

# Application of Problem Based Learning Model in Integrated Media Animation to Improve Students' Science Process Skills

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**Abstract:** This study aims to determine the application of problem-based learning models combined with animation media that can improve students' learning science process skills. The method used in this research is an experiment with a pretest-posttest control group design. This research was conducted at two senior high schools in North Aceh Regency, Aceh, Indonesia. The study was conducted in the even semester of the 2020/2021 Academic Year. The research sample was taken by random sampling of 102 students, namely the experimental group 51 and the control group 51. The parameter measured in the study was the students' science process skills. The data of science process skills were analyzed by parametric statistical test independent sample t-test. The results showed that there was an increase in science process skills after being taught using a problem-based learning model combined with animation media. The conclusion of this study is that the application of problem-based learning models combined with animation media can improve students' science process skills on the sensory system material at SMAN 1 Meurah Mulia and SMAN 1 Tanah Pasir.

**Keywords:** Problem Based Learning; Animation Media; Science Process Skills

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## Introduction

The 21st century learning paradigm emphasizes the ability of students to find out from various sources, formulate problems, think analytically, collaborate and collaborate in solving problems. An innovative support system must be created to help students master life and career skills, learning and innovation skills, and information media and technology skills (Daryanto & Karim, 2017). Schools must be prepared to support learners to enter a more demanding and skills-oriented workplace (Saleh, 2019).

Some of these skills include critical thinking, creative thinking, problem solving, and decision making (Rhashvinder, et al., 2018) as well as science process skills (Akinbola & Afolabi, 2010). According to Ozgelen, (2012) Science Process Skills are thinking skills used by scientists to build knowledge in order to solve a problem and formulate results. Science process skills help students to think critically and think scientifically

(Gillies & Nichols, 2015). Science process skills equip students in learning permanently by finding their own answers to problems and can make students active in the learning process (Risamasu, 2016).

Weak mastery of concepts is one of the problems in the learning process. The learning process at SMA North Aceh, students are not encouraged to develop science process skills and the learning activities carried out have not invited students to be actively involved during the learning process and the lack of ability of students to understand Biology concepts, resulting in less-than-optimal learning outcomes.

The results of the identification of learning conditions in schools currently indicate problems, based on the results of interviews with Biology teachers at SMAN 1 Meurah Mulia and SMAN 1 Tanah Pasir on the sensory system material, it was found that the learning outcomes that students achieved were still low. This is due to 1) the lack of ability of teachers and students to use innovative learning media, 2) teachers do not do

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practicum on sensory system material, because the tools and materials for carrying out practicals are incomplete, 3) teachers still think that students are not independent to complete problems in the sensory system material, 4) usually teachers only use textbooks, 5) learning is dominated by the delivery of information not emphasized on information processing, 6) learning activities are still centered on hearing and memorization, teachers do not provide opportunities for students to develop knowledge skills, science process skills.

The application of the learning model and media applied by the teacher is still not appropriate for the biological learning process, especially on the sensory system material. The low mastery of concepts makes students less active in the learning process and not active in the investigation process. So that students are not motivated to find ideas in solving problems that exist in their environment. The problems above cause a very large influence on student learning outcomes, namely the value of Biology lessons is below the Minimum Completeness Criteria of 75 which are set in several SMAN Aceh Utara.

The scientific process skills of students who are still lacking are revealed from the results of the study of Astuti, et al. (2016) that science process skills in Vocational High Schools using modified free experimental methods and guided experiments from the affective domain are still lacking on average. From the results of observations in several senior high schools in North Aceh, it was also found that science process skills were still lacking, especially in solving problems scientifically. Students are still less active in providing opinions or answers to problems that exist at school and in the surrounding environment, this happens due to a lack of knowledge and also the science process skills possessed by students are still very limited and will have an effect on the final grades of students.

The results of these observations are supported by the National Examination data. The average value of the 2019 Biology National Examination at North Aceh High School is only 41.91, far below the average value of the 2019 National Biology National Examination, which is 50.97. This shows that the value of Biology lessons for the North Aceh region is still low compared to the national average value.

One strategy that can refer to interactive learning is the Problem Based Learning learning model, which is student-centered learning to solve a problem and can think further in solving problems completely Duch, et al., (2001) in Baturay and Bay, (2010). Students will be more active in exploring new ideas and will be skilled in making decisions and arguing.

The Problem Based Learning model in reasoning knowledge and processing information makes students more responsible for finding the desired information, the teacher's role becomes lighter and can control every change of students (Andersen, 2002; Baturay and Bay,

2010b). The use of media to support the Problem Based Learning learning model has an influence on the motivation and learning outcomes of students. The results of the study (Fernández-Jiménez, et al., 2019) stated that the use of problem-based learning strategies gave better results tailored to the student profile.

The results of the research show that PBL which involves the role of students in solving problems has the effect of increasing student outcomes, (Sevian, et al., 2018). The research results also explain that there is an increase in student learning outcomes through problem-based learning, (Lubis, et al., 2019). Another study also resulted in an increase in learning outcomes before using problem-based learning by 58.80 to 89.30 after using problem-based learning. Through a learning-based model, students can understand the learning process both inside and outside the classroom, (Malmia, et al., 2019; Evendi, et al., 2021; Ramadhani et al., 2019). The PBL model can improve student learning outcomes from the first cycle to the second cycle. The application of the PBL learning model has an effect on cognitive learning outcomes and can improve students' metacognition skills, (Ismayawati & Purwoko, 2016; Ramdoniati, et al., 2019).

The use of animation media in the learning process can convey complex material visually and dynamically. Doyle, et al. (2018) states that learning with animation media can help students explain complex concepts more clearly and help motivate students to learn. Animated media can also improve student learning outcomes which are more relevant than before, Animated media affects student learning outcomes in science lessons in junior high school with a sig  $F_{count}$  of 138.4 large from  $F_{table}$  6.81, (Sanchez and Weber, 2019).

Several studies on Problem Based Learning that examine students' science process skills, motivation, and learning outcomes have been carried out. The results of the study only revealed that students who took lessons with the Problem Based Learning model had different science process skills with students who studied with the direct learning model, increasing students' learning motivation and improving guided learning skills, (Fidan & Tuncel, 2019; Suardani, et al., 2014; Wijnia et al., 2011).

The Problem Based Learning model gives students the freedom to think actively, both individually and in groups and can build motivation so that it will improve student learning outcomes. Meanwhile, studies that examine how to overcome the problems of science process skills, motivation and student learning outcomes using animation media are still very limited.

Therefore, researchers want to conduct research, to answer research questions about improving the Problem Based Learning learning model combined with animation media can improve students' science process skills.

**Method**

The approach used in this study is a quantitative approach, the type of research used is applied research using quasi-experimental methods and conventional methods in the control class, pretest-posttest control group design. The learning process takes place by applying the Problem Based Learning model combined with animation media on the sensory system material. The population in this study were all students of class XI of SMAN Meurah Mulia and SMAN 1 Tanah Pasir, North Aceh Regency, which amounted to 163 students, and both schools were accredited B.

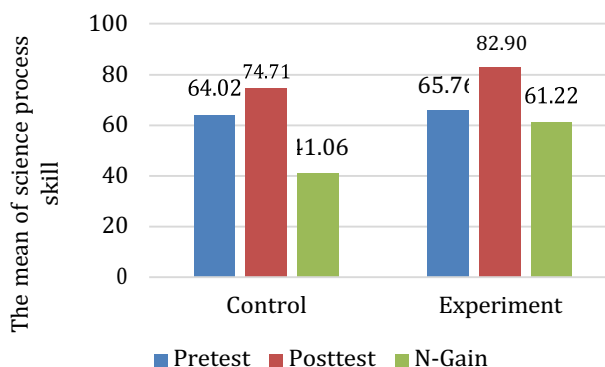
Sampling was done by purposive sampling technique. Each school was assigned two classes that had homogeneous average scores after being given a pretest to be used as an experimental class and a control class in both schools. The number of samples is 102 students from the total population taken from the two homogeneous classes. The sample at SMAN Meurah Mulia consisted of 51 students and at SMAN 1 Tanah Pasir, North Aceh Regency, 51 students.

The instrument for collecting data on students' science process skills was in the form of multiple-choice questions with 5 answer choices consisting of 40 multiple-choice questions. Previously, the question had been validated by the validator. After validation, the test instrument was carried out field trials with content validity techniques to find the level of validity, the difficulty of the questions, and differentiating power. The test instrument trials were carried out on class XII students who had studied the sensory system material. So that the obtained  $r\text{-Spearman} = 0.89$  which means the reliability of the test items is high.

Data collection techniques for science process skills of students in the form of pretest and posttest, then the data will be calculated normalized Gain score using the formula from Meltzer, (2002). Before the data is analyzed, the analysis prerequisites are tested, namely normality and, homogeneity test. If the test results show that the data is normally distributed and homogeneous, then the hypothesis test is continued with the help of the SPSS 22 for windows program on the Independent Sample T test.

**Result and Discussion**

Data from research on science process skills of students include pretest, posttest and N-gain. To see the difference in the average science process skills of students in the control and experimental classes, it can be seen in Figure 1.



**Figure 1.** Average Pretest and Posttest Scores of Science Process Skills

The results of the science process skills test of students increased and were better after being given a posttest because it applied the Problem Based Learning model combined with animation media. This learning model encourages students to find problem-solving and stimulates students to think when solving contextual problems (Marian, 2014). Based on the syntax of the Problem Based Learning model which consists of five stages, namely problem orientation, organizing problems, helping with investigations, presenting work, and evaluating problem-solving, making students more active, and teachers acting only as guides in conducting investigations, not providing concepts to students, so that the learning process is more independent and meaningful.

Problem Based Learning activities make students more enthusiastic in exploring questions, discussions, presentations, and also practicums about the work of the sense organs because at the beginning of learning activities students have been faced with problems and asked to solve these problems based on experience gained independently so that students are familiar with the problem and its solution.

Learning using Problem Based Learning models and animation media provides opportunities for students directly in the learning process. According to Rusmiyanti & Yulianto, (2009) learning that provides direct opportunities for students will provide good learning outcomes. In the control class, which only uses a scientific approach, in the learning process students are not familiar with problems and their solutions so that when they are given assignments and during the discussion process, they are only based on textbooks and are not trained in thinking.

Problem Based Learning learning model allows students to gain direct experience. Zaini, (2009) argues that a student will easily remember the knowledge obtained independently longer than getting information from the listening process. Problem Based Learning makes students to participate in all learning processes so that students are trained to ask questions, answer and solve problems related to the sensory system material.

In addition to the Problem Based Learning model, learning activities using animated media also provide a meaningful experience to students, because the use of this media makes it easier for students to understand an abstract concept to be more concrete and clear, for example in the listening process and viewing process sub-materials which are considered a little difficult and requires a deeper understanding and explanation, but with the help of animated media students become easier to understand the process because it is equipped with images, audio and video. This is also supported by Syarifah, (2017) which states that audio-visual media, one of which is animation media, is able to shape learning as if it looks real because some displays are supported by animation, thus making students excited in the learning process.

The results showed that the application of the Problem Based Learning model combined with animation media in the experimental class could have a major influence on improving students' science process skills. The science process skill score of the experimental class taught by applying the Problem Based Learning model combined with animation media was higher than that of the control class. The results of this study support previous research conducted by Hasanah & Utami, (2017) that the application of the Problem Based Learning model has an impact on students' science process skills. Joni Purba, (2015) revealed that the application of problem-based learning can improve science process skills, where problem-based learning students participate more actively in solving problems.

The Problem Based Learning model combined with animation media can be used to train students actively in developing aspects of science process skills, namely basic, processing, and investigative skills. The following is a comparison of the level of science process skills of students before and after learning using the Problem Based Learning model combined with animation media. The acquisition of posttest data of students per sub-aspect of the experimental and control groups can be seen in Figure 2.

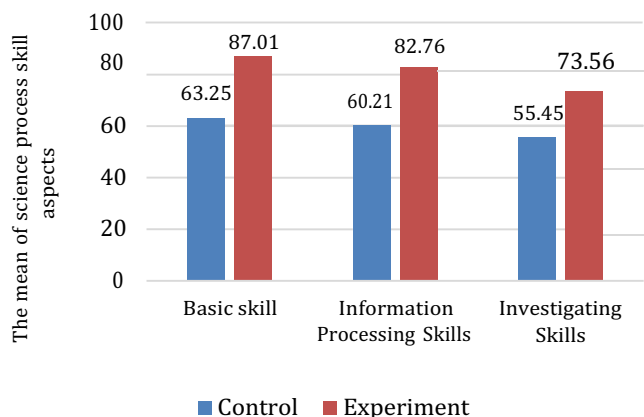


Figure 2. Average Score of Science Process Skills Per-Aspect

The basic skill aspect is the highest aspect, the control class with a score of 63.25 while the experimental class gets a score of 87.01. In the learning process, students are first given a problem related to the material, such as making observations, identifying objects, and identifying problems related to the sensory system material. students will make observations. In accordance with the opinion of Aan Hanafiah, (2010) learning with the Problem Based Learning model, students are faced with discourses that begin with problems, thus helping students to be more skilled in observing an event.

The investigative skill aspect is the lowest aspect, the control class has a score of 60.21 while the experimental class gets a score of 82.76. In the learning process, students must be able to design, implement and report research results. This low aspect is because students are not familiar with investigative actions, so when this activity is carried out students find it difficult to design sensory work practicum tools and materials, carry out and report the results of the practicum in a written report. Students who are familiar with investigative activities will improve science process skills, otherwise, if they are not familiar with investigative activities, science process skills will not develop (Widjayanti, 2011).

The information processing skills aspect of the experimental class is superior with an average score of 73.56 to the control class with an average score of 55.45. This is because the experimental class with the Problem Based Learning model conducts group discussions and presents their work in front of other groups. This discussion activity can develop students' communication skills in groups and with other groups (Puji Rahayu., 2012).

### Conclusion

The Problem Based Learning learning model combined with animation media has an effect on increasing students' scientific process skills because the learning model involves students in solving problems related to everyday life, requiring students to play an active role, so as to improve cognitive abilities.

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