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ANALYSIS OF SCIENCE LITERATION IN THE E-BOOK OF DISASTER EDUCATION IN SCIENCE LEARNING OF JUNIOR HIGH SCHOOL

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Abstract

This study aims to analyze the quality of scientific literacy in disaster education e-books in science learning in junior high schools. This research uses descriptive qualitative method. The research instrument used in this study was an observation. Based on the four categories of scientific literacy quality, the results of the analysis of the three disaster education e-books obtained from the percentage of the three e-books show that science as the body in minimizing disaster risk is 76.2%, science as a way to investigate in emergency response planning skills is 33.3%, science as a way of thinking in simulation activities was 66.7%, and the interaction between science, technology and the community in the socialization of alertness was 16.7%. Overall from the three e-books analyzed, that science as the body in minimizing disaster risk received the highest percentage and the interaction of science, technology with the community in the socialization of preparedness received a very low percentage. Therefore, it is necessary to pay attention so that scientific literacy is more balanced in the disaster education e-books used in science learning in order to provide a complete picture of science for students.

Keywords*: Science Literacy, E-book, Disaster Education, Science Learning*

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INTRODUCTION

In line with the development of the era, education is always changing. Currently, we are faced with the 21st century education era, known as the age of knowledge, where all alternative ways of fulfilling the interests of life will be more knowledge-based. (Widestra et al. 2018). Educational graduates should have sufficient abilities to exist in the 21st century, including: ways of thinking, ways of working, tools for work, and skills for life (Paige *et al*, 2016). One of the factors that influence the advancement of science at this time is the ability related to mastery of science, which has emerged with the term scientific literacy.

Scientific literacy is an understanding and scientific skills to be able to identify questions, gain new understanding, interpret scientific events, get conclusions based on facts, master the characteristics of science, perceptions of how science and technology affect the natural environment, scholars and culture, as well as a desire to participate and care about problems related to science (OECD, 2016). Science literacy is the student's ability to know science which is aimed at solving problems. Science literacy will increase if teachers train it in applying process skills in daily life (Asyhari *et al*, 2015; Adisendjaja, 2011). Thus, understanding scientific literacy is something that needs attention. That is, learning activities are not only oriented to understanding knowledge but must be oriented to the learning process and the application of knowledge. Understanding scientific literacy is related to how students understand their environment.

Scientific literacy includes literacy studies in PISA. Science literacy assessments are carried out by PISA on an ongoing basis every 3 years. Indonesia is one of the countries participating in the PISA assessment. However, the results obtained are still not satisfactory. Most Indonesian students have limited knowledge of science, that is students can only answer questions in a general context, not able to answer questions that require in-depth analysis (OECD, 2016). The low ability of scientific literacy in Indonesia is influenced by many things, including the curriculum and education system, the use of learning methods and models, learning facilities, and learning resources.

Learning resources are one of the supporting components of learning activities. Learning resources are anything that is used to convey a learning experience. The environment becomes a source of learning that can foster motivation and student participation in learning activities (Suhardi, 2011; Siregar, 2018). The teacher should use learning resources in the surrounding environment. This is because the use of learning resources is important. Learning resources designed are learning resources that are planned to be used in the learning process, for example teaching materials. Teaching materials are fundamental and important learning resources needed in the learning process in schools. Teaching materials are able to encourage teachers to be effective and develop student performance. The availability of teaching materials makes learning more

practical, efficient and realistic (Olayinka, 2016). The problem is that not all teaching materials are of good quality.

Regulation of the Minister of National Education Number 41 of 2007 concerning Process Standards for Primary and Secondary Education Units advises teachers to be able to apply Information and Communication Technology in making lesson plans. The advances in communication and computing technology have developed simple learning patterns into electronic learning (*e-learning*). The use of information technology is an effective and efficient method of presenting information. One part of electronic learning is electronic textbooks or what are called e-books. One of the solutions where at this time the advancement of gadgets in the form of smartphones is increasing by utilizing e-book based technology (Wibawa, 2016; Fathoni dan Marpanaji, 2018). E-books are preferred because they are not too big, easy to carry, and they are not easily damaged. This study is focused on analyzing e-books (electronic textbooks) on disaster education and analyzing e-books for disaster education based on scientific literacy in science learning in schools.

Empowerment of control of danger warning signs is carried out to minimize disaster risk. Education about disasters needs to be empowered with the aim that students can make connections between disasters and their scientific understanding so that students 'skills and students' understanding of disasters will increase. (Kemendiknas, 2009; Sampurno *et al*, 2015). One of the means used in an effort to minimize disaster risk is school. School is a means that can be used to convey knowledge about disasters. Sekolah juga dapat dijadikan sarana dalam berkolaborasi dengan lingkungan sekitar, mengembangkan keterampilan masyarakat, serta mengatur sentral penampungan pengungsi ketika bencana (Ozmen *and* Fatma, 2006; Shiwaku *et al*, 2007). Disaster education is education that combines disaster content into formal education, which then allows students to act in fostering understanding, skills, and behaviors needed to prepare for and minimize disasters, and support students and communities to return based on their normal activities after a disaster (Kagawa *and* Selby, 2012). Disasters can be used as an accurate learning resource, especially for those who live in disaster-prone areas. To foster community preparedness about disasters, one of which is through increasing scientific literacy skills.

Mastery of scientific literacy is related to how students understand the environment. The way students master scientific literacy about the environment is by understanding natural phenomena including changes that occur in nature. Science is related to nature. Science that studies events that occur in nature. Learning that examines natural phenomena directly is science. Therefore, understanding about disasters is linked in science learning (Agustiana dkk, 2013). Nature is the main source in science learning. Science studies all objects that exist in nature as well as various events or phenomena that appear in nature. Disaster education tends to emphasize knowledge, skills and social skills to reduce risks and increase resilience when natural disasters occur. *The expected output of disaster education is that students have scientific literacy* (Chung & Yen, 2016). Through science learning, disasters can be learned both in terms of knowledge and skills. By understanding various natural phenomena such as disasters, students can minimize the risk of disasters through mastery of scientific literacy.

Disaster education e-books must show disaster education as dynamic science knowledge, not only knowledge/symptoms and scientific terminology, but also a series of scientific process skills to overcome various scientific problems and also their application in everyday life. According to Chiappetta *et al* (1991), There are four categories of scientific literacy that are applied to analyze science teaching materials including, science as the body of knowledge; science as a way of investigating; science as a way of thinking; as well as the interaction of science, technology with society. Scientific literacy integrated with disaster education indicators is used as a parameter to analyze e-books on disaster education in science learning in junior high schools. Based on the description of the problems above, the researcher feels the need to do research on "Analysis of Science Literation in the E-Book of Disaster Education in Science Learning of Junior High School".

Mastery of scientific literacy is important for students so that they have knowledge and understanding of disasters, and they can also identify problems related to disasters. Thus, students can minimize the risk of disasters that arise when a disaster occurs. Therefore, teaching materials in science learning must contain scientific literacy. The purpose of this study was to analyze the quality of scientific literacy in disaster education e-books at the junior high school. Hasil penelitian ini dapat diterapkan sebagai sumber informasi mengenai *e-book* pendidikan kebencanaan yang sangat baik untuk digunakan sebagai bahan ajar yang terintegrasi dengan literasi sains dalam pembelajaran IPA di SMP.

METHOD

The type of this research is a descriptive study with a qualitative approachMoleong (2012) defines qualitative research as research aimed at mastering the symptoms / phenomena felt by research subjects, such as actions, responses, motivation, activities by describing in the form of words and language. The e-books that were sampled were: e-book A or Natural Science E-book Class VII Semester 2, Revised Edition 2017, e-book B or E-book Saku Tangkas Tangguh Menghadapi Bencana, dan *e-book* C or *E-book* Pembelajaran Mitigasi Bencana di Magelang. Sampling using purposive sampling technique. *Disaster education e-books are determined based on the presence or absence of material regarding natural disasters and are intended for students. Data collection was carried out by observation*.

On the observation sheet, the scientific literacy indicators for each category are added up and then the percentage is calculated. The percentage of scientific literacy indicators is calculated by the following formula:

$$\% \text{ scientific literacy} = \frac{number\ of\ indicators\ per\ category}{jthe\ number\ of\ indicators\ across\ categories} \text{ x } 100\%$$

Source: (Adisenjaja & Romlah, 2008)

The data obtained is then interpreted based on the criteria in Table 1.

Table 1. Quality of Disaster Education E-book based on Scientific Literacy

Percentage	Criteria
85%-100%	Very good
65%-84%	Good
55%-64%	pretty good
40%-54%	Poorly
0%-39%	Not good

Source: (Riduwan, 2010)

Percentage data is made based on the science literacy category in each ebook. The percentage data is then averaged, the next step is to determine the percentage of each category in the disaster education e-book and make it in graphic form.

Based on Table 1, it can be seen the quality of the e-book from the percentage obtained. The results of the book quality analysis for each e-book can be interpreted in Table 2.

Table 2. Results of Quality Analysis of Disaster Education E-book based on Scientific Literacy

E-book	Percentage of Average Science Literacy Score	Criteria
E-book A	50 %	Poorly
E-book B	43,75 %	Poorly
E-book C	37,5 %	Not good

Based on Table 2, it can be seen whether there is a difference in the percentage of each e-book. The three disaster education e-books used come from different publishers. E-book A is a disaster education e-book used in science learning published by the Ministry of Education and Culture, so its presentation is in accordance with the curriculum. Whereas e-book B and e-book C are disaster education e-books that are not integrated with IPA, meaning that they are e-books specifically for disasters and are not published by the Ministry of Education and Culture, so their presentation is not in accordance with the learning curriculum..

RESULTS AND DISCUSSION

From the research conducted, data was obtained about the number and percentage of emergence of scientific literacy in each e-book. The results of the analysis that has been carried out on the three disaster education e-books are presented in Figure 1.

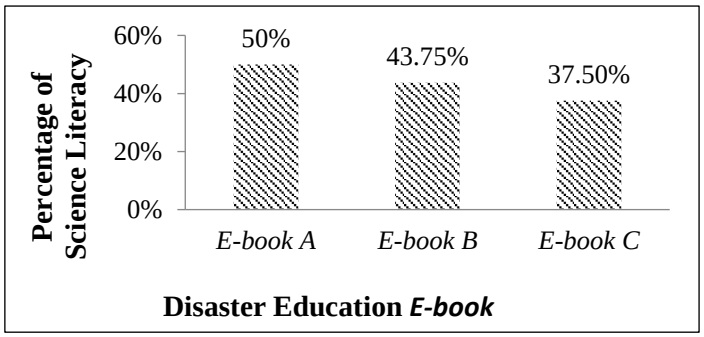

Figure 1. Quality of Disaster Education E-book based on Scientific Literacy

Based on Figure 1, the results show that e-book A has the highest literacy quality compared to the other two e-books. E-book C has the lowest scientific literacy eligibility compared to other e-books. The average value of the feasibility of scientific literacy from the three e-books in a row from the highest is as follows e-book A 50%, e-book B 43.75%, and e-book C 37.5%. The three e-books are not suitable for use based on aspects of scientific literacy. This is because the percentage results on the e-book are different because of the difference in the percentage obtained in each category of scientific literacy.

The three e-books have different percentages because the e-books analyzed are disaster education e-books that contain scientific literacy. Some of the abilities that are expected to be mastered by students with scientific literacy include: having the ability to know and understand scientific concepts and processes needed to participate in society, the ability to find answers to questions that come from curiosity related to daily experiences, having ability and explain phenomena, can identify scientific problems (Kusuma, 2016). Related to this, the teaching materials used in learning must contain scientific literacy.

The e-books that are analyzed are disaster education e-books which are designed with different uses, some are devoted to learning for students in class so that they are in accordance with the curriculum and other e-books that are used to support student learning that promotes disaster education. The curriculum that refers to disaster education is found in Basic Competencies 3.11 and 4.11 concerning Earth Layers and Disasters (Kemendikbud, 2016). E-book A is a disaster education e-book used in junior high school science learning with the author Wahono Widodo et al, published by the Ministry of Education and Culture. E-book B is an e-book used by students to deepen their understanding and skills regarding disaster with the author Theophilus Yanuarto et al. E-book C is an e-book used by Magelang students to understand natural disasters that occur in the Magelang area with the author Setiyo Prajoko et al. The difference in the percentage of the three e-books analyzed can vary the results of scientific literacy for students. The higher the percentage of scientific literacy in the e-book, the easier it is for students to develop their scientific literacy skills. Mesa and Griffiths (2012) and Ramda (2017) state that textbooks are closely related to the curriculum. Textbooks used by students are books published by the Ministry of Education and Culture which are known as student books.

The four categories used to measure scientific literacy in science textbooks (modification of Chiappeta, et al. (1991) and Suharwoto, et al. (2015)) are: 1) Science as a body of knowledge in minimizing disaster risk; 2) Science as a way to investigate in emergency response planning skills; 3) Science as a way of thinking in simulation activities; 4) The interaction of science, technology with the community in the socialization of alertness. The average percentage of indicators for each category of scientific literacy in disaster education e-books can be seen in Figure 2.

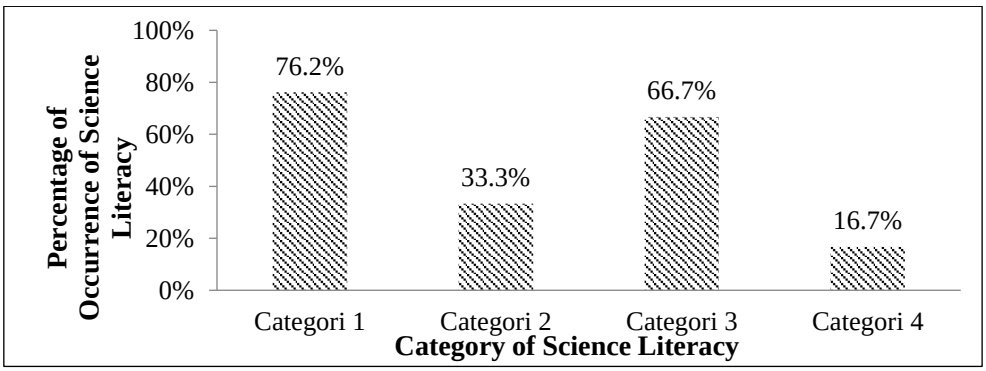

Figure 2. Category of Science Literacy in Disaster Education E-book

Based on Figure 2 it is known that category 1 dominates the other three categories with a percentage of 76.2%. These results are similar to research conducted by Chiappetta and Filman (2007); Ramnarain and Padayachee (2015); Udeani (2013) who states that the category of science as a body in his research is more dominant in the books analyzed. The category of science as a body of knowledge replaces the basics of understanding such as facts, concepts, principles, laws, theories, hypotheses, models, and others.

The results of this kind of research often occur in e-books that have been circulating and are used for students. When viewed from the facts, students are very good at memorizing, but less skilled in applying the knowledge they get. This is in line with Lailatul et al (2015); Ardianto and Pursitasari (2017); Maturradiya and Rusilowati (2015) stated that the impact of dominant science knowledge is that students become less skilled in implementing the knowledge they get. This is related to students' habits in using memory as a tool in mastering science, not the ability to think. This is because the provision of material is more concerned with knowledge, so students tend to use memorization as a vehicle to master knowledge, not their ability to think.

The second highest occurrence was category 3, namely science as a way of thinking in simulation activities with a percentage of 66.7%. Science is a human activity that is seen by the thinking techniques that occur in the minds of anyone involved in it. Activities carried out by scientists related to reason describe human curiosity and their hope of mastering natural phenomena. Science as a way of thinking in simulation activities as referred to in the e-book on disaster education is an illustration of how the steps in conducting disaster simulations are; show the causal relationship in disaster simulation activities; discuss facts and evidence in simulation activities; and simulation activities as a scientific method and problem solving.

Science as a way of thinking in simulation activities has an important position for the development of scientific literacy. This is because basically science has a causal relationship between observed natural phenomena, especially natural disasters. E-books used by students are required to contain something that can stimulate thinking, because it can attract students' attention in starting learning activities. This is supported by Ruwanto (2013); Ismet and Andriani (2017) state that textbooks should be used to initiate the student inquiry process and become an attraction for students in conducting investigations because textbooks that lead to inquiry can stimulate students to be active, not only receive information. This also proves that learning has provided students with opportunities to work together, share information and knowledge. Meanwhile, according to Erdogan and Koseoglu (2012), it is important to emphasize in an effort to shape students' thought processes so that improvement occurs. It must be underlined that to obtain this, science as a way of thinking must be emphasized more in textbooks.

Science is made up of a continuous method of inquiry. Scientific understanding can be formed when the intensity of people's attention to natural phenomena is further enhanced, for example through the use of scientific processes, such as observation, measurement, and various other methods. Category 2, namely science as a way of investigating, is the category that has the third largest percentage of occurrence with 33.3%. This percentage amount is much different from the total percentage in the first category. These results are in line with the research of Sandi et al (2014) through the analysis of physics textbooks which found that the category of science as a way of investigating was in third place. This indicates that the author of the book / e-book does not emphasize the development and presentation of science as a process in the lesson. Meanwhile, according to Toharudin, et al (2011); Lumpe and Beck (1996); Martin et al (2005) stated that the most important part in sians is when carrying out activities that are in the high cognitive category. Students should understand the nature of scientific inquiry, including the various scientific methods when performing hands-on activities at a high cognitive level. Process skills that have been successfully improved will ultimately encourage students to practice their scientific attitudes and thought processes. KPS encourages students to learn through experience, get meaningful information and gather knowledge by increasing understanding inside or outside of science learning.

Category 4 is science, technology, and society as an inseparable form of interaction. Science becomes the basis for technological advancement, while technology supports the advancement of science. The two of them have a reciprocal relationship. Increasing science is not always connected with aspects of the public interest, whereas technology is the application of science that is used to meet the interests of society. The percentage of category 4 is 16.7% where this category is the category with the lowest percentage. This is in line with research conducted by Kurnia et al. (2014) which states that the interaction category of science, technology, and society has the lowest occurrence compared to other categories.

This category is related to the dimensions of the scientific context, which presents all matters related to science and technology in everyday life, especially those related to alertness. This section is an interesting part for students when reading an e-book on disaster education. This is due to a phenomenon that is encountered in daily life. So, if this category is presented more in disaster education e-books, students'

interest in science lessons, especially disasters will increase and can be used as a strengthening concept. Nurfaidah (2017) states that technology should be included as a part of learning because basically science and technology also have an interest in a reciprocal relationship.

Based on the results of the analysis that has been carried out, the analyzed e-book includes all categories of scientific literacy. Thus, the e-book has reflected scientific literacy, even though the proportion of scientific literacy categories presented is not balanced because only one category dominates, namely science as the body in minimizing disaster risk. Of the three e-books analyzed, there is one e-book that is suitable to be used to support students' scientific literacy about hate, namely e-book A, although other e-books have a percentage that is not much different from e-book A, attention is needed so that the category of scientific literacy is included in more disaster education e-books.

CONCLUSION

There are four categories of scientific literacy analyzed, namely science as a body of knowledge in minimizing disaster risk; science as a way to probe deep into emergency response planning skills; science as a way of thinking in simulation activities; and the interaction of science, technology with the community in the socialization of alertness. The three e-books analyzed based on scientific literacy, obtained the results of the proportion of the scientific literacy category as follows: category one was 76.2%, category two was 33.3%, category three was 66.7%, and category four was 16.7 %. Overall, from the three e-books analyzed, category one got the highest percentage and category four got the lowest percentage. Therefore, it is necessary to pay attention so that scientific literacy is more balanced in the disaster education e-books used in science learning so that it can provide a complete picture of science for junior high school students. For teachers, they should understand scientific literacy and its indicators as a basis for choosing e-books that have balanced scientific literacy to be used as teaching materials. In this case the teacher must choose books that can support the active student learning process. And for writers, writing e-books, especially disaster education, in addition to referring to the curriculum in Indonesia, it should also refer to scientific literacy. For policy makers, dissemination of disaster education must be held in schools because this supports several disaster-prone areas.

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