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Application of Problem-based Learning assisted by Decision Maker Application on Computational Thinking Materials to Improve Student Learning Outcomes

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ABSTRACT

Computational thinking material in Informatics subjects requires the same pattern of thinking as how technology works. Where can receive assignments and complete these tasks quickly. Decision-maker applications are able to make decisions quickly, and efficiently, and optimize the process of making decisions about a problem. By applying problem-based learning assisted by decision-maker applications on smartphones in computational thinking material in Informatics lessons, it is able to improve student learning outcomes. Student learning outcomes increase in each cycle, where in the pre-cycle it produces an average score of 78 ¸ the highest score is 88 and the lowest score is 68. In cycle I, the average score increases to 82 ¸ the highest score is 89 and the lowest score is 77, there is an increase in the average score was 1.05%, and in cycle II the average score increased to 84, the highest score reached 92, and the lowest score was 75. Improving student learning outcomes by applying problem-based learning assisted by decision-maker applications was successfully implemented with an increased average value of 1.12% of pre-cycle conditions. And experienced an increase in learning outcomes of 0.7% when compared to the previous cycle.

Keywords: Computational thinking, Decision maker, Informatics, Problem-Based Learning.

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1. INTRODUCTION

Smartphones are the latest and most popular modern technology, smartphones cannot be separated from human life, from waking up to sleeping again smartphones are always with them whenever and wherever. The need for communication and getting information is everyone's need. Smartphones are mobile phones with high-level functions that function almost the same as computers [1]. Anyone with a smartphone can easily access social networking communications and other applications, smartphones are also a way of life [2], the ease of accessing the features offered causes users to lose time [3], are lazy to interact with the environment and can weaken the immune system [4][5][6]. This fact can affect motivation to learn at home and at school [7].

Informatics is a subject that is very close to smartphone technology, so currently smartphones are one of the latest learning media [4], even though some schools prohibit students from carrying smartphones [8]. On the other hand, it cannot be denied that smartphones are very useful for students [9], smartphones make it easier for students to find learning information [4][10]. These are the pros and cons of using smartphones in education [11]. Computational thinking material in Informatics subjects demands to have a forward and more dynamic way of thinking. This mindset is the same as how technology works, which can accept tasks and complete them quickly. By thinking computationally, students will be able to observe problems and solve problems so that they can develop solutions from solving problems. Decision-maker applications can make decisions quickly, and efficiently, and optimize the process of making decisions about a problem. With the help of smartphones, computational thinking material in Informatics lessons in grade 7 is expected to improve student learning outcomes at SMPN 2 Gemolong, Sragen. In this study, the decision-maker application uses the decision roulette application which can be used on Android and iOS.

The average value of Informatics learning outcomes in class 7F of SMP Negeri 2 Gemolong, Sragen. is relatively low, from observations it is known that the average value of Informatics is only 76. Even though in the implementation of the independent curriculum there is no minimum completeness criterion, it should be noted that the average value is still under the minimum completeness criteria that have been applied to ICT subjects, namely 75. The solution to

overcome the low learning outcomes of Informatics is to make improvements to the learning process [12], to improve the quality of learning teachers are required to be creative using effective approaches to attract students' attention and interest to improve abilities that include motivation, knowledge and learning outcomes.

Problem-Based Learning (PBL) helps teachers in learning by presenting problems that are experienced daily and are relevant to students so that students gain more learning experience [13]. PBL also stimulates students to think at a higher level [14]. PBL challenges students to solve and present complex problems, increases student activity in expressing opinions, and encourages student collaboration and cohesion in groups [15], PBL also provides resolution, and interpretation in different contexts [16]. Learning begins by presenting problems, then students identify problems, equate perceptions of problems by discussing, designing solutions and goals to be achieved, and students collect information from various sources. Utilizing a decision-making application on a smartphone, it is hoped that it will be able to encourage students to be more active and help with research. Smartphones make students find the information they need more quickly and share it easily [1]. Based on the description above, this classroom action research will apply problem-based learning assisted by decision-maker applications on computational thinking material to improve student learning outcomes at SMPN 2 Gemolong, Sragen.

2. RESEARCH METHODOLOGY

This class action research (CAR) aims to determine the increase in student learning outcomes in computational thinking materials with the help of decision-makers to be successful in the learning process at SMPN 2 Gemolong, Sragen. The objects of this study were 7F grade students, which consisted of 32 students, 14 male students and 18 female students. The data were obtained from the results of tests and observations. Written tests were used to measure students' cognitive achievement, while observational data were used to determine whether the learning process was going well or not. To analyze student learning outcomes data using quantitative data analysis techniques. PTK has carried out in 4 (four) stages, in the first stage the teacher makes a plan, the second stage the teacher takes action, the third stage the teacher makes observations, and the last stage is the teacher reflects. This study consisted of 2 (two) cycles, namely cycle I and cycle II, the research stages can be explained in Figure 1.

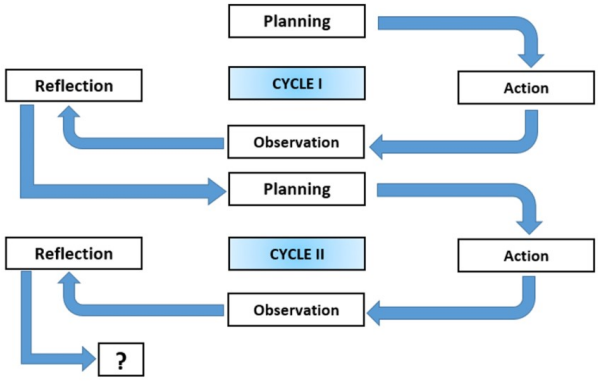

Figure 1. Class Action Cycle Research Chart

In the implementation of cycle, I, observations and formative tests were carried out, the observed data were processed descriptively as material for reflection on the actions that had been carried out, while the formative test results data were taken based on individual test results, then analyzed. The results of the analysis are used as a reflection to improve the next learning design, in the next cycle it is hoped that there will be improvements in the learning design so that learning is more effective, and efficient, attracts the attention of students which is marked by a significant increase in the average value of learning outcomes.

3. RESULTS AND DISCUSSION

This classroom action research uses the decision roulette application using a smartphone applied to computational thinking material informatics lessons. This research was conducted in 2 (two) cycles, namely cycle I and cycle II, for pre-cycle data taken from data already owned by the teacher obtained from the previous material formative assessment, for cycle I data obtained from observations and formative tests, from the data is then analyzed to see the advantages and disadvantages of learning that has been implemented, the results of data analysis in cycle I are used as evaluation material to make plans in order to improve action, the results of the analysis are also a measuring tool for learning success which is marked by an increase in the average learning outcomes.

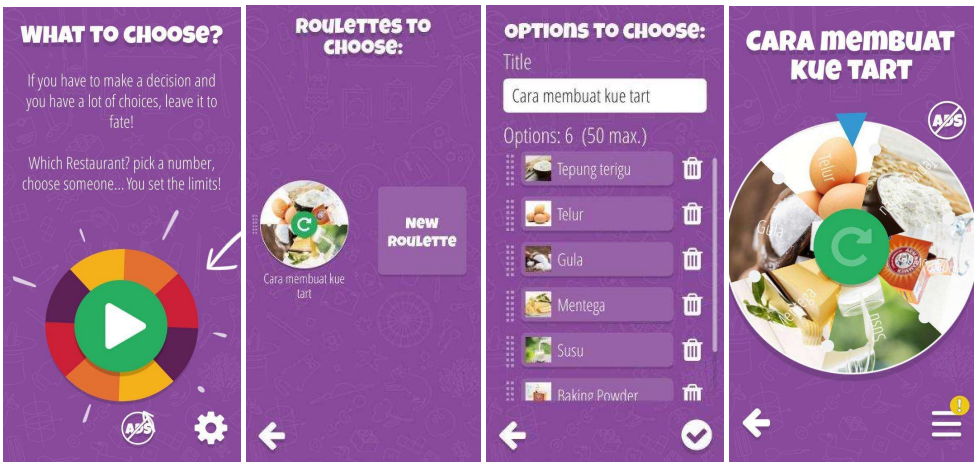

Figure 1. Decision roulette on computational thinking material

The results of the analysis in cycle I show that the average increase in learning outcomes is not yet significant. One of the innovations that will be implemented in cycle II is by utilizing the decision maker application on a smartphone, namely the decision roulette application as shown in Figure 1.

3.1. RESULTS

3.1.1. Pre-Cycle Conditions

Pre-cycle data is data that is already owned by the teacher, in the form of daily values taken before the action is taken or data on the values possessed by the teacher in the previous material, from these data it is known that the average value is 76, the highest value is 88 and the lowest value is 68, although there are no the minimum completeness criteria in the implementation of the independent curriculum, the student learning outcomes need to be improved again because the minimum mastery limit that has been applied to ICT subjects is 75 in the 2013 curriculum. a better understanding of the material learning outcomes also increased. This also reflects that the implementation of learning with the method used by the teacher at pre-cycles has not been maximized, therefore action is needed to improve understanding and the average value of learning outcomes.

3.1.2. Conditions of Cycle I

The results of the pre-cycle are used as the basis for PTK which aims to increase the average value of student learning outcomes in Informatics subject matter of computational thinking. In cycle I, researchers apply PBL, the stages are as follows:

a. planning stage
   At the planning stage, the teacher must make or prepare teaching modules, design discussion groups, make worksheets, and prepare observation sheets and prepare documentation forms.
b. Actions are taken in the initial activity.
   1) The teacher starts the lesson by greeting, then the teacher orders the class leader to lead the prayer together, then coordinates the class and students' readiness to take part in the lesson, and then the teacher explains the learning objectives.
   2) The core activities carried out the Problem-based learning model, with the following learning steps: the teacher conducts orientation and organizes students, the teacher guides students in carrying out investigations both individually and in groups, the teacher organizes students to communicate their work by presenting their work, and the teacher performs analysis and evaluate problem-solving in group work presentation activities
   3) At the end of the activity the teacher together with the students made a conclusion about today's lesson.
c. Results of data analysis
   The results of data analysis in cycle I obtained the fact that the average learning outcome increased by 1.05%, the average score increased to 82, the highest score was 89 and the lowest score was 77.
d. Reflection
   The average value has increased but not significantly, from the results of observations during the discussion process some students were seen walking back and forth as if they were looking for something from another group. After the teacher observed and conducted interviews with students, the reason students walked back and forth was that students needed other sources of information to solve problems. For improvement in the next cycle, a media is needed that can provide more complete, more complete and up-to-date information, an alternative solution that will be implemented is by utilizing the smartphone application as a source of

information, to keep smartphones from being misused for other purposes the teacher monitors their use and ensures Group discussion activities went well.

3.1.3. Conditions of Cycle II

Cycle II was carried out with scheduling optimization material assisted by a decision-maker application on a smartphone to find sources of weather parking information and use the results for reference for solving cases, through the following stages:

a. planning stage
   At the planning stage, the teacher must make or prepare teaching modules, design discussion groups, make worksheets, and prepare observation sheets and prepare documentation forms.
b. Actions are taken in the initial activity.
   1) The teacher starts the lesson by greeting then the teacher orders the class leader to lead the prayer together, then the teacher conditions the class and students' readiness to take part in the lesson, and then the teacher explains the learning objectives.
   2) The core activities carried out the problem-based learning model, with the following learning steps: the teacher orientates and organizes students in class, the teacher guides students in conducting investigations both individually and in groups, the teacher instructs students to use the decision-maker application using a smartphone to search for sources of information, the teacher organizes students to communicate their work by presenting their work, and the teacher analyzes and evaluates problem-solving in group work presentation activities.
   3) At the end of the activity, the teacher together with the students made a conclusion about today's lesson.
c. Results of Data Analysis
   From the results of data analysis in cycle II, it was obtained the fact that the data increased the average value to 82, the results of data analysis obtained in cycle II can be seen in Table 1.

Table 1. Cycle II conditions

	Average pre-cycle value	Cycle 1 Formative Test	Formative Test Cycle II
Maximum value	88	89	95
Min value	68	77	75
Average value	78	82	84
Percentage increase		1,05%	1,12%

d. Reflection
   From the results of our monitoring, group discussions became more active, there were no more students pacing back and forth as was the case in cycle I, students actively searched for the information they needed by using smartphones and the discussion process became more lively and meaningful.
   According to the results of the data analysis, the average value from cycle I to cycle II has increased. In cycle I, the percentage increase in the average value was 1.05%. In cycle II, the percentage increase in the average value was 1.12%. The increase in the average value has shown the successful application of problem-based learning assisted by decision-maker applications on computational thinking material to improve student learning outcomes at SMPN 2 Gemolong, Sragen.

3.2. DISCUSSION

Based on data from cycle I and cycle II, the comparison of the data can be described as follows: student learning outcomes increase in each cycle whereas in the pre-cycle using the lecture method the average value is 78 ¸ the highest score is 88 and the lowest score is 68. After PBL learning is carried out in cycle I, the average value increases to 82 ¸ the highest value is 89 and the lowest value was 77, there was an increase in the average value of 1.05%, and in cycle II the average value increased to 84, the highest value reached 92, and the lowest value was 75. When compared to pre-cycle the average value increased by 1.12%.

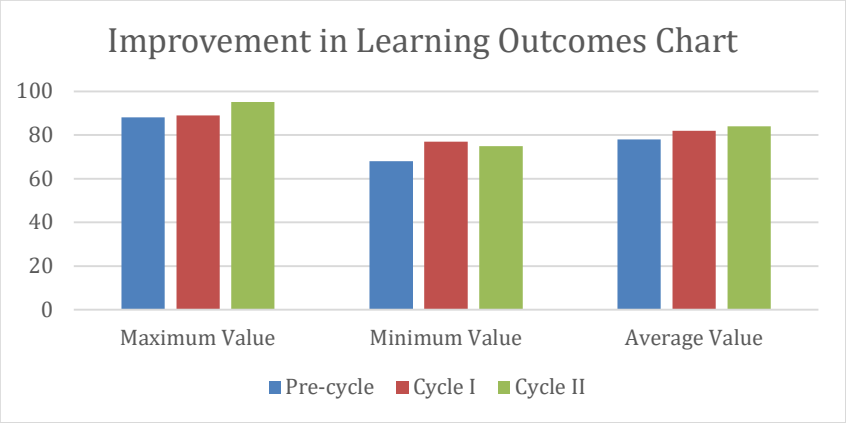

Figure 2. Improvement in Learning Outcomes Chart

The results of this study showed that there was an increase in the average value in each cycle as shown in Figure 2. The results in the first cycle were 1.05%, and there was an increase in the second cycle to 1.12%. This shows that the use of decision-maker applications on smartphones in the Informatics subject for computational thinking material can improve student learning outcomes in class 7F of SMPN 2 Gemolong, Sragen this is in accordance with previous research [7], Smartphones as the latest technology make everyone interested in always using them [17], and smartphones really help students to find sources of information [9][18][19] and can improve learning outcomes [20].

4. CONCLUSION

Utilization of decision-maker applications using smartphones for computational thinking material in Informatics able to perform data representation through modelling or simulation. Besides being able to identify, analyze and find solutions with various combinations of steps or ways and resources that are efficient and effective. This encourages students to think computationally and consciously in solving problems in a more structured and systematic way. Student learning outcomes in Informatics class 7 in cycle II showed an increase from cycle I which had not used the decision maker application. Improving student learning outcomes by applying problem-based learning assisted by decision-maker applications was successfully carried out with an increase in the average value of 1.12% from pre-cycle conditions and experienced an increase in learning outcomes of 0.7% when compared to the previous cycle.

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