



LEARNING DEVICE REQUIREMENT SCIENCE EDUCATION BY PROBLEM BASED LEARNING (PBL) TO INCREASE STUDENTS' HIGH ORDER THINKING SKILLS ON JUNIOR HIGH SCHOOLS

Nur Fuaidah *, Madlazim, Rudiana Agustini

Science Education Postgraduate State University of Surabaya, Surabaya, Indonesia

* Email: nur.17070795031@mhs.unesa.ac.id

Abstract

At this 21st century, thinking ability for students based on High Order Thinking Skills. This research was to analyze learning device requirement science education by Problem Based Learning to increase High Order Thinking Skills junior high school. This research method is using survey and observation with interviews and review of the literature. The results this research in one of junior high school in Pasuruan showed that the learning activity and cognitive tests does not show higher level thinking skills yet. Science teacher from one of school in Pasuruan result shows the value of student learning static electricity in National exam is less than 58.68 from minimum completeness criteria 70. The level of results percentage of static electricity of junior high school in Pasuruan City, East Java Province, and national education levels are 48.86; 45.13; and 40.29. These results indicate the difficulty of static electricity. One of learning requirement that can support to increase high order thinking skills is Problem Based Learning. Science teacher in junior high school Pasuruan clarified that have not used Problem Based Learning, teacher only uses interactive dialogue. Therefore, learning device of science learning needs Problem Based Learning to increase High Order Thinking Skills junior high school on chapter static electricity.

Keywords: Learning device, static electricity, problem based learning, high order thinking skills

Abstrak

Pada abad ke-21 ini, kemampuan berpikir untuk siswa berdasarkan Keterampilan Berpikir Tingkat Tinggi. Penelitian ini adalah untuk menganalisis kebutuhan perangkat pembelajaran pendidikan sains dengan Problem Based Learning untuk meningkatkan Keterampilan Berpikir Tingkat Tinggi sekolah menengah pertama. Metode penelitian ini menggunakan survei dan observasi dengan wawancara dan tinjauan literatur. Hasil penelitian ini di salah satu SMP di Pasuruan menunjukkan bahwa aktivitas belajar dan tes kognitif belum menunjukkan keterampilan berpikir tingkat tinggi. Guru IPA dari salah satu sekolah di Pasuruan menunjukkan nilai siswa belajar listrik statis pada ujian nasional kurang dari 58,68 dari kriteria ketuntasan minimum 70. Tingkat persentase hasil listrik statis SMP di Kota Pasuruan, Provinsi Jawa Timur, dan tingkat pendidikan nasional adalah 48,86; 45,13; dan 40,29. Hasil ini menunjukkan kesulitan listrik statis. Salah satu syarat pembelajaran yang dapat mendukung peningkatan keterampilan berpikir tingkat tinggi adalah Problem Based Learning. Guru IPA di SMP Pasuruan menjelaskan bahwa belum menggunakan Pembelajaran Berbasis Masalah, guru hanya menggunakan dialog interaktif. Oleh karena itu, perangkat pembelajaran pembelajaran sains memerlukan Pembelajaran Berbasis Masalah untuk meningkatkan Keterampilan Berpikir Tingkat Tinggi sekolah menengah pertama pada bab listrik statis.

Kata Kunci: Perangkat pembelajaran, listrik statis, pembelajaran berbasis masalah, keterampilan berpikir tingkat tinggi

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INTRODUCTION

Curriculum 2013 developed with the improvement mindset among learning patterns are learner-centered, interactive learning, network learning, active learning and critical (Permendikbud 68, 2013). Curriculum 2013 development was based on internal and external factors. Internal challenges seen from the state of education associated with the demands of education in the eight National Education Standards and Human Resource abundance of productive age. Human Resources efforts for productive age is not a burden, then human resources at productive age need to be transformed into the Human Resources who have the competence and skills through education. External challenges to influence and transformation tekno-sains and quality of education. It can be seen from Indonesia's participation in the International Study is Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA) since 1999 until today also showed that the achievement of Indonesian children are not encouraging. This is due, among others, the number of test material being asked in TIMSS and PISA are not included in the curriculum of Indonesia.

TIMSS latest report in 2015 that the average value of science Indonesian children in the dimension of knowing, applying, and reasoning ranks 45 out of 48 countries (Martin, 2016), The results of the PISA study conducted by the Organization for Economic Cooperation and Development (OECD) in 2015 also showed that the dimension or scientific process skills, concepts and content, context or application of learners in science junior ranks 62 out of 70 countries. Reports of PISA and TIMSS shows that Indonesian participants only able to reach the second stage of the six levels of thinking on the matter were competitively. This suggests that the ability of learners in a logical and rational thinking is still low, so the ranking achievement from year to year is still at low levels among the participating countries (Sani, 2016), The results of Indonesia's participation in this international study shows that there must be an effort to increase the thinking ability of students.

Human resources of 21st century must begin to be prepared, through science teaching is expected to lead learners meet 21st century skills, namely: (1) skill learning and innovating that include critical thinking and problem solving, creative and innovative, and able to communicate and collaborate; (2) skilled to use the media, technology, and information and communication technologies (ICT); (3) the ability to live a life and career, including adaptability, flexibility, initiative, trustworthy, have a spirit of leadership and responsibility (Kemdikbud, 2016). The abilities mentioned above of the 21st century is the ability to think critically or High Order Thinking Skills.

Build quality human resources, the school has a very important role. Schools should start training high order thinking skills and not only emphasizes on understanding the concept. This is in accordance with the characteristics of the people skills of the 21st century according to the partnership of 21st century that identifies skills that students must be able to develop competitive skills focused on the development of high order thinking skills (Basuki, 2014), high order thinking skills include critical thinking, logical, reflective, metacognitive, and creative. The ability to think happens when someone gets the new information and the information stored in the memory are interconnected, orderly return and expand this information to achieve a goal or find possible answers in a confusing situation (Richland, 2015), various skill of high order thinking skills that have been described, schools need to model or learning strategies that support increased high order thinking skills. Learning model that can support to increase high order thinking skills of students is problem based learning.

The PBL Model has five syntaxes, namely: directing students to problems, organizing students to learn, helping independent and group investigations, developing and presenting artifacts and exhibits, and analyzing and evaluating problem-solving processes (Arends, 2012). Characteristics of the PBL Model are designed to help students improving their inquiry skills and problem-solving skills, social behavior and skills according to the role of adults, as well as independent learning skills

for the investigation of everyday life issues (Arends, 2012; Arizaga et al., 2016; Jatmiko et al., 2018; Nilson, 2016). The PBL Model begins with a complex real life (Ledesma, 2016), unstructured, and involves interdisciplinary content (Loucky, 2017), engages in collaborative teaching to manage an increasingly diverse student population (Guilherme et al., 2016; Jatmiko et al., 2018; Kang et al., 2015). PBL is an important practice that provides a suitable learning environment for students (Caesar et al., 2016; Nuninger & Châtelet, 2017). The PBL Model can enhance self-study skills and provide a more realistic picture of higher order thinking skills, more confidence, better problem-solving skills, critical thinking skills, and provide the improvement of communication skills (Jatmiko et al., 2018; Malan et al., 2014; Williams, 2005). The application of PBL Model will promote students to have motivation, confidence in learning and able to improve students' higher order thinking skills ability to solve more complex problems (Caesar et al., 2016; Jatmiko et al., 2018; Nilson, 2016; Sern et al., 2015; Tracey & Morrow, 2017).

RESEARCH METHOD

The method used in this research is survey method and observation. The research was conducted through interviews and review of the literature. This research was conducted in one of the junior high school in Pasuruan. Source data from this research is a science teacher at junior high school, students of grade nine and previous research literature on learning device. Subjects tested in this study was a junior high school science teachers and sixty students of grade nine who have taken subjects static electricity and electricity on living things at each school.

The researcher's role as the main data collection instrument. All activity in the study of planning, implementation, data analysis, to the preparation of research reports conducted by the researchers. The data generated in this research is qualitative. Data analysis techniques used to process data and information is by using qualitative descriptive analysis techniques. Data information interviews and literature studies analyzed by the researchers as a material to determine an alternative solution to overcome the problems of science teaching device learning.

RESULTS AND DISCUSSION

The study was conducted with survey and observation through interviews with junior high science teacher. Interviews are conducted related to the devices used science teaching and learning methods are also often used by teachers to explain the static electricity and electrical material in living organisms. In addition to the interview, also conducted earlier research literature on learning device. Results of interviews with junior high school science teacher in one of the grade nine Junior high school in Pasuruan shows that the activity of learning and cognitive tests given to students yet to show higher order thinking skills. The learning process is to transfer knowledge, have not been trained to learn to make the formulation of the problem, formulate hypotheses, identify of variables, analyzing and critiquing events in daily life. Teachers only emphasizes conceptual understanding, so that high order thinking skills learners received less attention from the teacher. Percentage graph of students who answered right in one of school in Pasuruan, Pasuruan City, East Java and National can be seen in Figure 1.

Percentage of students answered correctly Science in National Exam (UNAS)

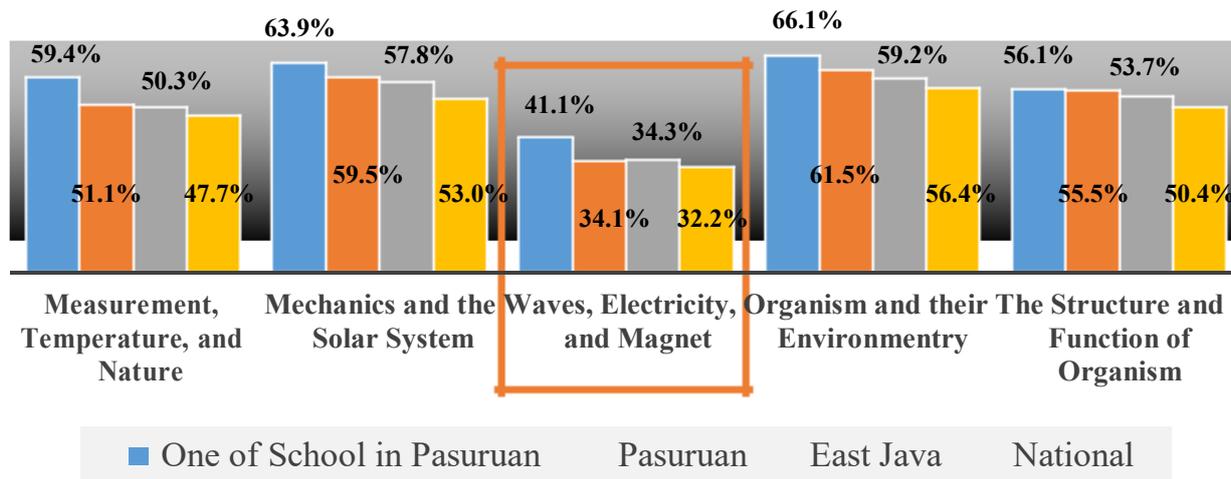


Figure 1. Percentage of Students Answered Correctly Science in National Exam (Puspendik, 2019)

The picture above shows that the chapter waves, electricity, and magnet are the most difficult. The percentage of static electricity chapter in National exam is less than 58.68 from minimum completeness criteria 70 in the one of school Pasuruan, and then the level of results percentage of static electricity of junior high school in Pasuruan City, East Java Province, and national education levels are 48.86; 45.13; and 40.29. There are can be seen in Figure 2.

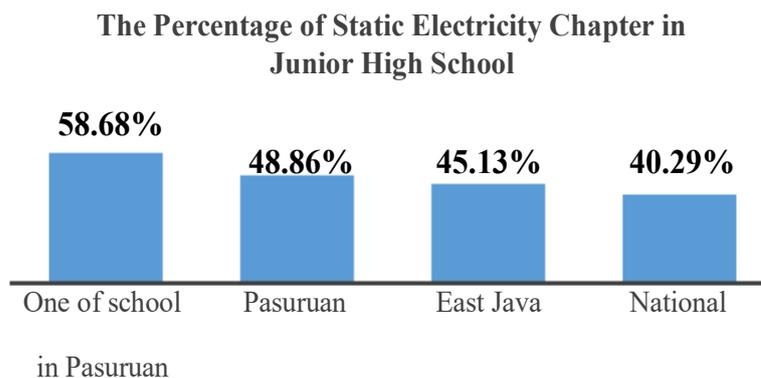


Figure 2. The Percentage of Static Electricity Chapter in Junior High School (Puspendik, 2019)

A matter indicator of static electricity chapter is presented illustrations of electric loading events, determine the process of losing or receiving electrons which are presented in tabular form. This matter indicator haven't trained high order thinking skills. The percentage graph of students who answered right is 40.72 (Puspendik, 2019). In National Exam 2018 have reasoning questions, but just 19 % students can answer the question correctly (Research and Development Agency, Ministry of Education and Culture, 2018). High order thinking skill category are analyze (differentiating, organizing, attributing), evaluate (checking, critiquing), create (generating, planning, producing) (Anderson & Krathwohl, 2001). Average daily test scores for static electricity chapter in one school in Pasuruan is 60.21 out of the minimum completeness criteria score 70. These results indicate the difficulty of static electricity. Results of research questionnaire given to students also reinforces that most learners have difficulty in that chapter. This is due to several things: (1) planning learning tools developed by teachers has been based on innovative learning

model, which can attract and stimulate motivation of learners; (2) students feel less understanding of the application of static electricity and electricity to living things in everyday life; (3) the implementation process of learning science still has not led to efforts to increase high order thinking skills; (4) learning is still centered on the teacher (teacher center).

Results of International studies and research that has been presented, it is necessary to increase the quality of Indonesian human resources so that the nation can compete with other more developed nations. Build quality human resources, the school has a very important role. Schools should start planting High Order Thinking Skills and not only emphasizes on understanding the concept. According of partnership of 21st century skills, identifies skills of students in the 21st century must be able to develop competitive skills focused on the development of High Order Thinking Skills (Basuki, 2014). High Order Thinking Skills include in critical thinking, logical, reflective, metacognitive, and creative. The ability to think happens when someone gets the new information and the information stored in the memory are interconnected, orderly return and expand this information to achieve a goal or find possible answers in a confusing situation (Richland, 2015), Various skill of High Order Thinking Skills that have been described, students need to model or learning strategies that support increased high order thinking skills.

Learning model that can support to increase high order thinking skills of students is Problem Based Learning. High order thinking skills by using Problem Based Learning may involve the development of thinking and reasoning learners, but it can stimulate the curiosity and thought *sosiatif* learners (Magsino, 2014), Mayasari (2015) asserts that learning to use Problem Based Learning positive effect on higher order thinking skills. Other researchers also concluded that the learning Problem Based Learning can increase high order thinking skills of learners (Noma, 2016), Science teacher who was interviewed by the researchers also clarified that have not used the model of Problem Based Learning, during the teacher only uses less interactive dialogue and never train high order thinking skills of students.

Problem Based Learning can be used in learning to help learners develop thinking skills and problem solving, learning authentic adult roles, and become independent learners (Nur, 2011). The teacher's role here give authentic problems, facilitating the investigation of learners, and support the learning of students. The lessons in this model give real-life situations that avoids simple answers and inviting alternative solutions. The results of the above description shows that the problem based learning is effective to increase high order thinking skills. Therefore, we need a research on the development of science material using problem based learning to increase high order thinking skills for junior high school students.

CONCLUSION

The conclusion based on interviews and studies literature, the learning device of science needs problem based learning (PBL) to increase high order thinking skills (HOTS) junior high school. Suggestion in this research is the development of science material using Problem Based Learning to increase high order tinking skills of junior high school students. This is done to overcome obstacles not yet maximized of science device learning.

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