



## Implementation of the Creative Problem Solving (CPS) Learning Model Based on Information and Communicaton Technologies (ICT) to Improve Mathematics Learning Outcomes

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### Abstract

This research aims to improve students' mathematics learning outcomes by using a learning model based on Information and Communicaton Technologies (ICT). This research is a Classroom action research qualitative research. This research method consists of: (1) planning (planning); (2) the implementation of the action (action); (3) observation and evaluation (observation and evaluation); (4) reflection (reflection). This research uses descriptive statistical data analysis involving 20 students, including 7 boys and 13 girls and using instruments in the form of student worksheets and interview guidelines for teachers and students. Based on the results of initial observations, it shows that the low learning outcomes obtained by students. This is because teachers have less ability to vary learning models/strategies, where teachers only explain the material to students and then ask questions, but only a few students have an active understanding of concepts/knowledge in learning. Based on the daily test results, before the first cycle of action, only 40% of students with an average score of 60.1 scored 70 from the KKM (Minimum Graduation Criteria), which was 75%. In the first cycle, there was an increase from the initial test which was 40% to 55% of students with an average score of 65.98 who obtained a score of 70, while in the second cycle the test also increased to 85% with an average score of 80.56 who obtained a score 70. The final result of this research is that it can improve Mathematics Learning Outcomes by Applying the ICT-based Creative Problem Solving (CPS) Learning Model.

**Keywords:** Creative Problem Solving; ICT; learning outcomes

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## INTRODUCTION

A learning is said to be successful if it produces positive behavior in students in accordance with the planned learning objectives. In this context, it basically depends on the teacher as an important element in learning activities (Bukhori 2012). At this time it is not uncommon for a teacher to dominate learning activities in the classroom, where the implementation is the teacher who has control, plays an active role, while students sit passively receiving knowledge and skill information (Yusnani, 2016; Nasruddin at al, 2017).

Teachers do not give students the opportunity and freedom to express their opinions. So, the creativity and independence of students have many obstacles and tend not to be able to develop (Hidayati, 2015; Kurniawan, 2021).

In the current digital era, teachers as educators and motivators in the learning process, always make improvements and changes to the learning system in the classroom. For example, the use of Information and Communication Technology (ICT)-based learning media must be fully understood (Fuad, 2013; Vajoczki, 2011; Nasruddin, 2019). Reforms in learning need to be built and developed in order to create a pleasant learning atmosphere, so that the atmosphere of interaction in the classroom, both between teachers and students, as well as between students, can grow and develop well. To make this happen, one way that can be taken by a teacher is the use of learning media, a student can easily illustrate and describe the material, especially if the material is related to building space (Rahmawati, 2012).

One of the learning media is ICT-based teaching aids. Teaching aids are used to assist teachers in the learning process, so that the student learning process is more effective and efficient. Each learning process is characterized by the existence of goals, methods, tools and evaluations (Fuad, 2013). The thinking process of junior high school students allows them to be able to deal with various problems effectively, but they are still not able to efficiently in the abstract field. In this case, the role of teaching aids is very important, so that the material can be easily accessed by students (Yuliawati, 2012; Arikunto, 2016; Nasruddin, 2017).

In learning mathematics, both teachers and students are increasingly required to have high and creative thinking skills, honest and independent personalities (Adriani et al., 2019). So it is very necessary and carried out mathematics learning that can improve student learning outcomes, and be able to educate students, so that they can grow into human beings who think creatively, independently and excel (Djidu, 2018; Jahring 2020).

Unfortunately, mathematics learning outcomes are still in the weak category. Based on the results of observations made by researchers and the team, several problems were found in learning mathematics: (1) The process of learning mathematics, especially the subject of Constructing Flat Sided Space, still uses the lecture method, so that students are less able to express their ideas, both in the form of questions and how to solve them, and actively participate in the learning process, such as asking and answering questions. (2) The lack of use of existing teaching aids has an impact on the low level of students in critical and creative thinking. Especially for the subject matter of Constructing Flat Side Space. In addition to the unavailability of adequate teaching aids, teachers are also still less skilled in utilizing the available teaching aids. (3) The results of learning mathematics are low, especially on the subject of flat side space. (4) In carrying out the learning process, teachers have not utilized ICT media optimally, so that the implementation of learning is still very limited. This is because the mathematics learning process still uses conventional methods and does not utilize teaching aids. In addition, it is also shown by the results of students' daily tests on building materials which are only able to reach 60.0 (below the standard set by the school, which is 70.0). In direct interviews with the teacher, information was obtained that students were less able to illustrate the material of building space without any learning media. This is in line with what was stated by Nu'man (2014) that the use of ICT learning media in this case the application of the Edmodo e-learning model can improve student learning outcomes

The several existing problems, one of the things that can be used to solve these problems is to conduct ICT-based learning. In the application of ICT-based learning, it can make it easier for students to solve problems given by the teacher. Solving these problems is greatly helped by the existence of technology, because students are able to adjust and solve these problems, especially problems related to related to the flat material..

The various problems above require appropriate solutions and handling so that learning can take place properly. One of the steps taken is to use the Creative Problem Solving (CPS) learning model with teaching aids as learning media. Creative Problem Solving-based learning is a learning model that focuses on teaching and problem solving

skills, followed by skill strengthening. In this learning model, students not only solve problems in mathematics but they're required to skillfully use teaching aids as learning media in solving these problems too. By using this learning model, students are expected to obtain maximum benefits both from the process and from the learning outcomes (Adriani et al, 2019; Booree, 2010).

Based on the description above, in this research, the aim is to improve mathematics learning outcomes by conducting Information and Communication Technology-based learning by using a Creative Problem Solving learning approach to class VIII students at SMP Negeri Samaturu.

## METHOD

The subjects in this study were class VIII SMP Negeri 3 Samaturu, even semester, consisting of 20 students, 7 male students and 13 female students, as well as the subject of cubes and blocks.

This research is a Classroom Action Research (CAR). CAR is action research with the aim of improving the quality of learning practices in the classroom, in the form of self-reflective activities carried out by perpetrators of action, to improve rationality and justice about educational practices, understanding and situations in which these practices are carried out (Kunandar, 20018). The stages of CAR include: planning, action, observation, and reflection.

Classroom Action Research (CAR) is a research using an assessment process through a cycle system of various learning activities. The cycle goes through the stages of planning, implementing actions, observing, and self-reflection. These stages consist of several cycles in one simulation until the thing to be improved has been achieved. This research was carried out up to 2 (two) cycles.

According to Arikunto (2016) research procedures in classroom action research are presented in the research design as follows:

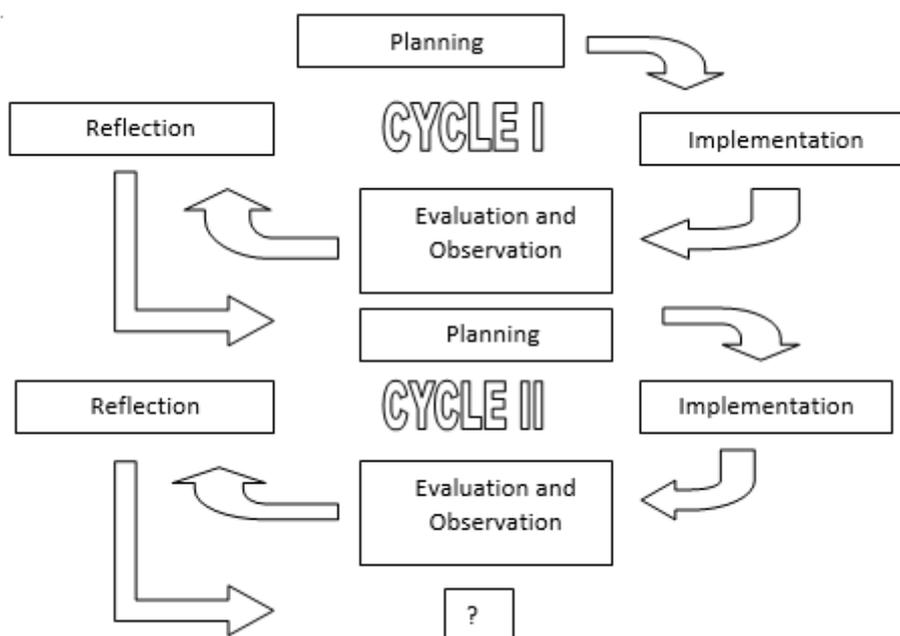


Figure 1: Classroom action research design (Arikunto, 2016)

The subjects in this study were class VIII SMP Negeri 3 Samaturu, even semester, consisting of 20 students, 7 male students and 13 female students, as well as the subject of cubes and blocks.

The instrument used in this study was in the form of test questions given to students in the form of daily quizzes to see the extent to which students' understanding of the material that had been studied was related to the flat wake material. Then the instrument in the form of an observation sheet of the learning process carried out by teachers and students is assessed at the end of each meeting. So that the analysis of teacher activities in learning, analysis of student activities in the learning process and analysis of learning completeness is carried out. The ICT media used are computer or laptop devices operated by teachers and students equipped with geogebra application programs.

Based on the provisions and conditions of the students in the school where this research was conducted, which is also adapted to the curriculum used in the school, this research is said to be successful if it has achievement criteria or indicators of research success, namely at least 80% of students who are taught with the application of ICT-based CPS learning get score. a minimum of 70 based on the KKM value that has been determined by the school on the competence of flat building materials. Furthermore, in terms of the process, it is said to be successful if 85% of the class learning plans have been implemented

## RESULTS AND DISCUSSION

Before carrying out the action, the researcher obtained data on the daily test scores of class VIII students to be used as reference material in carrying out these actions, the results of the test scores showed that students obtained an average score of 60.1 with a learning completeness of 40%. This shows that students still do not understand the material that has been taught.

### Results

The results in this study were divided into two parts: the implementation of the Action Cycle I and the implementation of the Action Cycle II. Each cycle is described in detail as follows:

#### Action Cycle I

The implementation of this action was carried out by the researcher acting as a teacher. The learning action in cycle I was carried out for three meetings. At the meeting, the material taught was about the properties of the cube and making the framework and nets of cubes, as planned in the lesson plan using Information and Communication technologies (ICT) as teaching aids. The implementation of this action was carried out by the researcher acting as a teacher. The learning action in action cycle I was carried out for three meetings. At the meeting, the material taught was about the properties of the cube and making the framework and cube nets, as planned in the lesson plan using Information and Communication technologies (ICT) as teaching aids. The teacher starts the learning process by conducting preliminary activities, informing the material to be discussed, applying the Creative Problem Solving learning model based on Information and Communication technologies (ICT), but in this initial activity the teacher forgets to convey the learning objectives and does not motivate students.

After all the material in action cycle I is taught, then an evaluation test of the first cycle is held. This evaluation test includes all the material in the action cycle I, which aims to find out which material has been studied can be understood by students and whether there is an increase in student learning outcomes after the action cycle is held .

The results of the evaluation test showed that student learning outcomes for the material being taught had increased compared to the results of the daily test scores before the action, which was an average of 60.1 or with a learning completeness of 40%. Meanwhile, the average result of the the action cycle I test was 65.98 or with 55% learning completeness. This means that there is a 15% increase in learning completeness. Thus, 11 out of 20 students who took the evaluation test got a minimum score of 70.

From the results of the evaluation and observation in the action cycle I, it shows that the performance indicators that have been set have not been achieved. It means that the research or implementation of the action is still continued in the next cycle.

### Action Cycle II

The Action Cycle II is the last cycle in the implementation of learning by using ICT as a teaching aids. For this reason, researchers and observers plan the action cycle II in the hope that all deficiencies in the action cycle I can be corrected as appropriate based on the results of observation, evaluation and reflection on the implementation of the action cycle I.

After conducting two meetings for the action cycle II by discussing the block material using ICT as a learning medium, then the students were given a test as an evaluation of the implementation of the action cycle II.

The test results show that the students' ability to calculate the surface area and volume of cubes and blocks has increased compared to the implementation of the action cycle I, 55% of students who have obtained a minimum score of 70 have increased to 85%. The average value of student learning outcomes in the action cycle I, which is 65.98, increases to 80.56 after the implementation of the action cycle II. Thus the established performance indicators have been achieved.

### Discussion

Before carrying out the action, the researcher first obtained a daily test score from the mathematics teacher with an average value of 60.1 or a 40% completeness percentage.

From the data obtained, the average value of student learning outcomes is 65.98 with a classical completeness percentage of 55%.

Tabel 1. The average value and percentage of completeness in Action Cycle I

Score	Cycle I
The Average	65,98
Classical Completeness	55%

The low score of students in action cycle I was caused by several things, among others, because students were not used to following the learning model using teaching aids and there were still many students who did not pay attention to the teacher's explanation. In addition, due to the fact that all components and learning scenarios have not been implemented, this can be seen from the results of observations, namely the indicators of successful implementation of learning have not been achieved. It means that the research is continued in action cycle II because it has not reached the predetermined performance indicators. In the classroom action research, the cycle continued if the classroom has not reached the minimum score performance as in the previous research that has been conducted (Eismawati et al., 2019; Kusrianti & Suharto, 2019; Sukariasih et al., 2019; Yuafian & Astuti, 2020)

At the end of the action cycle II evaluation, students collect the results of their evaluation. Before the teacher ended the lesson, the teacher told the students that today was the last day of doing research. Because the time was over, the teacher ended the lesson with greetings and the students answered in unison. The implementation in action cycle II has been optimal. This can be seen from the increase in the average score of 80.56 with classical completeness of 85%. if the minimum score in the class has been met, the class action research is declared complete and there is no need to go to the next cycle (Gustinawati et al., 2015; Hekmah et al., 2018).

Table 2. The average grade and percentage of completeness in Action Cycle I

Score	Cycle II
The Average	80,56
Classical Completeness	85%

Based on the table of the acquisition of the average value of student learning outcomes shows an increase, for more details it is presented in Figure 2 below:

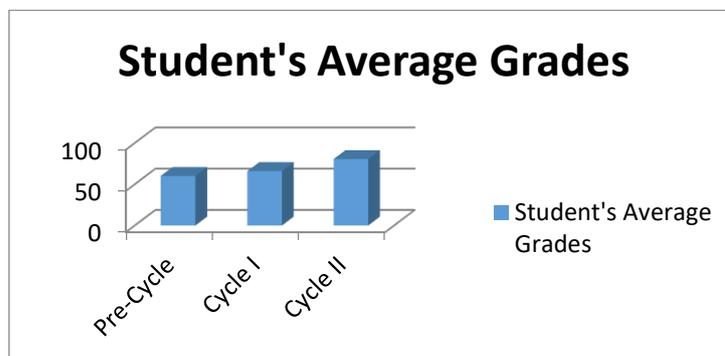


Figure 2. Percentage of students' average grades

Based on Figure 2, it shows that the average value in the pre-cycle is 60.1, then it increases in the action cycle I by 65.98 and in the action cycle II it increases by 80.56. The increase in the average value of student learning outcomes has an effect on increasing student learning mastery which can be seen in Figure 3 below:

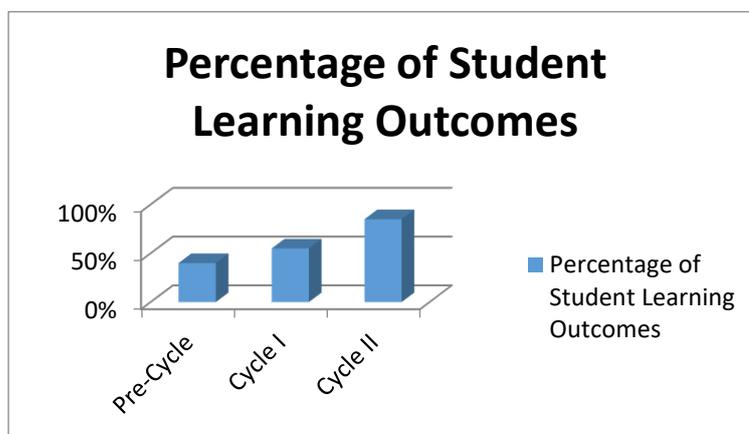


Figure 3. Percentage of increase in student learning outcomes

Based on Figure 2 and Figure 3 above, it is clear that the indicators of success in this research have been achieved. Therefore, this research was stopped until the action cycle II. Thus, the purpose of this study is to improve mathematics learning outcomes through the ICT-based Creative Problem Solving (CPS) learning model as a teaching aids that is successful or achieved in accordance with the indicators of success. This is in line with research conducted by Rangkuti (2019) which states that by conducting ICT-based mathematics learning, it can improve student learning outcomes and creativity on the subject of quadratic functions. Furthermore, Rahmawati (2018) from her research concluded that the use of ICT in mathematics learning has a very positive impact on reasoning abilities, mathematical communication, problem solving, and mathematical connections, where these abilities are included in the 5 competencies in mathematical literacy.

## CONCLUSION

Based on the results of research and discussion, it can be concluded with the Implementation of Creative Problem Solving Learning Models by Using Teaching Aids to Improve Mathematics Learning Outcomes in Basic Competence in Calculating Surface Area and Volume of Cubes and Blocks for Class VIII\_(C) SMP Negeri 3 Samaturu. This can be seen from the data on the results of students' daily tests before the implementation of the action cycle I, namely from the average value of 60.1 with learning completeness to 40% to 65.98 with learning completeness of 55%. However, this has not yet reached the established performance indicators. Furthermore, the average score of students after the action cycle II increased compared to the average value of 65.98 to 80.56 and had met the predetermined performance indicators, namely more than 75% of students had scored 70 and above.

## RECOMMENDATION

The implementation of Information and Communication Technology (ICT)-Based Learning Models is very necessary for educators, because the main capital in facing Digital Era Education is one of them by mastering the use of technology both in the classroom and outside the classroom. In this case, teachers as educators are required to know and understand the use of technology-based learning media. One of the learning models that can be applied by teachers is the ICT-based Creative Problem Solving Learning Model (CPS), because it is proven to improve student learning outcomes. For further researchers who want to develop this research, they can carry it out on other material or subject matter at different grade levels.

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