Can be used
LKS	Good	Can be used
TKPM	Good	Can be used

Based on Table 1, validated learning tools are included in both categories and can be used as learning tools used for research. At the learning implementation stage, quality is measured from the learning achievement sheet. Implementation of quality learning if the results of observations of the implementation of learning are minimal in category good. Teacher assessment in the implementation of learning is done five times in five meetings. The results of the assessment of the feasibility of learning in five meetings can be said to be quality because of the score of observing the implementation of learning in good category.

For more details, observations of the implementation of learning are listed in Table 2.

Table 2. Average Score for Learning Execution

Meeting	Category
Meeting 1	Good
Meeting 2	Good
Meeting 3	Good
Meeting 4	Good
Meeting 5	Good

Based on Table 2, the implementation of learning with creative problem-solving models included in both categories. At each learning, a meeting conducted included in good category.

Problem solving ability tests is performed at the learning assessment stage Problem-solving

ability tests are conducted to determine the ability of students after learning by using a creative problem-solving model. From the results of tests of problem-solving abilities obtained average score is complete.

Based on the research, it was found that learning with creative problem-solving models is good quality. This means learning from lesson plan, learning implementation and assessment, included in good category, so learning used creative problem-solving models has good quality.

This study is in line with Hariawan, Kamaluddin, and Wahyono research (2013) which states that the creative problem-solving learning model significantly influences students' ability to solve physics problems. Also, Zulyadaini research (2017) found that there is an influence of creative problem-solving learning models on students' mathematical problem-solving abilities. So, learning with quality creative problem-solving can affect students' ability in problem-solving. Cahyani, Khoiri, and Setianingsih research (2019) creative problem-solving learning model has a positive effect on the mathematical problem-solving ability of fifth-grade students of Public Elementary School Pandean Lamper 01 Semarang.

The Pattern of The Problem-Solving Ability of Learning Styles Converges

The ability to solve mathematical problems at the stage of understanding problems on convergent subjects in category good. The convergent subject writes information based on the questions given. Figure 1 answers convergent subjects in understanding the problem.

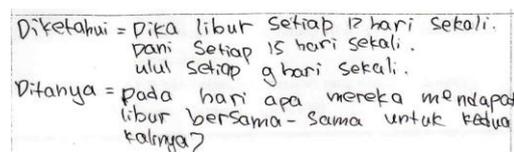


Figure 1. Answers to Understanding The Problem of Convergent Student

Figure 1 shows the convergent student in understanding the problem of writing information that is known and asked, but

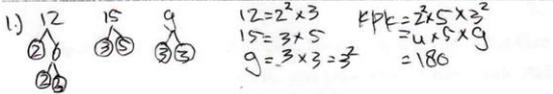
incomplete. Convergent student can understand the problem well but are still incomplete in writing information that is known and asked.

In the problem-solving planning stage, convergent subjects can write a problem-solving plan. Figure 2 is the result of convergent subject work in planning problem-solving.

Rencana 1. dibuat pohon faktor
 2. dibuat kelipatan bilangan

Figure 2. Answers to The Convergent Student Settlement Plan

Figure 2 shows the convergent student making a problem-solving plan, but not in detail. Plans made by convergent student are just made of a factor tree, and multiples of numbers are made without any plans to be made next.

1) 

2) 12 = 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144
 15 = 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, 180
 9 = 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108, 117, 126, 135, 144, 153, 162, 171, 180

Figure 3. Answers for Implementing The Convergent Student Completion Plan

Figure 3 shows the convergent student carrying out the completion plan in full. Convergent student carry out the plan well following the plans that have been made, namely the factor tree and the multiple of numbers. Through both steps, the same results are obtained.

Convergent student reexamine the answers that have been obtained. The convergent student counts again by counting from the factor tree search with multiples performed. It also counts up to answer according to the questions. Figure 4 results of convergent subject work in re-checking the answer.

Figure 4 convergent student check back the settlement that has been done well so that the right answer is obtained as expected from the problem.

hari apa mereka mendapat libur bersama-sama untuk kedua kalinya? 180 : 7 hari = 25 sisa 5
 hari minggu + 5 hari = jumat

Figure 4. Answers to Re-examine the Results of Convergent Student Settlement

Based on the results of research on the subject of students who have convergent learning styles, obtained information that shows that students with convergent learning styles can solve problems until the re-checking stage. The pattern of students' ability to solve problems in converging learning styles is as follows: (1) students with convergent learning styles can understand the problem. The level of understanding of students' problems with convergent learning styles in either category. Students with convergent learning styles can write information that is known, and asked, (2) Students with convergent learning styles can plan problem-solving. Students can plan problem-solving but still lack detail. Students can write down how to solve problems by determining the steps of problem-solving through searching using the Corruption Eradication Commission from known information, (3) Students with convergent learning styles can implement and solve the mathematical problem well, (4) Students with convergent learning styles can re-check the answers that have been completed.

The description above shows that students with convergent learning styles have good mathematical problem-solving skills. Indicators of NCTM problem-solving students with convergent learning styles can achieve that are indicators one, two, and four, namely indicators of applying, and adapting various approaches and strategies to solve problems, solve problems that arise in mathematics or in other contexts involving mathematics, monitor, and reflect on the mathematical problem-solving process. The results of this study are following the results of research conducted by Riau, and Junaedi (2016) which states that students with convergent learning styles can solve problem-solving in the step of checking back, but differ in understanding

the problem, making plans, and implementing problem-solving.

Divergent Learning Style, Problem-Solving Ability Patterns

Divergent subjects can understand the problem well. Based on the answer sheet, divergent subjects can write information well. Figure 5 the result of Divergent subject in understanding the problem.

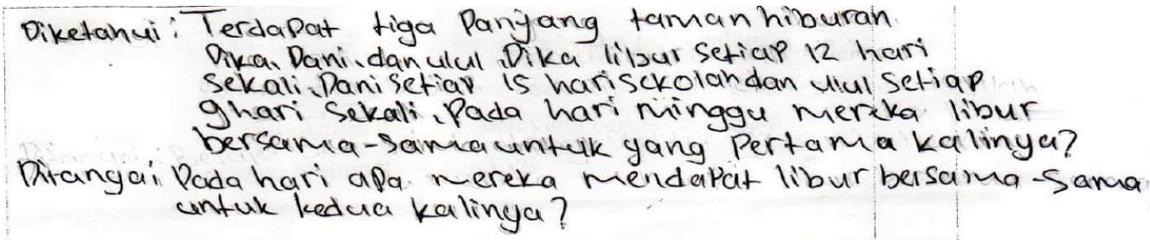


Figure 5. Answers to Understanding Divergent Student Problems

Figure 5 shows divergent student understand the problem well. Divergent student write information that is known and asked in full following the information in the problem.

At the stage of making a problem-solving plan, divergent student can write down a problem-solving plan. Figure 6 is the result of divergent subject work in planning problem-solving.

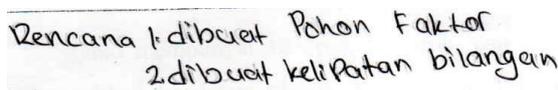


Figure 6. the Answers of Problem-Solving Plan for Divergent Student

Figure 6 shows a divergent subject writes down a detailed problem-solving plan. Student only write down the factor tree and make multiples.

At the stage of implementing the problem-solving plan, the divergent subject can carry out well. Divergent student can complete the questions given following the plans that have

been written before. Figure 7 shows divergent student able to carry out the plan well.

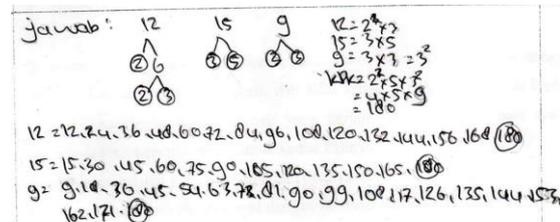


Figure 7. The Answer of Implementation The Problem-Solving of Divergent Student Plan

Figure 7 shows the divergent student implementing the completion plan in full and getting good results. Divergent student implement plans according to the plans that have been prepared and get the same results in two different ways.

Divergent student re-examine the answers that have been obtained. Divergent student count again by counting from a factor tree search with multiples performed. It also counts up to answer questions according to the questions. Figure 8 is the result of divergent work of the subject in rechecking the answer.

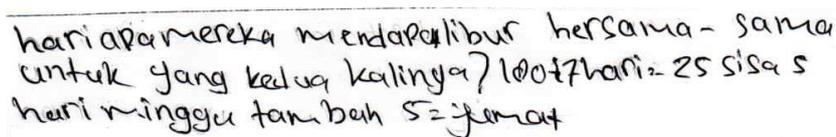


Figure 8. The Answers to Re-examine Divergent Student Problem-Solving

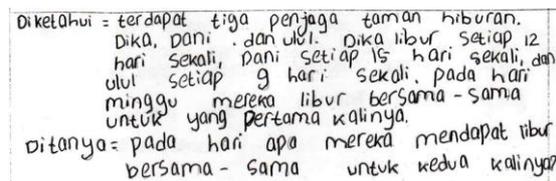
Figure 8 divergent student can check back the settlement that has been carried out and get results according to what was asked.

Based on the results of research on the subject of students who have divergent learning styles, information obtained shows that students with divergent learning styles can solve problems until the re-checking stage. The pattern of students' ability to solve problems in divergent learning styles is as follows: (1) Students with divergent learning styles can understand the problem — the level of understanding of students' problems with divergent learning styles in either category. Students with divergent learning styles can write things that are known and ask, (2) Students with divergent learning styles can plan problem-solving. Students can write down how to solve problems by determining the steps of problem-solving through searching using the Corruption Eradication Commission from known information, (3) Students with divergent learning styles are incomplete in carrying out mathematical problem-solving plans, (4) Students with divergent learning styles can check again on the answers that have been completed.

The above description shows that students with divergent learning styles have good mathematical problem-solving skills. NCTM problem-solving indicators that can be achieved by students with divergent learning styles are indicators one, two, and four, which are indicators of building new mathematical knowledge through problem-solving, solving problems in various contexts related to mathematics, and reflecting on the problem-solving process. The results of research from Rofiqoh, Rochmad, and Kurniasih (2016) that students with divergent learning styles can understand problems, and explain problems according to their sentences. This means that students with divergent learning styles can solve problems well.

Assimilation Learning Style as The Problem-Solving

The student of assimilation can understand the problem well. Based on the answer sheet, the student of assimilation can write information well. Figure 9 results of the assimilation of the student work in understanding the problem.

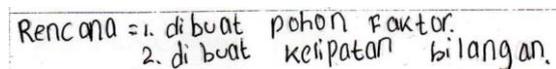


Diketahui = terdapat tiga penjaga taman hiburan.
Dika, Dani, dan Ulul. Dika libur setiap 12 hari sekali, Dani setiap 15 hari sekali, dan Ulul setiap 9 hari sekali. pada hari minggu mereka libur bersama-sama untuk yang pertama kalinya.
Ditanya = pada hari apa mereka mendapat libur bersama-sama untuk kedua kalinya?

Figure 9. Answers to Understand The Student Assimilation Problem

Figure 9 shows the assimilation student writing the information that is known and asked in full following the information in the problem.

At the stage of making a problem-solving plan, the assimilation student can write down the problem-solving plan. Figure 10 results of the assimilation of the student work in planning problem-solving.



Rencana = 1. dibuat pohon faktor.
2. di buat kelipatan bilangan.

Figure 10. The Answers of Resolving Assimilation Student Problems Plan

Figure 10 assimilation student write a completion plan but do not detail what will be implemented. The assimilation student only writes the factor tree and multiples.

At the stage of implementing the problem-solving plan, the student of assimilation can carry out well. The student of assimilation can carry out the plan following what was previously planned. Figure 11 shows the student of assimilation capable of carrying out the plan well.

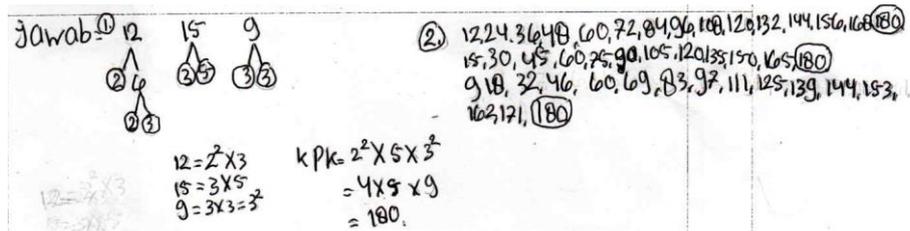


Figure 11. Answer of The Implementation of the Assimilation Student Problem Resolution Plan

Figure 11 The student of assimilation carried out the plan well and was written in full. The student of assimilation carried out the plan following the plan that had been made.

The assimilation student re-checks the answers that have been obtained. The student of assimilation is recalculated by counting from a factor tree search with multiples performed. It also counts up to answer questions according to the questions. Figure 12 below is the result of good work on the student of assimilation in checking the answers.

hari apa mereka mendapat libur bersama-sama untuk kedua kalinya? 180 ÷ hari = 25 sisa 5.
hari minggu + 5 = jumlah.

Figure 12. The Answer of Re-Checking Assimilation of Problem-Solving Student

Figure 12 assimilation student can check the results of the settlement well so that the answers obtained following what was asked.

Based on the results of research on the student of students who have the learning style of assimilation, obtained information that shows that students with an assimilation learning style can solve problems until the re-checking stage. The pattern of students' ability to solve problems in the assimilation learning style is as follows: (1) Students with an assimilation learning style can understand the problem — the level of understanding of students' problems with assimilation learning styles in either category. Students with an assimilation learning style can write things that are known and asked, (2) Students with an assimilation learning style can plan problem-solving. Students can write down how to solve problems by determining the steps of problem-solving through searching using the KPK of things that are known, (3) Students

with assimilator learning styles can implement and solve mathematical problem problems well, (4) Students with an assimilation learning style can check again on the answers that have been completed.

The description above shows that students with assimilation learning styles have good mathematical problem-solving skills. NCTM problem-solving indicators that can be achieved by students with an assimilation learning style are indicators one, two, and four, which are indicators of building new mathematical knowledge through problem-solving, solving problems in various contexts related to mathematics, and reflecting on the problem-solving process. This is different from research conducted by Daimaturrohmatin, and Rufiana (2019) which states that the type of learning style of the assimilator is less able to conclude the results of the solution clearly. Whereas in research conducted by researchers, students can conclude well.

The Pattern of Problem-Solving Ability to Learn Accommodation Style

Figure 13. Answers to Understand the Student of Accommodation. The student of accommodation can understand the problem well. Based on the answer sheet, the student of accommodation can write information well. Figure 13 below is one of the results of the work of the student of accommodation in understanding the problem.

Diketahui: Dita libur 15 hari sekali
Dani libur 12 hari sekali
Ulul libur 9 hari sekali
Ditanya: Pada hari apa mereka libur bersama?

Figure 13. Answers to Understand the Student of Accommodation

Figure 13 shows the student of accommodation writing information that is well known and asked but is incomplete.

At the stage of making a problem-solving plan, the student of accommodation can write down a problem-solving plan. Figure 14 below is the result of the accommodation student in problem-solving plan.

1. Membuat Pohon faktor
2. Membuat faktorisasi prima

Figure 14. The Answers of The Problem Student Plan Resolution

1. $12 = 2^2 \times 3$
 $15 = 3 \times 5$
 $9 = 3^2$

KPK = $2^2 \times 3^2 \times 5$
 $= 4 \times 9 \times 5$
 $= 36 \times 5$
 $= 180$

2.
 $12 = 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, 168, 180$
 $15 = 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, 180$
 $9 = 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108, 117, 126, 135, 144, 153, 162, 171, 180$

Figure 15. The Answers of the Implementation of Accommodation Student Problem-Solving Plan

Figure 15 student of accommodation implement problem-solving properly following the planned plan and write in full. The results obtained from the two steps are the same.

The student of accommodation checks the answers already obtained. The student of

Figure 14 student of accommodation write a plan for completion well, but not in detail. The student of accommodation is just writing down, making factor trees and making prime factorization.

At the stage of implementing the problem-solving plan, the student of accommodation can carry out well. The student of accommodation can carry out the plan following the plan that has been written before. Figure 15 shows the student of accommodation being able to carry out the plan well.

accommodation recalculates by calculating the factor tree search with multiples performed. It also counts up to answer questions according to the questions. Figure 16 results in a good job of the student of accommodation in re-checking the answer.

Mereka libur bersama pada hari jumat.

Figure 16. The Answers of Looking Back to The Problem Solving of the Student Accommodation

Figure 16 student accommodation re-checking the answers that have been implemented, and get answers to questions on the problem, but the solution is not written in detail. The student of accommodation only writes the final result.

Based on the results of research on the student of students who have accommodation learning styles, obtained information that shows that students with accommodation learning styles can solve the problem until the stage of re-

checking. The pattern of students' ability to solve problems in accommodation learning styles is as follows: (1) students with accommodation learning styles can understand the problem — the level of understanding of students' problems with accommodation learning styles in good category. Students with accommodation learning styles can write things that are known and ask, but still incomplete in writing known, (2) students with a learning style of accommodation are incomplete in making problem-solving plans, (3) students

with accommodation learning styles can implement, and solve math problem problems well, (4) students with accommodation learning styles can check again on the answers that have been completed.

The description above shows that students with accommodation learning styles have good mathematical problem-solving skills. NCTM problem-solving indicators that can be achieved by students with accommodation learning styles are indicators one, two and four namely indicators of building new mathematical knowledge through problem-solving, solving problems in various contexts related to mathematics and reflecting on the problem-solving process.

The obstacles faced by students with epistemologically convergent learning styles are the obstacles that come from students' knowledge, including the following: (1) Students with convergent learning styles in understanding problems must be read repeatedly, so that they can only write down what is known, and asked in full, (2) Students with convergent learning styles lack detail in determining plans to be implemented to solve problems, (3) Students with convergent learning styles do not have obstacles in carrying out problem-solving, (4) Students with convergent learning styles do not have barriers to checking back.

Barriers faced by students with epistemologically divergent learning styles are obstacles that originate from students' knowledge, including: (1) Students with divergent learning styles in understanding problems must be read repeatedly so that they can only write down what is known, and asked in full, (2) Students with divergent learning styles do not have obstacles in planning problem solving, (3) Students with divergent learning styles are less complete in carrying out problem-solving, so answers that should be expected are not achieved, (4) Students with divergent learning styles do not have obstacles in checking back.

Barriers faced by students with epistemological assimilation learning styles are obstacles that originate from students' knowledge, including students with assimilation

learning techniques in understanding problems must be read repeatedly so that they can write what is known and asked in full, students with assimilation learning styles lack detail in determining plans to be implemented to solve problems, students with an assimilation learning style have no obstacles in solving problems, students with an assimilation learning style have no barriers in checking back.

Barriers faced by students with epistemological accommodation learning styles are obstacles that originate from students' knowledge, including: students with accommodation learning styles in understanding problems must be read repeatedly so that they can only write what is known and asked, students with accommodation learning styles are incomplete in making problem-solving plans, students with accommodation learning styles have no obstacles in implementing problem-solving plans, students with accommodation learning styles have no obstacles in re-checking the answers that have been implemented.

CONCLUSION

The conclusions that can be drawn from the results of the study show that the quality of learning with the CPS model on the ability to solve mathematical problems in category good shown with the results of the validation of good learning tools, good quality learning, and the average score of students completing. Students with convergent learning styles can solve problems until the stage of re-checking, but at the stage of planning problem-solving lacks detail. Students with divergent learning styles can solve problems up to the stage of checking back and can solve them well. Students with assimilation learning styles can solve problems until the re-checking stage, at the stage of planning problem solving is not perfect. While students with accommodation learning styles can solve problems until the re-checking stage, but at the stage of carrying out problem-solving is not complete.

ACKNOWLEDGMENT

The researcher gratefully thank to the principal and the teachers of SD N 1 Kalibawang for allowing and helping during the research there.

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