International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 5, Issue 5, Special Edition: ICET Malang City, 2019

Constructivism Approach in Science Learning

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The aims of this study were to determine the effect of the constructivist approach to the science learning of material based on human respiration. This study uses the classroom research method and is completed across several stages of planning, implementation, observation, and reflection. The subjects of the research were fifth grade students of the elementary school, Inpres 4/82 Walian. The data collection in the study used two assessments: namely, observation and the assessment sheet. The progress and improvement obtained during the two-cycle learning process shows that through the implementation of constructivism approaches in the science subject, it can improve learning outcomes. This study concluded that the constructivism learning approach had a positive influence on science learning.

Keywords: constructivism approach, science learning.

INTRODUCTION

The application of the 2013 curriculum is a character-based education that demands the personal development of each student. The activity of students in the process of science learning can help them to construct their knowledge (Carey & Smith, 1993; Driver, Asoko, Leach, Scott, & Mortimer, 1994; Hyland, 2016; Markauskaite, 2019; Paavola & Hakkarainen, 2005; Pettenger, 2016). The science learning of material on human respiration is a material that is difficult to explain, if only using the direct method or using a concrete learning media in the form of images (Fuady & Mutalib, 2018; Murdiana & Lefrida, 2019; Zhuang, Mei, Hoi, Hua, & Li, 2011).

The purpose of implementing the 2013 curriculum is to provide an enjoyable experience for each student. However, in its application, existing learning outcomes have not met the objectives of the 2013 curriculum implementation. Observations have found that learning in class V at SD Inpres 4/82 Walian identified a learning process that had not been able to provide optimal learning outcomes. Based on discussions with the teacher, factors were identified that position the students to obtain grades under the minimal completeness criteria for learning the human respiratory material. The reasons were noted as students lack concentration in following learning, are less active, lack attention to teacher explanations, play alone, and sometimes feel bored. Factors in general that lead to low learning outcomes in science subjects currently include that there are still many teachers who use traditional approaches to science learning, so students have not been directed to understand the science concepts that are being studied (Hamid, 2019; Ogara & Suyanto, 2019; Rohaenah, Ngadiyem, Hasbudin, & ..., 2019).

In an effort to improve science learning outcomes on human respiratory material in class V at the elementary school, Inpres 4/82 Walian, researchers applied the constructivism learning approach. Constructivism learning is an approach to learning that believes that people actively build or make their own knowledge by the experience of the person himself (Cobern, 2012; Kong & Song, 2013; Mainemelis, Boyatzis, & Kolb, 2002; O. Sari, 2019). One reason for the broad, intuitive appeal that has fueled the growth of constructivism as an epistemological commitment and instructional model, may be that it includes aspects of Piagetian, Ausubelian and Vygotskian learning theories; namely, the importance of ascertaining prior knowledge, or existing cognitive frameworks, as well as the use of dissonant events (relevant information) to drive conceptual change (Bada & Olusegun, 2015; Cakir, 2008; Cetin-Dindar, 2016; Q. Liu, 2012; S. H.-J. Liu & Lan, 2016; Sofie, Loyens, & Gijbels, 2008). Based on the detail described above, the author intends to conduct research with the title: "Constructivism Approach in Science Learning". Based on the background described earlier, the problems and question that exist in this research regard how can constructivism approaches improve the learning outcomes of science learning on human respiratory material?

The aim of this study was to determine the effect of the constructivist approach to the science learning of material on human respiration.

METHOD

This study uses the classroom research (CAR) method adopted from Kemmis and McTaggart and which is completed across several stages of planning, implementation, observation, and reflection (Hajar & Yusoff, 2017; Moreno & Mayer, 1999; Mufdalifah, 2017; Muzaki, 2018; Rorita, Ulfa, & Wedi, 2018; Zhuang et al., 2011). In the research planning stage, the activities carried out include visiting the school to submit research permit applications and compile the learning devices to be used. At the implementation stage, learning is carried out by applying a constructivism approach. Observation activities are carried out when learning activities are in progress by recording important interactions and events. For example, what the teacher does and what responses the students give, the atmosphere in the teaching and learning process and the results obtained by students.

This is completed with the help of the classroom teacher, to observe the researcher in teaching. After the implementation of the learning activities, reflection activities involving the observers (class teachers) are held to discuss the results of the observations and determine the success of the study. The research success criteria is for 75 per cent of students to complete. If the learning results in cycle one have not been fulfiled, then the research is continued in the second cycle, taking into account the results of the discussion between the researchers and teachers as observers about the shortcomings that occur, which are factors of cycle one failure.

The subjects of the classroom action research were fifth grade students of the elementary school, Inpres 4/82 Walian. The total number of students in class V is 21 students, consisting of 16 male students and five female students.

The data collection methods in the study used two assessments, namely observation and the assessment sheet. Data collection techniques were carried out through an observation sheet with two assessments that were used by class teachers to observe students who are studying and researchers who are teaching.

Then, to determine student learning outcomes, they can be calculated using the formula: CL = $\frac{T}{Tt} x$ 100 %
Where:
CL: Complete Learning
T: Number of scores obtained
Tt: Total total score

RESULTS

Classroom action research was conducted in the fifth grade of the elementary school, Inpres 4/82 Walian, with a total of 21 students divided into 16 male students and five female students. The class action is carried out in two cycles; the first cycle was held on Monday, 27 May 2019 and the second cycle was held on Friday, 31 May 2019. Cycle two is an improvement from the first cycle, and the implementation of each cycle uses a time allotment of four, 35-minute

sessions. In the first cycle meeting, the number of students present was only 20 people, while in the second cycle meeting, all students attended; namely 21 people.

A. Cycle *1 Plan Stage*

The research begins with pre-research conducted through observation in the implementation of the learning process in class V to obtain an initial picture in the process of learning science. The implementation of class actions are carried out through the following stages. In the learning planning stage, it is planned that one meeting held for four, 35-minute intervals with material on human respiration, and an indicator to be achieved in learning is to show the human organs, their functions and underline important words in the reading of human respiratory organs.

The steps that are undertaken in the action planning phase are preparing a research permit as an introduction at the elementary school, Inpres 4/82 Walian; preparing a Learning Implementation Plan in accordance with the constructivism approach; preparing the material; preparing teaching aids that be used during learning; preparing the observation of students sheets; preparing observation of researchers sheets; and preparing assessment sheets that will be used during reflection.

B. Cycle *1 Implementation Stage*

The implementation of the action is carried out in accordance with the plan of learning. Learning activities are carried out in accordance with the constructivism approach. The learning activities are divided into several stages:

Initial activities

In the initial activity, the teacher greets students and students answer greetings from the teacher. Then, the teacher asks one of the students to lead the prayer in front of the class, which is followed by checking the attendance of the students. Afterwards, the teacher conditions a good learning situation by tidying up the tables, chairs, conveying the learning objectives and ensuring students are ready to learn, and conveying apperception. The teacher asks the question: "What is a respirator in humans?". Student answers vary, some answer the nose and others, the throat.

Core activities

The teacher issues questions about what the nose, throat and lungs function. Students are asked to write the answer on the student worksheet provided. The teacher asks: "What is felt in a room full of smoke?". Students are asked to make hypotheses or provisional guesses based on the experience had.

Furthermore, the teacher showed a smoke video that caused someone to cough when trapped in a room that had a fire, and students were asked to retell what they observed from watching the video.

The teacher uses the teaching aids so that students are curious about the learning material, then the teacher begins to introduce teaching aids to students through an interspersed posing of questions that contain puzzles to encourage students to be interested in watching the pictures to be compiled. Then, the teacher asks questions after the drafting process is carried out, and the teacher checks the students' understanding by distributing the student worksheet (LKS) and giving conclusions and students record the summary of the material provided.

Closing activities

In the closing activity phase, the teacher conducts an evaluation by giving an assessment sheet to each student. This is done to examine the extent of the students' level of understanding of the material that has been taught. After evaluating, the teacher closes the lesson by providing motivation to students to be more active in learning at home. The teacher and students close the lesson with a prayer.

C. Cycle *1 Observation Stage*

The results of the observation during the learning process identified that there are still some students who lack focus and are less courageous to come to the front of the class. Further, the ability of teachers in guiding students is still lacking, collectively impacting on the achievement of the learning outcomes. There are some students who have not been able to answer the evaluation questions correctly. The conclusion of the first cycle learning outcomes test is presented in Table 1 below.

TABLE 1. THE FIRST CYCLE OF LEARNING OUTCOMES

Number	**Student Name**	**Item of Question**					**Total Value**
		1	***2***	***3***	***4***	***5***	
		10	***10***	***20***	***30***	***30***	
1.	A T	10	5	10	0	0	25
2.	A P	10	10	10	15	10	55
3.	A S	10	10	10	10	25	65
4.	A W	5	10	10	10	10	45
5.	G T	10	10	10	15	10	55
6.	G P	10	10	20	30	30	100
7.	G W	10	10	20	10	15	65
8.	J W	10	5	10	15	10	50
9.	J P	10	10	10	10	10	50

Number	Student Name	Item of Question					Total Value
		1	*2*	*3*	*4*	*5*	
		10	*10*	*20*	*30*	*30*	
10.	M W	10	10	20	30	30	100
11.	L M	10	10	10	15	15	60
12.	M M	10	5	0	15	10	40
13.	N P	10	5	10	20	10	55
14.	S P	10	10	20	30	20	90
15.	S S	10	10	20	20	20	80
16	V M	5	5	10	10	10	40
17	R K	10	10	15	10	10	55
18	J P ·	-	-	-	-	-	-
19	R W	10	10	20	15	20	75
20	T G	10	10	10	10	10	50
21	T D	10	10	20	30	30	100
						Total	1.265

Based on the data in Table 1, it can be calculated that the learning completeness obtained in cycle 1 is as follows:

$$\text{CL} = \frac{T}{Tt} x\ 100\ \% = \frac{1265}{2100} x100\% = 60.24\%$$

The results of the evaluation of the achievement of the learning outcomes in the first cycle is 60.24 per cent.

Some of the obstacles encountered in cycle 1 included students who are not ready to learn, so students are not calm when the teacher conveys the learning objectives, some students do not pay attention to the material explained by the teacher, and the teacher also does not provide opportunities for all students to advance to the front of the class to attach pictures of the breathing apparatus of humans and provide opinions in front of the class about the human respiratory material. Thus, the learning outcomes obtained by students have not been satisfactory or have not reached the criteria for research success.

Therefore, the role of the teacher in the learning process is very important by looking at the condition and situation of the class, so the teacher can analyse the way of teaching that can arouse enthusiasm and actively engage students in the learning process.

D. Cycle *1 Reflection Stage*

The learning outcomes of student participation in the first cycle was still very lacking and had not reached the research success criteria because the intended results are 75 per cent of students must achieve. Therefore, the research continued into the second cycle.

Cycle two was conducted to correct the deficiencies carried out in the first cycle. Namely, the researcher did not fully prepare students before receiving lessons and did not provide an opportunity for all students to come to the front of the class to pose opinions about human respiration and thus, not all students could understand and absorb what was being taught.

E. Cycle 2 *Plan Stage*

Therefore, in cycle two and before commencing the learning activities, the researcher prepares students first by arranging the seating of students and telling all students to be calm when the learning process begins. The teacher provides the opportunity for students to give their opinions about the material on human respiration.

F. Cycle 2 *Implementation Stage*

The implementation of the cycle two activities was completed through the following steps:

Initial activities

In the initial activity, the teacher greets students and students answer greetings from the teacher. Then, the teacher asks one of the students to lead the prayer in front of the class, which is followed by checking the attendance of the students. Afterward, the teacher conditions a good learning situation by tidying up the tables, chairs, conveying the learning objectives and ensuring students are ready to learn, and conveys apperception. When the teacher issues questions to students, students respond well. There are some students who answer questions from the teacher and the answers of students vary.

Core activities

At the core activity, the teacher shows the teaching aids so that students are curious about the learning material that will be carried out. The teacher begins to introduce teaching aids to students through the interspersed issuing of questions that contain puzzles, so as to encourage students to be interested in watching the pictures to be compiled. Then, the teacher asks questions after the drafting process is carried out, and the teacher checks the students' understanding by distributing the Student Worksheet (LKS) and giving conclusions and students record the summary of the material provided.

Closing activities

In the closing activity phase, the teacher conducts an evaluation by giving an assessment sheet to each student. This is done to examine the extent of the students' level of understanding on the material that has been taught. After evaluating, the teacher closes the lesson by providing motivation to students to be more active in their learning at home. Finally, the teacher and students close the lesson with a prayer.

G. Cycle 2 *Observation Stage*

In the results of the observation of the class teacher as an observer, it was stated that the researcher had carried out learning activities from the beginning to the end quite well. The researcher could manage the class and achieve a learning atmosphere that was not tense, which engaged students actively in conducting the learning activities by giving their opinions in front of the class, experiencing improvements in the process of receiving lessons, and actively paying attention to the opinions given by each student who comes to the front of the class. The conclusion of the second cycle of the learning outcomes test is presented in Table 2 below.

TABLE 2. THE SECOND CYCLE OF LEARNING OUTCOMES

Number	Student Name	Item of Question					Total Value
		1	*2*	*3*	*4*	*5*	
		10	*10*	*20*	*30*	*30*	
1.	A T	10	5	10	20	20	65
2.	A P	10	10	20	20	20	80
3.	A S	10	10	10	10	25	65
4.	A W	10	10	20	30	30	100
5.	G T	10	10	20	20	30	90
6.	G P	10	10	20	30	30	100
7.	G W	10	10	20	10	15	65
8.	J W	10	10	20	20	20	80
9.	J P	10	10	20	30	20	90
10.	M W	10	10	20	30	30	100
11.	L M	10	10	15	20	20	75
12.	M M	10	10	20	20	20	80
13.	N P	10	10	10	25	20	75
14.	S P	10	10	20	30	30	100
15.	S S	10	10	20	20	20	80
16	V M	10	10	10	20	25	75
17	R K	10	10	15	20	20	75

Number	Student Name	Item of Question					Total Value
		1	*2*	*3*	*4*	*5*	
		10	***10***	***20***	***30***	***30***	
18	J P ·	10	10	20	25	20	80
19	R W	10	10	20	15	20	75
20	T G	10	10	10	10	10	50
21	T D	10	10	20	30	30	100
Total							1.720

Based on the data in Table 2, it can be calculated that the learning completeness obtained in cycle 2 is as follows:

$$CL = \frac{T}{Tt} x\ 100\ \% = \frac{1720}{2100} x100\% = 81.90\%$$

The success of the learning outcomes achieved in the second cycle was 81.90 per cent.

H. Cycle 2 *Reflection Stage*

After making observations during the learning action taking place, the observation results are discussed by the researcher together with collaborative partners, consisting of the researchers, teacher and principals, to assess the level of success obtained. With the fulfilment of the student achievement criteria, the researcher draws the conclusion that the results of this second cycle are satisfactory because the learning steps of the constructivism approach have been completed well and the results of the second cycle have exceeded the minimum completion criteria. Thus, the class action research ends at cycle two and does not proceed to the next cycle.

DISCUSSION

The implementation of the constructivism approach in cycle one of the science learning did not provide optimal results, where student learning outcomes did not reach the minimum completion criteria. Some of the obstacles encountered in cycle one included students who were not ready to learn and subsequently were not calm when the teacher conveyed the learning objectives, some students did not pay attention to the material explained by the teacher, and the teacher did not provide opportunities for all students to advance to the front of the class to attach pictures of the breathing apparatus of humans and provide their opinions in front of the class about the human respiratory material. Thus, the learning outcomes obtained by students was not satisfactory and did not reach the criteria for research success. This occurred because researchers were not able to carry out the learning activities according to the learning process plan that was developed.

However, in the second cycle, students' readiness for learning began to grow and students could now observe the teacher's learning, so that when the teacher gave opportunities to the students

to give their opinions in front of the class, students could do it well. Consequently, the learning outcomes achieved in cycle two increased from the results of cycle one.

Therefore, the role of the teacher in the learning process is very important by looking at the condition and situation of the class, so the teacher can analyse the way of teaching that can arouse enthusiasm and actively engage students in the learning process. This is in line with Tuerah's opinion which states that the learning management ability of a teacher influences their performance.

One of the factors in the success of the learning process is the teacher. A teacher who is able to create optimal performance is a teacher who has contextual ideas in developing the learning process and involves feeling as a professional teacher (Beijaard, Meijer, & Verloop, 2004; Burgess & McGregor, 2018; Frederiksen, Lund, & Beck, 2016; Girvan, Conneely, & Tangney, 2016; Hiim, 2015), but if in the context of e-learning, this might not be an obstacle (McCombs & Vakili, 2005; McKnight et al., 2016; Murphy & Rodriguez-Manzanares, 2009).

In science learning in class, the internal factors of students is very significant because sometimes students are present with more motivation to fulfil attendance rather than with motivation to seek more knowledge. Therefore, science teachers should use social modeling and collaborative learning activities to foster students' motivation, achievement, and interest in science careers (Bryan, Glynn, & Kittleson, 2011; Deterding, 2012; Garris, Ahlers, & Driskell, 2002; Kusurkar, Artino, & Ten Cate, 2015; Putra, Handarini, & ..., 2019; N. Sari, Sunarno, & Sarwanto, 2019; Schunk & Zimmerman, 2012).

The research is continued in the second cycle by making improvements from the first cycle to achieve better results. The second cycle still uses the constructivism approach with the belief that it can improve student learning outcomes (Huang, 2002; Knowles, Holton, & Swanson, 2005; Mainemelis et al., 2002; Stoney & Oliver, 1998). The results obtained from the implementation of the action of the two cycles showed good progress. The achievement of student learning outcomes in the first cycle was 60.24 per cent, while in the second cycle it was 81.90 per cent.

The implementation of constructivism learning models in the science learning of the two cycles enabled the students to construct knowledge with the experience gained in the learning activities. Thus, it is concluded that the results achieved have reached the expected target.

The progress and improvement obtained during the two-cycle learning process shows that through the implementation of constructivism approaches in the science subject, it can improve learning outcomes of fifth grade students of SD Inpres 4/82 Walian. The results of the analysis showed that there was an increase in the development of the teacher activities and student activities developed towards achieving better student learning outcomes from cycle one to cycle two.

CONCLUSION

Research results show that the application of the constructivism approach to science learning in the fifth grade of the elementary school, Inpres 4/82 Walian, was able to help students construct their knowledge of human respiration and provided optimal learning outcomes. Thus, it was concluded that the constructivism learning approach had an influence on science learning.

ACKNOWLEDGMENT

Thank you to Universitas Negeri Manado for giving me the task to research and publish the results of this research. Thank you to the principal of Inpres 4/82 Walian elementary school and the teachers and students who helped greatly in the research process so that researchers could complete this research. Thank you to the Universitas Negeri Malang, which hosted the FIP-JIP event and became a committee in publishing this scientific work.

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