



THE EFFECTIVENESS OF CONSTRUCTIVISM APPROACH TOWARDS ACITIVITY AND LEARNING RESULT ON MICROSCOPE MATERIAL

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Abstract

This study aimed to describe the effectiveness of a constructivism approach to the activity and student learning result in materials microscopy in SMP Negeri 2 Welahan, Jepara. This study is a pre-experimental research design one shoot case study. The study population was all students of class VII consists of six classes (VIIA-VIIF). Samples were taken using purposive sampling, consists of two classes, namely VIIE class consisting of 38 students and VIIF class consisting of 37 students. The independent variables in this study are materializing learning with a constructivism approach, and the dependent variable is the activity and student learning result. Data captured using student activity observation sheet, sheet materialize questionnaire study with a constructivism approach, interview teachers, and the post-test. Based on the results of the data, analysis, and discussion, student activities classically reached 89.5% (VIIE) and 86.5% (VIIF). Classical completeness of student learning result was 92.1% (VIIE) and 89.1% (VIIF). Materialize learning with a constructivist approach shows very good and good result, both in class VIIE and VIIF. Teachers give a positive response to a constructivism approach to learning. It can be concluded that effective learning with a constructivism approach to the activity and student learning result in materials microscopy.

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INTRODUCTION

According to Law Number 20 Year 2003 about National Education System, education is a conscious and planned effort to create a learning environment and learning process so that students will actively develop their potential to possess religious spiritual, self-control, personality, good morality, and the skills needed by themselves, society, and the nation. Learning process in educational unit is conducted in an interactive, inspirational, fun, and challenging way. It motivates the students to be active, also provides enough space for initiative, creativity, and independence in the accordance with talent, interest, physical and psychological development of the students.

The result of observation and interview with Biology teacher in SMP Negeri 2 Welahan showed that an active student-centered learning had not been conducted yet. Teaching material is a set of learning material which is systematically packed based on the competence that will be achieved according to learning purposes (Asfiah et al., 2013). The learning process was conducted using lecture method supported by LCD as media. Lecture method was used by the teacher to deliver the material written in the text book, while LCD was used to show the assignment which contained questions to be answered by the students individually. Students were not taught to find a concept by themselves. The teacher conducted a one way learning, in which students only listened to the teacher's explanation. Students were not actively involved in the learning process. If this condition was continued, students' activity and learning result would be low.

According to Killen (1998), the characteristics of effective science learning were involving students actively, using a collaborative approach, and emphasizing on result/academic competence of the students. Lawson (1995) also stated that effective science learning was aimed to help students to develop their critical and creative thinking skills, build essential concept mastery and the basic form of scientific thinking, build a confidence in stating a problem or question, and solve the problem. All of the three experts' idea stated that biology learning should not deliver theories only, but also involve the students actively in the learning process.

One of biology learning alternatives which helps the students to be more active is constructivism learning (Rostika, 2008). According to Karli & Yuliariatiningsih (2003), constructivism is a point of view about learning process saying that learning process (knowledge acquisition) is begun with cognitive conflict which can be solved by self-knowledge only, and in the end of learning process, knowledge will be built by the students through their experience from the interaction with their environment. Constructivism approach emphasizes on the building of understanding actively, creatively, and productively based on the previous knowledge and meaningful learning experience (Muslich, 2008). A study by Lisnawati (2010) also shows that the application of constructivism approach improves students' learning result in biology.

One of the learning purposes of natural science, especially biology, in Junior High School is to develop the understanding about some nature phenomena, concepts, and science principles, which are useful and can be applied in daily life. Advanced science concepts can be approached in to an interdisciplinary context (Miron, C., & Staicu, I., 2010) or during non-formal activities (Niculae et al., 2011). With a view to ascertain the opportunity of studying of advanced science concepts using constructivist strategies in middle and high school we deployed a study using an inquiry questionnaire (Iofciu et al., 2013). Constructivism is a learning process which explains how knowledge is built in human (Hapsari, 2011). Microscope material will involve the students actively in the learning process if constructivism approach is used. Constructivism in biology is biology learning concept which emphasizes on the way to discover a concept through some activities designed by the teacher. Those activities are important to coordinate knowledge and skill to achieve learning purpose. Elvinawati (2011) states that constructivism notes that students' knowledge is the result of their own construction. Constructivism approach directs the students to build their own knowledge, and the teacher may help and direct them by delivering the material in the form of concept, principle, or theory to make it understandable for the students (Abdi et al. 2013). In this research, learning process with constructivism approach was conducted in a laboratory. The students were expected to be able to learn by building their own

knowledge in order to find an answer, or students' experience inside the class when learning biology.

METHODS

This research was conducted in the academic year of 2015/2016 in SMP N 2 Welahan. It was a pre-experiment research using one shoot case study design. The samples of this research were VII E class consisted of 38 students and VII F class consisted of 37 students, chosen using purposive sampling technique. VII E and VII F were treated with constructivism approach. The independent variable of this research was learning process using constructivism approach, while the

dependent variable was students' activity and learning result. Types of data, method of data collection, instruments, subjects, and time can be seen in Table 1.

Students' activity and the implementation of learning with constructivism approach were analyzed using descriptive percentage. Students' learning result was acquired from three instruments such as discussion sheet, worksheet, and posttest questions. Posttest questions were tested to analyze its validity, reliability, difficulty level, and the distinguishing capacity. Teacher's interview was analyzed using descriptive qualitative.

Table 1. Types of Data, Method of Data Collection, Instruments, Subjects, and Time

Type of Data	Method	Instrument	Subject	Time
Students' activity	Observation	Observation form	Students	During learning process
Students learning result	Test	Posttest questions, discussion sheet, worksheet	Students	During and after learning process
The implementation of learning with constructivism approach	Questionnaire	Questionnaire form	Students	After learning process
Teacher' responses on the learning with constructivism approach	Interview	Interview manual	Teacher	After learning process

RESULT AND DISCUSSION

Students' Activity

The observation of students' activity in the learning process using constructivism approach on microscope material showed that students were very active and active.

The implementation of constructivism approach caused the students to be active in doing observation, listening to teacher's explanation, analyzing, doing an experiment, and discussing (presenting). Observation result is presented in Table 2.

Table 2. The Observation Result of Students' Activity with Constructivism Approach on Microscope Material in VII E and VII F class in SMP Negeri 2 Welahan

Indicator	VII E		VII F	
	Activeness (%)	Criteria	Activeness (%)	Criteria
Observation on teacher's demonstration	92.1	Very Active	100	Very Active
	97.3	Very Active	100	Very Active

Indicator	VIIIE		VIIF	
	Activeness (%)	Criteria	Activeness (%)	Criteria
Microscope Observation				
Listen to teacher's explanation in the first meeting	81.5	Active	89.1	Very Active
Analyzing (doing) the discussion sheet	94.7	Very Active	67.5	Intermediate
Discussing while doing the discussion sheet	94.7	Very Active	67.5	Intermediate
Observing while doing experiment	89.4	Very Active	97.2	Very Active
Listen to teacher's explanation in the second meeting	81.5	Very Active	70.2	Intermediate
Analyzing (doing) the worksheet	89.4	Active	89.1	Very Active
Doing an experiment on water straw bath	100	Very Active	97.2	Very Active
Discussing the questions in the worksheet	89.4	Very Active	89.1	Very Active

Based on Table 2, it is known that the highest students' activity is 100% in VII E. The indicator is doing an experiment on water straw bath. The lowest students' activity is 81.5% in VII F. The indicator is listening to teacher's explanation in the first and second meeting. In VII F, the highest

students' activity is 100% with the indicator of observing teacher's demonstration and microscope, while the lowest is 67.5% with the indicator of analyzing the discussion sheet and discussing while doing the discussion sheet.

Table 3. Students' Activeness Percentage with Constructivism Approach on Microscope Material in VII E and VII F class in SMP Negeri 2 Welahan.

Interval	Criteria	VIIIE Class (%)	VIIF Class (%)
$86\% < A \leq 100\%$	Very Active	78.9	59.4
$71\% < A \leq 85\%$	Active	10.6	27.1
$61\% < A \leq 70\%$	Intermediate	7.9	8.1
$51\% < A \leq 60\%$	Inactive	0	2.7
$0 < A \leq 50\%$	Very Inactive	2.6	2.7
Classical Students' Activity		89.5	86.5

Based on Table 3, it is known that the result of learning using constructivism approach is good. It can be seen that most of the students in VIIIE (89.5%) and VIIF (86.5%) are including in active and very active criteria. It shows that learning using constructivism approach affects the students to be active during learning process.

Learning activity is a very important thing for the students because it gives the students

chances to have a direct contact with the object they are learning. Therefore, the construction process is better. According to Rosalia (2005), students' activity during teaching and learning process is one of the indicators of students' interest to learn.

In VIIIE, the highest activity is 100% on doing the experiment about water straw bath material. It shows that the whole class (38

students) did the activity. In that indicator, students conducted an experiment on water straw bath by using microscope. The activity was done in group. That was the first time for them to use the microscope. That was also the first time for them to observe a microorganism through microscope. They were very enthusiastic because they were able to see something that could not be seen by naked eye. That was the cause why water straw bath experiment achieved 100%. The lowest activity is 81.5% on listening to teacher's explanation in both first and second meetings. It shows that some of the students were less interested in teacher's explanation. Students preferred to find a concept independently and build their own knowledge based on the activities designed by the teacher.

In VIIF, the highest activity is 100% on observing teacher's demonstration and observing through microscope. It shows that the whole class (37 students) did both activities. Students were interested in observing teacher's demonstration because the teacher used microscope in the demonstration. Students had not seen and known microscope before. It became a new thing which triggered their curiosity. In the indicator of observing through microscope, each group used one microscope. They were free to see, observe, and touch it directly. Those activities helped the students to build a concept about the part and function of microscope. The lowest activity is 67.5% on analyzing discussion sheet and discussing the discussion sheet indicator. The activities in both indicators were done in group. The purpose of analyzing the discussion sheet was to help the students to recognize and mention the parts and functions of microscope. During the activities, each group used one microscope. Both indicators achieved the lowest percentage because students were more interested in observing something through microscope than discussing the questions and discussion sheet, so that the questions in the discussion sheet were ignored.

Students' activeness percentage in the learning process using constructivism approach on microscope material in VIIE is good (89.5%). Students' activeness is very high and high. VIIF also achieves good percentage of students' activeness (86.5%). Students' activeness is very high and high. Students' activeness percentage in VIIE is higher than VIIF because of internal factors from the students such as motivation and

attention. The higher the motivation and attention, the higher the students' activity will be.

The explanation above shows that learning process using constructivism approach affects the students to be active during learning process. It can be said that constructivism approach on microscope material is effective to improve students' activity in VIIE and VIIF class in SMP Negeri 2 Welahan.

Students' Learning Result

The data of students' learning result is acquired from discussion sheet and worksheet score about the observation of life phenomena: water straw bath, and posttest score on microscope material. Discussion sheet is given score 1; worksheet is given score 2; and posttest is given score 3. Final score is acquired by adding discussion sheet, worksheet, and posttest score. The result is divided by 6. The passing grade is 72. Students' learning result on microscope material in VIIE and VIIF is presented below.

Table 4. Students' Learning Result Using Constructivism Approach on Microscope Material in VIIE and VIIF class in SMP Negeri 2 Welahan

Data	Class	
	VIIE	VIIF
Discussion sheet average score	79.7	75.6
Worksheet average score	77.7	78.9
Posttest average score	76.9	68.2
Final average score	77.7	73.04
Highest score	90.1	83.8
Lowest score	60.8	34.7
Total students	38	37
Students who passed the test	35	33
Students who did not passed the test	3	4
Classical passing	92.1%	89.1%

Based on Table 4, it is known that the students' learning result using constructivism approach on microscope material in VIIE and VIIF is good. The highest score in VIIE is 90.1 and the lowest is 60.8. The highest score in VIIF is 83.8 and the lowest is 34.7. There is a significance difference between the highest and lowest score. To get a high score, students also

need to get high scores for discussion sheet, worksheet, and posttest. In observing teacher's demonstration, observing through microscope, and doing the experiment, students got a new knowledge by interacting with environment. If the knowledge that was constructed was different from the previous knowledge, students would find a conflict in their cognitive structure. Students got low score because there was an uneven cognitive structure. Students whose new knowledge was similar to the previous one would have a stronger knowledge so that assimilation process happened (the formation of appropriate cognitive structure).

There was a significant difference between the average of discussion sheet score in VIIE and VIIF class. The discussion sheet was done by the students in the beginning of learning process in the first meeting. It shows that although the students had different previous knowledge, they were still able to construct the same concept after doing the experiment on water straw bath. A study by Sumarsih (2011) showed that students build their own knowledge based on their experiences with the environment. The average of posttest and final score in both classes showed a

quite significant result because students' ability to construct the concept got after doing the experiment was different. Students whose previous knowledge was similar to the new knowledge would have a better posttest and final score.

Classical passing qualification in VIIE class achieves 92.1%, while VIIF achieves 89.1%. It means both classes have met the criteria. It shows that learning with constructivism approach improves students' learning result. It can be said that constructivism approach on microscope material is effective to improve students' learning result in VIIE and VIIF class in SMP Negeri 2 Welahan.

The Implementation of Learning Using Constructivism Approach

The implementation of learning using constructivism approach on microscope material in VIIE and VIIF class is acquired from the questionnaire form. The questionnaire was given to the students in the end of learning process. The result is presented in Table 5.

Table 5. The Implementation of Learning Using Constructivism Approach on Microscope Material in VIIE and VIIF class in SMP Negeri 2 Welahan

Indicator	VIIE		VIIF	
	Implementation (%)	Interpretation	Implementation (%)	Interpretation
Teacher explains the learning purpose	88.4	Excellent	86.3	Excellent
Teacher explains the material briefly	81.5	Excellent	69.4	Good
Teacher gives question to dig students' initial	85.7	Excellent	84.7	Excellent
Students find the concept independently during learning	72.6	Good	72.6	Good
Students explore through observing teacher's demonstration	81.5	Excellent	84.2	Excellent
Students explore through the observation with microscope	91	Excellent	85.2	Excellent
Students explore by doing the discussion sheet	84.7	Excellent	81	Excellent

Indicator	VIIE		VIIF	
	Implementation (%)	Interpretation	Implementation (%)	Interpretation
Students explore during water straw bath experiment	91.5	Excellent	82.6	Excellent
Students discuss (communicate) the discussion sheet	80.5	Good	76.3	Good
Students discuss (communicate) the experiment result	85.2	Excellent	78.4	Good
Students do question and answer to respond to other groups' discussion result	76.6	Good	70.5	Good
Teacher emphasized on the concept related to the material	80	Good	82.1	Excellent
Students with the guidance from the teacher make a conclusion in the end of learning process	85.7	Excellent	86.8	Excellent
Students with the guidance from the teacher apply the conceptual understanding related to daily life	80	Good	78.4	Good

The implementation of learning using constructivism approach on microscope material shows a good result. Teacher had conducted a series of activities in the learning process using constructivism approach well. It can be shown from the implementation of all indicators which have excellent and good interpretation. According to Table 5, the highest implementation indicator in VIIE class is 91.5% on the exploration while doing water straw bath experiment. The lowest indicator is 72.6% on finding the concept independently during learning process. The highest indicator in VIIF class is 86.8% on drawing conclusion in the end of learning process with the guidance from the teacher, while the lowest is 69.4%. The indicator is teacher explains the material briefly.

The highest implementation indicator in VIIE was achieved because students were interested in doing the activity of water straw bath experiment. The activity was done in the laboratory in group so that the learning process was more fun. The activity enabled the students to use the microscope to observe water straw bath. Students were very enthusiastic when they found something through the microscope. Those

things caused the indicator achieved the highest percentage. The lowest indicator is students find a concept independently during learning process. It was because students were not able to find a basic concept from the activity. Students were more interested in doing the experiment and ignored the concepts that should be constructed independently.

The highest indicator in VIIF class is 86.8% on drawing conclusion in the end of learning process with the guidance from the teacher. It happened because students were interested in drawing conclusion about what they learn that day. The activity was done in the end of learning process with the guidance from the teacher to make the activity more enjoyable. By drawing conclusion, students knew and understood the material they learn that day. Those things affected the indicator to achieve the highest percentage. The lowest indicator is teacher explains the material briefly. It happened because some students were less interested in listening to teacher's explanation. When teacher explained the material briefly, students tended to think that the explanation was less important.

Teacher's Response

Teacher's response on the learning using constructivism approach on microscope material in VIIIE and VIIF class in SMP Negeri 2 Welahan is acquired through interview with biology teacher who taught both classes. The interview was conducted in the end of learning process. The interview summary is presented in Table 6.

Table 6. Teacher's Response on Learning Using Constructivism Approach on Microscope Material in VIIIE and VIIF class in SMP Negeri 2 Welahan

Aspect	Answer
Have/have not the teacher applied constructivism approach	I had. The understanding to use the equipment is important, but it had not been maximal yet.
Teacher's impression about learning using constructivism approach	Good. Students were happy because they were given a freedom to learn by constructing their thinking.
Teacher's opinion about students' learning result	A deeper supervision was needed for theory mastery and equipment usage
The difficulties found by the teacher	Some equipment was imperfect, and some students thought that microscope was a toy.
The way to overcome the problem	Theory should be clear so that students were able to use the microscope well.
There was/there was no students' improvement	There was a significant improvement.
Students' understanding towards the material	The material was easily understood because students could see, touch, and use microscope

Aspect	Answer
	directly.
Students' interest in the learning using constructivism approach	They were very interested. It could be seen from the fun learning atmosphere.
Students' interest in the implementation of constructivism approach for other material	Teacher was interested in applying that approach for other materials as long as the equipment was provided.
Suggestion	Constructivism approach needed to be applied for other subjects. Besides, teacher should be well prepared.

Based on Table 6, it is known that overall teacher gave positive responses for constructivism approach on microscope material. It can be seen from the teacher's answers during interview. Teacher stated that there was a significant improvement comparing to the previous year. Students were able to see, touch, and use the microscope directly so that they understood the material better. They were happy to be given a freedom to learn independently by constructing their thinking. Students were highly interested in participating in the learning process. However, teacher still found some difficulties because of the limited numbers of equipment, especially microscope. Teacher suggested the stakeholder of the school to provide microscopes with higher quality.

CONCLUSION

It can be concluded that constructivism approach is effective to improve students' activity and learning result of VIIIE and VIIF class in SMP Negeri 2 Welahan.

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