Scientific Literacy Analysis in Biology of High School Student of Demak

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Article Info	Abstract
	This study aims to analyse linkage between scientific literacy, knowledge, competency, and attitude also analyzing the correlation between scientific literacy aspects of knowledge with competencies, attitudes with competencies, knowledge with attitudes. The study was conducted using a survey method with a cross-sectional design. The entire student of class XI MIPA of State High Schools in Demak regency academic year 2017/2018 were chosen as the population. The method in taking the sample was Stratified Random Sampling. The sample of the study is 304 students. Test, questionnaire, documentation, and interview were methods used in collecting the data. The result showed that students' scientific literacy level on knowledge at 37,54% on the "low" category, students' competencies at 36,75% on the "low" category, and students' attitudes at 68,11% on the "good" category. Correlation test results between scientific literacy aspects of knowledge with competencies obtained correlation coefficient at 0,534, between attitudes and competencies obtained correlation coefficient at 0,172, between attitudes with knowledge obtained correlation coefficient at -0,094. Based on the result, the level of students' scientific literacy on knowledge and competencies aspects were classified in the low category. The level of students' scientific literacy on attitudes aspect was classified in the good category. The correlation between knowledge with competencies aspect has a positive correlation in the medium category. The correlation between attitudes with competencies aspect has a positive correlation in the very weak category. But, the correlation between knowledge with attitudes aspect was not correlated.

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INTRODUCTION

Scientific literacy is a person ability to use knowledge and thinking ability in problems relating to science, as a reflective citizen. A person called "literate" on science when to engaging in matters relating to science and technology that require competence to explain the phenomena scientifically, evaluate and design scientific investigation, and interpret data and evidence scientifically (OECD, 2016).

The scientific literacy is very important scientific literacy is importantly underpine positive attitude towards perception by students in relation to how they perceive the environment, health, economy, and the problems of modern society more dependent on technology and progress and development of science (Russilowati, Kurniawati, dan Nugroho 2016). Students who have good scientific literacy are able to solve problems in complex and less familiar situations, while students who have poor scientific literacy are only able to solve problems in simple and familiar situations (Rahayu, 2014). Because having scientific literacy is very important, it is also important to build scientific literacy of students as the next generation of the nation in the future. One of efforts made by Kementerian Pendidikan dan Kebudayaan Republik Indonesia is to accommodate scientific literacy in the education curriculum.

Scientific literacy in the education curriculum in Indonesia has been accommodated in the 2006 (KTSP) curriculum and more clearly seen in the 2013 curriculum through inquiry activities and scientific approaches (Anjarsari, 2014). Inquiry activities and scientific approach in the 2013 curriculum can be seen in Permendikbud number 103 in 2014, about guidelines for implementing primary education and secondary education. In these regulations, learning activities must use the principle of learning, among others, students are facilitated to find out (inquiry) and the learning process uses a scientific approach (Kemendikbud, 2014).

Based on the practice of field experience (PPL) in SMA N 3 Demak, in August to October 2016 and the preliminary information during field experience practice and interview with biology class XI MIPA teachers in SMA N Demak 3, SMA N 2 Mranggen, SMA N 2 Demak, and SMA N 1 Mijen in March 2017, the information has been obtained that biology class XI MIPA teachers in Demak regency, in general, have implemented the 2006 curriculum and 2013 curriculum as a whole in biology learning oriented to scientific literacy. Biology teachers class XI MIPA in Demak regency generally were accommodated scientific literacy in biology learning through inquiry activities and scientific approaches in teaching and learning activities. However, the practice questions and evaluation of biology learning used in State High Schools throughout the Demak regency in general have not been linked to the phenomenon of daily life, these questions are still in the dimension of conceptual knowledge so that they cannot be used to measure students scientific literacy abilities.

Measurement of scientific literacy in Indonesia was carried out by the OECD through the Program for International Student Assessment (PISA). Scientific literacy that has been measured through PISA is only applied to students who are 15 years old. The results of the research are used to reveal the overall level of scientific literacy of students for all Indonesian students (Hadi & Mulyatiningsih, 2009). That is, the results of students' scientific literacy can be different if the test is carried out on a smaller scope. Another thing that has not been revealed is how the scientific literacy ability of Indonesian students aged over 15 years is high school students of grade XI MIPA in the scope of the regency. According to Pantiwati &

Husamah (2014), measuring the level of scientific literacy of students produces data that has valuable information for introspection and correction of the education system.

Based on those statements, it is very important to study on the analysis of students scientific literacy on XI MIPA class in State High Schools throughout Demak regency in biology. The purpose of this study is to analyze the level of students scientific literacy aspects of knowledge, competencies, and attitudes, also analyzing the correlation scientific literacy of knowledge with competencies aspects, the correlation between attitudes with competencies aspects, the correlation between knowledge with attitudes aspects on class XI MIPA of State High Schools students in Demak regency on biology lessons.

RESEARCH METHOD

This research was conducted at SMA N 1 Demak, SMA N 3 Demak, SMA N 1 Mijen and SMA N 1 Dempet on October-November 2017. This study was used Survey Research Method with Cross-Sectional Research Design. The population of this study is all students of XI MIPA SMA N in Demak regency at academic years 2017/2018. The sample was taken by clustered random sampling technique. Sample in the study were 304 students of class XI MIPA consisting of 2 classes in each school.

The procedure began with interviews with biology teacher of class XI MIPA, and compiled research instruments. Research instruments include questions about aspects of knowledge and competencies in scientific literacy, items on attitudes aspects towards the scientific literacy questionnaire, student attitude interview sheets, and documentation. Questions and test items were prepared using the 2015 PISA indicator and fungi, plantae, animalia, ecology, environmental change, waste and recycling materials. Then conduct empirical trials at SMA N 3 Demak to find out the feasibility of the research instrument including validity, reliability, differentiation, and difficulty test using the help of the IBM SPSS Statistics 21 application. The implementation phase includes a scientific literacy test of knowledge and competence aspect, filling out the attitude questionnaires by students, student attitude interviews, and research documentation. The data of this study are scientific literacy scores. The data analysis technique of this research is descriptive analysis and correlation analysis. Quantitative paradigm analysis was carried out using percentage descriptive methods to determine the level of scientific literacy in the students' knowledge, competencies, and attitudes. Interviews data were analyzed to support data at the level of scientific literacy in attitudes aspect. Pearson Product-Moment correlation analysis techniques are used to find out the relationship between scientific literacy aspects of knowledge with competencies, aspects of attitudes with competence, aspects of knowledge with attitudes. Correlation analysis used IBM SPSS Statistics 21.

RESULTS AND DISCUSSION

The information obtained in this study illustrates the real situation of scientific literacy level aspects of knowledge, competencies, and attitudes. It also illustrates the relationship between scientific literacy aspects of knowledge with competencies, the attitudes with the competencies, and the knowledge with the attitudes in students of class XI MIPA Demak Regency on biology lessons.

Student's Knowledge Level

The results of students' scientific literacy level on the knowledge aspect can be seen in Figure 1.
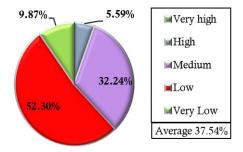

Figure 1 Percentage of student's scientific literacy level on the knowledge aspect

Based on Figure 1, the average level of student's scientific literacy on the knowledge aspect is a low category. This indicates that the learning process of biology based on scientific literacy in the XI MIPA class of SMA N in Demak regency is not yet optimal. The low level of student's scientific literacy on knowledge aspect is supported by the existence of an evaluation tool in learning biology in the form of test questions and practice questions in SMA N Demak in general not yet using discourse related to the context of daily life. According to Nadhifatuzzahro, Setiawan, and Sudibyo (2015), studying biology in schools must be able to help students to explain biological phenomena in their daily lives and use the biological knowledge they have gained, including answering scientific literacy questions. In accordance with Anggraini (2014), one of the factors causing the low level of students' scientific literacy is that they cannot work on questions that use discourse in the context of everyday life. The results of this study are accordance with the results of measurements scientific literasi by the OECD (2015), concluding that Indonesia is a country with low scientific literacy skills, including students' knowledge level in XI MIPA class of SMAN in Demak Regency.

Student's Competencies Level

The results of student's scientific literacy level on the competencies aspect can be seen in Figure 2.
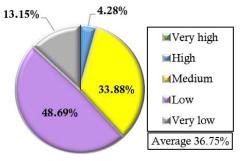

Figure 2 Persentage of student's scientific literacy level on competencies aspect

Based on Figure 2, the average level of student's scientific literacy on the competencies aspect is a low category. This shows students are not familiar with the analysis-oriented

questions. This is supported by biology learning evaluation tools in the form of test questions and practice questions in Demak Regency High School in general are still oriented towards remembering and understanding questions and not yet oriented to analysis questions. in accordance with Huryah, Sumarmin, and Effendi (2017), one of the factors that influences the achievement of the biological literacy level in the aspect of competence is that the problem given is not a matter of analysis, so it does not require students to use their reasoning. As a result students are not accustomed to reasoning and analytical thinking so that the scientific literacy ability of the competency aspects is low. The results of this study are in accordance with the OECD (2015), concluding that Indonesia is a country with low scientific literacy skills, including students' competencies level in class XI MIPA SMAN of Demak Regency.

Student's Attitudes Level

The results of students' scientific literacy level on the attitudes aspect can be seen in Figure 3.
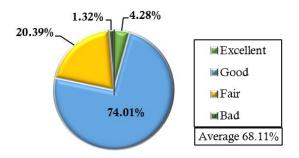

Figure 3 Persentage of student's scientific literacy level on attitudes aspect

Based on Figure 3, the average level of student's scientific literacy in the attitudes aspect is a good category. These results are supported by the results of interviews with students. Eight out of ten students interviewed had an interest in science and technology, seven out of ten students supported inquiry as a scientific approach, seven out of ten students had environmental awareness. In this study measurement of the level of scientific literacy in attitude aspect, has used a questionnaire. This is not in accordance with the 2015 PISA scientific literacy framework which measures the level of scientific literacy of students using multiple choice tests. The use of questionnaires for data collection on student's scientific literacy in the attitudes aspect is not appropriate because students tend to be careless in filling out questionnaire items so that the resulting data tends to be inaccurate. This is in accordance with Azwar (2012), compared to the measurement of physical attributes, the measurement of psychological attributes is far more difficult and will never even be done with a very high level of validity, reliability, and objectivity because psychological attributes in humans are not high stability, many have changed over time and situations so that in psychological measurements there are more errors.

Correlation between Knowledge and Competencies

The result of the Pearson Product-Moment correlation test between the knowledge and competencies aspect are presented in Table 1.

Tabel 1 Pearson correlation test results between the knowledge and competencies aspect

Correlations

		Knowledge aspect	Competencies aspect
Knowledge aspect	Pearson correlation	1	.534[**]
	Sig. (2-tailed)		.000
	N	304	304
competencies aspect	Pearson Correlation	.534[**]	1
	Sig. (2-tailed)	.000	
	N	304	304

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the correlations results presented in Table 1, the correlation coefficient is 0,534 and sig. 0,000. It means that there is a positive relationship in the medium category between knowledge with competencies. Students who have a high level of knowledge tend to have a high level of competencies. Conversely students who have a low level of knowledge tend to have a low level of competencies. explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting data and evidence scientifically are high-level thinking competencies. Explain phenomena scientifically including in the realm of analysis or C4. Evaluate and design scientific investigations included in the realm of evaluation or C6. Interpret scientific data and evidence included in the realm of creating or C5. In accordance with Anderson & Krathwohl (2009), analysis, synthesis, and evaluation are the classification of high-level thinking competencies. High-level thinking is part of the realm of thinking. The results of this study are in accordance with the statements of Zaenal, Haryadi, and Natsir (2014), thinking provides the possibility of humans to acquire knowledge, in the next stage that knowledge can become an important foundation for deeper thinking activities. The results of this study are also in accordance with Soedijarto (2014), the more information that enters, the person's knowledge will increase and the ability to think at a higher level (scientific literacy in competency aspects) will be good so that it is able to apply applications in accordance with existing events.

Correlation between Attitudes and Competencies

The results of Pearson Product-Moment correlation test between the attitudes and competencies aspect are presented in Table 2.

Tabel 2 Pearson correlation test results between the attitudes and competencies aspect

Correlations

		Attitudes aspect	Competencies aspect
Attitudes aspect	Pearson Correlation	1	.172[**]
	Sig. (2-tailed)		.003
	N	304	304
Competencies aspect	Pearson Correlation	.172[**]	1
	Sig. (2-tailed)	.003	
	N	304	304

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the correlations results presented in Table 2, the correlation coefficient is 0,172 and sig. 0,003. It means that there is a very weak positive correlation between attitudes and competencies aspect. Students who have a high level of attitudes aspect tend to have a high level of competencies aspect. Conversely students who have low attitudes aspect tend to have low levels of competencies aspect.

In biology learning the relationship between aspects of attitude with aspects of competence is seen in the inquiry learning process. Scientific phenomena will give rise to students' attitudes towards science and technology (an indicator of aspects of attitudes aspect), will trigger the process of finding out /inkuiri (indicators of attitudes aspects). The inquiry process certainly requires the design and evaluation of scientific investigations, interpreting data and scientific evidence (indicators of competency aspects), after students know they will be able to explain scientific phenomena and have awareness of the environment (indicators of attitudes aspects). According to Bloom in Munandar (1999), no matter how low the level of students' cognitive processes can affect attitudes. However, a low level of cognition might influence attitudes, but their influence is very weak and attitudes tend to be unstable. The process of cognition that can grow and develop attitudes significantly is at the level of analysis, synthesis, and evaluation. In accordance with Taringan, Harsono, and Yusriati (2017), there is a correlation between attitude and student competence in the material of the circulatory system in SMP N 7 Binjai.

Correlation between Knowledge and Attitudes

The results of the Pearson Product-Moment correlation test between the knowledge and attitudes aspect are presented in Table 3.

Tabel 3 Pearson correlation test results between the attitudes and knowledge aspect

		Correlations	
		Attitudes aspect	Knowledge aspect
Attitudes aspect	Pearson Correlation	1	-.094
	Sig. (2-tailed)		.101
	N	304	304
Knowledge aspect	Pearson Correlation	-.094	1
	Sig. (2-tailed)	.101	
	N	304	304

Based on the correlations results presented in Table 3, the correlation coefficient is -0,094 and sig. 0,101. It means there is no correlation between knowledge and attitude aspects. Both aspects have no meaningful correlation if the level of knowledge is higher or lower then there will be no increase or decrease in the attitudes level. knowledge with attitude must have a relationship because knowledge is one of the factors forming students' attitudes. According to Azwar (2012), increasing knowledge about an object becomes one of the things that can shape a person's attitudes.

The results of this research are suspected because the data collection instruments were not in accordance with the PISA 2015 assessment and analytical framework. This framework measures student attitudes using multiple-choice questions, while this research uses a questionnaire. The questionnaire produces inaccurate data about the level of student attitudes because in filling out the questionnaire students tend to be dishonest towards the attitudes possessed by students themselves. This causes students to fill out questionnaires not adjusted to student attitudes so the research data is wrong and the results of Pearson correlation analysis are wrong. The results are not in accordance with Notoatmodjo (2010), good knowledge will influence the correct attitude towards an object. The results are also not in accordance with Sulistin & Widajat's research (2015), that there is a meaningful relationship between the level of knowledge and people's attitudes about schistosomiasis in Sigi Regency.

The results of this study are appropriate with Baron in Maolinda, Sriati, and Maryati (2012), knowledge is a strong factor in attitude change.

CONCLUSIONS

Based on the data analysis results and discussions can be concluded that students scientific literacy level on knowledge and competencies aspect are a low category, and students attitudes aspect is a good category. Quantitative result are a positive correlation and the medium category between knowledge with competencies aspect. There are a positive correlation and the very weak category between attitudes with competencies aspect. There are no correlation between knowledge and attitude aspect on State High School students of demak regency in biology lessons.

SUGGESTION

Assessment of students attitudes must use multiple-choice questions in accordance with the PISA 2015 assessment and analytical framework.

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