Original Paper

Junior High School Student's Literacy of Science Concept:

Electricity & Heredity

Ely Djulia[1*], Martina Restuati[1], Roma Sihotang[1], Rosinta L.P. Sianturi[1], Mona M. Hutagaol[1]

& Jihan Syabrina[1]

[1] Department of Biology, Universitas Negeri Medan, Medan, Indonesia

[*] Ely Djulia, E-mail: djulia247@gmail.com

Abstract

High Order Thinking Skills (HOTs) is the way of thinking which should have been mastered by students everywhere early for their life skills. This HOTs skill has been internationally assessed since 2000 every three years attended by all OECD members includes Indonesia through Program International for Student Assessment (PISA). Result of PISA of Indonesian students from 2000 until 2018 still have achieved at level 1a of highest level 6 as national average. Considering geographical area located from West to East, it is very important to map students literacy in each area as base-line of creating integrated effort for Junior High School to increase student's literacy. This descriptive study aims to promote the profile of Junior High School Literacy. About 40 of 9-grade students and two science teachers involved in this study as research subject. Data were obtained through participative observation, test and video typing for classroom activity during two months on the topic of heredity and electricity. Data were analyzed quantitatively and qualitatively as well. Result showed that students literacy still in low category based on national competence assessment. However there is increase of learning outcome proven by pretest (24.46), post test (33.46), and second post test (59.82). Looking into class level in detail based on daily assessment on the topic of electricity and heredity percentage of students literacy can be categorized as scientific comprehension (57%), higher than partial comprehension (19%) and naïve or wrong comprehension (24%). Student scientific comprehension promoted close to PISA literacy competencies includes explaining phenomena scientifically, evaluating and designing scientific enquiry, interpreting data and evidence scientifically. The study imply the important of keep improving daily science classroom activity which promote students higher order thinking skills in order to achieve better scientific literacy.

1. Introduction

Revolution 4.0 has contributed into all aspects of human life includes education. Online-based learning in digital era has become important effort. Higher Order Thinking Skills has become competence to fulfill students needs in the future.

Indonesian students literacy based on national average of PISA 2018 were still in level 1a, and level 2 contributed from students in two provinces DKI Jaya and DI Yogyakarta. At level 1a, students are able to use content knowledge and daily basic procedural to recognize, to identify explanation about simple scientific phenomena. With supports they can conduct structured scientific research by using no more than two variables. They are able to identify relationship of causal effect and to infer graph and visual data which needs cognitive prerequisite at lower level. Students who achieved this level 1a can choose best scientific explanation for data presented in usual context in personally, locally, and globally.

Reading skills is very important to support various human activities, begin with following guidance, searching who, what, when, where, and why about phenomena, into communicating with each others for specific transaction. Development of technology have changed the way people read and change information both at home, school, even in the office as well. Digitalization have promoted and provided new text which range from short text (message text, annotated searching machine) into long text (site web multi pages, tab; new archives that can be accessed). Responding the development in digital era, education system involved digital literacy more into its guidance and practice.

Reading is a main subject assessed in PISA 2018. Reading assessment encloses text format and new assessment through digital administered. This test aims to evaluate reading literacy in digital era and also measure trends of reading literacy during the last two years. PISA 2018 set reading literacy as comprehending, using, evaluating, reflecting, and involving in text to achieve objective, to develop knowledge and potency, and to participate among society.

Students reading skills in Beijing, Shanghai, Jiangsu, Zhejiang (China) and Singapore achieved score significantly higher than those who participated in PISA2018. Estonia, Canada, Finland, and Ireland also showed best performance in reading. About 77% students, average from OECD countries, achieved skill of Level 2 in reading. At least they are able to identify main idea in long text, searching information based on explicit criteria, even some time more complex, and to reflect the objective and type of text if its needed explicitly. More than 85% students in Beijing, Shanghai, Jiangsu, Zhejiang (China), Canada, Estonia, Finland, Hong Kong (China), Ireland, Macau (China), Poland, and Singapore achieved this level or even higher. About 8,7% students, in average of OECD countries, achieved best score in reading means achieved level 5 or 6 of PISA assessment. In this level, students are able to comprehend long text, to handle abstract or non intuitive concept, and able to differentiate between fact and opinion according to implicit guidance concerning content or its source of information.

The average students achievement in mathematic and science of OECD countries showed 76% students achieved level 2 or more in mathematics. At least they can inference and recognize without direct instruction, how a simple situation can be represented systematically such as comparing total distance between two different routes or to converse price into different curs. However in 24 countries, about more than 50% students achieved score below this skills. About one of six from 15-year old in Beijing, Shanghai, Jiangsu, and Zhejiang (China) (16,5%), and about one of seven students in Singapore (13,8%), achieved score of level 6 in mathematics, the highest level described in PISA. These students are able to promote advanced mathematical thinking and reasoning. In average of OECD countries, only 2,4% students achieved in this level. Most students (78%) students achieved level 2 or higher in science.

At least these students can recognize the right explanation of familiar scientific phenomena and can use its knowledge to identify simple case and formulate valid conclusion based on data provided. More than 90% students in Beijing, Shanghai, Jiangsu, and Zhejiang (China) (97,9%), Macau (China) (94,0%),Estonia (91,2%), and Singapore (91,0%) achieved this qualification. Trend of average achievement in all OECD countries in reading, mathematics, and science was stable performance between 2015 and 2018.

There are prominent differences among each country concerning achievement change between 2015 and 2018. Such as the average achievement in mathematics increased in 13 countries (Albania, Island, Jordan, Latvia, Macau (China], Montenegro, Peru, Poland, Qatar, Republic of North Macedonia, Republic of Slovak, Turkey, and UK), but decreased in 3 countries (Malta, Rumania, and Taipei), while keep stable in others 47 countries. There are 7 countries which have average increase of students achievement in reading, mathematics, and science during participating in PISA: Albania, Colombia, Macau (China), Republic of Moldova, Peru, Portugal, and Qatar. Different with others 7 countries which have average decrease of students achievement in that three subjects: Australia, Finland, Island, Korea, Holland, New Zealand, and Republic of Slovak.

From 2003 until 2018, Brazil, Indonesia, Mexico, Turkey, and Uruguay have attended more than 15-year old students in junior high school. Students achievement of 15-year old, in grade 7 or 8, who achieve minimum reading skills at least in level 2 of PISA scale, range from almost 90% in Beijing, Shanghai, Jiangsu, and Zhejiang (China), Estonia, Macau (China) and Singapore, until less than 10% in Cambodia, Senegal, and Zambia. Students achievement of 15-year old, in grade 7 or 8, who achieve minimum mathematical skills at least in level 2 of PISA are more various among 98% in Beijing, Shanghai, Jiangsu, Zhejiang (China) and 2% in Zambia. About one of four of 15-year old students did not achieve minimum skills level both in reading and mathematics as well. These scores above showed that all countries still need efforts to achieve global aims for educational quality as set in sustainable development goals, United Nations for education 2030.

Previous descriptive research have been conducted to investigate students literacy concerning conten, context, and scientific process.By administering literacy tests, science process skill observation sheets

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and scientific attitude questionnaire into 180junior high school students, result showed that scientific literacy skills of junior high school students in average are still in low level. In detailed, students scientific process is better (score 62) respectively rather than scientific attitude (score 58), context (score 53) and content dimension (score 50). Based on geography there was no difference in scientific literacy skills of students whom live in town or village, both in low category. Correlation test showed that there was a close relationship between dimensions of scientific attitude towards dimensions of content, context, and process and the correlation was positive. The results indicated that teachers, school and education authorities in regency need to make improvements in the learning process to improve student's scientific literacy skills (Siagian, Silitonga, & Djulia, 2017). Another descriptive research with same objective was conducted to describe 10th grade student's science literacy, to find out science literacy based on regions in context dimension, and 10th grader student's knowledge and attitudes into 193 students. The result showed student's scientific literacy in average is 36.36 (low). In detailed of three dimensions show students ability of context dimension was 33.71, competence was 36.93, knowledge was 30.50, and attitudes was 44.27. Student's science literacy based on regions showed there was no difference in science literacy between urban regions and rural regions both were in low level (Sinaga et al., 2019). Another descriptive study of the analysis of scientific literacy skills of junior high school students has been conducted in different district. The data collection technique used the PISA scientific literacy questions of 2015 and was supported by interviews between students and a teacher. Through analyzing the average value of the students' scientific literacy test, then triangulation checking data, results showed that the achievement of students' scientific literacy was in the low category (Sartika & Ahda, 2021).

Based on backgrounds described above, this study aims to investigate more deeply about junior high school students scientific literacy based on PISA test and daily problem solving assignment in science topic focusing on heredity and electricity.

2. Method

2.1 Data Collection

This descriptive study involved 40 junior high school students and their two science teachers. Data were obtained through test, participative observation, and video typing into classroom activities. Pre test was administered by using 50 items of PISA-based constructed national test, to investigate students pre conception of science. During two months of classroom activity, test were conducted as pretest then two times of post tests. Participative observation were conducted eights times, they are 4 times for classroom activities in the topic heredity and others 4 times for electricity topics completed with video typing. Post tests were conducted to investigate students HOTS skills ability during classroom activities and their development conception before and after HOTS skills-based teaching learning.

2.2 *Data Analysis*

Data were analyzed quantitatively and qualitatively. Result of pretest and posttests and daily quiz were

analyzed quantitatively then displayed in average. Students answer of daily quizzes in essay test were analyzed qualitatively by classifying and categorizing their answer into scientific, partial, and misconception. To comprehend data more deeply, these three categories continue to be classified and categorized to promote their HOTs from students scientific understanding. Worksheet and video were analyzed qualitatively to describe students activities happen during learning. All data then were discussed interactively based on Higher Order Thinking Skills referred to Bloom Taxonomy (knowledge, comprehension, application, analyzing-synthesizing, evaluating, and creating) and Cohen category (critical thinking, creative thinking, problem solving, and decision making), to formulate comprehensive conclusion.

3. Result

Students literacy and HOT skills have been obtained through pretest, post test and 2nd post-test conducted during classroom activities. Result is presented in Figure 1.
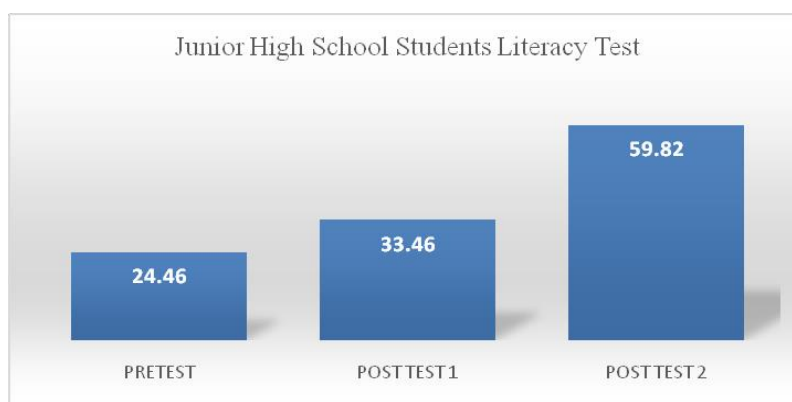

Figure 1. Junior High School Students Literacy and HOT Skills according to PISA-based National Test (N=40)

Data showed that students literacy and their HOT skills in answering PISA-based test were still in low. However there are increase achievement from pretest to post test and second posttest. It means that science learning that is managed through HOT skills-based can change students outcome although its final test were still need improvement. Assessment package used in this test were constructed and validated nationally by Educational Ministry consisted of integrated science material referred to PISA which promoted local, national, and global contexts. Therefore it challenged students ability of complex problem solving. A few different to national assessment test, detailed learning performance can be took a closer at classroom level as follow.
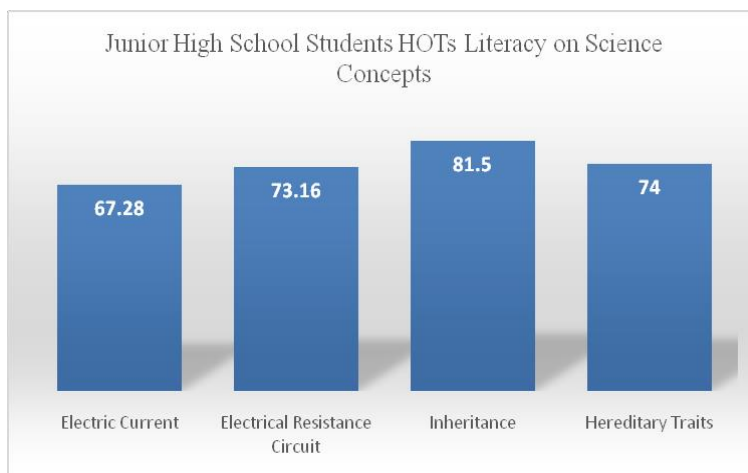
Figure 2. Junior High School Students HOTs Literacy on Science Concepts

The figure showed junior high students HOTS Literacy on science concepts, especially on electricity and heredity based on daily problem solving evaluation through essay quizzes. Among four subtopics students performance showed higher respectively on inheritance (81.5) followed by hereditary traits (74), electrical resistance circuit (73.16), and electric current (67.28). The various results were related to learning process happened in the classroom.

Based on students answer of daily essay quizzes, through qualitative analysis, the detailed data can be displayed as three categories: scientific, partial, and misconception as follow.
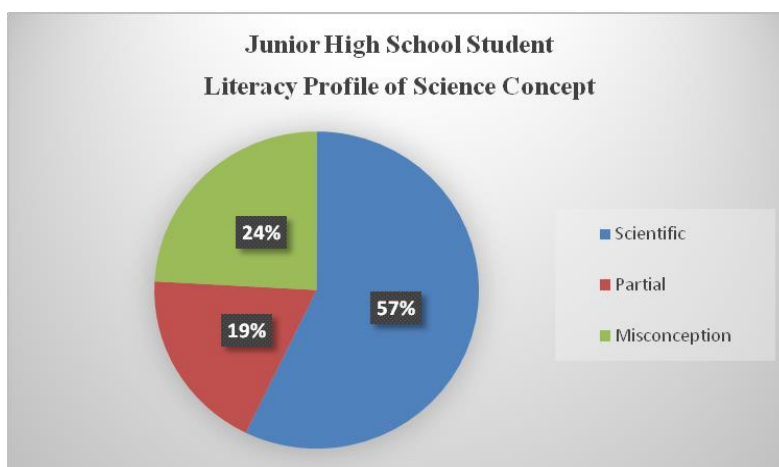

Figure 3. Junior High School Students Literacy Profile of Science Concept: Electricity and Heredity

The figure above showed profile of students HOTs Literacy on the topic of electricity and inheritance based on daily evaluation through essay quiz. By analyzing and categorizing students answers, profile can be categorized into scientific, partial, and misconception. Students scientific comprehension mostly close to three competencies of PISA literacy includes explaining phenomena scientifically, evaluating

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and designing scientific enquiry, and interpreting data and evidence scientifically. The detailed example of each category are basically based on students higher order thinking which mostly related to analysis-synthesis, evaluation, and creation of Bloom Taxonomy.

4. Discussion

4.1 Learning Process of Electricity

During learning about electric current, students experienced these learning phases:

    a.   Begin with analyzing text of electric current to identify key concepts then join constructing sentence by sentence into paragraph consist of each group comprehension. Here are example of group joint construction

"Electric current arises by differences of electrical voltages in the circuit (proton and neutron) which move and connected by a conductor" (group 1)

"Electric current is an electric charge movement flowing from one into another point continuously. Electric current is symbolized by I unit with international quantity Ampere (A).Electricity is very useful for human daily life, as household appliances such as refrigerator, lamp, Television, washing machine, etc." (group 2)

b. Students observe video showing fruit battery accompanied by its teacher explanation. Students played simulation by using PHET Colorado to comprehend relationship among strong currents, resistance and potential difference in series and parallel circuit. Based on Phet simulation, students noted data into table then displayed into graph.

c. Students answer quiz

d. Students conducted experiment to create direct current circuit by using 4-5 limes, cable, LED, completed with nails, and clamps. All five groups in each class did it successfully. The little lamp lights on. They can look at differences of light intensity when they use 4 and 5 limes.

e. Students presented PHET simulation graph and fruit electricity experiment, then formulate their conclusion.

In another class, a different learning syntax were created. After made joint construction to promote pre conception of electricity, they begin with fruit electricity experiment then followed by PHET Colorado simulation. Although there are still lack of questions after presentation, some HOT skills they promoted such as analyzing relationship among strong currents, resistance and potential difference during creating series and parallel circuit through PHET simulation, presenting data into table and graph, trial and error during fruit electricity experiment, changed LED, cable, lime until successful to light on the lamp. Learning is finalized with answering daily quizzes about electricity.

4.2 Learning phases of Inheritance

During teaching learning about inheritance, students experiences learning phases as follow.

    a.   Students analyzed image of a marriage cross on a flower, then observing each family photo. Students detected some phenotype from that images, identify dominant and recessive traits

from their family and another half-blood family as compared. They can find that phenotype of nose and skin color look clearer in half-blood family rather than their family.

b. Each group conducted monohybrid and dihybrid simulation by using color pipettes. Students identified two different traits, write down genitive, phenotype, calculate its proportion. This cross simulation look interesting for students, because they can trial and error when one trait and two traits were crossed through simulation. They look enthusiastic.

c. Students presented result of monohybrid and dihybrid simulation

d. Students discussed about hereditary disorder: case albino, color blind, hemophilia, and andotia. Students observed video about color blind test then they tested it.

e. Students answered daily quizzes

Although they still look silent to answer teacher question about why using more color when crossing two traits, there are some HOTs promoted by students begin with comparing Indonesian family photo with half-blood family photo, analyzing their phenotype differences, identifying phenotype traits passed on from parents into children. The first two groups have successfully earlier conducting simulation as in worksheet guided, followed by other groups. Through teacher explanation, guidance, the rest of tree groups could improve simulation procedures until finished. At monohybrid cross simulation calculating the average from all group 115:35 = 3 : 1, they found phenotype proportion 3:1. While at dihybrid cross simulation they found phenotype proportion 9:3:3:1. During discussing about hereditary disorder, students analyzed why there children suffered albino while their parent don't. Who need sunscreen. Students simulated to test their color blind.

4.3 Students Competencies of PISA Literacy

According to PISA 2018 science framework there are three science-specific competencies are required to understand and involve in critical discussion about issues that integrate science and technology: 1) the ability to provide explanatory accounts of natural phenomena, and technologies and their implications for society: 2) competency to use one's knowledge and understanding of scientific enquiry to identify questions that can be answered by scientific enquiry; propose ways in which such questions might possibly be addressed; and identify whether appropriate procedures have been used, and 3) competency to interpret and evaluate data and evidence scientifically and evaluate whether the conclusions are warranted. So that scientific literacy in PISA 2018 is defined by the three competencies of explaining phenomena scientifically, evaluating and designing scientific enquiry; and interpreting data and evidence scientifically.

All of these competencies require knowledge. Explaining scientific and technological phenomena, demands content knowledge of science. The second and third competencies, however, require beyond content knowledge. They also depend on an understanding of how scientific knowledge is established and the degree of confidence with which it is held. Recognizing and identifying the features that characterize scientific enquiry requires procedural knowledge. Finally, these competencies require epistemic knowledge, defined here as an understanding of the rationale for the common practices of

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scientific enquiry, the status of the claims that are generated, and the meaning of foundational terms such as theory, hypothesis and data.

Here are the examples of students question-answer promoted in daily evaluation that express competency of explaining phenomena scientifically, evaluating and designing scientific enquiry.

Question 1: The principle of maglev train is using magnetic lifting force on railroad tracks so that they lift slightly, then the thrust is generated by the induction motor. This train is capable of traveling at speed 650 km/hour (404 mpj) faster then conventional train. Why doesn't this maglev train make any noise during traveling?

Scientific answer: because there is no engine friction between train and maglev railroad track

Partial answer: there is no engine friction among machine parts, unlike in conventional train.

Question 2: At dry season there are news about fire on television. The firefighter always spray eater to stop the fire. Why can water stop the fire?

Scientific answer: Because water temperature is relatively colder than burning things. When sprayed the heat required to maintain the chain reaction of combustion of fuel with air is reduced, water can also close contact between fuel and air so that combustion reaction stop.

Question 3:

The fire extinguisher gas cylinder is more effective than water to stop the fire, why?

Scientific answer: Because CO_2 gas in fire extinguisher can isolate O_2 in the atmosphere from fire.

Wrong answer: Water can play role as electric isolator

Question 4:

Condensing glass is one of most important component in designing sea water purifier. It is installed with a certain slope. Why?

Scientific answer: it may get clean water more than those installed with flat condensing glass.

Wrong answer: glass installed with slope will create a greenhouse effect so that it rises into maximum temperature and influence sea water evaporates

Question 5:

The process of purifying sea water into clean drinking water looks simple and cheap. Why?

Scientific answer: sun energy provided is a cheap energy source and useful as alternative energy. One of these benefits is to produce freshwater from sea water by using heat energy from the sun for sea water purifying.

Partial answer: because purifying process is conducted by using sun energy

Wrong answer: the need of clean water in coastal area keep growing with increasing population in that area.

Question 6:

Does the volume of clean water is stably produced? Explain

Scientific answer: No it doesn't. Because the water volume can change anytime. When not hot sun, the clean water produced can be less because of time consuming. And when hot sun then purifying process

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will be faster and more results.

Partial answer: not always because the water volume can change anytime

Wrong answer: the amount of water on earth is always constant because of hydrology cycle

Question 7:

Traditional fisherman mostly use ice to preserve fish so they don't rot fast. Why doesn't fish in the ice experience decay?

Scientific answer: because ice as cold media can move heat from fish body into another ingredient so that temperature of fish body keep low.

Partial answer: ice can keep fatty acid and protein content.

Question 8:

Why does male suffer color blind than female?

Scientific answer: because gen which express color blind is controlled by X chromosome.

Wrong answer: because gen which express color blind is controlled by X and Y chromosomes

Question 9:

Look at ethnic and mixed family photos. Describe some differences of their phenotypes

Scientific answer: hair shape, hair color, eye shape, eyebrow shape.

Partial answer: hair shape and color

Question 10: formulate research question

Although fish caught by fishermen is preserved in ice, however there often found spoilage bacteria in fish body. It speculated how can the bacteria still there. Do these questions below appropriately proposed to search reason for investigating bacteria in the preserved and clean fish in ice when will be cooked. Choose yes or no

Scientific question: can the spoilage bacteria survive in temperature below $0^{o}C$?

Procedural question:

When processing fish, did it put in hygienic container?

When preserving fish is water added before put it into the ice?

Can spoilage bacteria survive on temperature below zero?

When processing fish did use sterile water?

Question 11: formulating research question and objective

Scientists recently face new challenges to solve color blind case. Are these challenges appropriate to solve?

Scientific answer: to search ways of detecting color blind early

Wrong answer: searching effective ways to help people suffered color blind in order to look at color and to decrease percentage of male suffered color blind

Question 12 formulating research question and objective

Which question below can be answered through research concerning hemophilia?

Scientific answer: Which factors cause hemophilia hard to cure? Can Replacement Therapy cure

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hemophilia?

Wrong answer: Can hemophilia be transmitted through blood transfusion?

Students also describe their scientific understanding when look carefully at graph case of hemophilia to identify its annual increase, its highest and lowest increment difference, highest and lowest point of that case.

4.4 Role and Usefulness of PHET Simulation in Various Learning

The series of service workshop has increased teachers competence to conduct online-based HOTS evaluation. It increased in the knowledge and skills of teachers in designing and making HOTS-based online evaluation tools. This activity also produced a HOTS question collection document and a google form link containing an online based HOTS question instrument (Anwar et al., 2020)

In this 21st century, teachers are required to empower students' Higher-Order Thinking Skills (HOTS). To overcome teachers who have difficulty compiling HOTS questions training would be good alternative in formulating HOTS-based online test instrument for Senior High School teachers (Anwar et al, 2020). The teachers, in general, have not understood the planning and assessment of HOTS-based teaching and learning; however 6,25% of the teaching and learning objectives was HOTS-oriented, 17,19% of the teaching and learning activities was HOTS-oriented, 5,83% of the test questions was HOTS-oriented, and all of the teachers considered HOTS very important and it became the orientation of biology teaching and learning at Madrasah Aliyah (Yusuf, 2019). HOT skills-based evaluation developed by another researcher has resulted interactive questions that were effective in measuring students' HOTS (Afandi, 2019).

HOT-Lab model for topic of force had been implemented. The model was characterized by problem solving and higher order thinking development through real laboratory activities.

The samples were divided into 2 classes, experiment class (HOT-lab model) and control class (verification lab model). Research instruments were essay tests for creative and critical thinking skills measurements. The results revealed that both the models have improved student's creative and critical thinking skills (Setiawan et al., 2018).

The competence of teachers to conduct online-based HOTS evaluation has increased through service activities, there has been an increase in the knowledge and skills of teachers in designing and making HOTS-based online evaluation tools. This activity also produced a HOTS question collection document and a google form link containing an online based HOTS question instrument. HOTS-based questions had been developed in various topic of science such as on environmental learning based on green consumerism and measure HOTS of students in the process of learning science in junior high school (Ichsan et al., 2019).

PHET simulation as part of a lab session provides students with the opportunity to understand both chemical systems and simulations, relate them to learning and attitudes, and identify the most useful features of PHET. It has a positive impact on students' attitudes and perceptions of learning, and it develops students' conceptual understanding of chemistry concepts and content. It means to promote.

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Doing so promotes learning and understanding, and promotes abstract concepts (Salame & Makki, 2021).

A survey and interview questions have been administered to explore Australian high school students perceptions of how PHET simulations helped visualize abstract physical concepts and connect mathematical understanding to physical concepts. Overall, students found PHET simulations to be very helpful in visualizing abstract physics concepts and understanding how mathematics applies to physics. This study summarizes student explanations of why simulation was found to be useful in nine ways to learn physics (six for visualization and three for mathematical understanding). With the help of PHET simulations, the three epistemological enablers with mathematical understanding were instant graphing, demonstrating relationships between variables, and testing predictions (Lin, 2020).

Computer simulations are often considered as effective educational tool. Previous studies have found that when students read visual representations some reading difficulties can arise, especially when found complex or dynamic representations. Secondary school students read the visual representations displayed in two PHET simulations (one reading the compositional structure of the representation, when groups of students, despite the different scientific content of the comprehension of the content of scientific simulations per se, and students read images to take benefit of their educational potential (Lopez & Pinto, 2017). The use of simulation in science education has reduced to some extent the number of students misunderstandings. This is proven by better post test based on analysis of students conceptual answer collected (Ramnarain & Moosa, 2017)

The number of random samples consisted of 59 students, 30 of whom were excellence class students and 29 of whom were regular class students. Student HOTS results for excellence class student analysis are 71.25% in the high category, 48% in the regular class and 71% in the middle category. The results of the analysis show that the student's HOTS is in the middle category because it is difficult for students to connect one concept to another or use math as a tool to solve physical problems (Rahmawati et al., 2019).

The PHET simulations are very involved, interactive animated environments that create a unique opportunity for students. In each case, we demonstrate that discussion simulations are more productive, for developing student conceptual understanding for photo electric effect than traditional discussion without simulations. During the discussion with PHET simulation, students can construct their understanding about concepts photo electric effect within this framework. Students learn by building on their prior understanding through a series of constrained and supportive exploration. The simulations support an interactive approach and constrain students productively (Superwoko et al., 2017).

A quantitative descriptive study into elementary students also showed that the PHET simulation media increased cognitive learning outcomes. Data collection techniques were carried out using questionnaires and tests which were sent to students via google form. The results showed that (i) 80% of students got scored with average of 85,4 and (ii) 91% of students responded positively to using this application (Masruroh et al., 2020). Students of conceptual and algebra-based physics conducted

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scientific research using interactive simulations of Physics Education Technology (PHET) in a semester-long group project. Quantitative analysis of this study showed significant effect sizes for both conceptual physics and algebra-based physics students (Cohen's d> 0.8 in both courses) (Taibu et al., 2021).

Those findings above have proven the usefulness and effectiveness of using PHET in various teaching material, various level of students, and various context in classroom and laboratory s well. Students learning on topics of algebra, chemistry, electricity, or in science generally, the PHET could be effective learning media to make learning fun and increase students cognitive and psychomotor abilities.

5. Conclusion

Based on quantitative and qualitative study into junior high school students during science learning on topics electricity and inheritance there are increased of student's literacy referred to PISA-based national competence assessment proven by pretest into post test (59.82). This is supported by the percentage of daily evaluation which showed scientific comprehension (57%) that promoted close to PISA literacy competencies includes explaining phenomena scientifically, evaluating and designing scientific enquiry, interpreting data and evidence scientifically. The study imply the important of improving and enhancing science teaching learning for junior high school.

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