Analysis mathematical literacy skills in terms of the students’ metacognition on PISA-CPS model

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Abstract. This research was aimed to know the effectiveness of PISA-CPS model and describe the mathematical literacy skills (KLM) in terms of the students’ metacognition. This study used Mixed Methods approaches with the concurrent embedded design. The technique of data analysis on quantitative research done analysis of lesson plan, prerequisite test, test hypothesis 1 and hypothesis test. While qualitative research done data reduction, data presentation, and drawing conclusion and data verification. The subject of this study was the students of Grade Eight (VIII) of SMP Islam Sultan Agung 4 Semarang, Central Java. The writer analyzed the data with quantitative and qualitative approaches based on the metacognition of the students in low, medium and high groups. Subsequently, taken the mathematical literacy skills (KLM) from students’ metacognition in low, medium, and high. The results of the study showed that the PISA-CPS model was complete and the students’ mathematical literacy skills in terms of the students’ metacognition taught by the PISA-CPS model was higher than the expository learning. Metacognitions’ students classified low had mathematical literacy skills (KLM) less good, metacognitions’ students classified medium had mathematical literacy skills (KLM) good enough, metacognitions’ students classified high had mathematical literacy skills (KLM) very good. Based on result analysis got conclusion that the PISA-CPS model was effective toward the students’ mathematical literacy skills (KLM). To increase the students’ mathematical literacy skills (KLM), the teachers need to provide reinforcements in the form of the exercises so that the student’s mathematical literacy was achieved at level 5 and level 6.

1. Introduction
The programme of International Student Assessment was international literacy study in reading literacy, Mathematics Literacy, Problem solving literacy, and science literacy and the new was financial literacy [1]. The Indonesian students' mathematical literacy skill at international level had not been encouraging. The results of participation in the assessment through the Program for International Student Assessment (PISA), sponsored by country of The Organization for Economic Cooperation and Development (OECD) from 2000 to 2015, ranking Indonesia was still at the bottom with an average still far from the International score. The results of PISA data in 2015 showed that the mathematics achievement of Indonesia was very low [2]. the result of PISA in 2015 showed that mathematic accomplishment in Indonesia was level 62 from 70 countries with a gain score was 386 [3].
Effective learning is a learning that allows students to learn specific skills, knowledge, and make students happy. Effective learning makes students to learn something useful, such as fact, skill, the concepts value and how to live in harmony with others or a desired learning outcome.

The level of mastery of students in learning mathematics at Islamic Junior High School 4 Sultan Agung Semarang had not yet reached KKM determined. One of the factors that influence was the accuracy of the learning model used. Teachers still considered the students had the same ability to absorb the lessons and solve mathematical problems. The teacher still focused on basic competence (KD), so the development of mathematical literacy had not been maximized. Another problem arose when learning in the classroom only emphasized the result that students tend to be more individualistic, closed and less able to socialize so that students' attitudes became antipathy and did not care about each other and the environment was increasing.

Metacognition was interpreted as thinking about what was thought [4]. Metacognition was a person’s knowledge of own cognitive process and product or whatever related to it [5]. According to [6] Metacognition was thinking itself and management of learning itself. Metacognition meant a person’s awareness of the thinking process and its ability to control the process. The level of students’ metacognition in solving mathematical problems was Tacit use (using of thought without awareness), Aware use (using of thought with awareness), Strategic use (using of thought which was strategic), Reflective use (using of thought Which was reflective). Metacognition of problem solving used as the National curriculum reference in many developed countries. such as the mathematics curriculum framework in Singapore, make mathematics problem solution as its center and to achieve it needed various components such as attitudes, metacognition, processes, concepts, and skills [7]. The awareness of person’s thinking could be observed. So the level of awareness of students' thinking could be observed on the steps which was done in solving a problem.

Metacognition level measured by several stages namely stage planning, monitoring, and evaluating. Based on the previous description, the purpose of this study were: (1) to know learning in the classroom by using Model-CPS PISA effective, and (2) to describe the mathematical literacy skills (KLM) in terms of students’ metacognition on PISA-CPS model.

2. Methods
This research was research of mixed method with concurrent embedded design. Quantitative research was to know the effectiveness of PISA-CPS learning, while qualitative research was to know description of KLM in terms of students' metacognition.

The research was conducted at Islamic Junior High School of Sultan Agung 4 Semarang, the material taken were cube and beam. Research subject were the second grade students of Islamic Junior High School of Sultan Agung 4 Semarang. Research subjects on quantitative research were experimental class (VIII-A2) and control class (VIII-A4). In qualitative research, the research subjects used only class which got PISA-CPS learning namely experimental class (VIII-A2). Selection of study subjects used random sampling technique. The research subjects was chosen from the experimental class (VIII-A2) grouped into group subject low, medium, and high based on metacognition inventory results, where each group was chosen two students to be analyzed by KLM in terms of students' metacognition.

The data sources of this study were got from the results of student KLM test were pre-test and posttest, interview result sheet, and inventory result. The research instrument consists of research instrument test and non-test. The test research instrument was KLM test. Non-test research instruments included inventory and interview sheets. Each research instrument was done validated and try out. Inventory and interview sheet were not done try out. The technique of analysis data on quantitative research was done analysis of lesson plan, prerequisite test, hypothesis test I and hypothesis test II. The analysis of Prerequisite test includes normality test, homogeneity test and equality test of two averages. Hypothesis test I includes individual completeness test and classical completeness test. The hypothesis test II includes the average difference test. while in qualitative research conducted data reduction, data presentation, and drawing conclusion and data verification.
3. Result and discussion
The research result were described into two research phases, namely quantitative research phase and qualitative research phase. On quantitative research phase examined the effectiveness of PISA-CPS learning on students’ KLM through mastery test, and KLM average difference test. According to [8] learning stated classical complete if the students’ proportion got score 70 had reached 75%. Based on the result of previous data analysis (prerequisite test) obtained that the second sample classes were from the normal distributed population, had the same variance or homogeneous, and there was no KLM difference average between the second sample. It meant that the sample comes from condition or the same condition.

Based on the results of test mastery learning, student by PISA-CPS learning had achieved mastery. Students who achieved a minimum mastery criteria(KKM = 70) individually were 88.89%, while based on mastery test showed that students group with PISA-CPS learning achieved classical mastery. Furthermore effectiveness criteria for the second obtained from KLM average difference test, which KLM average result taught by learning PISA-CPS higher, amounting to 74.58 when compared with class taught expository learning classes 65.66. The mastery test results and students’ KLM average difference test showed that PISA-CPS learning was effective of student KLM.

The CPS learning had a good impact on academic achievement when compared with expository learning. Using PISA-CPS learning, then students were accustomed to solving problems of KLM and overcoming difficulties in learning math and able to help to improve the problem-solving skills.

Description of qualitative research results can be seen on the results of inventory data of the students of class VIII-A2 at Islamic Junior High School 4 Sultan Agung 4 Semarang that is 10 students in high category, 11 students in medium category, and 9 students in low category. Each category has different KLM.

Analysis of students’ KLM taught by PISA-CPS learning divided into three groups based on students’ metacognition namely students of low group, medium, and high. Low group students were represented by subjects S02 and S08, middle group students were represented by subjects S03 and S09, and high group students were represented by subjects S10 and S20. Here was presented student inventory score graph of each KLM student by PISA-CPS learning on the first Graph.

![Figure 1. Grouping of research subjects](image_url)
Based on the first Graph that Analysis was done by describing the group by looking KLM in terms of metacognition. The analysis result showed that subject with low student metacognition had KLM such as the component of Communication, Reasoning and Argument, Devising Strategies for Solving Problems, Using symbolic, Using Mathematics Tools had weakness but on mathematizing component, the subject was able to change the problems of the real world in the mathematic form and subjects used modeling coherently according to problem given and the subject representation components was able to give reasons for the object which would be measured and could be observed well.

The strategy used was not so appropriate that problems could not be solved well. Subjects should be more accustomed to be able to understand the concept given and can provide reasons about the context of the problem. Subjects were not so able to interpret well. The strategy to solve the problem was quite simple and less connect that gained results of answer less maximum.

Subjects with medium students’ metacognition had KLM as the component of communication, mathematising. Represetation and Using Mathematics Tools was quite good but on component of Reasoning and Argument, subject was able to reason and providing a logical reason. In component Devising Strategies for Solving Problems, subjects used planning mechanisms of problem-solving properly planning so that obtained the right solution also. Using symbolic component, the subject was able to understand the relationship between the context of the problem and the representation of the solution at the end of the test.

The subject did not understand the problem maximally. Subjects should be more accustomed to be able to understand the concept given and could provide reasons about the context of the problem. Subjects could summarize information, present problem-solving processes, and interpret solutions. Analysis of the subject in solving the problem was quite coherent so that it could be understood. The strategy used was quite appropriate in order to get the answer result that was quite appropriate based on the context of the problems presented. Subjects with high students’ metacognition had KLM as components of Communication, mathematising, Representation, Reasoning and Argument, Devising Strategies for Solving Problems, Using symbolic, and Using Mathematics Tools is very good.

Generally, high capable subjects were capable of all components of mathematical literacy. Subjects could complete what was already planned. Subjects wrote down what was known and what was asked. Analyze of subject in solving problem both good and coherent so easy to be understood. The subject gave a reasonable conclusion or language used logically. The strategy used to solve the problem was proper in order to get proper answer results based on the context of the problems presented. Subjects had understood the problem, be able to interpret and manipulate well.

The results was supported by research by [9] stated that character education and the resulting PISA assessment have valid category, practical and effective to improve students' math literacy problem solving skills of junior high school. The conclusion of learning was quite good and the character of the students improved to be better. The research results of [10] conducted research which used qualitative approach method. From the data analysis obtained, it can be concluded that students’ mathematics literacy skill of the second grade of Vocational High School(SMK) RoudlotusSaidiyyahsamarang was still low, not all constructivism values were reflected in learning, and the most prominent character of the students is the responsibility than the character of curiosity, stand alone and creative.

Improvement of literacy skills could not be separated from PISA-KLM tests that refer to assessment not only knowledge as a domain but also applying that knowledge. According to [11] defined mathematical literacy as the knowledge for applying mathematics into daily life. Literacy included reading skill, writing, speaking, counting arguments, and manipulate verbal symbol and visual or concepts. Literacy was the reading skill and activity related to reading.

PISA-CPS learning was able to encourage the learning of students who have different metacognition. This was based on the research of [12], which concludes that metacognition strategies gave a positive impact on students' success in solving problems. The Research [13], on the problem-solving behavior of two candidates of teachers who solve individually on non-routine questions about
geometry. The Sketpad software has become a tool that facilitates the discovery and investigation of metacognition processes. During reading, understanding, and analyzing, the prospective teacher used the monitor to create, draw diagrams and allocate potential resources and approaches that help to make decisions. Similarly, research by [14], which showed that there was a positive relationship of metacognition awareness and cognitive skills.

4. Conclusion
Based on the analysis and discussion gained conclusions as follow: (1) PISA-CPS learning was effective on students’ KLM; (2) Low students' metacognition had poor mathematical literacy skills, Medium metacognition students were having good mathematical literacy skills, high students’ metacognition had very good mathematical literacy skills. To increase students’ KLM then teachers need to provide strengthening in the form of exercise of math literacy questions so that students’ KLM on the fifth level and the sixth level was achieved.

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