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# APPLICATION OF PRACTICE WITH SCIENTIFE SHORTENING TO IMPROVE STUDENTS' PROBLEM SOLVING SKILLS ON HUMAN DIGESTION MATERIAL IN CLASS XI MIPA SMAN I SUSUKAN CIREBON

**Siti Mahmudah[1], Djohar Maknun[2], Mujib Ubaidillah[3]**
Biology Education, Islamic State University of Syekh Nurjati Cirebon, Cirebon, West Java, Indonesia[1,2,3]
E-mail addresses: sitimahmudah0094@gmail.com
*Corresponding: sitimahmudah0094@gmail.com

**Abstract:** Problem solving skills are very important in learning biology, but the facts in the field show that problem solving skills in learning biology are still relatively low. So that accuracy is needed in choosing a learning approach that gives more room for problem solving for students is the scientific approach. This approach is to be able to solve problems systematically, gain knowledge, skills and attitudes. The purpose of this study is to examine; 1) student learning activities, 2) differences in the problem solving skills of the control class and experimental class students, and 3) students' responses to the application of practicum with a scientific approach. This research is a quantitative study conducted at SMAN 1 Susukan with a population of 120 students of Class XI MIPA 1.2 and 3 at SMAN 1 Insert and samples as many as 34 students of Class XI MIPA 1 in the experimental class and 34 students in Class XI MIPA 2 in control class. The research design used was a pretest posttest control group with data collection techniques using tests, observations and questionnaires. The results showed 1) there was a difference in the increase in student learning activities, 2) there was a significant difference in the increase in students' problem solving skills in the experimental class by 0.64 and the control class by 0.11, and 3) students gave a positive response to the application of practicum with an approach scientific material on the human digestive system. Based on the results of the study it can be concluded that the application of practicum with a scientific approach can improve student learning activities and student problem solving skills and students give a positive response to biology learning by applying a scientific approach.

**Keywords:** practicum; scientific approach; problem solving skills; human digestive system.

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## INTRODUCTION

Education in the 21st century emphasizes more on students as *student-centered learning.* For this reason, teachers are required to create learning using a thematic-integrative approach and the learning process through a scientific approach, so students are required to be active, innovative and creative in solving a problem, including biology learning. Learning biology in the classroom will significantly present challenges for all parties especially to teachers. In this case, teachers are the main actors of education, the back and forth of a nation depends on how the teachers themselves are. So in this case the teacher is the pillar of a nation. As in his book Halimah (2017) which revealed that the determining factor for the quality of education is the quality of teachers, and effective teachers can generate significantly the learning gains obtained by learners compared to ineffective teachers. The essence of the purpose of biology education is as an ongoing process for students to face and overcome biology problems in everyday life. Students must be trained to think innovatively independently. This habituation of independent and innovative thinking is necessary to solve problems in everyday life and it is real. Problem solving can be developed and part of high intellectual skills. This can be understood because problem solving is the highest type of learning of the eight types proposed (Nuralam and Eliyana, 2017).

One of the factors that favor the level of student participation in solving problems is the approach to learning carried out by biology teachers. The learning approach is a strategy that can clarify the direction set. The learning approach is defined as the way taken by the teacher in carrying out the planned learning so that students understand the concepts being studied. Therefore, accuracy is needed in choosing a learning approach. One learning approach that has more space in problem solving is a scientific approach. (Nuralam and Eliyana, 2017). Based on research conducted by Nuralam and Eliyana (2017) shows that in traditional learning, information retention from teachers is 10 percent after 15 minutes and contextual understanding gains by 25 percent. In scientific approach-based learning, the retention of information from teachers is more than 90 percent after two days and and the acquisition of contextual understanding is 50-70 percent. The 2013 curriculum paradigm is an integrative and in-depth mindset about curriculum development based on Law number 20 of 2003 concerning the National Education System, namely competency-based learning with three basic competencies, namely attitudes, knowledge, and skills (Musfiqon and Nurdyansah, 2015). The learning process in the 2013 curriculum is carried out using a scientific approach, ideally touching three domains, namely attitudes, knowledge, and skills. In the learning process based on a scientific approach, the realm of attitudes requires the transformation of substance or material so that learners "know why". The realm of skill is to transform substance or matter so that learners "know what". The end result is an increase and balance between the ability to be a good human being *(soft skills)* and a human being who has the skills and knowledge to live decently *(hard skills)* of students which includes aspects of competence attitudes, skills, and knowledge (Halimah, 2017). Permendikbud 2013 explained that the scientific learning process in detail includes observing, questioning, trying / collecting information, associating / reasoning and communicating. The stages of activity are used in all subjects, including biology (Halimah, 2017). Problem solving is very important in learning biology, but facts in the field show that problem solving skills in biology learning in Indonesia are still relatively low. Based on the findings made by Novitasari et al., (2015) that students' *problem solving* skills are still very low, lacking, and even failing. This is because the teacher only gives routine questions or daily test questions that are the same as the evaluation questions in the textbook.

The findings of Destalia et al., (2014) that in solving a problem that exists around or the achievement of understanding the concept of the lesson is still very lacking. This is because teachers are less able to develop learning models or methods. Furthermore, research from Askar (2016) shows that the application of a scientific approach can increase positive learning activities. And based on research by Alamsyah (2016) shows that a scientific approach provides solutions to the implementation of learning. Meanwhile, at SMAN 1 Susukan, in the process of learning biology, especially class XI students, teachers are still not skilled in solving problems. When the implementation of learning students still have difficulty in defining problems. This is because the teacher still uses conventional methods, so students have difficulty in understanding the concepts conveyed by the teacher. As a result, it is difficult for students to achieve the Minimum Completion Criteria (KKM) score determined by the school, which is 76. This was proven during the Midterm Assessment (PTS) in class XI science 1 SMAN 1 Susukan, namely out of 35 students, only 8 people graduated above KKM. The value of 76 is not too difficult to achieve by a student, if the teacher is able to convey the subject matter with the right learning, for example a *scientific approach.* It is hoped that applying *a scientific* approach in the teaching and learning process, especially in biology learning, it can improve problem-solving skills, especially in defining problems that were difficult to achieve before. Therefore, Musfiqon and Nurdyansah (2015) it takes accuracy in choosing a learning approach that provides more space in problem solving for students is a scientific approach. Based on the research of Nuralam and Eliyana (2017) that the scientific approach can provide a contextual understanding of 50-70%, in this case the scientific approach is important for students to have. Human digestive system material is an interesting biological material to be raised in this study, because students will be interested in knowledge about how the processes, benefits, or uses of body organs so that they can understand the body better. Based on this background, the author is interested in conducting this research because the scientific learning approach is a golden guide to the development and development of attitudes, skills and knowledge of students.

## MATERIALS AND METHODS

The method used in this study is a descriptive quantitative method, data is taken with samples using the LKS (Student Worksheet) test, statistical test using tess in the form of *pretest*t and *postest true experiment design* or also called experimentation because in this design, researchers can control all external variables that affect the course of the experiment. The research design used is *pretest-postest control group design* (Sugiono, 2014). The study was conducted with a comparison between the experimental class and the control class. In the experimental class, practicum is applied with *a scientific* approach. Meanwhile, in the control class, the learning method used is without applying the practicum with a scientific approach. The questionnaire test is seen from how much students assess learning by applying practicum with *a scientific* approach in improving students' *problem solving* skills.

| Data | Data sources | Instruments | Information |
|---|---|---|---|
| Student learning outcomes improvement tests | Student | Multiple choice tests | Before and after learning |
| Student response questionnaire | Student | Student response questionnaire | At the time after the learning takes place |
| Observation sheet | Student | Observation | At the time of learning takes place |

## RESULTS AND DISCUSSION

### A. Description of Learning Activities Using the Application of Practicum with *a Scientific* Approach to Materi Sistem Digestion Manusia

The results of observations that have been made during the learning process using the application of practicum with *a scientific* approach to the material of the human digestive system, obtained data on student activity that is quite varied. The student learning activities observed in this study consisted of five criteria for *problem solving* skills indicators, including (1) defining problems; (2) check for problems; (3) planning solutions; (4) implement the plan that has been made; and (5) evaluate. The observed student learning activities are known by the way students convey issues that develop in society related to the digestive system material appropriately, analyze problems, solve issues that develop in society (according to the analysis of the problems proposed, present the results of discussions and analyze and evaluate the results of other group discussions (responding to the opinions of other students and respecting the opinions of other students in the discussion). The learning activities of control class students and experiments in general can be seen in the graph below.

### Differences in *Improving Students' Problem Solving* Skills between Experimental and Control Classes Using practicum application with a *scientific* approach

Theice t used in this study was in the form of tests before learning (*pretest*) and after learning (*postest*). The test used is in the form of a multiple choice test with a cognitive level of C5-C6. The multiple choice type used is an unwarranted multiple choice. The application of learning using the application of practicum with *a scientific* approach to the material of the human digestive system shows the results of different *student problem solving* skills between the control class and the experimental class. The *problem solving* skills indicators used in this study refer to the indicators *of students' problem solving* skills according to Novitasari (2015). The indicators developed in this study include: (1) defining problems, (2) examining problems, (3) planning solutions, (4) implementing plans that have been made, and (5) evaluating. The average *pretest* and *posttest* values between the control and experimental classes can be seen in the graph below.

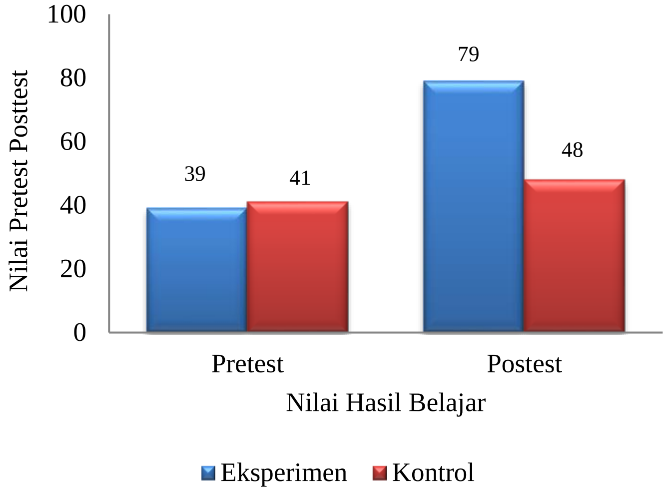


**Figure 1.** Graph of Average *Pretest* and *Posttest* Values *of Problem Solving* Skills between Control and Experimental Classes

The graph above shows the average acquisition of *pretest* and *posttest* scores of students*'* *problem solving* skills between the control class and the experimental class. Based on these data, the average *pretest* value of the control class is 41% while the average *pretest* value of the experimental class is 39%. The data showed that the average *pretest* of the control class was greater than the average *pretest* of the experimental class. The difference between the *pretest* value of the control class and the experiment is 2%. The average *posttest score of problem solving skills of* control and experimental class students has increased. The average *posttest* score of the control class was 48% while the average score of the experimental class *posttest* results was 79%. Based on these data, it shows that the average *posttest* score of the experimental class is greater than the average *posttest* score of the control class. The difference in *improving students' problem solving* skills in the control class was 7%, while the difference in improving *problem solving* skills of experimental class students was 40, while the difference in *the posttest* scores of the control and experimental classes was 31%. Figure 4.6 above shows the average acquisition of *pretest* and *posttest* scores of student *problem solving* skills between the control class and the experimental class. Based on these data, it can be analyzed that the average value of the *pretest of* the experimental class is smaller than the average value of *the pretest* of the control class. The difference in the average *pretest* value between the control class and the experiment did not show a large difference. The results describe the students' initial knowledge between the experimental class and the control class is not much different. *Pretests* are carried out before being treated to each class aiming to find out the ability before being treated, each class has not experienced the learning process directly from the researcher so that the abilities possessed by students between the control class and the experiment do not have significant differences, this is influenced by external factors including the condition of the students when doing the questions there are several who work together, while the internal factor is from within each student, namely the enthusiasm of the students in the experimental class is greater than that of the control class. Students' initial knowledge of a material concept is very important, because often students have difficulty in understanding a certain knowledge. One of the causes is that the new knowledge received does not have a relationship with previous knowledge, or perhaps the previous initial knowledge has not been possessed, making it difficult for students to understand a concept of the material, therefore initial knowledge becomes the main requirement and becomes very important for students (Trianto, 2009).

According to Trianto (2009) said that the initial knowledge possessed by students must be connected with the subject matter through various methods, strategies, approaches or learning models, therefore in teaching a material must be chosen a learning model that best suits the goals to be achieved. In addition, other considerations in choosing a learning model are the subject matter, the level of cognitive development of students, and the facilities or facilities available, so that the learning that has been applied can be achieved. The average value of *posttest* can be seen in figure 4.6. Based on these data, it shows that the average *posttest* score of the experimental class is greater than the average *posttest* score of the control class. Statistical tests on *the posttest* data showed a sig value of 0.000 smaller than 0.05 which means that there is a significant difference between the experimental class and the control class. The factor that causes the average value of the experimental class posttest to be greater is due to the application of learning using a *scientific* approach to the material nature of thehuman digestive system. According to Askar (2016) the *scientific* approach of learning materials is based on facts or phenomena that can be explained by certain logic or reasoning, not just guesses, fantasies, legends, or fairy tales alone. So that it can encourage critical, analytical, and appropriate thinking in identifying, understanding, solving problems, and applying learning materials. Meanwhile, according to Nuralam (2017) The scientific approach in learning has components of the learning process, including: (1) observing; (2) questioning him; (3) attempt/collect information; (4) reasoning/association; (5) form networks (communicate) that can encourage students to be actively involved in the learning process. The factor that causes the *posstest* value of the control class is smaller because the learning carried out is *teacher centeed* instead of *student center*. Meanwhile, according to Komariah (2011) that innovative learning with a student-centered approach (*student-centered learning)* has a diversity of learning methods that demand active from students. The learning process gives more opportunities to teachers in conveying the subject matter clearly and explicitly. The role of the teacher in the learning process is very dominant in the classroom. Students listen only to explanations from the teacher, so students are passive in the learning process. This is in line with the opinion expressed by Dahar (2011) who stated that if no effort is made to assimilate new knowledge to relevant concepts that already exist in cognitive structures, there will be a process of rote learning. Learning this rote memorization often leads students to put forward principles that they don't actually understand what is being said.

**Student Responses to Learning Using the Application of Practicum with *a Scientific* Approach to Human Digestive System Material experimental class and control class**

Data on student responses to the application of learning using the application of practicum with *a scientific* approach to the material of the human digestive system researchers obtained using questionnaires. Researchers used likert scale questionnaires with criteria of strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS). The filling of the questionnaire is carried out at the end of the learning process and is given or filled in to students who belong to the experimental class, namely classes that are given special treatment in the form of practicum application with *a scientific* approach to the material of the human digestive system. Researchers do not use the doubtful answer choice (R) because they will not get a truly valid student response answer, as is the case according to Sukardi (2007) who stated that there is a tendency for someone or the respondent gives the answer choice in the middle category for humanitarian reasons, if the respondent chooses the middle category, then the researcher will not get definite information. The statements on the response questionnaire consisted of 10 positive statements and also 10 negative statements. Statements in the questionnaire are divided into three dimensions. The first is to find out the student's response to learning by applying a *scientific* approach to the material of the human digestive system. This dimension is redeveloped into three indicators including student response, curiosity, and learning benefits. The second is to find out the student's response to the learning process using the application of practicum with a *scientific* approach to the material of the human digestive system. The dimension developed for this second dimension consists of four indicators including student interest, student activity, the ability to convey back and student learning motivation. Third, to find out the student's response to learning outcomes. There are three indicators developed from this third dimension including understanding of the material, student insights and improving students*' problem solving* skills.

The responses students give in a lesson can provide information on whether the treatment given to students in learning can be accepted or rejected by students. If students receive the treatment we give during the learning process, it means that students have a positive attitude towards the treatment. On the other hand, if students reject the treatment we give during the learning process, it means that indirectly students have a negative attitude towards the treatment given by the researcher during the learning process. The results of the calculation of the average percentage of student response questionnaires per dimension, student responses to learning and learning outcomes by applying learning using the application of practicum with a *scientific* approach to human digestive system material get a very strong response compared to other dimensions (see figure 4.11). The results of the data acquisition generally show that learning using the application of practicum with *a scientific* approach to the material of the human digestive system is well received by students. According to Halimah (2017) effective learning is learning that emphasizes students as a learning center *(student centered learning).* This is as stated by Trianto (2019) argues that effective learning starts from a student-centered learning environment and teaching must be centered on how students use their new knowledge. Similarly, according to Schunk (2012) learning must involve learners and context (which includes teachers, materials, *settings)* so that learners' learning goals are achieved effectively. The analysis of the questionnaire can be seen in the circle chart image below.

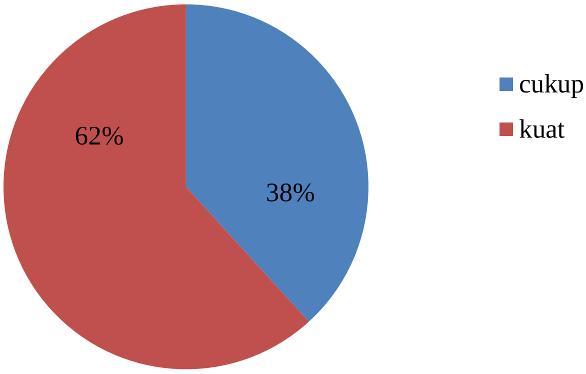


**Figure 2.** Diagram of The Percentage of Student Response Questionnaires to Learning Using the Application of Practicum with a *Scientific* Approach to the Concept of the Human Digestive System

The picture above shows a diagram of the percentage of student response questionnaires to the application of practicum with a *scientific* approach to the concept of the human digestive system. Based on the diagram, it is known that students' response to learninguses the application of practicum with *a scientific* approach to the concept of the human digestive system combined with human digestive system material, students responded, namely 62% of students gave a strong response and 38% of students gave a sufficient response. Based on these data, it can be concluded that learning using the application of practicum with *a scientific* approach to the concept of the human digestive system on the material of the human digestive system received a good and positive response from students.

## CONCLUSION

Learning activities that apply practicum with *a scientific* approach can increase student learning activities on the concept of the human digestive system. The activity from the first meeting to the third meeting increased by 34%. There is a significant difference in improving students' *problem solving* skills between the experiment class that applies practicum with a *scientific* approach and the control class without applying a *scientific* approach to the material of the human digestive system with an average N-Gain of the experimental class of 0.64 and the average N-Gain of the control class of 0.11.Students respond well to learning using application of practicum with *a scientific* approach to the material of the human digestive system with a percentage reaching 62% and is included in the strong category.

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