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Analysis of Student Literacy Levels in Chemistry Learning through the Utilization of Interactive Learning Media in Online Learning

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Abstract
The research aims to find out how the literacy level of students in chemistry learning is taught using interactive learning media in online learning. This type of research is a quasi-experimental research conducted with a one sample pre and post test design. This research was conducted in a chemistry education study program in Jakarta, Indonesia involving one class for experiments. The pre-test and post-test were given by the researcher to test students' scientific literacy abilities in learning chemistry with the subject matter of oxidation-reduction reactions. The validity, reliability, and difficulty level of the items were tested using the Rasch Model. The statistical analysis used was the prerequisite test for data analysis and hypothesis testing using the t-test (Independent sample t-test) with the help of SPSS 26 for windows. The results showed that the average N-gain score for students' scientific literacy was 78.5 with high criteria. So that it can be concluded that the literacy skills of students in chemistry learning which are taught using interactive learning media in online learning are in the high category.
Keywords— interactive learning; online learning; literacy ability

I. INTRODUCTION

Entering the era of global development that is increasingly fast and very complex, which is marked by the occurrence of various changes globally in the field of knowledge, technology and information which are basically all aimed at improving the quality of human life, many things that are considered to have a negative impact actually appear as as a result of these developments, both in terms of, for example the occurrence of global warming which has recently been greatly felt by the world (Kaniawati, 2017), in particular Indonesia, where several areas experienced major flooding, the temperature was so hot, many victims of fraud against a product, occurred changes in people's lifestyles and so on. Another thing that stands out the most in the current global development is the wide open access to communication and information. The dissemination of various kinds of information is fast and massive which is not limited by space and time and is able to reach almost all people in the world. This certainly has a positive value, especially in the field of science where there are many references that can be used by the community in increasing knowledge, including students. However, it must be admitted that there are also negative impacts from the large amount of information available, not the least of which is information that cannot be scientifically correct, is information that may be scientifically correct but is not suitable when applied to the local life of the recipient of the information. something else that was different from what was expected

In responding to these developments, individual abilities and skills are needed in reading, writing, speaking, calculating, and solving problems at a certain level of expertise needed in everyday life which is called literacy. There are several types of literacy, including scientific literacy which is one of the skills/capabilities needed

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in the 21st century among the 16 skills identified by the World Economic Forum (Wefusa, 2015). According to the OECD, scientific literacy is the ability to use scientific knowledge, identify questions, and draw conclusions based on evidence, to understand and make decisions about nature and changes made to nature through human activities (OECD, 2019). According to Zuriyani, there are several reasons for the importance of scientific literacy in a student, including the first, by having a good understanding of science, a person will be able to meet personal needs and make them happy and be able to share them with others. Second, global life. Countries in the world face questions that require information and a scientific mindset in making decisions concerning public interests, such as air, water and forests (Zuriyani, 2011).

One indicator of the level of scientific literacy is a survey conducted by PISA. Based on the results of the 2018 PISA survey, the average scientific literacy ability score of Indonesian students in 2018 was 396. This score placed Indonesia in 74th place out of 79 countries surveyed. Indonesia is only ahead of Morocco, Lebanon, Kosovo, the Dominican Republic and the Philippines. When compared with the results of the 2015 PISA survey, Indonesia's score decreased by 7 points (OECD, 2019). According to PISA, the low scientific literacy ability of Indonesia from 2012 to 2018 was one of the reasons why the government changed the 2006 curriculum to the 2013 curriculum (Odja, A.H. & Payu, 2014). Chemical literacy is part of scientific literacy (Cigdemoglu et al., 2017).

Chemical literacy is one of the skills that really needs to be taught to students and formulated in the form of chemistry learning objectives to produce competent graduates in the midst of a modern 21st century society (Andayani, 2020). Students who have good chemical literacy are expected to have a caring and environmentally conscious attitude. so that it is wise to balance the development of science and its implications for environmental pollution resulting from the inappropriate use of chemicals or industrial waste (Perkasa & Aznam, 2016). Someone who has good chemical literacy skills can understand chemical concepts and communicate them, explain an event based on scientific investigations and use that knowledge to draw a conclusion (Rahmawati et al., 2020). Assessment of chemical literacy can use the fit between the PISA scientific literacy assessment framework and the framework of Shwartz et al. The scientific/chemical literacy aspect in the 2015 PISA Assessment.

The low level of scientific or chemical literacy in Indonesia can be improved by improvements in education. The field of education is indeed a beacon of hope for improving the quality of human resources (HR) in Indonesia. Prospective educators are an important component in the field of education because prospective educators are the forerunners of teachers who will help students develop chemical literacy. Educators must have the ability to apply chemical literacy with several learning approaches or models, and develop questions and evaluation instruments that can improve students' chemical literacy skills. To find out the development of students' chemical literacy skills, it is necessary to know in advance how the literacy skills they already have

Several studies examining chemical literacy skills for both high school and university students show that chemical literacy is still in the low category. Novike et al's research shows that scientific literacy is an aspect of knowledge of chemistry teacher candidates at Musamus University which is divided into 3 aspects as follows: (1) content aspects are in the moderate category, (2) procedural aspects are in the low category, (3) Epistemic aspects are in the low category (Sumanik et al., 2021). In addition, Suprianto stated in his research that there is a significant relationship between understanding the basic concepts of chemistry and scientific literacy skills. In addition, the correlation coefficient shows that the two variables have a fairly strong relationship. The higher the understanding of the basic concepts of chemistry, the higher the scientific literacy ability (Seprianto, 2020). Another study was also conducted by Suriyati on the analysis of the scientific literacy abilities of chemistry teacher candidates showing that the average scientific literacy achievement of chemistry teacher candidates in the competency of explaining scientific phenomena was 52.5% in the less category, evaluating and designing scientific investigations was 52% in the less category , and interpreting data and evidence scientifically by 40% in the very poor category, so it is concluded that chemistry teacher candidates have low scientific literacy competence (48.2%) (Suryati et al., 2020). Therefore, this study aims to describe the chemical literacy skills of students in the Chemistry Education Study Program, Faculty of Teacher Training and Education, Indonesian Christian University with a sample of students from all batches to further map differences in chemical literacy abilities by year or semester.

II. RESEARCH METHODOLOGY,

This research is a quantitative descriptive study with a sample of Chemistry Education Study Program students, FKIP UKI semesters 2, 4, and 6 and 8. The data obtained was analyzed quantitatively using

descriptive statistics by calculating the average research results then made in the form of percent (%). The instrument of this research is a questionnaire. The questionnaire used to measure 4 aspects of chemical literacy, namely knowledge, context, competence and attitude. The scale in the questionnaire used is a Likert scale with three alternative answers. This scale is arranged in the form of a statement and is followed by a choice of responses that indicate the level.

The chemical literacy category according to PISA (2015) consists of 3 levels, namely: low level (Low, L); medium level (Medium, M); and high level (High, H) which is described in values as in the table 1

Table 1. Literacy Level Criteria

Ability Category	Percentage
High	<56
Medium	56-75
Low	76-100

III. RESULT AND DISCUSSION

Based on the results of the analysis carried out, the overall scientific literacy value of the students was obtained as shown in Table 2

Table 2. Results of Student Literacy Analysis

Class	Means		Means of N-Gain	N-Gain Criteria
	Pre-Test	Post-Test		
Experiment	35.08	88.7	78.5 %	High

Based on Table 1 above, the experimental class obtained an average score of increasing scientific literacy with high criteria. the high ability of scientific literacy in the experimental class is due to the instrument factor used, interactive multimedia also has a positive influence, meaning that the interactive multimedia used can help students understand microscopic and abstract material well so as to improve students' scientific literacy skills. The developed interactive learning media presents a good summary of oxidation-reduction reaction material, displays several animations to explain microscopic and abstract concepts of oxidation-reduction reaction material which cannot be explained in detail by the printed textbooks used by students. With the explanation of microscopic and abstract concepts through animation in interactive multimedia, it is easier for students to understand and focus when the teacher explains the learning material. Most of the material concepts of oxidation-reduction reactions are microscopic and abstract concepts. This proves that abstract concepts can be more easily understood when visualized through the right media (Gunawan, 2014). However, the multimedia used does not fully provide guidance to students in analyzing questions at a higher level.

Following are the results of the analysis of students' scientific literacy abilities for each indicator as listed in Table 3 below.

Table 3. The results of the analysis on each indicator of scientific literacy

Class	N-Gain		
	Explain scientific phenomena	Evaluating and designing scientific investigations	Interpret scientific data and evidence
Criteria for N-Gain experimental class	76.2 (High)	68.3 (Medium)	74.7 (High)

Based on Table 3, the distribution of N-Gain scores shows that students answered the most questions on indicators explaining scientific phenomena, the ability to interpret scientific data and evidence, and finally evaluating and designing scientific investigations. It can be seen from the indicators explaining scientific phenomena obtaining an N-Gain value of 76.2 in the high category, this is the highest indicator achievement when compared to other indicators. On this indicator students practice a lot and understand material with phenomena and events in nature in everyday life. Many phenomena occur, starting from the process of blood circulation, blood pressure, blood clots and the process of maintaining a healthy heart.

Factors causing the low mastery of students in carrying out scientific investigation activities, namely: (a) students rarely carry out practical activities because of the lack of school laboratory facilities; (b) students do not understand terms in several scientific investigation activities; (b) students spend more time with rote knowledge and concepts (Rusilowati, 2016). The experimental group has high criteria on explaining scientific phenomena, the ability to interpret data and scientific evidence with the ability to evaluate and design scientific investigations. Most of the students in the experimental class were able to solve problems that had a higher cognitive level than just remembering and understanding. Students in the high group tend to analyze the questions and answer questions in more detail than the medium and low groups. The moderate group dominates the ability to interpret data and scientific evidence.

Based on the problems in the field, there are several factors causing the lower scientific literacy of students at M.S. Ihsan, S.W. Jannah In the control class, the students had never been trained to work on scientific literacy questions previously related to chemistry learning. Students are more likely to learn and understand rote material, so students do not understand and apply this material in everyday life. Educators are also required to have good scientific literacy skills and are very important to support so that they can develop the scientific literacy abilities of their students (Jamaluddin, 2018). Educators in the field of science should also pay full attention to efforts to improve and develop science literacy in students (Jupri, 2018).

IV. CONCLUSION,

Interactive Learning Media in online learning can be used to develop students' scientific literacy abilities, especially in learning chemistry with oxidation-reduction reactions material. Interactive multimedia can facilitate students well in understanding chemical material both in terms of context, knowledge, competence and attitudes.

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