

# Bockron as a Medium of Learning in The Process of Inquiry based Learning to Improve Science Process Skills of Junior High School Students in Growth and Development Concept

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**Abstract.** Investigative research on Influence of bockron as a medium of learning in process of inquiry-based learning to the development of science process skills on the concept of growth and development. This research was done in an effort to follow up underdeveloped skills of observing, communicating and conclude on students. This research was conducted using classroom action research (PTK), which consisted of 3 cycles. Cycle 1 students observe differences in growth and development, cycle 2 students measure the growth rate, cycle 3 students observe factors that influence growth and development. In these three cycles is used as a planting medium bocron (bottles and dacron). It involves 8th grade junior high-school students of 14-15 years old as research subjects in six meetings. Indicators of process skill include observation, communication, interpretation and inference. Data is collected through students' work sheets, written tests and observation. Processing of the data to see N-Gain used Microsoft Excel 2007, and the results showed that an increase in science process skills with a value of medium N-Gain (0,63). Bokron learning medium easily and cheaply obtainable around the students, particularly those in urban areas is quite difficult to get land to be used as a planting medium. In addition to observation of growth and development, bokron media can also be used to observe the motion in plants. The use bokronas a learning medium can train and develop science process skills, attitude and scientific method also gives students concrete experience of the process of growth and development in plants.

## 1. Introduction

Study and practice on science involves three main elements, namely attitude, process/method, and product. Process of invention and composition of science theories or concepts is carried through scientific method steps. A good science learning process ideally passes through process of how the concept is invented. However, when students use scientific method in learning process, they are required to understand components in scientific method. The components of scientific method are known as Science process skill. Science process skill (SPS) is very important to learn and master for everyone. If one has mastered process skill, he/she has mastered necessary skill for higher learning level, namely conducting research and solving problems [1].

Although there are some types of process skills, they are distinguished into two groups: basic process skill and integrated process skill. Included in basic process skill are skills of observing, classifying, measuring, interfering, interpreting, communicating, and predicting [1],[2],[3]. The skills are needed by



students to run the scientific method well. Process skill can also be a tool to train thinking ability. Thinking process is a part of intelligence. Intelligence can be developed by training thinking process. To train students' thinking process can be done by increasing student participation in learning. one learning can help students practice thinking is inquiry based learning.

Inquiry learning is designed to engage students directly into the scientific process. Schlenker research results, in Joyce and Weil [4], the inquiry showed that exercise can improve the understanding of science, productive in creative thinking, and students become skilled in obtaining and analyzing information. Cleaf [5] states that the inquiry is one of the strategies of student-centered teaching, which encourages students to investigate the problem and find information. The process is the same as the procedures used by scientists who investigate problems and find information. Wilson [6] states that the inquiry model is a model of the process of teaching based on learning theory and behavior. Inquiry is a way to teach students how to learn by using the skills, processes, attitudes and knowledge of rational thinking [7]. Inquiry approach can increase the science process skills [8],[9].

The learning process often does not go as expected because there are several factors that influence the behavior of the learning process. According Dollar and Miller [10] the effectiveness of the learning behavior is influenced by four things: motivation, students must want something; attention and know the targets, students should pay attention to something; businesses, students must do something; evaluation and consolidation of the results, students must obtain something. One way that learning to work effectively is to use instructional media. The media is important and necessary in the learning process. Because the media is anything that can deliver a message from the sender to the receiver of the message so that it can stimulate the mind, feelings, concerns and interests of students so that learning occurs. Learning media useful for: a. Overcoming the passive attitude of the students, b. Stimulating learning, c. Pose a direct interaction between students with the environment and reality, d. Allows students to learn on their own according to their ability and interest, e. Provide the same stimulus in students, f. Liken the experience of students, g. Raises the same perception in students. [1].

According to Setiawan *et al.* [11] at first the teachers have used a variety of media and simple homemade props. Unfortunately, the media and simple props was later abandoned because teachers prefer and depending on the use of modern learning media. The teacher becomes passive and less creative. For that is necessary to develop further the use of simple media from recycled materials and simple equipment. Not only will stimulate the creativity of teachers but also be able to function effectively is not inferior to modern media and can be superior if the user is right and appropriate.

Growth and development in seed plants is a process that is often observed to be used as a medium of learning. Soil is a natural medium which is used as a growth medium for seed plants. The use of soil as a growing medium on observations of growth and development of seed plants less effective. The roots of plants grown in soil cannot be observed, soil media also can contaminate the classroom or laboratory. The students who are in the urban areas will be quite difficult to find land. Because some of these shortcomings Then the media was replaced with cotton planting soil. Media planted cotton on observations of the growth and development also was less effective. When cotton exposed to water will deflate so that the growth of roots and stems difficult to observe. Therefore we need to develop ways and growing media that facilitate observation of the process of growth and development of seed plants.

## 2. Research methodology

This research was conducted by the method of action research or Classroom Action Research (CAR). According Wardhani et al [12] CAR is the research conducted by teachers in the class itself through self-reflection with the aim to improve its performance as a teacher, so that the result of increased student learning. The subjects of research involved are class 8th A SMPN 3 Margahayu Bandung District 2012-2013 school year, amounting to 22 boys and 20 girls. In order for this research directional, scope of the

study is limited to the following points. Mastery of science process skills were measured: observation, interpretation, inference, communicate, [2],[13]. Topics were selected in this study refers to the Competency Standards and competency base curriculum KTSP 8th class, that is Competency Standards 1. Understand the different systems in the human life and basic competence 1.1 Analysing the importance of growth and development of living things.

The procedure is done by Classroom Action Research (CAR). CAR is an assessment process through a system of cycles of various learning activities. According to Joni [14], there are five stages in the implementation of the CAR, is: 1. To determine the focus of the research problem, 2. plan for an improvement actions, 3. To carry corrective action, observation, and interpretation, 4. Analysis and reflection, 5. Make planning a follow-up.

Implementation of research begins with the research held the pretest. Pretest activities filled test the ability of science process skills, research was conducted as many as four meetings. cycles 1 is students to observe the growth and development of seeds by using bocron and continued discussions in the classroom with a sub-topic material differences in growth and development. In cycle 2 students measure the length of roots, stems and leaves, followed by counting the growth rates. The measurement results then graphed. Cycle 3 students observe factors that influence growth and development. Observations were made from the cycle 1 until cycle 3. The variables measured were the development of science process skills, as well as increasing mastery of the concept of growth and development. All variables are measured and observed before and after the learning process. The measurement results in the form of student worksheets score data for the development of science process skills, written test score of concepts mastery of growth and development.

The research instrument consists of worksheets students to measure progress in the mastery of science process skills and a written test to measure the growth and development of the procurement concept. Written test mastery of the concept of growth and development carried out at the beginning and end of the sub-subject learning. This test is done to detect students' mastery of the concept of the material before and after the learning process.

### **3. Result and discussion**

#### *3.1. The development of bocron media*

One of the growing media which interest to be developed to observe the process of growth and development of seed plants are Dacron. Dacron is a synthetic material that is popular in the needs of the textile as a material for filling dolls, bolsters and pillows. Dacron is a trade name of a textile fiber made by the company Du-Pont from England. Dacron is real name is polyethylene terephthalate which is a plastic polymer resin termoplast of polyester groups. When dacron was waterd, it would not be going down, flat that makes it easier for seed storage set appropriate experimental design. Dacron is also good at storing water so appropriate planting medium used. The media developed can be seen in the Fig. 1.

Bocron is used as a medium of learning to observe the growth and development of the seed plants, namely by entering the dacron rolls into a transparent plastic bottle, then the seeds that will be observed placed between dacron and bottles. Seeds are watered twice a day through the dacron. Growth and development of seeds is observed every day. Observations consist of measuring the length of the roots, stems and leaves, observing the timing of the roots, stems and leaves. Bocron also be used to observe the motion in plants with clear and easily.

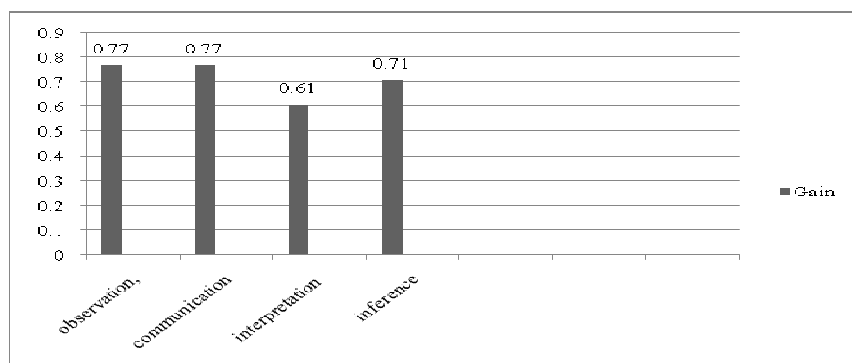


**Figure 1.** Bocron as a learning media.

### 3.2. *The impact of using bocron media on students' science process skills*

On this research was obtained data of percentage score, science process skills and mastery of the concept of growth and development. Data of science process skill was obtained from the percentage score of student worksheet and mastery of the concept was obtained from the percentage score of written test about growth and development.

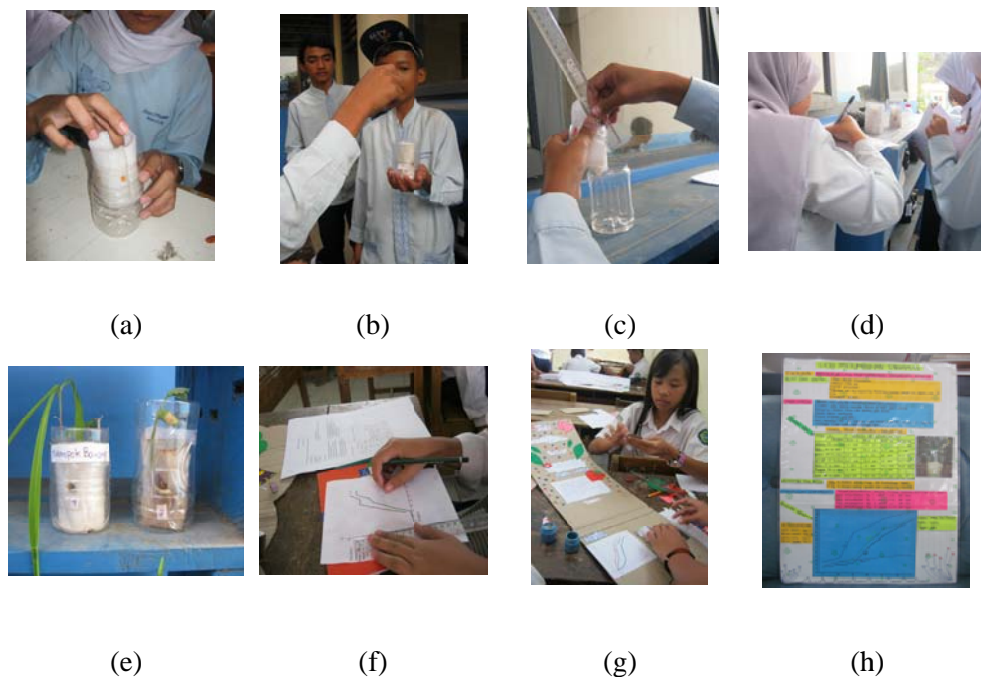
This research observes science process skills of observation, communication, interpretation and inference. N-gain observation, communication and inference has high category (0.77, 0.77 and 0.71 and interpretation has moderate category (0.61). N-gain from SPS indicator is illustrated in Figure 2.



**Figure 2.** N-gain from observation, communication, interpretation and inference.

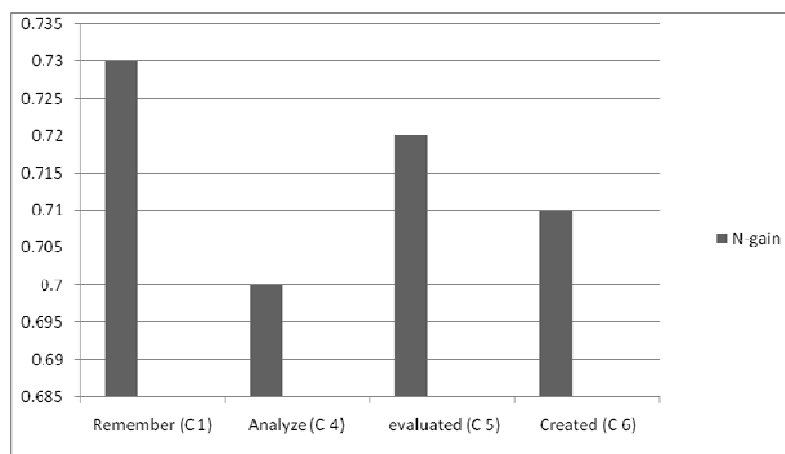
After bocron was used as a learning medium it can increase the percentage score of SPS, the mastery of the concept of growth and development. Increased percentage scores (N-Gain) are categorized as being (0.61) to high (0.77). In the learning process with Bocron media learning that based on this inquiry. students are invited to observe the growth and development of seed plants directly and easily. When students observe the growth and development of seed plants they conduct observation activities such as, began observing the appearance of roots, stems and leaves. Measuring changes in the length of roots, stems and leaves, observing the effect of the amount of water, light and storage location of the seeds in the process of growth and development of seed plants. Observation according Rezba [2] is the process of searching for information in a way perceived through one or more of the five senses. Therefore, in this study the students were given the opportunity to make observations using many senses to capture the

stimulus in the form of a natural material object that is observing the growth and development of seed plants directly.



**Figure 3.** Photos (a) (b), (c), (d). Activities students are conducting observations of growth and development of the seed plants. Photos (e) of corn and beans are planted in bokron. Photos (f), (g) and (h) the student is making a report on the observation.

Observation activity also aims to provide concrete experience in accordance with the students' cognitive development (15), thus providing a more meaningful learning process [1]. Observing natural material object is very helping students understand terms the concept of growth and development. Catching stimuli natural material object then processed through a series of thought processes [15],[16],[17] the thought process is necessary science process skills. Science process skills greatly assist students in their concept mastery. This is evident from the increase in the procurement concept conveniently indicates generally increased the criteria N-Gain high (C1: 0.73; C4: 0.70; C5: 0.72; C6: 0,71).



**Figure 4.** N-gain from remember, analyze, evaluated and created.

The next science process skills that students master important is communicating. Communicating is the ability of the delivery and reception symbols verbal and non-verbal [16], these capabilities will thrive when supported by the ability of interpretation. Interpretation is the ability to interpret observations by recording the observations and then link the observations and then find the pattern or regularity of a series of observations [13].

In this research to develop the skills deliver, receive and interpret the symbol of non-verbal students are trained to make reading and interpreting charts, tables and graphs from the observation of the growth and development of seed plants were planted on Bocron. Meanwhile, to develop capabilities deliver, receives and interprets verbal symbols, students are trained to present his exhibition boards in front of the classroom during class discussions. Such skills are indicators of the science process skills that is communication and interpretation. The results demonstrated through these activities there is a significant improvement in communication skills (50% pre, post 89%, N-Gain 0.77) and inference students (Pre 38%, Post 92%, N-Gain 0.85) .

Table 1. Percentage of Pre-Post Test Scores and N-Gain of Science Process Skills Indicators on growth and developments observations seed plants is by using bokron.

Indicator	Pre (%)	Post (%)
Observation	51	89
Communication	50	89
Interpretation	37	72
Inference	38	92

On observation of the growth and development activities by using Bocron students gain new information among other things, on how the process and the rate of growth and development of roots, stems and leaves, plant condition if the lack of water, how the light affects the position of the roots, stems and leaves. The next activity students are trained to make a conclusion (inference). Inference is a conclusion made using old information that is already known from past experience and new information is being observed through the senses through observation [2].

When students put their inference practice process and incorporate new information and nature patterns from the observation of the growth and development of seed plants with the knowledge that they have learned previously. Then student then interpret and explain the process of growth and development. Students detect patterns of interaction between the plant and its environment.

#### 4. Conclusion

According to the research data results, it can be concluded that using Bocron as a learning media can improve students' science process skill and mastery of the concept of growth and development. Using the concrete media Bocron also facilitate students to easily learn the growth and development of seed plants.

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