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IMPROVING THE PROCESS AND MATHEMATICAL LEARNING RESULTS USING THREE DIMENSIONAL LEARNING MEDIA IN BEAM AND CUBE BUILDING MATERIALS THROUGH THE STAD TYPE COOPERATIVE LEARNING

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ABSTRACT

The background of this research is that in the field there are still many teachers who do not pay attention to the potential of students to develop social skills and learning outcomes. STAD type cooperative learning model is one small group learning model between 4-5 people with different backgrounds to complete a task for a common goal. This model can also foster positive social skills for students. The most visible stages of growing social skills are discussion and evaluation. The research method used is classroom action research. This research is designed with a cycle model that is repeatable and sustainable. The research subjects were students in grade IV of Public Elementary School 031 Pelesiran with a total of 28 people. Research instruments are student worksheets (LKS), process assessment sheets, test questions, observation sheets, documentation. The results showed that there was an increase in the results of mathematics learning material in building the beam and cube space of the fourth grade students with STAD type Cooperative Learning models using three-dimensional media in the form of models of space building. The results showed that the STAD type Cooperative Learning model using three-dimensional media can improve student learning processes and results in learning to build a beam space and cube.

Keywords: Learning outcomes, building space, three-dimensional media

INTRODUCTION

Education is essentially a process of activity that takes the form of an act. The act in question is carried out by humans to foster and form children in accordance with the objectives to be achieved. In the 1973 GBHN (Ihsan, 2008: 5) stated that "education is essentially a conscious effort to develop personality and abilities within and outside of school and last a lifetime". In accordance with the content that education is an effort to improve human status, the purpose of education must be formulated clearly and precisely. The purpose of education directs the formation of a whole Indonesian human being. This is explained in the Law of the Republic of Indonesia Number 20 of 2006 concerning the National Education System (2009: 5) explaining that: National education functions to develop the ability and shape of dignified national character and civilization in order to educate the life of the nation, aiming to develop the potential of students to become human

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beings who are faithful and devoted to God Almighty, noble, healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen. Teachers as one of the main actors in learning must be professionals in their fields in order to carry out their duties and functions as educators as well as competent teachers. For this reason the teacher must master the material taught, skilled in teaching it, and able to overcome various obstacles encountered in learning. One of the things that can be done by the teacher is being able to choose and use appropriately the methods, models and learning media that are appropriate to the learning objectives, learning materials, and characteristics of students so that the goals that have been set can be achieved optimally. The teaching and learning process includes activities carried out by teachers ranging from planning, implementing activities, to evaluations and follow-up programs that take place in an educational situation to achieve certain goals, namely teaching. Mathematics as a subject in all formal education is seen as a subject that plays an important role. Mathematics education is the foundation and development framework for science and technology. Recognizing the importance of mathematics lessons, many efforts have been made by the government, including completing facilities and infrastructure, improving the quality of teaching staff, renewing approaches to learning and developing and improving the curriculum. But to achieve the expected learning outcomes, it is not as easy as we want. This is evidenced by the low level of understanding of students reflected through learning achievement, especially in mathematics subjects. One learning model that can activate students, form peer tutors and is able to assist students in understanding learning is STAD type cooperative learning model. In addition, researchers also use three-dimensional learning media intended to enable students to better understand the learning material. According to Roger et al (Huda, 2012: 29) states that: *Cooperative learning is group learning activity organized in such a way that learning is based on the socially structured change of information between learners in group in which each learner is held accountablefor his or her own learning and is motivated to increase the learning of others*.

Cooperative learning models are intended to provide more opportunities for students to increase student activities so that they truly feel partake and play an active role in the teaching and learning process. Daryanto and Rahardjo (2012) with the selection of learning models and learning media are expected to change in memorizing or rote learning towards thinking and understanding so that students will not experience confusion in working on different questions. . Artz and Newman (Huda, 2012: 32) define cooperative learning as "a

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small group of learners / students who work together in a team to solve a problem, complete a task, or achieve a common goal". So it can be concluded that cooperative learning is group learning that aims to solve tasks / problems together to achieve the desired goals. In the STAD type cooperative learning model students are given the opportunity to discuss the assignments given using small groups with the number of each member consisting of 4-5 students heterogeneously. Slavin (Trianto, 2012: 68) states that "in STAD students are placed in a learning team consisting of 4-5 people who are mixed according to their level of achievement, gender, and ethnicity". Like other learning STAD learning also requires careful preparation before learning activities are carried out. These preparations include, "(1) learning tools, (2) forming cooperative groups, (3) determining initial scores, (4) seating arrangements, and (5) group work" (Trianto, 2012: 69). In addition to learning models, learning media also function as a tool in learning and learning that we cannot deny. In general, the benefits of learning media in the learning process are to facilitate the interaction of teachers and students so that learning activities will be more effective and efficient. One of the learning media that can support the process of learning mathematics is three-dimensional learning media. Utamy (2012) three-dimensional learning media is a medium whose appearance can be seen from all directions, both from the front, back, right, left, top and bottom which have dimensions of length and height or thickness. The use of three-dimensional learning media is intended so that students can see real objects or miniature objects directly, so that students do not only imagine or fantasize about objects described by the teacher. With the application of the STAD type cooperative learning model and the use of three-dimensional learning media, it is expected that it will increase students 'learning motivation so that student learning outcomes, especially mathematics subjects, can increase, because one of the functions of cooperative learning models and the use of three-dimensional learning media is to improve students' abilities. , both in terms of knowledge, attitude and skills. Based on the description above, researchers are interested in conducting research with the title "Improving Mathematics Learning Processes and Results by Using Three-Dimensional Learning Media in Building Blocks and Cube Materials through Cooperative Learning Model Type STAD" and subtitles "Classroom Action Research on Grade IV Students 2017-2018 Academic Year in Public Elementary School 031 Pelesiran Coblong District, Bandung City.

Thinking Framwork

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In order to improve mathematics learning outcomes that are expected to be achieved, researchers try to apply the STAD type of cooperative learning model using three-dimensional learning media. The application of STAD type cooperative learning model using three-dimensional learning media can improve mathematics learning outcomes, because students learn in small groups heterogeneously so as to enable students to discuss with each other in completing group tasks. In addition, the use of three-dimensional learning media is also very supportive of the learning process because it can help teachers in conveying learning messages or information to students and can facilitate the learning process, especially the interaction between teachers and students so that learning activities will be more effective and efficient. The framework of thinking in this study can be described in the form of the following chart.

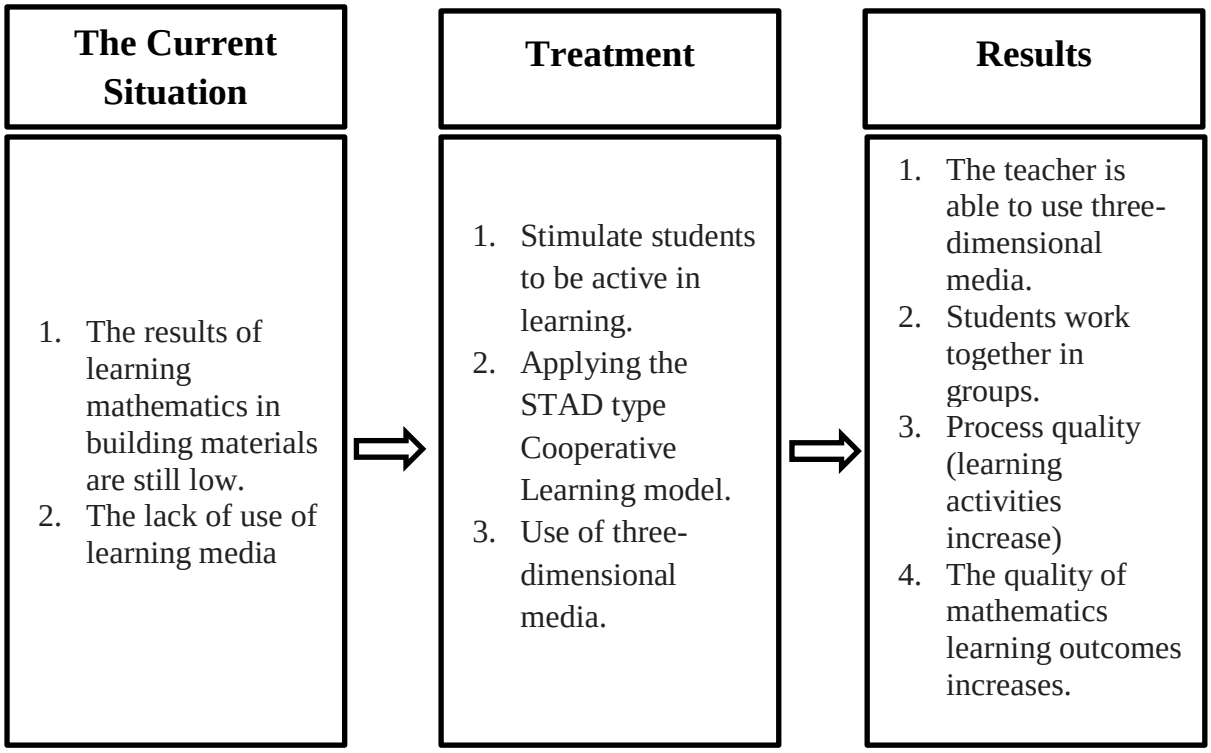

Figure 1. Chart Framework thinks

THEORETICAL BASIS

Mathematics according to Ruseffendi, E.T (Heruman, 2007: 1) "Mathematics is a symbol of deductive science that does not accept inductive proof, the science of order and organized structures ranging from elements that are not defined to defined elements". Meanwhile, according to Soedjadi (Heruman, 2007: 1) the essence of mathematics is "having an objective object that is abstract, based on agreement and a pattern of deductive thinking."

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Some say mathematics is the language of symbols; mathematics is a numeric language; mathematics is the queen of science and at the same time being a servant; mathematics is numbers and space; mathematics is human activity (MKPBM, 2007: 17). Johnson and Rising (MKPBM, 2007: 19) mathematics is "logical thinking, coordinating, proving patterns, mathematics is a language that uses carefully defined, clear and accurate terms." Mathematics comes from the word mathema which means knowledge or knowledge. Mathematike words are very closely related to another similar word, namely mathanein which means learning (thinking). The terms mathematics (English), mathematic (German), mathematique (French), matematico (Italian), matematiceski (Russian), mathematic (Dutch), derived from the word mathematica which comes from the Greek meaning "relating to learning." (MKPBM , 2007: 18). Suwangsih (2006: 3) states that the word mathematics comes from the Latin word "mathematics" which was originally taken from the Greek preface "Mathematike" which means to study. Adji & Maulanan (2006 B: 34) suggests that mathematics is a language, because mathematics is a symbolic language that is universally valid (international) and very dense in meaning and understanding. Prihandoko (2006: 1) argues that mathematics is a basic science that has become a tool for learning other sciences. Therefore, mastery of mathematics is absolutely necessary and mathematical concepts must be understood correctly and correctly from an early age. In line with the opinions above, Wale (2006: 13) defines mathematics as a science that has a logical pattern and sequence. Based on the above definition, knowing that mathematics is not science is dominated by calculations without reason. So that by interpreting and applying this order pattern will emerge the meaning of learning mathematics.

COOPERATIVE LEARNING MODEL

According to Seokamto, et al (Trianto, 2012: 22) states that: "The learning model is a conceptual framework that describes systematic procedures in organizing learning experiences to achieve specific learning goals and serves as a guide for learning designers and instructors in planning teaching and learning activities". Another opinion about the notion of learning models is proposed by Joyce and Weil (Azhmi, 2011: 13) "learning models are a plan or pattern that can be used to form a curriculum (long-term learning plan), design learning materials, and guide in the classroom or another." Learning that prioritizes cooperation in groups is in the form of cooperative learning. "In cooperative learning, students are formed in groups of 4 or 5 people to work together in mastering the material given by the teacher" Slavin (Trianto, 2012: 56). In the cooperative class students learn

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together in small groups of 4-5 heterogeneous students both from achievement, gender, ethnicity / race, and each other helping each other. Artzt and Newman (Trianto, 2012: 56) state that in cooperative learning students learn together as a team in completing group tasks to achieve common goals and each group member has the same responsibility for the success of the group. According to Chotimah (Ilmi, 2011: 15) describes that "cooperative learning is learning that provides opportunities for students to work together with fellow students in structured tasks". Whereas according to Isjoni (Rusminah, 2011: 10) states that "Cooperative Learning is a learning model that is currently widely used to realize student-centered teaching and learning activities, especially to overcome problems that teachers find in activating students, who cannot cooperate with others, aggressive students and do not care for others.

The word media comes from Latin medius which literally means middle, intermediary or introduction. According to AECT (Association of Education an Communication Technology) (Arsyad, 2002: 3) states that "media as all forms and channels used to convey messages or information". As with the opinion of the National Education Association (NEA) (Sidharta, 2005: 5) defines "the media as all things that can be manipulated, seen, heard, read, or discussed and the instruments used for these activities".

THREE- DIMENSIONAL LEARNING MEDIA

Three-dimensional learning media is a medium whose appearance can be observed from any point of view and has dimensions of length, width and height / thickness. This media group can be tangible as a living object both alive and dead, and can also form as an imitation and represent the original. According to Santyasa (2007: 15) "three-dimensional media is a group of media without projections with three-dimensional visual presentation". Three-dimensional media that can be easily produced is relatively simple in its use and use, because without the need for special expertise, the teacher can make it directly and the material can be easily obtained in the surrounding environment.

Moedjiono (Santyasa, 2007) said that simple, three-dimensional media has advantages, namely: (1) giving direct experience, concrete presentation and avoiding verbalism, (2) being able to show the object in its entirety both construction and how it works, (3) can clearly show the organizational structure, and (4) can clearly show the flow of a process. While the weaknesses of three-dimensional media are (1) unable to reach large numbers of targets, and (2) storage requires large space and complicated maintenance.

LEARNING OUTCOMES

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Santrock and Yussen (Sugihartono et al, 2012: 74) define learning as a relatively permanent change due to experience. Winkle (Purwanto, 2010: 39) argues that learning is a mental / psychological activity that takes place in active interaction with the environment that produces changes in knowledge, skills, and attitudes. Changes are obtained through business (not due to maturity), settled in a relatively long time and is the result of experience. Understanding learning according to cognitive theory is a change in perception and understanding, which is not always in the form of behavior that can be observed and measured (Budiningsih, 2003: 51). The assumption of this theory is that everyone has the knowledge and experience that has been arranged in the form of the cognitive structure they have. The learning process will run well if new learning material or information adapts to the cognitive structure it has. According to Piaget (Budiningsih, 2003: 51) learning activities occur according to patterns of stages of cognitive development according to one's age. Elementary students who are generally 7-12 years old are in the concrete operational stage. At that stage, the child still needs help manipulating concrete objects to think abstractly. A concept will be well understood by the child if represented through concrete objects or direct experience. In learning, according to Piaget (Pitadjeng, 2006: 27) the cognitive structure that a person has is due to assimilation and accommodation. Assimilation is the process of getting new information and experiences that are directly integrated with the mental structure that someone already has. While accommodation is a process of mental restructuring as a result of new information and experience. So learning not only receives new information and experiences, but also accommodates new information and experiences. Piaget argued that in learning, especially learning mathematics through 4 stages: concrete, semi-concrete, semi-abstract, and abstract stages (Pitadjeng, 2006: 28). In the concrete stage the activities carried out by the child are to gain direct experience or manipulate concrete objects. In the semi-concrete stage the activities carried out can already use the description of the object in question. Activities carried out in the semi-abstract stage are manipulating / seeing signs instead of pictures. While in the abstract stage the child has been able to see the symbol / symbol or read / hear verbally without having to do with concrete objects. In line with this opinion, Brunner (Sugihartono et al. 2012: 111) suggests that learning is an active process, that is, students interact with their environment through exploration and manipulation of objects, making questions and experiments.

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MATHEMATICS LEARNING IN BASIC SCHOOL

Learning mathematics is not just learning to know, but must be improved to include learning to do, learning to be and learning to live together. Therefore, the view of teaching mathematics needs to be changed into mathematics learning. In teaching mathematics, teachers are more dominant in learning activities or known as teacher center. In the context of teaching students act passively while the teacher is more active. Unlike mathematics learning where students play a more active role as learners and the role of the teacher is more to the facilitator and dynamicator. (MKPBM, 2007: 255) Mathematical learning is more important than teaching mathematics, it implies that mathematics is important and must be mastered by students in an integrated and holistic manner. This has the consequence that mathematics learning should optimize the existence and role of students as learners. Teaching and learning of mathematics are actually different, therefore there must be a paradigm shift about it. Changes from teacher centered to student centered in the sense of optimizing the existence and potential of students to gain knowledge. Changes from content based to competency based, namely understanding students not only meet the demands of substantive mathematics goals, but also the basic competencies that students must have. Student learning outcomes are not seen from the results of their learning but from the process when students gain knowledge. In addition assessment must be carried out thoroughly covering all cognitive, affective, and psychomotor aspects. The teacher should look at the class as a place for problems that need to be explored by students using mathematical ideas. (MKPBM, 2007: 255).

METHOD

The method used in this study is a qualitative method in the design of Classroom Action Research (CAR) or in foreign terms known as classroom action research. In Hermawan. R (2009: 79) PTK is a "form of research that is reflective by taking certain actions in order to improve and or improve the practices of classroom learning more professionally". The same thing was also expressed by Mc. Niff who views "CAR as a form of reflective research conducted by the teacher himself and the results can be used as a tool to develop teaching skills" (Chintia. S, 2009: 28). One of the objectives of PTK is "improvement and improvement of teacher services in the learning process by conducting various alternative actions planned by the teacher in solving various problems that exist when learning in class". (Hermawan. R, 2007: 80). This research was carried out at 031 Pelesiran

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Public Elementary School, Coblong District, Bandung City. The research was conducted in the classroom. This research was conducted in the even semester of 2017/2018 school year, from February to April 2018. The research subjects were individuals or groups of people who could provide clear and precise information related to the research conducted. Subjects in this study were 28th grade students of SDN 031 Pelesiran, consisting of 13 men and 15 women. The object of this research is the improvement of mathematics learning process and results by using three-dimensional learning media on the building material of cubes and cubes through the STAD type Cooperative Learning model for grade IV students of SDN 031 Pelesiran 2017/2018 Academic Year. The subject of this research is to optimize the social potential of students in group learning so as to improve the learning outcomes of elementary school students in grade IV in learning to build a beam space and cube. Research is reflective, by taking appropriate actions and carried out cooperatively / working together in groups. With optimal learning, it is expected that there will be changes, improvements, and improvements in the teaching and learning process in the classroom. Practical benefits that can be felt by researchers according to Suyanto are "the implementation of learning innovations, curriculum development at the elementary school level and classrooms and improvement of teacher professionalism." (Kasbolah, 1998: 27-38). This study uses Classroom Action Research (CAR) Kemmis and McTaggart models (Hamzah B. Uno et al., 2011: 87) which consists of four components, namely planning, action, observation and reflection. The four components are seen as a cycle. This cycle is carried out continuously and continuously until the indicator of the success of the action is achieved. Classroom Action Research Descriptions (CAR) of the Kemmis and McTaggart models.

RESULTS AND DISCUSSION

RESULT

Based on the test results data on the pre-action performed by the researcher obtained the average grade of 66.07 with the highest value of 90 and the lowest value of 30. While students who have completed learning or have reached the defined KKM of 75 number 15 students or 53 , 57% and students who have not yet completed learning are 13 students or 46.43%. These results illustrate that student learning outcomes in building material are still low. Therefore it is necessary to take action immediately to improve learning outcomes. Researchers choose actions in the form of the use of three-dimensional media to improve student learning outcomes. In this study each cycle consists of planning, action, observation and reflection. In the second cycle the stages carried out were improvements in the previous

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cycle, namely cycle I. The results obtained in this study consisted of tests in the form of student learning outcomes and non-test data consisting of observations and documentation. The average value of the first cycle learning class showed an increase when compared to the pre-action stage, which is from 66.07 to 71.42. The highest score was 95 and the lowest score was 50. While the percentage of students who had reached the KKM in the first cycle increased by 14.28% from 53.57 in the pre-action to 67.85% in cycle I. Whereas students who had completed learning or had reached the KKM that had been determined namely 70 numbering 19 students or 67% and students who have not yet completed learning amounted to 9 students or 33%. In the first cycle study the percentage of success has not reached 75% because it only reached 67.85% of the number of students who received a score of ≥ 70. For this reason the research continued into cycle II by looking at important notes that still need to be reflected again for the next learning. The existence of efforts to improve the action in this cycle II, the learning outcomes are increased compared to pre-action and cycle I. This can be seen in the table below.

Table 1. Comparison of Learning Outcomes in Action, Cycle I and Cycle II

No.	Aspect	Pre-action	Cycle I	Cycle II
1.	The highest score	90	95	100
2.	Lowest value	30	50	65
3.	Average value	66.07	71,42	82,14
4.	Percentage or completeness	53,57%	67,85%	89,28%

Discussions

If the average average achieved by students in pre-action, cycle I and cycle II are given with a diagram, the bait is as follows.

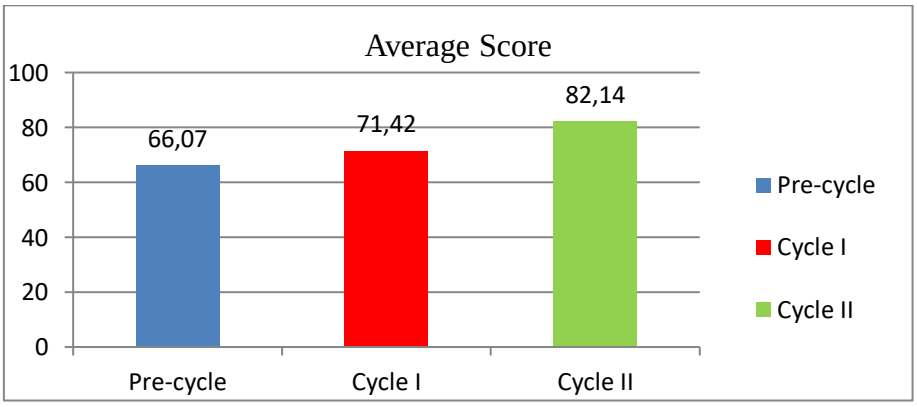

Figure 2. Comparison Diagram of Student Average Score in Action, Cycle I and Cycle II

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Based on the diagram above, the average value of students has increased at each stage of the study. In the pre-action stage the average value of students reached 66.07 and in the first cycle increased to 71.42 then increased later in the second cycle to 82.14. Dapai is seen in the comparison diagram, the percentage of completeness is as follows.

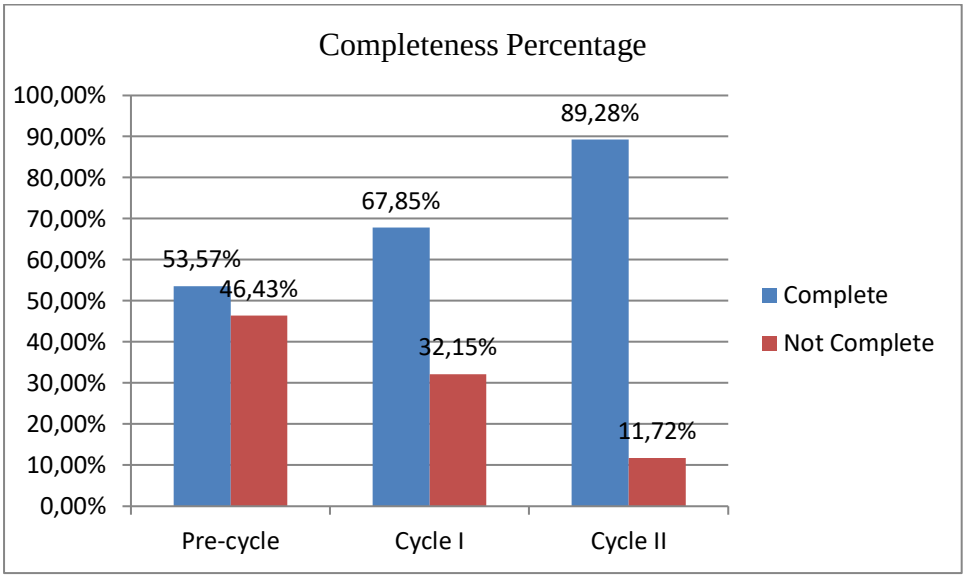

Figure 3. Comparison Diagram of Student Completeness Percentage in Action, Cycle I and Cycle II

Based on the diagram above, the percentage of students who have reached the KKM also increased during the study. In the pre-action stage the percentage of completeness has only reached 53.57% while in the first cycle the completeness of students increased to 67.85% but this completeness has not reached the established criteria of 75% so that the second cycle action was taken. In the second cycle action students completeness increased again to 89.28% meaning that it had reached the completeness criteria set by the researcher so that the study was stopped. While students who do not complete learning experience a decrease in each stage of research. In pre-learning students who did not complete learning reached 46.43% in the first cycle decreased to 32.15% and in the second cycle decreased again to 11.72%. In addition to improving learning outcomes, the use of three-dimensional media is also able to increase students' activities in following the mathematics learning process in building material. Increased student activity is seen from the enthusiasm of students in following the learning process, the involvement of students in using the media, cooperation in groups, the courage to express opinions and answer teacher's questions, and compliance in following agreed rules. Increasing student activity from cycle I to cycle II can be seen in the following diagram.

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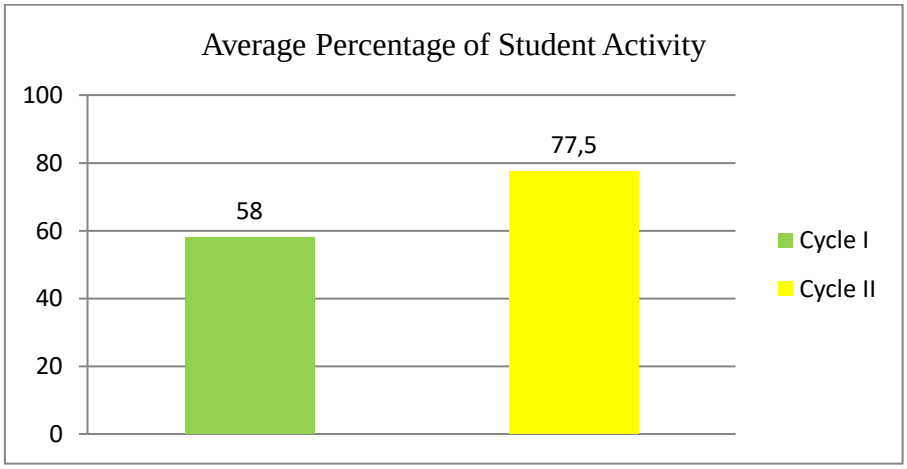

Figure 4. Comparison Diagram of Average Percentage of Student Activity in Cycle I and Cycle II.

Based on the diagram above, it can be seen that the average percentage of student activity in the process of learning to build space using three-dimensional media has increased. In cycle I the average percentage of student activity is 50%. In the second cycle increased by 19.5% to 77.5%. This increase in learning outcomes and student activities can occur due to the use of three-dimensional media in the learning process of building space. Students are actively involved in constructing their knowledge through the help of models of space building. In addition, students also work together and are responsible when carrying out activities in their groups.

CONCLUSION

Based on the results of the research and discussion that has been done, it can be concluded as follows. (1) The use of three-dimensional media in space learning with STAD type cooperative learning model for students in grade IV SD N 031 Pelesiran can improve student learning outcomes. This is evidenced by an increase in the average grade and percentage of students completing at each stage of the study. In the pre-action stage the average value of students reached 66.07 and in the first cycle increased to 71.74 then increased again in the second cycle to 82.14. While the percentage of students completing in the pre-action stage only reached 53.57% while in the first cycle students' completeness increased to 67.85% and then increased again in the second cycle to 89.28%. (2) The use of three-dimensional media in learning to build space for students in grade IV SD N 031 Pelesiran can improve the quality of the learning process. This is evidenced by the increase in student activity during the learning process from cycle I by 58% to 77.5% in cycle II with

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good categories. (3) Student learning motivation also increased by using cooperative learning models and the use of three-dimensional media. This is evidenced by his enthusiasm for students to take mathematics lessons in building the beam and cube space.

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