Impact of Problem-based Learning (PBL) model through Science Technology Society (STS) approach on students’ interest

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Abstract. This study examines the effects of PBL model through the STS approach to learning interest and students conceptual understanding of dynamic fluid material in Senior High School 1 Delima. The type of pre-experimental research with the form of one group pre-test and post-test. The research instruments consisted of interest questionnaires and conceptual understanding questions, interest data were analyzed by percentage formula and learning outcome data were analyzed by n-gain to determine the percentage effect of PBL model through the STS approach to students’ conceptual understanding. The results of the study show that learning using the PBL model through the STS approach can increase student learning interest about 45%.

1. Introduction
Education is one of the most important factors in human life and an effort to improve welfare, skills, and soft skills towards a better direction. Education process can influence students to be able to make change in their behavior [1].

The development of science is very rapid along with advances in technology and industry, this has affected the world of education [2]. The government is trying to improve the quality of education, so it is ready to compete in the world, in this case education is always related to the teaching and learning process [3,4]. All educational processes are always directed to be able to provide and create educated society for better education, nation and state.

Efforts to achieve a goal in learning need to be created for a more conducive learning system (condition), this will be related to teaching activities. Teaching is interpreted as an effort to create an environmental system that allows learning to occur [5]. The learning environment system itself consists or is influenced by various components for examples the quality of teacher, facilities, teaching method, and pupils respond, each of which will influence each other to achieve the material taught [6-9].

The decline in the quality of education has been highlighted by the public, educators and the government. Therefore, the government has tried every effort to make improvements in the field of...
education. As a precautionary measure, education is directed towards structuring the learning process, using and selecting learning models appropriately with to archive effective learning outcomes [10].

The development of education in Indonesia has declined from year to year. Educational achievement in Indonesia lags far behind other developing countries such as India, Brazil, and South Africa [11]. The weakness of human resources (HR) in education outcomes also resulted in the slow pace of Indonesian rise from the deterioration of the economic sector which declined significantly in 1998 [12].

One way to improve the quality of education is by updating the structure of the curriculum, education system and teaching models that are effective and efficient. These efforts included improving facilities and infrastructure, improving the quality of educators and students as well as changing and improving the curriculum. The educational process serves as a tool to achieve educational goals, namely competencies that must be achieved in educational endeavors. However, a good and ideally competency formula ultimately a success also depends on the implementation of the learning process carried out by the teacher [13]. The teaching and learning process takes place well, then the function of the teacher is not only as a teacher but also as a guide and director to learning process, think towards scientifically, because the teacher is directly responsible for the quality of education in the teaching-learning process, the teacher as someone who deliver the lesson and students as the subject of learning needs a certain profile of qualifications in terms of knowledge, abilities, attitudes and values as well as personal characteristics, so that the process takes place effectively and efficiently [14,15,16].

Physics is one of the basic natural sciences that is widely used as the basis for other sciences [17]. Physics lessons in school are less desirable subject for students, the same to Delima 1 Public High School students, most of them do not like physics lessons. According to students, physics lessons are difficult to understand. Physics is one of the lessons that the truth is often a frightening specter for most students [18]. Students perceive that physics is subject that contain formulas that must be memorized, so students are lazy to learn, and they show a lack of interest in it so that learning outcomes are reduced.

Based on the results of case studies conducted at Delima 1 High School, the problems in physics include: (1) the lack of students’ interest in participating in physics learning; (2) students are less active in teaching and learning activities, most students only keep silent (passive) while teaching and learning process, can be seen when the teacher gives students the opportunity to ask questions and lack the basic concepts of mathematics; (3) teachers more often use models, methods, and conventional approaches that make students show less active participation; (4) students only listen and record what is told by the teacher, so that students' learning interest becomes less.

The problems that arise are not only from students and learning models, but also from their environment, society, facilities, and infrastructure. For this problem to be overcome it is necessary to examine in-depth the impact of the PBL model through the STS approach to conceptual interest and understanding. The STS approach is a learning process that uses technology as a link between science and society [19]. which means that this learning is done by utilizing technology as a liaison between science and society to solve problems and understand what has been learned. Besides, the STS approach can also train students to always be sensitive to the development of science (science) and technology that is suitable for their life [20].

The STS approach in learning as a sharpener so that students are always sensitive to the development of science and technology under with their life and provide opportunities for students to master in every material they learned. Mastery of material and its relation to real-life cannot be separated from how students get learning, in this case the selection of the right learning model needs to be considered.

The selection of learning models needs to be done to attract students’ interest in learning, because of the variety in the model or method used by the teacher can result in the presentation of lesson materials to attract students' attention, easily accepted by students and often come alive. The model that fits in learning and its relation to real life is the blend of PBL model with the STS approach.
PBL models can influence student learning outcomes [21], and PBL creates a relationship between students' beliefs and understanding of concepts [22]. The effectiveness of PBL learning is not only in the application of learning but in developing teaching materials [23].

The relation between the PBL model and the STS approach is found in the PBL learning steps that require students to be able to analyze a problem and find solutions to these problems. The problem is about people's daily lives, and this is experienced directly by students in real terms. The results of the study indicate that the STS learning model can be used as an alternative learning model to improve material mastery and problem-solving skills [24]. The results of the study about STS show that: 1) there are differences in understanding concepts, creative thinking skills between students who study with the STS learning model compared to the direct learning model [25], therefore based on performance indicators, can be concluded that the use of the STS approach applied in learning science about energy and its use can improve understanding of students [26].

Furthermore, other studies also prove the effectiveness of learning with the STS approach in improving students' creativity [27] intelligent students’ activities [28] life skills [29], improving perceptions [30], analysis of technological capabilities [31], beliefs [32], understanding and scientific attitudes of students in learning [33].

Previous studies above, all claim that students' understanding increases because it is associated with real-life, students learn with the environment and experience directly. This is what makes students more easily understand the concept. Based on the background of the problems, the results of the analysis of case studies and previous studies, the researcher will examine the impact of the PBL model through the STS approach to students' interest of dynamic fluid concept at Delima 1 High School.

2. Research method
This study used the pre-experimental research method, with one group pretest-posttest design. The pre-experimental design method is the research carried out to one group of students, without any comparison group or control group. Experiment classes are taught using the PBL learning model through the STS approach. The independent variable in this study is the PBL model through the STS approach, while the dependent variable is the interest in learning and understanding students’ concepts.

The design of this study uses one class, namely the experimental class where students experience a low interest in learning and understanding of concepts. To find out this, first an initial observation or test is given to students of class XI IPA to get data on students with low concept understanding. Then students who have a low concept are made into the experimental class uses PBL model through the STS approach.

Sampling is done by giving a diagnostic fluid dynamic concept test questions to all students of class XI Science. The result of the diagnostic tests was analyzed with percentages and shows that only 25 students whose level of conceptual understanding was low. The instruments in this study were questionnaires of student learning interest with indicators (1) pleasure, (2) attention, (3) involvement, and (4) interest.

3. Result and discussion
The increasing of students’ interest is seen from the N-gain test, which is have three categories, namely high, medium and low. Before applying the PBL model through the STS approach, student learning interest is not maximal, students are still waiting for the teacher's instruction in learning, but after PBL learning is implemented through the STS approach, students seem to be enthusiastic in learning, students seem to be active and ask teachers, and also in conducting experiments and group learning. Increased interest in student learning before and after learning is 5.68, which is obtained from the difference in the average value before learning 12.92 and the average value after learning 18.60 so that the n-gain is 0.45. Based on the n-gain value shows student learning interest is influenced by PBL model through the STS approach.
Incrased interest in student learning is also seen based on interest indicators, namely: (1) pleasure, (2) attention, (3) involvement, (4) interest. The increasing interest in student learning based on indicators before and after holistically can be seen in Figure 1.

Figure 1 shows that there are differences in the increase in student learning interest based on indicators before and after learning. The biggest increase is in the indicator of pleasure because students have their desires without any compulsion to do an activity in the learning process. Furthermore, the improvement is also in the indicators of attention and involvement because students have their desire and attention to involving themselves in the activities given by the teacher so that they have more curiosity without compulsion.

Increased interest in student learning from the result of statistical tests was significant. Increasing students’ interest in learning cannot be separated from the accuracy of choosing the model applied by the teacher and adjusting to the condition of the students, and the PBL model through the STS approach is one of the suitable models for increasing students’ interest.

The teacher must carry out many kinds of plans, responses, opportunities for active students, opportunities to adjust their work, and the existence of interesting activities in learning. The results of data on student learning interest categories after learning with PBL models through the STS approach showed a significant increase. Increased students’ learning interest in the pleasure indicator from 49.33 to 81.33. This shows that students are very happy with the PBL learning atmosphere through the STS approach. Increased students’ learning interest in attention indicators from 51.33 to 78.67, on the involvement indicator from 63.33 to 78.67, and the indicator of attraction increased from 51.33 to 71.33.

This model makes students able to analyze a problem/case and find a solution for it. The influence of the PBL model through the STS approach in detail can be seen from the performance indicators as follows:

3.1. Pleasure
Increased interest in student learning on the indicator of "pleasure" before treatment is 49.33% and after treatment is 81.33%. A student who has feelings of pleasure for physics lessons, especially dynamic fluid concept, gladly continue to study it so that there is no forced feeling to study about the concept. But for some students who don’t like physics lesson, interest arises after learning with the PBL model through the STS approach. This model allows students to use their sensitivity or explore their knowledge of science and technology in daily lives. The STS approach makes students aware of the development of science and technology currently.
3.2. Attention
Attention is one important indicator of learning interest. The increase of students’ interest using the PBL model with STS approaches is 78.67%, this model makes students pay attention to the lesson seriously and full of concentration. Learning by showing the current phenomena in society can attract students’ attention. Attention is the concentration or activity of the soul towards observation, understanding, and so on by putting aside the others. Someone who has an interest in learning on a particular object then naturally he will pay attention to the object. If students’ interest in learning about physics lessons, so students should pay attention to the explanation from the teacher.

3.3. Involvement
The PBL model and the STS approach involve students in learning directly. Students who engage in learning activities tend to have a desire to develop themselves, gain self-confidence, expand knowledge, and have curiosity. Learning with the PBL model tends to solve the problems posed by the teacher to students and required to be able to hypothesize and find solutions to these problems. Based on the results of data analysis, an increase in student learning interest in the indicator of interest reached 78.68.

3.4. Interest
Students’ interest in learning with PBL models through the STS approach reached 71.33%. Students’ interest in learning is often found in some students who respond and react to what the teacher’s explanations during the teaching and learning process in the classroom. The response of students shows students’ attention and resulting in great curiosity toward the lesson. Students’ interest in learning is due to learning with media that attract attention, so students’ interest is increased. Learning with the PBL model and the STS approach besides being interesting, also can explore new things for students, and are very appropriate to be applied to an abstract concept in physics such as dynamic fluid.

4. Conclusions
Learning using the PBL model through the STS approach can increase student learning interest. Increased interest in learning students with PBL models through the STS approach seen from N-gain reached 0.45 or about 45% in the experimental class. Pleasure is the most increase indicator, then interest, attention, and finally involvement.

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