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Home > Vol 24, No 1 (2023)

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### ANNOUNCEMENTS

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## TABLE OF CONTENTS

### ARTICLES

Scientific Learning Through The Edu Eco Approach As An Alternative Improving Student Knowledge And Skills  
Oktaffi Aninna Manaikana, Noer Af'idah, Andhika Mayasari, Faizah M Nur, Gunawan Gunawan, Tuti Liana, Junaidi Junaidi  
PDF 1-13

Pengaruh Implementasi Geoboard Melalui Pendekatan Open-Ended Terhadap Peningkatan Kemampuan Eksplorasi Matematis Ditinjau Dari Gender  
Martines Martines, Ruslaimi Ruslaimi, Fita Nelyza  
PDF 14-29

Penerapan Metode Scaffolding Berbantuan Soal Hots Untuk Meningkatkan Kemampuan Berpikir Kritis Matematis Siswa Pada Materi Trigonometri  
Wulandari Wulandari, Nuraina Nuraina, Marina Fadhillah, Eri Saputra, Erna Isfayani  
PDF 30-41

Pemanfaatan Legenda Aceh Sebagai Pembelajaran Nilai-Nilai Nasionalisme  
Asriani Asriani, Cut Faizah, Basri Basri, Edi Arwar, Riswan Riswan, T. Makmur, Hayati Hayati  
PDF 42-59

An analysis of Scientific Literacy Misconception Using FTT to IPA Teachers in Banda Aceh  
Muhammad Azzarkasyi, Syamsul Rizal  
PDF 60-74

Sosialisasi Pendidikan Kesehatan Melalui Pemanfaatan Jaba Sebagai Sumber Kesehatan Lokal Bagi Penderita Diabetes Mellitus  
Asri Junadevi, Yenni Sasmita, Rasma Rasma, Muhammad Ridhwan, Aris Winandar  
PDF 75-82

Improving Students' Vocabulary Mastery By Using Riddle Games  
Megi Megi, Syahrir Syahrir, Puspa Sari  
PDF 83-92

Pengaruh Penerapan Model SQ3R (Survey, Question, Read, Recite, Review) Terhadap Kemampuan Penguasaan Konsep Siswa  
Evi Aputana, Rubiah Rubiah, Samsul Bahri, Ernawati Ernawati  
PDF 93-112

Peningkatan Pengetahuan Dampak Sampah Terhadap Diare melalui Uji Korelasi Bagi Masyarakat Di Gampong Jawa Kota Madya Banda Aceh  
Nuriana Andalia, M. Ridhwan, Roslina Roslina, Jailani Jailani, Usman Usman  
PDF 113-121

Pembentukan Akhlak Takwaem Keagume : Pendekatan Sosiologi-Antropology Pada Pendidikan Paantren Tradisional Aceh  
Fahmi Arfan, Ida Hasanah, Mustafa Usman, M. Chalis, Abubakar Abubakar, Irwan Irwan, Muhammad Nur  
PDF 122-137

Efektivitas Metode Mengajar Resiprokal Dalam Meningkatkan Kemampuan Menggiring Bola  
Rahmat Putra Perdana  
PDF 138-147

Pengaruh Ketuhanan (Altruisme), Etos Kerja, dan Kepuasan Kerja terhadap Kinerja Guru MI Negeri di Kota Medan  
Rizki Utami Butabara, Darwin Darwin, Salman Bintang  
PDF 148-163

Analysis Of The Use Of Sarcasm Language Style In Student Interactions  
Rini Rasya, Tri Fayani, Akhan Akhan, Dhiya Azra  
PDF 164-176

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# Jurnal SERAMBI ILMU

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Journal of Scientific Information and Educational Creativity

## SCIENTIFIC LEARNING THROUGH THE EDU ECO APPROACH AS AN ALTERNATIVE IMPROVING STUDENT KNOWLEDGE AND SKILLS

Oktaffi, Arinna Manasikana, Noer Af'idah, Andriika Mayasari, Fatmah M. Nur, Gunawan Gunawan, Tuti Lisana, Junaidi Junaidi

### ABSTRACT

One of the real scientific learning is done through learning about environmental concepts and their utilization, namely edu eco. The objectives of this study are: (1) Provide student knowledge about real learning of the concept of herbal hydroponics by utilizing household waste (eco edu), (2) Provide student skills about processing organic waste as plant nutrients, (3) Provide student skills about hydroponic herbal plant cultivation. This type of research is descriptive through a qualitative approach. Data collection of learning knowledge through objective tests while for learning skills data through questionnaires. The subjects of this study were science education students of Hasym Aisyari Tebuireng University Jombang who were taking the Population and Environmental Education (PKLH) course. The results showed: (1) There is an effect of providing knowledge about real learning of the concept of herbal hydroponics by utilizing household waste through increasing the mean value of the pre test (57.4) and post test (83.6); (2) From the questionnaire results, the skills of making plant nutrients from organic waste obtained a mean value of 55.6, and herbal hydroponic skills mean value 54.3 (3) Student response to educate 87% of students strongly agree.

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### Contents

- Scientific Learning Through The Edu Eco Approach As An Alternative Improving Student Knowledge And Skills  
**Oktaffi Arinna Manasikana, Noer Afidah, Andhika Mayasari, Gunawan Faizah, M. Nur Tuti Liana, Junaidi** 1-13
- Pengaruh Implementasi *Geoboard* Melalui Pendekatan *Open-Ended* Terhadap Peningkatan Kemampuan Eksplorasi Matematis Ditinjau Dari Gender  
**Martines, Ruslaini, Fita Nelyza** 14-29
- Penerapan Metode *Scaffolding* Berbantuan Soal Hots Untuk Meningkatkan Kemampuan Berpikir Kritis Matematis Siswa Pada Materi Trigonometri  
**Wulandari, Nuraina, Marina Fadhilla, Eri Saputra, Erna Isfayani** 30-41
- Pemanfaatan Legenda Aceh Sebagai Pembelajaran Nilai-Nilai Nasionalisme  
**Asriani, Cut Faizah, Basri, Edi Azwar, Riswan, T. Makmur** 42-59
- An analysis of Scientific Literacy Misconception Using FTT to IPA Teachers in Banda Aceh  
**Muhammad Azzarkasyi, Syamsul Rizal** 60-74
- Sosialisasi Pendidikan Kesehatan Melalui Pemanfaatan Jahe Sebagai Sumber Kesehatan Lokal Bagi Penderita Diabetes Mellitus  
**Asri Jumadewi, Yenni Sasmita, Rasima, Muhammad Ridhwan, Aris Munandar** 75-82
- Meningkatkan Penguasaan Kosakata Siswa Dengan Menggunakan Permainan Teka-Teki  
**Megi, Syahrir, Puspa Sari** 83-92
- Pengaruh Penerapan Model Sq3r (Survey, Question, Read, Recite, Review) Terhadap Kemampuan Penguasaan Konsep Siswa  
**Evi Apriana, Rubiah, Samsul Bahri, Ernawati** 93-112
- Peningkatan Pengetahuan Dampak Sampah Terhadap Diare melalui Uji Korelasi Bagi Masyarakat Di Gampong Jawa Kota Madya Banda Aceh  
**Nurlena Andalia, M. Ridhwan, Roslina, Yuliana, Usman** 113-121
- Pembentukan Akhlak Takzeem Keuguree : Pendekatan Sosiologi-Antropology Pada Pendidikan Pasantren Tradisional Aceh  
**Fahmi Arfan, Ida Hasanah, Mustafa Usman, M. Chalis, Abubakar, Anwar, Irwan M. Nur** 122-137
- Efektivitas Metode Mengajar Resiprokal Dalam Meningkatkan Kemampuan Menggiring Bola  
**Rahmat Putra Perdana** 138-147
- Pengaruh Ketulusan (*Altruisme*), Etos Kerja, dan Kepuasan Kerja terhadap Kinerja Guru MI Negeri di Kota Medan  
**Rizki Utami Batubara, Darwin, Salman Bintang** 148-163

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## Forewords

Praise and gratitude to Allah SWT, because of Allah's love for us so that we are still given a long life and can carry out our various daily activities. May all our activities become our acts of worship, Aamiinnn

We are also be proud that the number of submitted manuscripts is quite large, but only a few are acceptable and worthy of publication. This means that Jurnal Serambi Ilmu has become one of the scientific publications that are considered by experts and education enthusiasts.

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## Scientific Learning Through The Edu Eco Approach As An Alternative Improving Student Knowledge And Skills

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### Abstract

One of the real scientific learning is done through learning about environmental concepts and their utilization, namely edu eco. The objectives of this study are: (1) Provide student knowledge about real learning of the concept of herbal hydroponics by utilizing household waste (eco edu); (2) Provide student skills about processing organic waste as plant nutrients; (3) Provide student skills about hydroponic herbal plant cultivation. This type of research is descriptive through a qualitative approach. Data collection of learning knowledge through objective tests while for learning skills data through questionnaires. The subjects of this study were science education students of Hasyim Asy'ari Tebuireng University Jombang who were taking the Population and Environmental Education (PKLH) course. The results showed: (1) There is an effect of providing knowledge about real learning of the concept of herbal hydroponics by utilizing household waste through increasing the mean value of the pre test (67.4) and post test (83.6); (2) From the questionnaire results, the skills of making plant nutrients from organic waste obtained a mean value of 85.6; and herbal hydroponic skills mean value 84.3 (3) Student response to edueco 87% of students strongly agree.

**Keywords:** *Edu eco*, herbal hydroponics, organic waste.

## INTRODUCTION

There are various kinds of learning models so that the expected learning outcomes are achieved. The learning model chosen will determine the technique of the learning process in it. Edu eco is a technique from the scientific learning model. This technique requires students not only to master knowledge but also skills. Edu eco teaches students about the knowledge and skills of environmental management. Through edu eco learning, the results of student learning will be more real and can be applied in their daily lives so that it is more useful for their future.

Limited land in housing can be cultivated into agricultural land. One solution to deal with and utilize limited land effectively and efficiently is hydroponic farming. Hydroponic farming combines the types of plant characters and suitable media. The principle is to emphasize the concept of sustainable plant production or not constrained by seasons. Hydroponic horticultural crops are produced by utilizing water and fertilizer efficiently. Hydroponic plants are not grown in soil, but this does not mean that they do not require soil but rather soil mixed with fertilizer, water and plant nutrients. The most important thing in a hydroponic growing system is the fulfillment of the nutrients needed by the plant. Nutrients are essential elements needed for plant growth. Plants require 16 essential elements or plant nutrients for their growth. The elements needed are magnesium, nitrogen, sulfur, chlorine, manganese, iron, boron, potassium, phosphorus, calcium, zinc and molybdenum. These elements or nutrients are found in household waste or organic waste around us.

Herbal plants are plants that can be cultivated in the yard and have benefits as traditional herbal medicines. The results of several studies prove that traditional medicines (potions) concocted from medicinal plants are more easily digested by the body and cause less side effects (Roidah, 2014). The trend of minimalist homes and healthy lifestyles can go hand in hand with the concept of hydroponic planting with herbal plants or herbal hydroponics. Herbal hydroponics is a simple hydroponic method for herbal plants. Not all herbal plants can be developed with hydroponic media. In this study, the herbal plants used were chili, red spinach, betel leaf, cucumber, celery. These plants have properties as natural or herbal medicines. Many benefits can be obtained by farming in hydroponic herbs including no need for soil, narrow media so it is easy to control nutrition, growth can be observed to be optimal.

Various human activities cause various kinds of problems and environmental damage if resource management is not done properly. One of these activities is littering. The accumulation of waste in landfills can be processed for further use or reuse. Household waste can be organic and inorganic. Organic waste used for making plant nutrients in the form of organic fertilizer is food waste in the form of vegetables, fruit, leaves and branches. Nutrients in the form of organic fertilizers utilize organic materials that come from nature for plant growth such as the use of fertilizers, pesticides, and plant growth hormones. Organic fertilizers through the process of decomposition by microorganisms can preserve the environment by increasing the



activity of soil organisms that are beneficial to plants and suppressing the growth of pests and plant diseases, improving the physical, biological and chemical properties of plants. In addition, it reduces environmental pollution due to the use of organic fertilizers and piles of garbage.

The scientific approach is a learning model applied in the 2013 curriculum by using scientific methods in its learning activities. The scientific approach is a learning model that starts from collecting data through observation, conducting experiments, asking questions, processing information or data, to communicating it in the process of applying scientific principles. The student-centered approach aims to provide students with critical, scientific, and analytical thinking skills.

Meanwhile, according to Hosnan (2014), the purpose of learning with a scientific approach, namely the first goal is that students are expected to be able to increase thinking power, especially in HOTS (high order thinking skills) high-level thinking skills. Students can solve problems sequentially and structured or systematically. The learning atmosphere faced by students can make them realize that learning is a necessity. Students will get good and meaningful learning outcomes. This scientific approach can also make students voice their ideas and ideas through writing and speaking. Through this learning, student character can also develop to its maximum potential. There are several principles in the scientific approach. The following are the principles of the scientific approach in learning activities according to Hosnan (2014).

1. Learner-centered learning activities.
2. Learning activities shape students' self-concept.
3. Learning avoids verbalism.
4. Learning provides space for students to simulate and accommodate the concepts, laws, and principles of the material being studied.
5. Learning encourages the creation of improved thinking skills Learners.
6. Learning increases motivation for students and teachers, namely motivation in learning and teaching.
7. Provides opportunities for learners to practice their communication skills.
8. There is a process of validation or testing of concepts, laws, and principles that students build in their cognitive structure.

In this model, it is designed so that students are given space to explore learning materials. They can actively build concepts, principles and laws through 5M activities, namely observing, questioning, proposing (hypothesis), collecting data in several ways and techniques, analyzing, and making conclusions and communicating concepts or principles that have been found. Through this model, students will get benefits, such as starting to investigate a problem, curiosity or curiosity and can also formulate concepts from a learning experience or knowledge that has been done. These things can make learning activities fun, meaningful and challenging. Learning objectives using the scientific approach:

1. Improving thinking skills

One of the goals of the scientific approach is to improve and develop high order thinking skills in students. Students are expected to think critically, analytically, and be able to create new ideas related to the material being studied.

2. Creating a conducive, active and productive learning environment.

By applying this student-centered approach. It is expected that teaching and learning activities will be conducive, through a series of systematically designed activities and the creation of an active and productive learning environment.

3. Improve the ability to think systematically

The main characteristic of the scientific approach is that the learning stages are sequential and systematic. This is what encourages students to start thinking systematically and slowly improve their abilities, both in understanding a problem, and when solving problems.

4. Improving concept understanding

In practice, the scientific approach directs independent learning activities to find and develop concepts from the material studied. Students will be able to gain meaningful concepts and understanding through this learning model. In addition, students will not only receive concepts in the form of memorization, but they will also get a deeper understanding of the concept.

5. Increase learning motivation

As a form of student-centered learning activity, this approach is expected to increase students' learning motivation. This is because learning activities that require students to be more active and innovative can create a new learning atmosphere that is not monotonous, so it is not easy to feel bored.

6. Improve communication skills

Through this scientific approach, it is also expected to present a learning process that can provide a stimulus for students to be more active in communicating through the delivery of ideas, discussion in solving problems, discussion of data processing, and how to communicate learning outcomes orally and in writing.

The objectives of this research are: (1) Provide student knowledge about real learning of the concept of herbal hydroponics by utilizing household waste (eco edu); (2) Provide student skills about processing organic waste as plant nutrients; (3) Provide student skills about hydroponic herbal plant cultivation.

## **RESEARCH METHOD**

This type of research is descriptive through qualitative methods. Qualitative research methods are research methods based on the philosophy of postpositivism, used to research on natural object conditions, where the researcher is the key instrument, data collection techniques with triangulation, data analysis is inductive or qualitative, and qualitative research results emphasize meaning rather than generalization. Qualitative descriptive research aims to describe and describe existing

phenomena, both natural and human engineering, which pay more attention to the characteristics, quality, interrelationships between activities.

The learning outcomes that will be measured in this study are knowledge and skills. Knowledge data collection through essay tests while for skills data through non-tests in the form of questionnaires. Data analysis was carried out qualitatively and quantitatively. The subjects of this study were science education students of Hasyim Asy'ari Tebuireng University Jombang who were taking Population and Environmental Education (PKLH) courses. The method of activities carried out as follows:

1. Interactive lecture on healthy environment.
2. Interactive lecture on thematic learning of environmental education.
3. Practice of utilizing organic waste as hydroponic plant nutrients.
4. Practice of hydroponic cultivation of herbal plants.

Research location in Building B of Hasyim Asy'ari Tebuireng University Jombang Jln. Irian Jaya No. 55 Tebuireng Jombang East Java Indonesia.

## **FINDING AND DISCUSSION**

The implementation of learning using scientific methods. In the implementation of learning there are syntax or steps in the scientific approach and activities:

### **1. Observing**

The first step in the scientific learning model is the observing process. Students can utilize their five senses to observe events around them that are in accordance with what they will learn. In practice, students can observe the environment directly or by using multimedia on news and videos. The involvement of students through this observation step can bring up new problems that previously had no solution. With this problem, teachers can guide students to investigate (observe) the problem. Then, to make learning more efficient, teachers should prepare media and activities that help solve the problems that students will investigate. Through observation, students can also find the fact that there is a relationship between the observed object and the learning material that is being studied with the teacher. The implementation of this observation activity can be done with or without the use of tools. Tools that can be used to assist the practice of observing activities, such as microscopes, binoculars, weighing tools, and so on. Then, in observing activities without tools, you can make direct observations. Examples include listening to the teacher's explanation, watching related videos, or listening to information from the radio and other news sources.

### **2. Questioning**

Questioning activities, of course, are activities carried out by students to create and ask questions that are relevant to the material being studied. This step is often related to in-class discussions about information that has not been understood, additional information, or clarification of information that is not clear. The teacher in this case must be well prepared to determine how or choose media that is in accordance with the characteristics of students and relevant to the material being studied, so that students will be interested and active in asking questions. Learning outcomes that can

be observed are the types and quality of questions that arise from students. The types of questions can be in the form of factual, conceptual, procedural, or hypothetical questions. Preferably, a teacher should also have the ability to analyze the type and quality of questions. Because, that's where we can make an assessment of the questions asked comprehensively by students.

### 3. Gathering Information or Experimenting

The information gathering step is a continuation of questioning in the previous stage. In its implementation, this activity can be done by digging or collecting information from various sources in various ways. Students can collect data and information using various methods. For example, by experimenting or conducting independent trials, observing events in the surrounding environment, asking sources, reading books, searching the internet, looking at encyclopedias, and statistics. The teacher is expected to be a facilitator for student learning references in collecting data. Student learning outcomes at this stage are the number and quality of information sources that have been reviewed by students. Starting from the completeness of the information collected, the truth of the information obtained, and the media used in collecting data or information.

### 4. Processing or Analyzing Data (Associating)

This step of processing or analyzing data is also referred to as the student reasoning stage. This is because students must carry out a logical and systematic thinking process on facts that can be observed from the data and information that has been collected, in order to obtain conclusions in the form of new knowledge. Students will utilize the data and information that has been collected to solve problems by formulating questions. Then, the teacher can guide students so that they can connect the data that has been collected and find patterns and make final conclusions. This activity is used so that students can analyze the work they have done and can compare their work with other students. This reasoning activity is also carried out by exploring and collecting data from various sources and in various ways, including: processing the information that has been collected, analyzing data by making several categories or groupings, connecting data or information into a pattern, and making final conclusions.

The teacher can direct students in conducting discussions related to the topic discussed. Furthermore, the teacher can assess at this stage the process of developing interpretations, arguments, and conclusions about information from two facts or concepts discussed by students. Then, the teacher must also be able to provide a fair assessment of students' ability to express arguments and make conclusions related to the type of facts, concepts, or their opinions. In addition, other learning outcomes can be in the form of new structures, development of interpretations, arguments, and conclusions that show the relationship of facts/concepts from two or more sources of data and information processed by students.

## 5. Communicating

In the last step, the teacher must provide opportunities for students to communicate the results of the learning process they have done. Learners can express it in the form of a report or paper that contains charts, diagrams, or graphs. At a more advanced level, students can compile the results of their learning in the form of a written report and present it systematically. Starting from the process, results, to conclusions orally by presenting in front of the class. The learning outcome that can be seen from this step is the ability of students to present the results of their analysis in the form of writing, graphics, electronic media, or other creative forms. In a physical form that teachers can assess directly, for example, it can be in the form of written reports, scientific works, or videos uploaded on student social media. Furthermore, teachers can provide feedback by providing input, straightening, and affirming so that students can understand the events they analyze deeply and broadly. The teacher can also guide the students to decide the important things that can be concluded before the class presentation begins.

### ***A. Provide students with knowledge about real learning of the concept of herbal hydroponics by utilizing household waste (eco edu).***

At the beginning of the lesson, the lecturer conveyed the syllabus and learning objectives of the course to be achieved. The edueco learning method was also explained to students interactively. After that, an interactive lecture about the material in general was explained by the lecturer, ending with a notification of a pretest at the next meeting so that students prepare themselves to learn. At the next meeting, a pretest was carried out to measure students' initial abilities in the Population and Environmental Education (PKLH) course. After the whole series was carried out in the form of: Interactive lecture on healthy environment; interactive lecture on thematic learning of environmental education; practice of utilizing organic waste as hydroponic plant nutrients; practice of hydroponic cultivation of herbal plants. Then to measure learning outcomes in the form of knowledge, a post test was conducted again. In order to be measurable, the pre-test and post-test questions are the same, only the number is randomized, the form of the question is an essay consisting of 5 questions.

In the aspect of student learning outcomes in the form of skills, assessment is carried out during practice, namely starting with the practice of making nutrients in the form of fertilizer from organic waste followed by the practice of organic fertilizer used for herbal cultivation. The skills questionnaire is assessed from the aspects of preparation for making, the process of making, and the final results of practice. The average value of the results of the skills questionnaire when making plant nutrients from organic waste obtained an average value of 85.6 and when practicing herbal hydroponic cultivation the average value was 84.3.

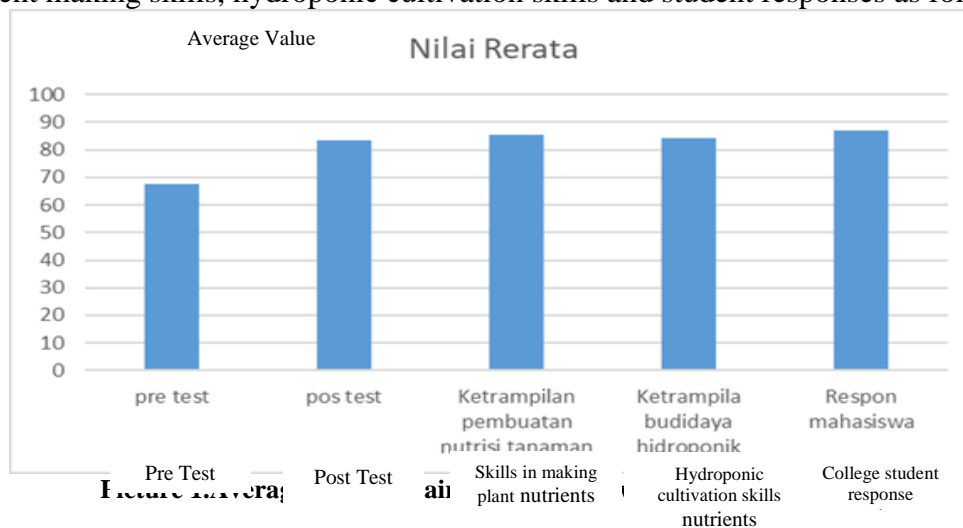
The implementation of the learning process through interactive lectures about edu eco has a positive influence on science education students which is characterized by increased insight, knowledge and skills of students as seen from the results of the

pretest average (67.4) and posttest average (83.6) which has increased (16.2) points. At the end of the lesson, a questionnaire and interview were distributed to find out the student's response when following the edu eco method in the PKLH lecture. The results of the student response questionnaire following the hydroponic herbal edueco by utilizing organic waste for plant nutrition 87% of students strongly agreed. From the results of interviews, students argue that they are very enthusiastic about attending lectures because they get real knowledge and life skills from the PKLH course. The table that illustrates the results of the observation assessment during learning is Table 1. as follows:

Table 1  
 Results of observation assessment during learning

Observation	Average Value
Pre test	67,4
Pos test	83,6
Skills in making plant nutrients	85,6
Hydroponic cultivation skills	84,3
College student response	87

The following is a graph of the average results of the pre-test, post-test, plant nutrient making skills, hydroponic cultivation skills and student responses as follows:



**B. Provide students with skills on processing organic waste as plant nutrients;**

Before doing hydroponic cultivation, the first step is to make hydroponic plant nutrients because after hydroponic cultivation nutrition is the first thing to support plant growth. Making nutrients from organic waste material requires one week of fermentation. Plant nutrition from organic waste is also known as liquid organic nutrition or liquid organic fertilizer (POC). Liquid organic nutrition is also widely sold



on the market. Liquid organic nutrition is also called foliar liquid nutrition because it contains essential macro and micro nutrients (N, P, K, S, Ca, Mg, B, Mo, Cu, Fe, Mn, and organic matter). Liquid organic nutrition can also help increase crop production, improve the quality of plant products, improve the physical, chemical, and biological properties of soil, reduce the use of inorganic nutrients and also as an alternative to manure. The benefits of organic fertilizer nutrition are:

- 1) Encourages and enhances leaf chlorophyll formation;
- 2) Encourage the formation of root nodules for leguminosae plants so as to increase the photosynthetic ability of plants and the absorption of nitrogen from the air;
- 3) Increase plant vigor so that plants become sturdy and strong;
- 4) Increase plant resistance to drought, weather stress and disease-causing pathogen attacks;
- 5) Stimulate the growth of production branches;
- 6) Increase flower and fruit formation;
- 7) Reduce the fall of leaves, flowers and fruit ovules.

The production of hydroponic plant nutrients from organic waste materials went well as planned. The organic fertilizer produced comes from leaf waste and vegetable stalks such as kale, cabbage which are added with EM4 modification so that the fermentation process into organic liquid nutrients runs faster. The fermentation process of liquid nutrients from organic waste takes four days. This happens faster because the vegetable stalk leaves used are still young so that the fermentation process is not disturbed by decaying bacteria on old leaves. The dose of organic fertilizer for plants must be adjusted, not excessive or deficient. Here is a picture of students practicing making plant nutrients from organic waste:

Picture 3  
The practice of making plant nutrients from organic waste



***C. Provide students with skills on hydroponic herbal plant cultivation;***

Hydroponics is a technique of cultivating fruit, vegetable and flower plants by utilizing water but without using soil as a growing medium. The advantages of hydroponic plants include disease and pest free plants. This simple hydroponic plant cultivation method with aquatic plant cultivation techniques, does not use soil so that the fulfillment of nutritional needs for plants using organic liquid fertilizer. Plant nutrition with liquid organic fertilizer that has been made before. When preparing to make nutrients, students must also prepare plant seeds and equipment for hydroponics so that both preparations go hand in hand. The first step is to make hydroponic growing media. The following picture shows the practice of making hydroponic planting media with pipes by students: Picture 4

Practice making pipes and cotton for hydroponic growing media



There are many hydroponic methods but this herbal hydroponic cultivation uses the NFT (Nutrient Film Technique) System. The concept works by placing the plant in a tube-shaped place where the roots will hang on the plant nutrients. This system does not require tools to pump nutrients because nutrients will flow continuously along with the flow of water. The most important part of the hydroponic growing system is the fulfillment of the nutrients needed by the plants. NFT is suitable for leafy plants. Herbs used in this hydroponic cultivation are chili peppers, red spinach, betel leaves, cucumber and celery.

Herbal plants with hydroponic systems grown in this study include chili peppers, betel leaves, red spinach and cucumber. Chili peppers contain a list of derived chemical compounds such as capsaicin a known plant that has disease prevention and health properties. Early experimental laboratory studies showed that capsaicin has anti-bacterial, anti-carcinogenic, analgesic and anti-diabetic properties, it was also found to lower LDL cholesterol levels in obesity. Betel leaves can be used as an antiseptic, prevent cavities and other unknowns that make the body healthy. Red spinach is low in calories but high in mineral content which is very useful for the body. Fresh red spinach contains high vitamin A and vitamin C. Cucumber is one of the

plants that is suitable for the hydroponic method. The advantage is easy maintenance and the potential for more water content and larger size. The vitamin content of cucumber includes vitamin K, vitamin C, magnesium, potassium, manganese and vitamin A, thiamin, riboflavin, B-6, folate, pantothenic acid, calcium, iron, phosphorus, zinc and copper. With these various vitamins, cucumbers are very beneficial for the health of the body. Here is a picture of herbal hydroponic cultivation practice:

Picture 5  
Plants after 14 days old are  $\pm 11$  cm in size



Picture 6 Red spinach and  
betel leaf after 73 days of  
age measuring  $\pm 21$  cm in length



In this hydroponic cultivation of herbal plants due to the limited time of the lecture, not all plants are ready to be harvested. Plants that are ready to be harvested are red spinach and betel leaves. Meanwhile, cucumber and chili plants cannot be harvested yet. This can be caused because cucumber and chili are plants that produce fruit so they need a long life time and require more doses of nutrients than other fruitless plants. In this study, many nutrients provided by all herbal plants are the same, both betel leaves, red spinach and chilies and cucumbers. Chili and cucumber should have received twice the dose of nutrients given to red spinach and betel because they produce fruit.

## **CLONCLUSION**

1. There is an effect of providing knowledge about real learning of the concept of herbal hydroponics by utilizing household waste through the increase in the average value of the pre test (67.4) and post test (83.6).

2. From the questionnaire results, the skills of making plant nutrients from organic waste obtained a mean value of 85.6; and herbal hydroponic skills a mean value of 84.3.

3. Student response to herbal hydroponic edueco by utilizing organic waste for plant nutrition 87% of students strongly agree.

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**Page : 1-13**

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