

The Use of The Quizizz Application in The Scientific Literacy Assessment of High School Students On Global Warming Material

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Abstract

This research aims to describe the feasibility of the scientific literacy assessment instrument, describe the high school students' scientific literacy profile on global warming material, and examine scientific literacy instruments' practicality. The research data was collected using scientific literacy instruments with 16 multiple choice and four essays and student response questionnaires. This research refers to the ADDIE model. The analysis data of this instrument's feasibility is viewed from five criteria: the logical and empirical validity of the items, reliability, difficulty level, and distinguishing power. Student response questionnaires analyzed using quantitative descriptive methods. The sampling technique selected randomly. This study's limited trial subjects were 24 physics education freshmen at one of the state university in Surabaya city to determine the feasibility of the scientific literacy assessment instrument. Thirty-three students of Class XI MIPA 3 at one of the private senior high schools in Krian is a field trial. The results showed that the scientific literacy assessment instrument was feasible, with 10 of the 20 items developed. The average achievement of students' scientific literacy as a whole was 38. While the students' ability in each aspect, namely explaining scientific phenomena, designing and evaluating scientific investigations, and interpreting scientific data and evidence, is in a very low category, less than 50%. The practicality of the instrument developed with a value range of 62%-74% in a good category. This research can be used as an evaluation material in learning activities to be more effective and optimal in improving scientific literacy skills.

Keywords: Assessment; Global Warming; Quizizz Application; Scientific Literacy

Received : 18 April 2021

Accepted : 24 June 2021

Published : 30 June 2021

DOI : <https://doi.org/10.20527/jipf.v5i2.3309>

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How to cite: Nadhifah, A. & Jauhariyah, M. N. R. (2021). The use of the quizizz application in the scientific literacy assessment of high school students on global warming material. *Jurnal Ilmiah Pendidikan Fisika*, 5(2), 162-174.

INTRODUCTION

The Covid-19 pandemic has impacted all aspects of life, one of which is education. All schools and colleges have been closed since the Covid-19 pandemic. Online learning is a solution to overcome the limitations caused by the Covid-19 pandemic so that the

teaching and learning process can continue even though all schools are closed (Herliandry et al., 2020). Generally, the face-to-face learning process carried out the paper-based assessment. The use of this paper is a problem in the current Covid-19 pandemic era. Therefore, online media is

needed to apply current assessments. One of the appropriate media to use scientific literacy instruments during the Covid-19 pandemic is to use the Quizizz application. Due to this pandemic, teachers can use the Quizizz application as a medium of evaluation to achieve learning objectives (Salsabila et al., 2020).

Quizizz is a game-based application used as a learning evaluation medium (Citra & Rosy, 2020). Quizizz has several game characteristics, such as avatars, themes, and entertaining music in the learning process. Quizizz also permits students to contend with each other and encourages them to study even more complex. Students can use the quiz at the same time and look at their ranking on the leaderboard. During the quiz process, the teacher can monitor it, then the results of the report can be downloaded when the quiz finished evaluating student achievement (Rahman et al., 2020). The Quizizz application chosen because of its attractive appearance and easy problem arrangement. Besides, the Quizizz application is available for free, so both teachers and students only need to access the Quizizz application with a computer or android connected to the internet network.

Previous research showed that Quizizz is an alternative assessment medium during the Covid-19 pandemic and is effectively used to improve student learning outcomes (Citra & Rosy, 2020; Hikmah et al., 2021). Other studies also reveal that Quizizz has a significant impact on student motivation (Rahman et al., 2020; Wijayanti et al., 2021). It is also in line with research conducted by (Eddy et al., 2021) that Quizizz is an application suitable for interactive online learning evaluation media.

In the 21st century, it takes seven skills to face the advancement and requirements of the times. According to

Wegner (Pratiwi et al., 2019), these seven skills include (1) critical thinking and problem-fixing skills; (2) collaboration and leadership; (3) agility and adaptability; (4) initiative and entrepreneurial spirit; (5) capable of speak successfully each verbally and in writing; (6) capable of getting right of entry to and analyze information; and (7) have interest and imagination. Education is also increasingly important in the 21st century. It ensures students have studying and renewal skills, use technology and information, work, and survive using life skills (Pratiwi et al., 2019).

The goal of 21st-century education is to encourage students to master 21st-century skills and be beneficial for them to be more responsive to the changes and developments of the times. Therefore, the education system must consider several aspects of 21st-century education. Scientific literacy is one of the skills needed in the 21st century (Pratiwi et al., 2019).

Scientific literacy is knowledge and scientific skills to recognize questions, receive new knowledge, clarify scientific phenomena, attract conclusions based on facts, know science's characteristics, and awareness of how science and technology form the natural, also the willingness to embroiled and concerned approximately science-related issues (OECD, 2019). Scientific literacy used to solve life problems responsibly by using scientific methods so that life will be better (Fatmawati & Utari, 2016). Therefore, scientific literacy is considered a critical competency that is very important in facing the 21st century and human welfare challenges in the present and the future.

Science literacy has been seen since Kurikulum Tingkat Satuan pendidikan (KTSP) or the 2006 Curriculum. In KTSP, learning conducted through scientific discovery or inquiry activities. This activity involves a scientific

process. It is by the objectives of scientific literacy, namely identifying questions, drawing conclusions based on facts, and making decisions regarding nature and its changes. However, scientific literacy began to see in the 2013 Curriculum (Anjarsari, 2014). One of the differences between the KTSP and the 2013 curriculum is that the KTSP is a form of educational reform that gives schools and education units autonomy to develop a curriculum according to the potential, demands and needs of each region, while the 2013 curriculum is a competency-based curriculum designed to anticipate the competency needs of the 21st century (Harahap, 2017). Other differences include subject units, lesson hours of learning implementation, learning strategies and the process of assessing graduation competency standards. The 2013 curriculum emphasizes modern pedagogical concepts, theories, and dimensions in scientific learning that can be scientifically justified (Hakim, 2017).

In the 2013 Curriculum, the approach used is the scientific approach which consists of five activities: observing, request questions, experimenting/investigating, combining and conveying. Some sources say that the scientific approach is similar to the inquiry approach, so based on the system, the 2013 Curriculum shows scientific literacy development (Anjarsari, 2014).

The PISA results (Program for International Student Assessment) in 2018 show that Indonesia's scientific literacy skills are still low. PISA is a continuing program that monitors the knowledge and skills possessed by students around the world. This assessment program focuses on reading literacy, mathematical literacy, and scientific literacy, which conducted every three years. Each year has its respective main domain (OECD, 2019). Based on the PISA data of 2018, quotes

from Kompas media show that Indonesia is ranked 70 out of 78 countries with a scientific literacy score of 396. It offers a decrease in score from the previous year, namely 2015, where the Indonesian state obtained 403, ranked 64 of 72 countries (OECD, 2016).

PISA assessment is carried out for students not older than 15 years (Indrawati & Sunarti, 2018). It shows that the PISA assessment is only at the junior high school. Therefore, the evaluation of scientific literacy needs to be developed at the high school level to increase students' scientific literacy in Indonesia. The application of scientific literacy Applyingluate students' learning is essential to living amid a modern society in the 21st century.

The scientific literacy assessment carried out in this study focuses on global warming material. Therefore, the purpose of this research is to describe the feasibility of scientific literacy assessment instruments, describe the scientific literacy skills of high school students on global warming material, and examine the practicality of scientific literacy instruments.

METHOD

This research uses a development research type referring to the ADDIE development model (Analysis, Design, Develop, Implement, and Evaluate) (Mulyatiningsih, 2011).

The analysis stage includes analyzing the need for question development through literature study based on relevant research regarding the importance of scientific literacy and the evaluation media used and determining scientific literacy indicators based on the PISA scientific literacy competence. The design stage carried out by designing a grid of scientific literacy assessment instruments that referred to the PISA scientific literacy competencies and designing student response questionnaires.

The development stage carried out by compiling 20 items according to the assessment indicators consisting of 16 multiple choice questions and four essay questions then inputting them into the Quizizz application. Scientific literacy skills measured in terms of context, knowledge, and competency aspects refer to PISA's scientific literacy assessment framework. The first aspect consists of personal, local, and global contexts. The second aspect used in all questions is content knowledge. Simultaneously, the competency aspect consists of explaining phenomena scientifically, evaluating and designing scientific inquiry, and interpreting data and evidence scientifically.

Furthermore, two expert lecturers validated the assessment instrument to obtain logical validity from the aspect of material, construct, language, and media. The percentage of logical fact referring to (Riduwan, 2010) with the criteria $\leq 20\%$ is very lacking; 21%-40% less, 41%-60% sufficient, 61%-80% good, and $\geq 81\%$ perfect.

The implementation phase begins with a limited trial of 24 first-year students of the physics education study program at one of the state university in Surabaya city to decide empirical validity, reliability, difficulty level, and distinguishing power. The percentage of empirical validity and reliability referring to (Sugiyono, 2014) with the following criteria as shown in Tabel 1.

Table 1 Criteria of Empirical Validity and Reliability

Correlation Number	Criteria
0.80-1.00	Very high
0.60-0.79	High
0.40-0.59	Sufficient
0.20-0.39	Low
0.00-0.19	Very low

While the percentage of the level of difficulty referring to (Arikunto, 2012) with the criteria as shown in Tabel 2.

Table 2 Criteria of Difficulty Level

Value	Criteria
0.00-0.29	Difficult
0.30-0.69	Medium
0.70-1.00	Easy

While the percentage of distinguishing power referring to (Arikunto, 2012) with the following criteria as shown in Tabel 3.

Table 3 Criteria of Distinguishing Power

Distinguishing Power	Criteria
0.70-1.00	Very high
0.40-0.69	Good
0.20-0.39	Sufficient
0.00-0.19	Bad
Negative	Must be discarded

The results obtained can determine that the appropriate questions are used for field trials in class XI MIPA 3 at one of the private senior high schools in Krian (Sidoarjo, East Java, Indonesia) based on the feasible items. Therefore the profile of students' scientific literacy skills referring to (Purwanto, 2008) with the following criteria as shown in Tabel 4.

Table 4 Criteria for Assessing Students' Scientific Literacy Skills

Score	Criteria
86-100	Very Good
76-85	Good
60-75	Enough
55-59	Low
≤ 54	Very Low

The evaluation stage was carried out using a student response questionnaire to determine the effectiveness of the scientific literacy instruments developed. The percentage of student response questionnaire referring to (Riduwan, 2010) with the following criteria as shown in Tabel 5.

Table 5 Criteria of Student Response Questionnaire

Percentage	Criteria
0%-20%	Very Less
21%-40%	Less
41%-60%	Sufficient
61%-80%	Good
81%-100%	Very Good

RESULT AND DISCUSSION

Based on the needs analysis results carried out through literature studies, scientific literacy is necessary for the 21st century. Scientific literacy is critical to be mastered for every individual because it is closely related to understanding the environment and fixing problems faced by modern people. People are very dependant on the progress of science and technology (Kurnia et al., 2014). Besides, the 2013 Curriculum also indirectly implies scientific literacy because students must have the skills to use the knowledge acquired to face problems or make decisions related to issues that develop in society (Indrawati & Sunarti, 2018).

Previous research (Puspitasari et al., 2019) showed that the science literacy skills of high school students were still low. Other studies also reveal that the science literacy skills of high school students are not good (Prabowo et al., 2018). It is also in line with research conducted by (Rahmayani et al., 2019) that scientific literacy skills at high school students are low. Therefore, scientific literacy assessment needs to develop so that high school students' scientific literacy skills in Indonesia increased.

The scientific literacy assessment in this study focuses on global warming material. Global warming is a worldwide issue because the Indonesian people experience it, but almost all people feel the impact. Global warming in recent years expected to be continuous and sustainable. Increasing global warming is very concerning for the earth's future (Tham et al., 2016). Knowledge and understanding of global warming issues are fundamental so that human survival on the planet is maintained.

They were researching the pandemic, online evaluation media such as Quizizz needed because of their attractive appearance, easy preparation of questions, and free of charge by

connecting a computer or android with an internet network.

The development of a scientific literacy assessment instrument begins with compiling 20 items where each question refers to an indicator that has been made based on the PISA scientific literacy competency. All of the questions in this scientific literacy assessment are associated with phenomena that exist in real life. This assessment's types of questions are in the form of 16 multiple choice questions with five answer options and four essay questions.

In more detail, the description of the research results is as follows.

The Feasibility Instruments of Scientific Literacy Assessment

Good evaluation data by reality is called valid data. For the data to be accurate, it must use a useful instrument (Riyani et al., 2017). The validity test includes logical validity and empirical validity. Before the test questions tried out, it is necessary to test their logical validity (Purwanti, 2014). It done by means the assessment instrument was reviewed and validated by two expert lecturers covering content, construct, language and media. After the scientific literacy instrument test validated, it revised according to the suggestions given by the validator. Based on the two validators' assessment results, the presentation of each aspect presented in Table 6.

Table 6 Logical Validity Results

Aspect	Percentage (%)	Category
Content	92	Very Good
Construct	94	
Language	94	
Media	98	
Total	95	

The assessment instrument developed stated to be very good based on the results because it reached an average percentage above 61%, 95% (Riduwan

& Akdon, 2013). It shows that the instrument is valid for use.

Two essential requirements must be met for the instrument to be good, namely, valid and reliable (Arikunto, 2012). The assessment instrument's feasibility was supported by a limited trial on 24 first-year students of physical education class 2020 at one state university in Surabaya. The data obtained used to obtain empirical validity, reliability, difficulty level, and

distinguishing power to get suitable items for use.

For empirical validity, test result data were analyzed by correlating instrument items' scores using the Pearson product-moment formula (Riduwan, 2010). If the r_{count} value is greater than r_{table} , the correlation is significant, and vice versa (Arikunto, 2005). The empirical validity data of the results of limited trials can see in Figure 1.

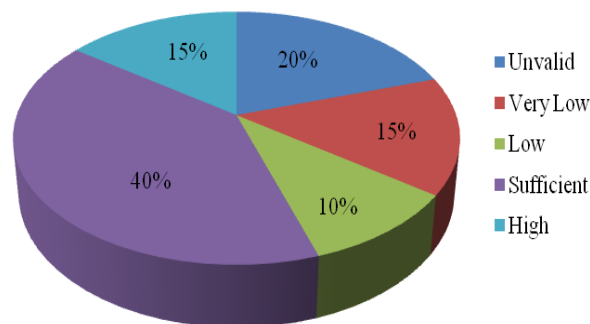


Figure 1 The Percentage of Item's Empirical Validity

The results of the empirical validity analysis of 20 items showed that 20% of the items were in the invalid category, 15% of the things were of the low sort, 10% of the questions were of the intense variety, 40% of the questions were of the medium category, and 15% of the questions were of the high sort. For questions with medium and high classes, the empirical validity value is above 0.396. So it can conclude that 11 questions are declared valid because $r_{\text{count}} > r_{\text{tabel}}$ where the r_{tabel} value is 0.396 (Rusydi & Fadhli, 2018).

The reliability test instrument calculated using the Kuder Richardson 20 (KR. 20) formula for multiple-choice questions. Cronbach Alpha formula for essay questions (Rusydi & Fadhli, 2018). Reliability shows how consistent the test score obtained from the measurement

results at different times (Kusaeri & Suprananto, 2012). So that the reliability value obtained is 0.530 for multiple-choice questions and 0.602 for essay questions. It shows that the scientific literacy assessment instrument developed is reliable because $r_{\text{count}} > r_{\text{tabel}}$ where r_{tabel} is 0.396 (Rusydi & Fadhli, 2018).

After the instrument has tested for reliability, the next step is to analyze the questions' difficulty level. A difficulty level is a number that shows the difficulty or ease of an item's (Arikunto, 2012). The instrument is said to be good if the level of difficulty of the questions is balanced or, in other words, not too easy and not too tricky (Lestari & Setyarsih, 2020). The data from the analysis of the scientific literacy assessment instrument's difficulty level presented in Figure 2.

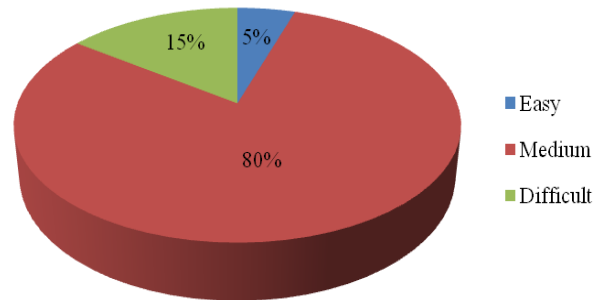


Figure 2 The Percentage of Item's Difficulty Level

The figure 2 shows that this assessment instrument's difficulty level is 1 question in the easy category, 16 questions in the medium category, and three questions in the challenging class. It found that 16 out of 20 questions declared good because of the level of difficulty included in the medium category.

Another aspect of the appropriateness of an assessment instrument is its distinguishing power. The typical capacity is to distinguish between high and low skills (Arikunto, 2012). The unprecedented power obtained from the calculation of the different power indexes. The results of the analysis of the specific power presented in Figure 3.

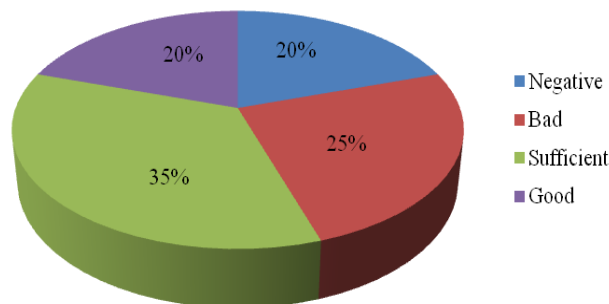


Figure 3 The percentage of item's distinguishing power

Based on Figure 3, the distinguishing power of 4 items (20%) is in the nasty category, five items (25%) are in the wrong sort, seven things (35%) are in the excellent variety, and four items (20%) included in the superb category. So that it found that 11 out of 20 questions stated to have good distinguishing power.

categories. They are reliable and have a moderate level of difficulty and distinguishability with excellent and reasonable types. The results of the feasibility test for these four aspects can see in Table 7.

The four aspects of the assessment instrument's appropriateness consist of empirical validity, reliability, difficulty level, and distinguishing power of questions described above. The test items are suitable for use if they have practical reality in the medium and high

Table 7 Item's Number for Each Aspect of Feasibility Instrument

Aspect	Item's Number
Empirical Validity with Valid Categories	1, 2, 4, 6, 7, 11, 14, 16, 17, 18, 19
Difficulty Level with a Moderate Level	1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 15, 16, 17, 18, 19

Distinguishing Power with Sufficient and Good Categories	1, 2, 3, 4, 5, 6, 7, 11, 16, 17, 18, 19
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Based on the Table 7, it can seem that the questions with the numbers 1, 2, 4, 6, 7, 11, 16, 17, 18, 19 are valid items with a level of difficulty in the medium category and good distinguishing power. For number 14, it is not suitable to be used even though it is in the correct type because of the difficulty level and the specific ability, which is not good categories. The explanation above explains that the scientific literacy assessment instrument developed is reliable with a reliability coefficient of 0.530 for multiple-choice questions and 0.602 for essay questions. Thus it can conclude that the ten questions (50%) are declared fit for use.

Profile of Students' Scientific Literacy

The application of scientific literacy assessment as an evaluation in student learning is essential to modern society in the 21st century. With the concept of scientific literacy, students expected to have a high level of concern for themselves and their environment in facing life problems and make decisions based on their knowledge (Wulandari & Sholihin, 2016). Instruments that have been declared fit for use are as many as ten items which are then implemented to 33 students of class XI MIPA 3 at one of the private senior high schools in Krian (Sidoarjo, East Java, Indonesia). It had done to identify students' scientific literacy profiles. The results of the assessment of students' scientific literacy abilities can see in Figure 4.

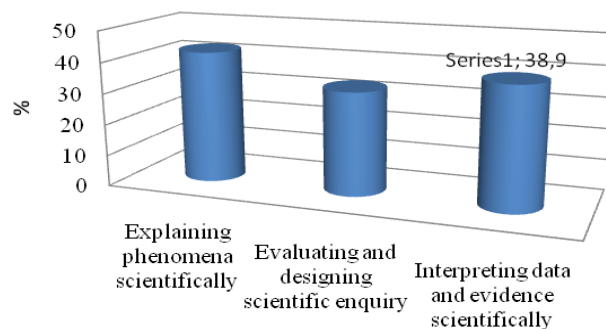


Figure 4 The Percentage Score Students' Scientific Literacy Skills

The picture above shows that students' scientific literacy skills at one of the private senior high schools in Krian are deficient. The research data presented are interpreted based on the student learning outcomes criteria proposed by (Purwanto, 2008).

Regarding indicators for each aspect of scientific literacy, the lowest ability to evaluate and design scientific inquiry is 33.1%. Type of item is in this aspect requires students to design experiments and evaluate a scientific investigation based on the information provided. Students have difficulty developing an

inquiry into global warming material because this material rarely conducted in experiments. Besides, the form of questions used in creating scientific studies is essay questions so that the expected answers are not appropriate and sometimes out of sync with the questions.

While other scientific literacy abilities are the highest in explaining phenomena scientifically, which is 42.4%, the types of questions used in this aspect are multiple-choice questions. Students are required to choose an answer that explains scientific

phenomena based on the information presented. The percentage of students' scientific literacy skills was 38.9% in interpreting data and evidence scientifically. In this aspect, students must analyze the data in the form of tables and graphs provided. In general, the average scores of scientific literacy skills of students is equal to 38.

Figure 4 shows that the average percentage of the three students' scientific literacy skills are less than 50%. It is relevant to the results of (Hidayah et al., 2019) research that there is a relationship between science knowledge and science application. The low level of one of the scientific literacy abilities will affect literacy skills.

Several factors cause students to have low literacy skills. Based on the monitoring, when students worked on the science literacy assessment, students only logged in to the Quizizz application and returned to work a few minutes later. Some students also answered questions quickly and took too long from the specified time because, in the Quizizz application, there was a time indicating how long the student worked on the question. The Covid-19 pandemic caused this research not to be carried out offline so that the teacher could not condition the students when they worked on the questions.

The mastery of science literacy skills influenced by several factors-including science learning methods can arouse student curiosity, such as practicum activities related to learning topics to encourage student enthusiasm to solve problems presented by the teacher (Wulandari & Sholihin, 2016). It is believed in building science process skills that are part of the competency aspects of scientific literacy.

Students' scientific literacy abilities are only in the category where students choose a statement based on the problem presented. Still, students are unable to provide a scientific explanation. These

factors indicate that teachers and the learning process in schools influence students' scientific literacy (Hidayah et al., 2019). However, learning activities were not as usual because of the Covid-19 pandemic. Understanding the concepts possessed by students depends on the discipline of the students themselves. Therefore, online learning demands the educator's role to evaluate its effectiveness according to education needs to continue to meet learning aspects such as knowledge, morals, skills, intelligence, and aesthetics (Herliandry et al., 2020).

Concept understanding and students' scientific literacy skills have the same or comparable tendency (Prabowo et al., 2018). So it can be said that students' understanding of the concept affects students' scientific literacy skills. Students' scientific literacy can grow with the support of reading interest and mastery of learning concepts (Diana et al., 2015).

An assessment will be better if it is related to real-life because it is more meaningful for students. Similar to the scientific literacy assessment developed, all questions in this scientific literacy assessment are associated with phenomena that exist in real life. An evaluation using pictures or real cases will leave the memory that the application of physics concepts learned can help him make decisions in society in this 21st century. When someone has the feeling to apply their knowledge to behave better, that is a sign of growing scientific literacy (Wasis et al., 2020).

The Practicality of The Scientific Literacy Instruments

The practicality of scientific literacy assessment instruments used can be seen through students' responses after filling a questionnaire. The reaction of this questionnaire used contained 15 questions which divided into three aspects, 1) Science literacy instrument

construct, 2) Student interest in scientific literacy instruments on global warming material, 3) Use of scientific literacy test instruments using the Quizizz application. The percentage of student responses to the science literacy

assessment instrument implemented for class XI MIPA students at one of the private senior high schools in Krian (Sidoarjo, East Java, Indonesia) can see in Figure 5.

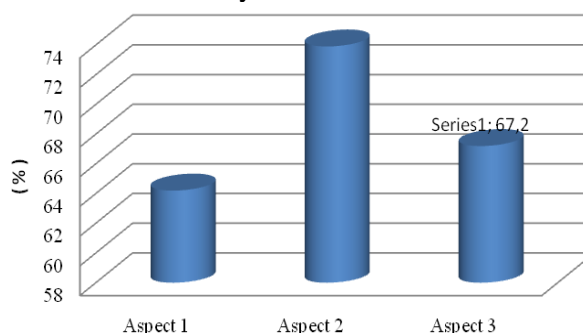


Figure 5 Result of Student Responses to The Science Literacy Assessment Instrument

For Information

Aspect 1: Constructs of scientific literacy instruments

Aspect 2: Students' interest in scientific literacy instruments on global warming material

Aspect 3: Media of scientific literacy test instruments using the Quizizz application

Based on Figure 5, it appears that all aspects are in a suitable category. The first aspect, namely the construction of the scientific literacy instrument, is equal to 64.2%. This aspect contains questions about the instructions for solving the questions, the ease of understanding the language and the material in the questions, the functioning of images, graphs and tables, and the relation between questions and daily life. The lowest percentage was on understanding the material and language conveyed in the questions in this aspect. Some students have difficulty understanding the questions asked.

While student interest in assessing scientific literacy on global warming material is equal to 73.9%, the highest percentage obtained in this aspect, according to the response questionnaires filled out by students, became more

interested, motivated, increased understanding and knowledge, and increased curiosity about global warming issues.

The last aspect, namely using Quizizz as a medium for assessing scientific literacy instruments, obtained 67.2%. This aspect consists of questions about attractiveness, ease of use, feelings when using Quizizz, and the effectiveness of using Quizizz in assessing scientific literacy. Using Quizizz gets the most significant percentage in this aspect because of its easy and attractive use. In line with (Mulatsih, 2020), Quizizz is an exciting and fun evaluation medium. Thus, the Quizizz application is effectively used as a medium in assessing scientific literacy.

CONCLUSION

Based on the results and discussion presented, as many as 10 of the 20 items (50%) developed have logical and empirical are valid for use, reliable, has a difficulty level with a medium category and has distinguishing power from sufficient to good distinction category. So it can conclude that the scientific literacy assessment instrument for high school students on global warming

material that has developed is feasible to use.

Students' scientific literacy skills at one of the private senior high schools in Krian (Sidoarjo, East Java, Indonesia) are in the deficient category with an average value of 38. Students' scientific literacy profile based on the PISA aspect is still dominant in explaining scientific phenomena. At the same time, evaluating and designing scientific inquiry has the lowest rate.

The assessment instrument developed also practices the questionnaire analysis results on students' responses in a suitable category. This research can be used as an evaluation material in learning activities to be more effective and optimal in improving scientific literacy skills and contributing to other researchers' ideas in preparing scientific literacy assessments.

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