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Analysis of Science Process Skills and Learning Outcomes In Inquiry Learning Model With Mini Research Strategy to Support Pharmacy Science in Vocational High Schools

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Abstract

Biology subjects in Pharmacy Vocational High Schools are not yet integrated with pharmacy subjects even though biology subjects have a close relationship with pharmacy fields related to organs and medicines in the human digestive system. This research aims to analyze the science process skills and learning outcomes in the inquiry learning model with a mini research strategy as a supporting of pharmacy science in Vocational High Schools. This research uses quasy experiment research with pretest posttest control group design. Analysis of learning outcomes using the independent sample t-test, N-Gain test, and N-Gain t-test to see differences in the value of learning outcomes between the control class and the experimental class. Analysis of science process skills uses the average score of observations of science process skills. To see whether the research can supporting Vocational Pharmacy Science is analyzed using descriptive analysis of interviews with vocational productive teachers. The result of the value of learning outcomes get data that the value of learning outcomes of the experimental class is better than the control class, while the science process skills of students in the experimental class are better than the control class. Descriptive analysis of interview productive teacher shows that this study can be used as a supported of pharmacy science in Vocational High Schools. Analysis of the value of student learning outcomes, science process skills and Interview productive teacher shows that inquiry learning models with mini research strategies can support subjects related to pharmacy.

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INTRODUCTION

One of the goals of learning biology in a pharmacy Vocational High School is to make a real contribution in studying pharmaceutical science, especially relating to organs and drugs in preventing and treating various diseases. This is in line with the aim of SMK Yayayasan Pharmasi which is to produce graduates who are ready for a career, capable of competence, and able to develop themselves and be able to produce graduates who are competent in the pharmaceutical field.

Preliminary studies at the Vocational Pharmacist Foundation obtained data that so far biology learning in vocational pharmacy has tended to only focus on biology and have not been associated with pharmacy vocational subjects, but biology subjects especially organ systems have a very close relationship with pharmacy vocational subjects related to disorders and diseases that occur in organ systems. Biology learning that is integrated between biology material with vocational pharmacy material can be used as one of the means to achieve the objectives of biology learning in Vocational High schools.

One of the materials of the organ system is the digestive system which is a material that quite difficult for students to understand, especially the sub-material of digestive organs, digestive enzymes, the mechanism of digesting food, and disorders and diseases of the digestive system. Observation results indicate that 52% of students have not reached the KKM value set, which is 75. Cardak (2015) states that many students experience misconceptions on the material of the digestive organ system, causing low learning outcomes. The learning process in the class also still focuses a lot on the teacher so students tend to be more passive in following the learning.

Teacher-centered learning models result in student learning outcomes and science process skills being less like the ability to design experiments, make hypotheses, interpret data, and communicate the results of practicums or research conducted. Suciati & Hermita (2016), Fernandez (2017) stated that science learning which tends to be textual and knowledge transfer alone has only a small impact on learning, which results in less ability of science process skills. Therefore we need a learning model that can improve learning outcomes, students' science process skills, and can integrate biology learning with pharmacy.

Learning models that can be used to overcome these problems are inquiry learning models. Inquiry learning is learning that emphasizes the process of thinking critically and analytically to find and find answers for themselves of a problem in question (Sanjaya, 2010). Inquiry learning can lead students to discover for themselves the facts related to drugs in the digestive system so that learning is more meaningful.

Providing direct experience to students in inquiry learning can be done with mini research activities. Mini research is a systematic, critical and scientific investigation of a problem to increase knowledge, obtain new facts and make better interpretations on a small scale. According to Tyler (2013) mini research is generally the same as research in general, but the scope of mini research is shorter both in terms of content and time required. Mini research that can be used on digestive system material is direct observation in pharmacies to find out the types of drugs in the human digestive system.

Learning inquiry with a mini research strategy is expected to improve science process skills and student learning outcomes. Research by Gormally *et al.* (2009), Leonor (2015), Suciati & Hermita (2016) states that inquiry learning can improve science process skills and science literacy skills because students are involved in higher investigations so that they can lead to well-integrated basic science. Science process skills have the aim to improve students' abilities, understand and master a series of activities namely observing, classifying, interpreting, predicting, applying, planning research, and communicating (Rustaman *et al*, 2005)..

Learning inquiry with a mini research strategy on the digestive system material is expected to improve science process skills and learning outcomes and can support pharmaceutical science subjects especially those related to drugs in the human digestive system.

METHODS

This research is a quasy experimental study with pretest-posttest control group design. The population in this study were all students of pharmacy vocational grade XI which were divided into five classes in the Vocational Pharmacist High School. The sample of this study used two classes of purposive sampling techniques. The independent variable in this study is an inquiry learning model with a mini research strategy while the dependent variable in this study is the science process skills and student learning outcomes.

Preliminary data analysis techniques using the analysis of the validity test, reliability, level of difficulty, and distinguishing test problems. The prerequisite test used to analyze the final data uses the normality test and homogeneity test. Analysis of the final data on learning outcomes uses the independent sample t-test and the N-Gain test. Data analysis of science process skills using the science process skills observation sheet was analyzed using the average percentage score. Analysis of inquiry learning models with a mini research strategy as a supporter of pharmacy using a pharmacy productive teacher interview technique.

RESULTS AND DISCUSSION

Student learning outcomes

The average value of the experimental class is 81 and the control class is 72. The analysis of the learning outcomes of the experimental class is better than the value of the control class, so the use of inquiry learning models with mini research strategies on the value of learning outcomes is more effective than the control class. Analysis of the learning outcomes of the control class and the experimental class is presented in Table 1.

Table 1. Analysis of the posttest scores on the learning outcomes of the control class and the experimental class

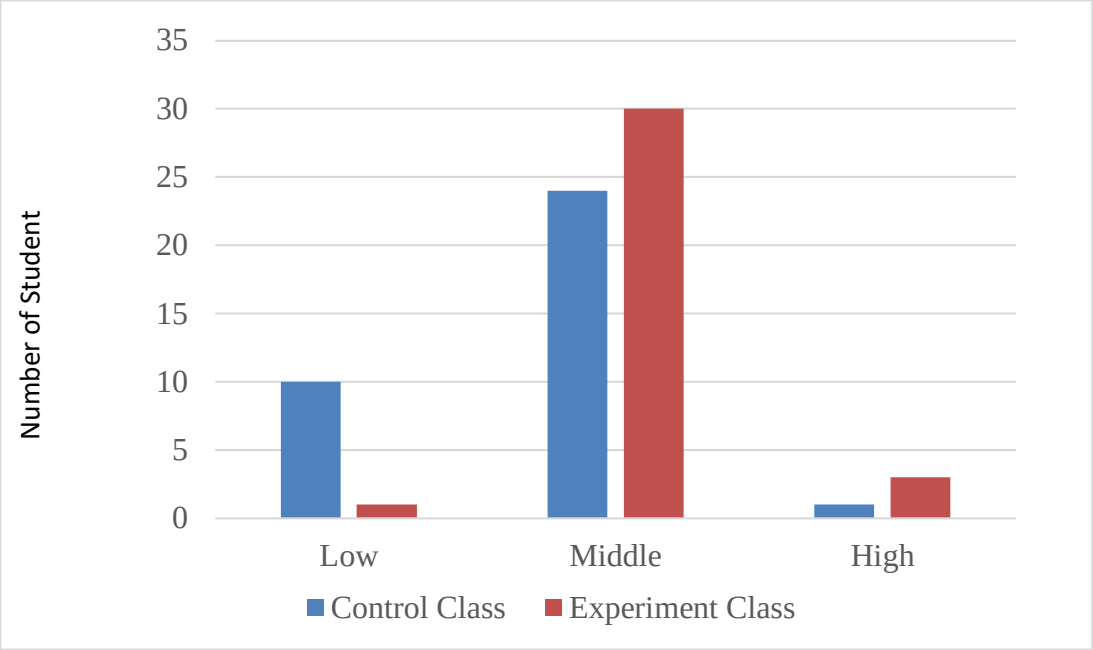
Data	Control Class	Experimental Class
The number of students	35	34
Average value	72	81
Students complete	12	30
Students not complete	23	4
Classical completeness (%)	34	88
T_{count}	6,211	
T_{table}	1.996	
Sig	0.000	
Average N-Gain	0.3654	0,5581

KKM that has been set for biology class XI in pharmacy majors is with 75. The analysis of the learning outcomes of classical completeness control class is 34%, while in the classical completeness experimental class is 88%. Analysis of the t-count value of the learning outcomes of 6.211 is greater than the t_{table} value of 1.996 (tcount> ttable) and the independent-samples t-test obtained a signification value of 0,000 smaller than the value of α 0.05 (sig p 0,000 <α 0, 05). Analysis of the posttest value both from the analysis of the t-count value and the independent-samples t-test both received Ha data that is there is a difference between the post-test value of the control class

and the post-test value of the experimental class with a significance level of 5%.

Analysis of the value of N-Gain in the control class, the number of students who entered the low category were 10 students, the moderate category was 24 students, and the high category was 1 student. N-Gain value of the experimental class the number of students who entered the low category were 1 student, the medium category was 30 students, and the high category was 3 students (look at the Figure 1). The N-Gain category of the control class and the experimental class has an average in the medium category, but if seen from the number of students who are in the low, medium, and high category it can be seen that the N-Gain value of the experimental class is better than the N-Gain value of the control class . The number of students in the low, medium, and high categories on the N-Gain score can be seen in Figure 1.

Figure 1. Number of students in N-Gain low, medium and high score



Analysis of the value of student learning outcomes from the control class and the experimental class as a whole both from the t-test, independent sample t-test, and N-Gain test in the Table 1, value of student learning outcomes of inquiry learning models with a mini research strategy in the experimental class is better than conventional learning in the control class. The inquiry learning model with a mini research strategy can improve student learning outcomes because students will be more active in ongoing learning. Inquiry learning with mini research strategies can improve students' ability to find and find their own answers to a problem raised by the teacher so that students will easily understand each digestive system learning material during the study so as to increase the value of learning outcomes. Inquiry learning model can enhance the development of cognitive aspects of students so that student learning will become more meaningful (Sanjaya, 2010). Research Sodikun et al. (2016), Pratono et al. (2018), Utomo (2018) also stated inquiry learning can improve the value of student learning outcomes.

The value of student learning outcomes in the experimental class is higher than the value of the control class is also influenced by the mini practicum research on food content testing and mini drug research on the digestive system at the pharmacy conducted by conducting in-depth interviews to obtain information about drugs in human digestive system. Mini research is a systematic, critical and scientific research of

problems to increase knowledge and understanding, obtain new facts, or make better interpretations on a small or small scale. Learning outcomes are always associated with mastery of the material, if the mastery of the material in students is good then student learning outcomes will also increase. Leksono (2016) in his research stated that the mini research strategy contributes to increasing mastery of the material in learning.

The use of a mini research strategy for food content testing in the inquiry learning model will make it easier for students to understanding the concept of food content testing in the food so that easier for students to answer posttest questions related to food content testing. Students will find it easier to remember concepts that are conceptual because they have already conducted mini research on direct food content testing. Wardani et al. (2017) conducting research on the Android-based inquiry module also concluded that inquiry learning can improve the mastery of concepts in alkane material. Nurjhani et al. (2012) in his research stated that the conceptual mastery of concepts that can be applied in daily life would be easier to understand.

Mini research interviews on drugs in the digestive system at the pharmacy also contribute to increasing the value of student learning outcomes. Direct observation in the field through interviews conducted on mini research can explore a variety of drug information in the digestive system making it easier for students to understand the types of drugs and their active substances because they will be easily recorded in the brain's memory when conducting in-depth interviews with pharmacists so that it is easy to answer each question posttest related to drugs in the digestive system of food. Joesyiana (2018) in his research stated that the observation method (outdor study) can improve learning activities, understanding of material, and learning outcomes.

Mini Research Science Process Skills

Science process skills in food content mini research are assessed from 10 aspects namely observing, formulating problems, hypothesizing, preparing mini food content research tools, using practicum tools, conducting mini research, interpreting data, and communicating the results of mini content research food substances. Analysis of mini research science process skills testing of food content in the experimental class had a percentage of success reaching 89% in the excellent category, while in the control class reaching 73% in the good category. The percentage of science process skills in the experimental class and the control class are presented in Table 2.

Table 2. Percentage of science process skills control class and experimental class

No	Aspect	Control Class	Experiment Class
		Percentage (%)	Percentage (%)
1	Observe	85	93
2	Formulate the problem	76	86
3	Hypothesis	75	89
4	Setting up a mini research tool	81	93
5	Prepare mini research material	70	90
6	Using tools	66	89
7	Mini research activity	71	85
8	Observe the results of mini research	64	86
9	Interpreting data	66	86
10	Communicating	67	90
	Average	73	89

Analysis of science process skills in Table 2 shows that the experimental class using the inquiry learning model with a mini research strategy has better results than the control class using the conventional learning model that is practicum. This is in line with research conducted by Permari (2016) which states that mini research activities can lead to even increase various student competencies such as science process skills. The success of inquiry learning models with mini research strategies is caused because students will more easily understand and be able to solve problems scientifically by first seeking information on food content testing before conducting mini research of food content testing so that students' scientific process skills increase. This analysis is in line with Dimyati & Mudjono (2019) research which states that the use of inquiry learning models in mini research strategies in the experimental class can develop intellectual skills, think critically, and be able to solve problems scientifically. Ping & Osman (2019) states that module-based inquiry learning is effective for the development of science process skills.

Science process skills in the drug on the food digestive system mini reesearch in experiment class are analyzed on 7 types of skills namely observing, classifying, formulating problems, designing mini research studies, conducting mini research, interpreting data, and communicating. Analysis of science process skills in the control class is only done on 4 types of skills namely observing, classifying, interpreting data, and communicating because in the control class only discussing drugs on the food digestive system without doing a mini research at the pharmacy. The science process skills of the experimental class and the control class are presented in Table 3.

Table 3. Percentage of medicine science process skills in the digestive system of the control class and the experimental class.

No	Aspect	Control Class	Experiment Class
		Persentage (%)	Persentage (%)
1	Observe	86	94
2	Classifying	76	87
3	Formulate the problem		86
4	Design mini research research		84
5	Do a mini research		88
6	Interpreting data	69	88
7	Communicating	63	90
	Average	74	88

The results of the analysis of the science process skills of medicines in the food digestive system in Table 3, in the control class had a percentage of 74% in the good category and 88% in the experimental class in the very good category. The use of mini research in the experimental class makes students more active and serious in conducting mini research starting from preparing the mini research to communicating skills because students have to go straight to the field and conduct in-depth interviews with pharmacists at the pharmacy to dig up information about the types of drugs. drug in the food digestive system. Hastutiningsih (2016) states that outdor learning is effective for improving and developing students' skills in science learning. Carrier (2009), Alves (2012) also states that learning science based on direct work experience gets results that the most satisfying aspects of students are directly involved in science activities in the real world that give students direct experience in the field. The science process skills of students in the control class are only done in the classroom by means of discussion about the types of drugs in the food digestive system, causing students to

become bored quickly and make some students become less active in discussions. Moussaid at al. (2018) also states that the discussion group can perform poorly if the internal structure of each group member also performs poorly.

Mini Research Analysis as a Supporting of Pharmaceutical Science in Vocational Hight Schools

Analysis of the inquiry learning model with a mini research strategy as a supporter of pharmacy science using interview data collection techniques with productive pharmacy teachers at the Yayasan Pharmasi Vocational High Scool. Interviews conducted on productive pharmacy teachers were pharmacology subjects. Based on the results of the interview pharmacology subjects related to drugs in the organ system such as drugs on the nerves, breathing, digestion, circulatory system. These drugs are analyzed based on their constituent components, active substances, the function of active substances, how they work, and the side effects of these drugs.

These pharmacological subjects turned out to be very related to biology subjects, especially with diseases and disorders in the human organ system such as the digestive, respiratory, circulatory, nervous, and reproductive systems. Biology subjects can be the initial knowledge of organs, and the names of diseases in pharmacy, especially pharmacology subjects. Interviews conducted turned out to be pharmacological subjects doing more discussion activities to analyze drugs ranging from composition, active substances, ways of working, and side effects of drugs "*discussion usually uses a drug wrapper which is then analyzed the content of the drug and grouping the types of drugs*".

The inquiry learning model with a mini research strategy will stimulate students to find their own concepts based on a mini research drug at a pharmacy. The approach that allows scientific inquiry so students become more active is inquiry learning (Lestari et al., 2018). The inquiry learning model with a mini research strategy based on interviews received positive appreciation from pharmacology teachers because it can indeed support the pharmacology learning process in vocational high schools, but with a note learning inquiry with a mini research strategy should be able to make students become active and the value of learning outcomes is also good. The value of learning outcomes and science process skills that have been analyzed can give an idea that the inquiry learning model with a mini research strategy can be used as a supporter of pharmaceutical science. Mini research conducted by conducting direct observations at pharmacies provides benefits for pharmaceutical science teachers, especially pharmacy subjects, namely teachers will more easily explain the drugs discussed. For students, they will get two benefits at once, namely students will more easily learn drugs and diseases of the digestive system and become the initial stock to recognize the pharmacy environment so that during labor, students are more adaptable.

CONCLUSION

Based on the research that has been done it can be concluded that (1) Inquiry learning model with mini research strategy can improve students science process skills (2) Inquiry learning model with mini research strategy can improve student learning outcomes (3) Based on analysis of the value of learning outcomes, science process skills, and interviews of productive vocational teachers, the inquiry learning model with a mini research strategy can be used as a means of supporting the learning of pharmacy in Vocational High Scools.

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