

Analysis of Scientific Literacy Capabilities of Senior High School Students in Sungai Penuh Based on Science Competences

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Abstract - This research aimed to analyze students scientific literacy skills of Grade X Senior High School in Sungai Penuh based on science competences. This research is a descriptive with a mixed method. The sample in this study were 86 students from three high schools with three categories: high, medium and, low categories taken by cluster random sampling technique. The instruments used were scientific literacy test questions and interview guideline sheets. The data analysis technique is done by describing the results of the student's test into the values and categories of scientific literacy achievements and analyzing the results of the interview. Based on the results of this research, it is known that the student scientific literacy skills of Grade X in Sungai Penuh based on science competency are classified as low with an average value of 22.66 to explain the phenomenon scientifically, 47.15 to evaluate data and designing scientific investigations, and 28.44 to interpret data and scientific evidence.

Keywords - Science Literacy, Science Competence.

I. INTRODUCTION

Currently, education is in the 21st century and also known as the term 4.0 industrial revolution era which is characterized by the rapid development of science and technology. Education in the 21st century aims to encourage students to have skills that support them to be responsive to change along with the times. NCRL and Metiri Group^[8] stated that one of the skills that must be possessed by students in the 21st century is literacy skills. Besides having to have skills, there is also a need for a change in mindset from humans or students^[15].

The government, especially Ministry of Education and Culture always strives to improve the quality of education. One of the government's efforts to improve the quality of

education in Indonesia is to develop the 2013 curriculum as a form of improvement KTSP curriculum. Permendikbud Number 69 of 2013 stated that through the development of the 2013 Curriculum, Indonesian people who are faithful, productive, creative and effective will be able to contribute to the life of the world, nation, state and world civilization through strengthening integrated attitudes, skills and knowledge^[12].

Natural Sciences (IPA) is one of the subjects in the 2013 Curriculum which is studied at the level of Junior High School (SMP). Science is the study of natural phenomena which include living things and non-living beings. At the Senior High School (SMA), science is studied separately in three subjects, namely Physics, Chemistry, and Biology.

Biology is a part of natural science that studies about living things and their environment. Biology learning is not just memorization but it is expected that students are able to understand concepts, processes, and apply the knowledge they get in their daily lives, so that the objectives of science learning can be achieved. Ariningtyas^[4] revealed that the purpose of science learning was to develop students' scientific literacy.

The phenomenon of learning science (Biology) in schools tends to be teacher-centered and still leads to knowledge only, so students tend to memorize and not be able to apply their knowledge in life. This is not in accordance with the nature of science learning that requires students to develop scientific literacy. Rakhmawan^[13] stated that the optimal level of meaningfulness in science learning can be obtained if students have good scientific literacy skills.

Science literacy is the ability to understand scientific concepts and processes and to use science to solve problems in everyday life. According to the PISA (Program for International Student Assessment) described in the OECD^[10] scientific literacy is the ability to use scientific knowledge, identify questions, and make conclusions based on scientific evidence in order to understand and make decisions regarding nature and its changes due to human activities.

OECD^[11] revealed that scientific literacy is divided into four dimensions, namely competence process of science, knowledge/content of science, context of application of science, and attitude of science. Science competence consists of three aspects, namely explaining scientific phenomena, evaluating, and designing scientific investigations, as well as interpreting scientific data and evidence. Science knowledge consists of content knowledge, procedural knowledge, and epistemic knowledge. The context of the application of science includes health and disease, natural resources, environmental quality, hazards and the latest developments in science and technology. Whereas the attitude of science refers to the development of further scientific knowledge, pursuing careers in science, and using scientific concepts and methods in life.

Science literacy is important for students so that they not only understand science as a concept but also can apply science in everyday life. According to the National Research Council (1996) in Ardianto and Rubbini^[2] scientific literacy is important to be developed because (1) provides personal satisfaction and pleasure that arises after understanding and learning science; (2) everyone needs information and scientific thinking for decision making; (3) everyone needs to involve their abilities in public discourse and debate on

important issues involving science and technology; and (4) scientific literacy is important in the world of work, so it requires people to learn science, reason, think creatively, make decisions, and solve problems.

Science literacy can be measured through PISA studies organized by the OECD (Organization for Economic Cooperation and Development) every three years. OECD is an international organization in the field of economic cooperation and development, while PISA is a form of evaluation of abilities and knowledge in reading, mathematics and science designed for students aged 15 years. Indonesia began to join in this PISA study since 2000. The results of the PISA study for scientific literacy skills of Indonesian students from 2000 to 2015 can be seen in Table 1.

Table 1. Results of the PISA Study of Science Literacy Ability of Indonesian Students

Year	Indonesian Average Scores	PISA Average Scores	Ranking	Country Participant
2000	393	500	38	41
2003	395	500	38	40
2006	393	500	50	57
2009	385	500	60	65
2012	375	500	64	65
2015	403	500	62	70

Source:OECD^[11].

Based on Table 1. above, it is known that the ability of Indonesian students for science literacy from 2000 to 2015 is still in the low category because the scores obtained are below the PISA completeness score. This indicates that Indonesian students have not been able to understand the concepts and processes of science and have not been able to apply the scientific knowledge that has been learned in everyday life.

The low level of scientific literacy skills of Indonesian students is generally caused by learning activities that have not been oriented towards the development of scientific literacy. Ardianto and Rubbini^[2] reveal that the low level of scientific literacy is caused by several factors, namely the state of school infrastructure, school human resources, and school management. Kurnia^[7] also revealed that the low literacy skills of Indonesian students are influenced by the curriculum and education system, the selection of teaching methods and models by teachers, learning facilities and facilities, and teaching materials.

The results of Angraini's study[1] showed that the scientific literacy skills of students Grade X in Solok were still relatively low due to the material being tested had never been studied, students were not used to working on questions using discourse, and learning processes that did not support students in developing scientific literacy skills. The same thing was expressed by Rizkita^[14] that the student scientific literacy skills of Malang were still low. The low level of scientific literacy is due to the learning process that has not involved the science process. In addition, Diana^[6] stated that the scientific literacy skills of students Grade X in Bandung were still relatively low due to differences in learning targets applied in schools with PISA demands.

Based on the results of interviews conducted by the researcher on October 2018 to four Biology teachers of Senior High School in Sungai Penuh, information was obtained that in teacher learning activities it was difficult to teach students independently and actively because students were familiar with the material directly given to them. it also causes students to be less active in exploring their own knowledge, students are less able to associate one concept with another concept that has been learned as evidenced by the inability of students to answer questions that demand analytical skills. In addition, students' scientific literacy abilities and the factors that influence them are not yet known because the evaluation questions given by the teacher have not been oriented towards measuring scientific literacy, but only limited to measuring students' knowledge of the material being studied.

Based on the problem described above, it is known that information or data about science literacy skills of Grade X Senior High School in Sungai Penuh is unknown. Information about scientific literacy skills is important to know in order to provide appropriate solutions to the problems faced, especially in the field of scientific literacy. So that, Researcher has conducted research on the analysis of students' scientific literacy skills of Grade X Senior High School in Sungai Penuh.

II. RESEARCH METHOD

This research is a descriptive research with a mixed method. The population in this study were all students of Grade X Senior High School enrolled in academic year 2018/2019. The sample in this study were 86 students from three schools that in three categories: high, medium and low categories taken by cluster random sampling technique. The instruments used in this study were the Biology science literacy questions and interview guideline sheets for teachers and students. Data analysis is done by giving a score for each

question answered by students and then converted to a value with a formula according to Arikunto^[2] as follows:

$$\text{Value} = \frac{\text{Obtained Score}}{\text{Maximal Score}} \times 100$$

The value of achievement of scientific literacy obtained is then interpreted based on criteria according to Hasan^[13] presented in Table 2.

Table 2. Criteria for Achieving Science Literacy

No	Value Range	Criteria
1	67 – 100	High
2	33 – 66	Medium
3	< 33	Low

III. FINDING AND DISCUSSION

Science literacy skills of students based on science competency are relatively low. This can be seen from the achievement of the average score obtained from the three science competencies below the value of 50. The results of the scientific literacy test based on science competence can be seen in Table 3.

Table 3. Results of Science Literacy Tests Based on Science Competence

No	Science Competences	Average
1	Explaining scientific phenomena	22,66
2	Evaluating data and design scientific investigations	47,15
3	Interpret data and scientific evidence	28,44

Table 3. shows that science competence of Grade X Senior High School students in Sungai Penuh City are still low, especially in the competence to explain scientific phenomena and interpret data and scientific evidence. That is, students have not been able to master the scientific competencies tested in scientific literacy tests.

Science literacy skills of students based on science competency are relatively low. This can be seen from the achievement of the average scores obtained from the three scientific competencies tested below the 50 mark. The scores obtained by students in each competency are 22.66 for competencies explaining scientific phenomena, 47.15 for competency in evaluating data and designing scientific

investigations, and 22.44 for competencies in interpreting scientific data and evidence. According to Nuraini, et al.^[9] the low mastery of students' scientific competencies can be seen from the achievement of scores obtained by students below the value of 50 which illustrates that students have not mastered the scientific competencies tested.

The low level of scientific competency of students is caused by the tendency of students to memorize material, not limited to learners with learning that begins with scientific problems, and it is not unusual for students to use scientific evidence to answer or solve scientific problems. This is in line with Purwani's statement^[16] which revealed that students' low scientific literacy competencies were caused by students who were not accustomed to learning with scientific problems. The results of Basam, et al.^[5] concluded that the low scientific competence of students was caused by a lack of learning that led to scientific discovery or investigation so that students were dominated by conceptual abilities.

IV. CONCLUSION

Science competencies of students is still low. The average value obtained in each competency is 22.66 for competency to explain phenomena scientifically, 47.15 for competence in evaluating and designing scientific investigations, and 28.44 for competence in interpreting data and scientific evidence.

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