

Verification Practicum 5E A New Conventional Practicum News

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Abstract: *Science knowledge is a process and product, therefore learning science needs to facilitate the students to build science through the process. The usual process for learning Natural Sciences in seventh grade junior high school is by practicing cook book verification. Such learning has various weaknesses. The weakness of the cook book verification practicum can be overcome by modifying the verification practicum. Modifications are made by blocking 5E activities into the verification practicum. This verification practice modification product is a novelty from the cook book verification practicum and is called the 5E verification practicum.*

Keywords: modification of practicum, 5E verification practicum.

1. Introduction

Natural Sciences according to Carin and Sund (1985), Abruscato (1988), Fitria, et al (2013) as a process and process. In other words, science is a human effort to understand the world as far as is observed, and this is produced through a process that involves scientific experience. Based on the meaning of science, learning science is not only the transfer of knowledge from teacher to student. Science learning should facilitate students building knowledge that involves processes to shape the meaning of science.

This is supported by NASA Science (2019) which states, in schools it is important to study science as a process of discovery that enables us to connect isolated facts into a coherent and comprehensive understanding of the natural world. Therefore, learning science in schools does not merely present a collection of static and isolated facts contained in textbooks (undsci.berkeley, 2019). Fitria, et al (2013) suggests learning science in schools, among others, must: (a) provide experience to students so that they are competent to take a variety of measurements, (b) convey to students the importance of empirical observations to test scientifically, (c) thinking exercises that support learning as activities that link with natural events. Based on the opinion of how learning science, it is concluded learning science in schools should be an effort to facilitate students to build science through the process. The process will give students experience. Experience is gained by seeing, hearing, asking, doing and communicating. At each of these stages students are facilitated to think. This technique is known as scientific activity. The experience gained by seeing, hearing, asking, doing, communicating, is a student's scientific process skills. Science process skills are one of the goals of science learning (Sukarno, Permanasari, Hamidah. 2013).

Scientific activities that are applied to learning should be adjusted to the characteristics of students, namely the level of their intellectual development. Grade VII middle school students generally only reach the level of intellectual development of concrete operations. Although according to Piaget, seventh grade junior high school students are at the level of intellectual development of formal operations

because they are over 11 years old. But the Carin and Sund (1985) states, that many high school students aged 11 years and older have not yet reached the level of intellectual development of formal operations, they have only reached the ability to think concretely. For this reason, the scientific activities of VII grade junior high school students need to be designed to help them build abstract science knowledge, from something that can be seen. This means that the scientific activities of seventh grade junior high school students include the activities of seeing, hearing, asking, doing and communicating something that they can immediately see and connect with science.

2. Verification Practicum

Carin and Sund (1985) state, there are still many high school students who have not yet reached the ability to think formally, this means that there are still many grade VII junior high school students who have not yet attained formal thinking skills. Therefore, if a VII grade junior high school student is facilitated to carry out scientific activities such as inquiry, then there is a gap for students to interpret the data obtained to build science. Many students have not been able to formulate hypotheses, use hypotheses to build science, arrange work steps and interpret data obtained to prove hypotheses. Carin and Sund (1985) recommend that science learning needs to be adjusted to the level of students' intellectual development. Moore (2005) states, learning must be adjusted to the characteristics of students. Science learning that is in accordance with the characteristics of seventh grade junior high school students, among others, with practicum. Practicum is useful to prove the truth of previously received knowledge. This practicum is commonly known as verification practicum or conventional practicum. Science learning in junior high schools, especially class VII Bandar Lampung currently has facilitated students to build science through the process. The usual stages of verification practicum are as follows.

- 1) Preliminary activities, consisting of the teacher (1) conveying the learning objectives, (2) delivering the subject matter, and (3) apperception activities.
- 2) The core learning activities consisting of teachers (1) explain learning material by lecturing, (2) explain and present working materials and procedures, (3) direct students to conduct practicum in a laboratory that

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functions as a verification activity, (4) teachers and students discuss the appropriateness of observations with the theory. In such learning does not facilitate students to find new information.

- 3) Closing activities consisting of activities (1) the teacher guides students to make conclusions based on the results of data verification with theory, and (2) the teacher receives a presentation of the results of the practicum in the form of a report.

Verification practicum has the advantage of being able to help students to strengthen knowledge in their cognitive structures. So when students are asked to answer questions or problems related to the knowledge, students will easily answer them. This practicum activity only functions as an activity of proving the information or knowledge that has been explained by the teacher (Montes and Rockley, 2002). According to Montes and Rockley (2002) verification activities are expected to strengthen the knowledge that students have acquired. Knowledge that is firmly embedded in cognitive structures can improve learning outcomes. Thus practicum activities that function as verification activities, can help students to achieve learning outcomes at a higher level of rote learning.

Higher learning outcomes from memorization can be achieved through conventional practice because learning facilitates students to learn by using all their physical senses. Maximum learning through all physical senses, based on the results of an analysis of information processing theory, has the opportunity to produce meaningful learning outcomes, namely learning outcomes not only at the rote level, but at a higher level than rote learning. According to information processing theory, if learning facilitates students to learn by using all the senses, the receptor will receive information from various senses, for example from sight, hearing, smell, taste, etc., so that the information passed and received by the receptor will be more complete. If the information received is more complete, then the opportunity to assimilate information and accommodation with previously owned knowledge will be even greater, and the chance of a balance in the cognitive structure of students will be even greater.

Dryden and Vos (1999), and Dryfus (2001) state that the more senses involved in learning, the greater the opportunity to obtain meaningful learning outcomes. Based on an analysis of statements that emphasize learning through activities involving all physical senses, it is concluded that to achieve meaningful learning outcomes, learning that needs to be considered to be applied should involve students with activities that see, hear, touch, smell and do or involve all physical senses. Conventional practicum activities that function as verification activities, facilitate students to learn by using all physical senses.

In addition to having advantages, verification practicums have weaknesses, namely conventional practicum although they involve students with activities that use all physical senses, but students are only able to answer the test questions at rote level. This is because learning does not facilitate students to learn through physical and mental activities, and practical activities are activities that are "cook book". Generally after the activities in the laboratory end

and when students are asked to answer questions that are presented differently from the questions in the book, or student worksheets, they only give answers to repeat what the teacher has said. Meanwhile, according to NASA Science (2019) learning science is not just a step by step approach to discovery. Science is more like a mystery that invites anyone who is interested to become an investigator and join in a fun activity.

Conventional practicum according to Clough and Clough (2002), is generally a cook book activity. Such learning makes students do not understand what and why they do activities, and lack the ability to respond to data obtained based on the symptoms that exist (DiPasquale, et al., 2001). In addition, cook book activities in the laboratory are determined before learning. This kind of thing happens everywhere and rarely involves students in the ways needed to facilitate their understanding, so learning does not help students achieve learning outcomes at a higher level than rote learning.

Students who are accustomed to being taught with conventional practicum, generally will have difficulty connecting and using knowledge that has been obtained previously, when presented problems and asked to find solutions to problem solving. In addition, students generally do not see a connection between what they have learned with daily life. This happens because conventional practice does not facilitate students to use thinking skills. This fact shows, although conventional practicum learning involves all students' senses in learning, but this learning 1) does not help students to build meaningful science, 2) students still have difficulty analyzing data obtained from observations, 3) students find it difficult to solve problems related to daily life. All of this ultimately affects the learning outcomes obtained by students. This is in accordance with the statement of Layng (2013) it is indeed not easy to teach science concepts to students, because if it is not right it will cause misunderstanding. In addition, according to Guzey, et.al (2019) the integration of techniques in the classroom and the use of technical language in learning results in an increase in science learning outcomes and higher techniques. This means that to improve learning outcomes requires the selection of appropriate learning strategies.

3. Modification of the Verification Practicum

Verification practicum has weaknesses and strengths of verification practicum. this means that this pactum has the opportunity to help students build science on condition that they overcome this practical weakness. The weakness of the verification practicum can be overcome by modifying the partium. Modifications are made by looking for techniques that can overcome weaknesses, according to the characteristics of seventh grade junior high school students, and develop thinking skills. The intended modification is to include 5E activities in the verification practice

According to Singh and Yaduvanshi (2015), 5E learning is learning that is able to help students learn maximally. This learning involves students to build knowledge through scientific activities. The 5E steps are referred from Singh and Yaduvanshi (2015) as follows.

1) Engage

This phase creates a relationship between previous and present learning experiences and anticipates activities that focus students' thinking on the learning outcomes of current activities. Students must be mentally involved in the concepts, processes or skills that must be learned. Here the teacher's role is to present the situation and identify the learning task. Explore

2) Explain

This Phase 5E helps students explain the concepts they have explored in the previous step. Here, the teacher tries to focus student attention on specific aspects of the experience of engagement and exploration. the key to this phase is to present concepts, processes or skills briefly, simply, clearly, and directly and move on to the next phase.

3) Elaborate

This Phase 5 E broadens students' conceptual understanding and enables them to practice their skills and behavior.

4) Evaluate

This is the last phase of 5E which encourages students to evaluate students' understanding of key concepts and skills development.

Modification of the verification practicum with the 5E technique is a novelty of the verification practicum to build science knowledge. 5E verification practicum is a learning activity that facilitates students to carry out practicum activities as a proof of activity from the knowledge that the teacher had previously submitted through the 5E stage. This update is important because according to Guzey, et.al (2019) the integration of techniques in the classroom and the use of technical language in learning results in an increase in science learning outcomes and higher techniques. This means that to improve learning outcomes requires the selection of appropriate learning strategies. The right science learning strategy for 7th grade students is a 5E verification practicum.

4. Implementation of the 5E Verification Practicum

Application of the 5E verification practicum for seventh grade junior high school students for material classification material. The competencies to be achieved after the 5E practicum activities are students are able to explain the substance has mass and keep space, the details of the 5E verification practicum are as follows.

Stages of the 5E Verification Practicum

Phase	What the teacher is doing	What students are doing
Engage Including	The teacher explains in general terms the concept of matter having mass and occupying space. An explanation of this concept is described in the textbook.	Students pay attention to the teacher's explanation of substances having mass and occupying space. Students learn equipped with textbooks that have been developed.
	The teacher provides various objects namely solid, liquid and gas objects. Previously students had been divided into study groups consisting of 4-5 people.	Students observe various types of solids, liquids.
	The teacher asks the learning groups to write down their experiences of whether solid, liquid and gas objects have mass and occupy space.	They become curious when writing their experiences and try to find answers to the questions asked.
Explore	Then the teacher asks each group to make preparations for evidence that matter has mass and occupies space.	Students discuss in group learning to answer questions 1) how to know that objects have mass, 2) how to know that objects occupy space.
	The verification activity starts with the guidance of the teacher. Guidance is done by asking questions 1) how to know that objects have mass, 2) how to know that objects occupy space.	Study groups are guided to be careful in conducting the practicum of proof. Teacher guidance is described in the student worksheet about substances having mass and occupying space, through practicum demonstration activities with step 5E.
	The teacher asks the student study groups to discuss the same practicum but use different tools and materials. Students can use materials and tools in accordance with the wishes of the study group.	Students will enjoy activities and discuss in group learning.
Explain	The teacher guides students to note whether matter has mass and occupies space.	Then students note their observations and ideas.
	The teacher tells each group to explain what they observed during the verification practicum	Students carefully listen to each other's observations and explanations about the verification practicum and try to redefine their own understanding
Elaborate	The teacher asks probing questions to prove that matter has mass and occupies space	Students provide appropriate justifications based on their 5E proof practicum activity that matter has mass and occupies space. Students pay attention to teacher clarification
	The teacher asks for other examples from everyday life where students can relate it to everyday experiences related to matter having mass and occupying space	Students can give examples of gas contained in gas cylinders for cooking in the kitchen, books and bottled drinks.
Evaluation	The teacher uses group discussion to discuss and emphasize how matter has mass and occupies space	Students during group discussions evaluate their own progress

The stages of the 5E verification practicum are planned by facilitating students to learn using the 5E verification practicum worksheet. So when the 5E verification practicum students use the worksheets of the student, students are directly guided to work step by step 5E verification practicum. The contents of the 5E verification practicum student worksheet guides the practicum students step by step as in step 5E, with the following details.

Substance Proof Has Mass and Occupies Space

Stage 1. Preparation

At the preparation stage in the student worksheet contains activities that direct students to engage activities. Engaging activities include a general description of the concept of matter having a mass and occupying space and examples in everyday life. A description of the concept explanation in writing in the textbook. In other words 5E verification practicum requires textbooks that explain clearly, structured, and factualize the concepts explained and examples contained in everyday life.

Stage 2. Data collection

At this stage, the student worksheet contains activities that lead students to explore activities. Exploration activities include 1) presentation of tools and materials needed to carry out verification activities, 2) asking students to answer questions for the tools and materials prepared at the 5E verification practicum, 3) practicum activities carried out step by step until data collection.

The study group is guided to be careful in conducting the practicum of proof as the teacher's guidance in the student worksheet about substances having mass and occupying space.

Stage 3. Data analysis

At this stage, in the student worksheet contains activities that direct students to do the explain and elaborate activities. Activities lead students to discuss in study groups to answer questions 1) how to know that objects have mass, 2) how to know that objects occupy space.

After the data is obtained, the study group is directed to carry out activities to explain the results of data analysis which includes 1) substances having mass and occupying space, 2) giving examples with other objects that prove that substances have mass and occupying the space found in daily life.

Stage 4. Conclusion

At this stage, in the student worksheet contains activities that direct students to carry out evaluation activities 1) themselves related to the results of the evidence carried out and 2) conclude the proof of the concept of matter has mass and occupies space and examples contained in everyday life.

Learning the verification practice 5E needs to know the results on student learning outcomes. The intended learning acquisition is the ability to 1) draw conclusions, 2) interpret the data, 3) compile the tools and materials needed and 4) the rationale for the evidentiary steps taken.

5. Conclusion

Science knowledge needs to be built through the process, the process of building science knowledge is done through activities that maximize the use of all student senses. These activities include doing, seeing, hearing, asking and communicating. The scientific process in students cannot be interpreted like an expert inquiry activity. The scientific process in junior high school students involves them enough to be able to build science through a process that involves them to do, see, hear, ask and communicate. All of these activities are facilitated to develop their thinking skills including the reasons for carrying out activities and the relationship between the data obtained to build science.

Weaknesses of this verification practicum are overcome, by modifying the verification practicum with the 5E model. The modification of this practicum is termed the 5E verification practicum. The advantages of the 5E verification practicum are 1) involving students in building knowledge by doing, seeing, hearing, asking and communicating, 2) involving students' physical and mental activities, 3) helping students interpret data to build knowledge of science.

6. Recommendation

Student learning outcomes with learning practice verification 5E needs to know the results on student learning acquisition. The intended learning acquisition is the ability to 1) draw conclusions, 2) interpret the data, 3) compile the tools and materials needed and 4) the rationale for the evidentiary steps taken.

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