Analysis Chemistry Science Literacy Abilities Of High School Students In Mataram

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Abstract. This research aims to 1) describe chemistry science literacy abilities of high school student in Mataram. 2) describe chemistry science literacy abilities based on gender differences. This type of research is qualitative descriptive study. Sampling was used multistage sampling technique study with the total population of research including all high school students in Mataram as many as 1,416 students and total sampel of 205 students. Data collection uses a scientific literacy ability test instrument in the form of multiple choice questions arranged based on indicators from aspects of science content, aspect of science context and aspect of science competence. The science literacy ability test instrument numbered 12 questions in the category of all valid questions and the reliability of the test question was 0.633 (high). The results of quantitative descriptive analysis show that the achievement of the test results for the ability of scientific literacy including the category is very less with an average 52.32. The results of the test analysis showed the average aspect of the science context was 55.05 (less) and the aspect of science content was 55.18 (less) while the aspect of science competence was 52.32 (very less). Based on gender differences in the scientific literacy ability of male students has an average of 48.77 (very less) while female students are included in the category of less than an average value of 55.83.

Keywords: Science literacy, Aspects science literacy, Gender differences

Introduction
Education in the 21st century is expected to be able to shape people who are fully aware of science and technology. Such education can be a bridge that connects individuals with their environment in the midst of an increasingly globalized era. Assessment and Teaching of 21st Century Skills (ATC21S) categorizes 21st century skill into four categories way of thinking, way of working, tools for working and skills for living in the world (Griffin, McGaw & Crew, 2012). One of which must be developed is to develop these skills through the field of science education. Science is very necessary in everyday life to meet human needs through solving problems that can be identified. Problems in life can be solved if someone has scientific literacy.
Literacy is one of the skills has a big influence in the development of human resources. Science literacy is the ability of someone to understand science, communicate science, and apply problems so that they have high attitudes and sensitivity towards themselves and their environment in making decisions based on scientific considerations (Toharudin, 2011). According to Poedjiadi (Toharudin, et al, 2011) a person has a scientific and technological literacy characterized by having the ability to solve problems using the concepts obtained in accordance with his level, getting to know the existing technological products and their impact, being able to use telecommunications products and maintaining them, being creative in making results simplified technology so students are able to make decisions based on community values and culture.

Indonesia is one of the countries that consistently follow PISA (Program for International Students Assessment). In 2015 the average score of Indonesian student’s science ability was 403 and ranked 66th out of 72 participating countries (OECD, 2015). This Indinesuans student’s science literacy competencies is still in the low category and is below established international standards.

Based on the results of an interview with one of the chemistry subjects teachers, learning science literacy has begun to be applied by providing a stimulus to learning materials which will then be studied jointly between teachers and students. However, there are still schools that have not implemented science literacy when learning in class. There are also teachers who interpret literacy only as limited to reading and writing abilities so that it can be concluded that aspects of science literacy that are applied are still aspects of science content and don’t develop other aspects of science literacy.

The concept of science literacy expects students to have a high sense of concern for themselves and their environment in dealing with problems of daily life and make decisions based on scientific knowledge that they have understood. The definition of science literacy in PISA are: (1) individual scientific knowledge and the ability to use the knowledge possessed to identify problems, obtain new knowledge, explain scientific phenomena and draw conclusions based on evidence discharging related to scientific issues; (2) understand the main characteristics of knowledge built from human and inquiry knowledge; (3) be aware of how science and technology create matter, intellectual and cultural environments; (4) the ability to engage in science-related issues and ideas (OECD, 2015). Therefore, aspects of science literacy consist of aspects of knowledge, aspects of context, aspects of competence and aspects of attitude. Measurement of science literacy should pay attention to the criteria for making science literacy questions Program for International Student Assessment (PISA), so that literacy skills can be better and can participate in the industrial world and have the same quality.

Gender factors don’t directly influence the formation of attitudes and learning motivation (Hoang, 2008). Someone who has a good learning motivation will have good learning outcomes as well. Biologically, the differences in brain structures allow male and female students to differ in several ways such as the ability to process, respond to information or store long-term information. The limbic system of male and female students is different. The difference is also in the hippocampus of women is greater than men, so women have the potential to have better long-term memory (Sasser, 2010). Because these differences allow there are difference in the ability of science literacy of male and female students.

Based on the description of theoretical assumptions and logic that have been described, efforts need to be made to improve science learning in schools, especially in chemistry. Efforts to improve the quality of learning at school level need to be supported by accurate information about the extent to which students’ literacy skills are reviewed in terms of aspects and see differences in the science literacy abilities of male and female students. Based on the above explanation, the late researcher conducted a research entitled Analysis Chemistry Science Literacy Abilities of High School Students In Mataram.

Research Methods
The type of research used in this study is descriptive qualitative research. The research population of all high school students in Mataram was 1,416 students. Sampling technique used in this research is multistage sampling or mulriple stepwise sampling, to determine the sample in this study used the Slovin formula (Sugiyono, 2017) thus obtained 205 samples or 46% of the population. This research was conducted at SMAN 3 Mataram and SMAN 7 Mataram.

The research instrument used in this study is a matter of science literacy ability test which was developed based on aspects of scientific literacy according to PISA 2015. The aspects of literacy in the test question instrument consist of context, content and competency aspects (OECD, 2015). Test questions in this study are multiple choice questions consisting of four alternative answers.

The validity trials used in this study were two namely external validity and internal validity. The external validity comprises the validity of the contents and the validity of the construct. While external validity is the validity of the contents of the Construct validity. The result of the validity of the grain test was conducted on the students at SMAN Mataram City at SMAN 3 Mataram and SMAN 7 Mataram amounting to 36 students. Based on the test using the correlation Point Biserial formula at a significant level of 5% with the Rtable value 0.271 obtained analysis results indicating that all questions are declared valid.

The reliability test is using the Kuder Richardson 20 formula (KR 20), based on the calculation results for science literacy skills tests acquired by 0.633 so that the reliability level of the test is high, because it is on a scale of 0.61-0.80.

Result and Discussion
Data on the results of chemical science literacy capabilities obtained from the overall research samples analyzed using a high score, the lowest score, the number of scores, the average calculation (mean). The category results in the students' chemistry literacy skills in the category is very less with an average of 53.32.

Based on the average science literacy skills the students conducted analysis for each aspect of the scientific literacy measured. The first aspect is the science competence, on the aspects of competency science indicators of the problem consists of 3 namely 1) explaining the scientific phenomenon; 2) Evaluating and designing scientific investigations; 3) interpret the data and evidence scientifically. The following is a percentage of the ability for students to answer questions based on the aspects of Science competence presented in Figure 1.

![Figure 1 Average Science Literacy Ability in Aspects of Scientific Competence](image)

The achievement of science literacy skills on the indicator explains the scientific phenomenon achieved at 54.02 with the very lesser category shown from the lack of ability of students in identifying
the issues and key features of the phenomenon contained in Science literacy instruments that can be investigated scientifically. The ability to explain scientific phenomena is closely related to the aspects of the content (knowledge science) they understand. The concept of knowledge that students possess affects its ability to describe scientific phenomena. According to Wulandari (2016) the category "very less" obtained on the indicator describes this scientific phenomenon describing the ability of students who have not optimal in explaining the scientific phenomenon triggered by several factors that will affect the outcome Achievement of science literacy skills.

The achievement of science literacy skills on indicators to interpret data and scientific evidence is drawing from the ability of students to recite scientific evidence and draw conclusions by interpreting the data contained in several graphs and The Instrument for Science literacy test. Indicators of the data and evidence are scientifically still in a very lacking category because it has an average of 51.46. The low indicator can be due to a factor of students who are not accustomed to the problems that contain the stimulus or discourse that contains the graph. These problems require expertise in the retelling. It is known from interviews with several students who complained about the many discourse on the subject, as well as the difficulty of the question they are working on. As Angraini (2014) stated that in his research results many things cause science literacy to be low, such as subjects that have not been studied, students are not used to work on questions that use discourse and process Learning that is lacking in supporting students in developing their scientific literacy skills. The lazy reading makes it difficult for students to understand the discourse given so that the achievement of chemical science literacy is lacking. When students work on this research, students are more likely to see an alternate statement of the answer which he has the most lengthy sentence and is regarded as the correct answer.

![Figure 2 Average Science Literacy Ability in Aspects of Scientific Content](image)

The aspect of science's competence in evaluating and designing a scientific investigation achieved at 51.46 with the category of achievement is very less indicated by the ability of students to apply science in certain situations, describing or Interpret scientific phenomena and predict changes, and identify appropriate descriptions as well as provide explanations and predictions. The very less category on this indicator signifies still a lack of knowledge of students in implementing his knowledge in solving existing problems. This is in line with the research results from Mujib & Suparingga (2013) which says when we see facts on the field of students in Indonesia tend to be very clever memorizing but less skilled in applying the knowledge it possesses. Science literacy problems are closely related to the students ' ability to solve problems so that the indicators evaluating and designing these scientific investigations need to be further improved through the learning process. According to Permatasari (2019) Questions on science literacy relate the knowledge of students to the phenomenon commonly encountered in life so that
knowledge contained in memory of students affects the ability of students to evaluate and designing scientific investigations.

The second aspect of science literacy is the content aspect (knowledge science), in the aspect of science content there are three indicators of 1) content knowledge; 2) Procedural testing of 3) epistemic knowledge. Here is an average of the students’ ability to answer questions based on the aspects of science content presented in Figure 2.

On the aspect of science knowledge based on the observation of the lack of the third achievement of this indicator because learning in the classroom still tends to conventional learning and using the lecture method. According to Toharudin (2011) Inquiry-based science learning gives students the opportunity to continuously develop their own potential optimally either cognitive, affective, or psychomotor in discovering scientific concepts.

The aspect of Science literacy is the third aspect of the science context, on the aspect of the science context indicator consists of 3 namely 1) Personal issues; 2) local/national issues; and 3) Global issues. The following is a percentage of the ability for students to answer questions based on aspects of the science context presented in Figure 3.

![Figure 3. Average Science Literacy Ability Aspects of Science Context](image)

![Figure 4 Graphic Capability of Science Literacy Based on Gender Differences](image)

The average results show that there is still a need to provide stimuli or issues originating from life around students so students can better interpret the real scientific literacy. According to Rusilowati (2016),
that various factors that indicate the lack of scientific literacy skills of students, especially in Indonesia among other things teachers often teach formulas compared to concepts; learners do not understand the basic concepts taught by the teacher; learners do not have enough knowledge about facts, terminology and science concepts; students' skills in critical thinking, inductive deductive reasoning, analyzing causality and analyzing scientific data that is lacking, students rarely do practical activities; learners spend more time with science that promotes rote learning; and lack of student knowledge in science and technology.

The ability of scientific literacy is very closely related to reading skills which lead to the ability to understand information analytically, critically and reflectively. Literacy is not just reading and writing, but it involves the ability to think that can make someone literate in learning, including in science learning.

If analyzed based on the gender differences of students, the results obtained where the average (mean) literacy ability of chemical science of male students as much as 48.77 which entered into the very poor category. While female students were 55.83 and included in the less category. The following graph shows the ability of scientific literacy based on gender differences.

According to Krutetski (2011), female students are superior in accuracy, accuracy, accuracy and equality of thinking compared to male students. This is in line with the results of research that says that the literacy ability of chemical science of female students is higher than male students. The ability of scientific literacy requires the ability to think carefully and thoroughly in understanding the discourse / stimulus that exists in the matter of scientific literacy. So, in this case female students have higher scientific literacy abilities than male students. According to Papalia (2009) women have a faster development stage than men, so it is considered to be one that affects the way of thinking of women in a matter, especially in the ability of scientific literacy.

Improving the achievement of students' scientific literacy in chemistry lessons The teacher must make some efforts in planning learning. According to Rahayu (2017), teacher efforts that can be done must meet several principles, namely 1) determining the chemical knowledge to be learned; 2) choosing an inquiry-based learning strategy; 3) determine the relevant context in chemical division; 4) determine what learning skills will be developed in learning chemistry; 5) Determine affective values by giving students the opportunity to express students' attitudes and / or perceptions about the issues raised by the teacher.

Conclusion

The category of achievement of learning outcomes for the literacy abilities of chemical science high school students in Mataram as a whole includes a category with an average of 52.32. Achievement of the results of tests for the literacy ability of chemical science high school students in Mataram based on gender differences for male students included in the category with an average of 48.77 and for female students by 55.83.

References


