

The Effectiveness of the Online-based Test of Scientific Literacy Skills (TOSLS) Assessment to Measure Science Literacy Ability During the Covid Pandemic

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Abstract

The purpose of this study is to analyze the effectiveness of assessments using online-based TOSLS during the Covid 19 pandemic. Therefore, to achieve these objectives researchers used data collection techniques by observation, questionnaires, and tests. The data were processed using quantitative analysis to determine the effectiveness of the online-based TOSLS assessment. The results of this study indicate that the effectiveness of the assessment using online-based TOSLS is 67.76 with good criteria. This is reinforced by the results of observations and student responses, namely 78% and 82% with high criteria. It can be concluded that the online-based Test of Scientific Literacy Skills (TOSLS) assessment is effective for measuring scientific literacy skills.

Keywords: assessments, Test of Scientific Literacy Skills, scientific literacy;

1. Introduction

During the Covid 19 pandemic that occurred for more than 1 year, it had a major impact on the education sector. This led the government to adopt a policy to conduct online learning. Online learning must still be done so that learning objectives are achieved. Teachers must be able to make effective and attractive online learning plans so that students don't feel bored. Online learning planning, especially in science learning, means that teachers must be able to make online lesson plans, choose learning models and methods, and assess learning. This actually has a positive impact on learning along with the development and advancement of increasingly sophisticated technology. Teachers and students are starting to be required to use and utilize this information technology in the learning process. Initially, the teacher did not master and develop assessment instruments through existing applications.

Assessment in learning is a process or an effort to obtain a number of information about developments as material in decision making by the teacher to find out and improve the process and student learning outcomes. Activities in learning evaluation, especially student assessment, are an important and integral aspect of learning in schools (Imania, 2019). Science lessons are subjects in which there is scientific literacy, scientific literacy means that in the curriculum students are required to be literate

towards science in accordance with the principles of scientific work. The importance of scientific literacy in science learning in junior high school is to prepare students to face everyday life in solving problems in accordance with the development of modern technology (Artati, 2013). In learning science, scientific literacy is very important, this is in accordance with the development of science and technology in society and in this era of globalization, so an assessment instrument for the TOSLS is needed to determine the extent of students' literacy skills, so that students are able to make scientific decisions with good (Utami, 2019). This TOSLS assessment is an instrument developed by Gormally (2012). The importance of teachers in making online-based assessment instruments during a pandemic is a must as a form of innovation in distance learning assessment.

The results of interviews with teachers at the SMPN 1 Srono school, Banyuwangi Regency that they had never used an online-based TOSLS assessment instrument during the pandemic, so researchers conducted trials and saw the effectiveness of the online-based TOSLS instrument if implemented in science learning at SMPN 1 Srono for measure scientific literacy skills. Scientific literacy is the ability to use scientific knowledge, communicate science, and apply it to solve problems based on scientific phenomena (Yuliati, 2017). The importance of scientific literacy in junior high school science learning is so that students understand what is being learned and can apply it in solving problems in everyday life (Utami, 2019). So in science learning in junior high schools, scientific literacy is very important. So that teachers know the extent to which students' scientific literacy skills can be measured using TOSLS, where TOSLS is developed by researchers and tested to see the effectiveness of this instrument in online learning. The implementation of TOSLS is through the Google Form application, where the researcher has prepared questions according to the TOSLS indicator which is then applied to class VII students of SMPN 1 Srono Banyuwangi.

Scientific literacy is one of the elements assessed in the International assessment program. The results of PISA Indonesia show that the scientific literacy of Indonesian students is still low. Any factors that influence it, such as school infrastructure, learning media, and evaluation affect students' scientific literacy (De Moraes, 2010). Several studies related to scientific literacy are expected to be the basis for formulating goals and strategies that can improve students' scientific literacy skills in order to achieve the set targets (Odja, 2014). That students' science knowledge and skills are low on dimensional science competence. This is caused by several factors. Students also do not understand about it, because the level of reading and analysis is low (Purwani, 2018). The result observation for 1 month indicates that science learning in school has been going well and is in accordance with the curriculum, but has not been guided by science literacy-based learning. This can be seen from the many components of scientific literacy that have not been implemented, such as science learning that has not identified scientific issues, explained phenomena, interpreted scientific evidence, identified assumptions, evidence, and the reasons behind conclusion, reflected on the social implication of science and technological development. Science learning in school tends to be on the content dimension more than to be on the context and competency dimensions (Sartika, 2021).

Based on the problems, the researcher wants to apply the TOSLS assessment instrument to class VII students of SMP Negeri 1 Srono Banyuwangi Regency online because it is still in a pandemic period with the aim of measuring students' scientific

literacy skills. It is important to analyze scientific literacy skills as an effort to determine the level of students' scientific literacy and efforts to increase scientific literacy so that they are able to provide solutions in everyday life. The importance of scientific literacy for students on Junior High School, the researchers conducted a study entitled "The effectiveness of the online-based TOSLS assessment to measure scientific literacy skills during the COVID-19 pandemic"

2. Research Method

The research method used in this research is descriptive quantitative. The subjects of this study were students of class VII SMP Negeri 1 Srono Banyuwangi. The data collection techniques using tests, observations, and questionnaires. The research instruments included online-based TOSLS questions, observation sheets and student response questionnaires. In this study the effectiveness of online-based TOSLS assessments can be measured through: (1) the results of student assessments using online-based TOSLS (2) Implementation of online-based TOSLS assessments through observation sheets, and (3) student responses / responses through questionnaire sheets. The data analysis technique used in this research is the analysis of test results using the TOSLS instrument. The assessment score is in accordance with the reference indicators contained in the TOSLS (Gormally, 2012).

Table 1. Score Interpretation Criteria

Score	Criteria
$80 \leq x \leq 100$	Very good
$66 \leq x \leq 79$	Good
$56 \leq x \leq 65$	Enough
$40 \leq x \leq 55$	Less
$30 \leq x \leq 39$	Very less

3. Result and Discussion

Data analysis is intended to determine the effectiveness of online-based TOSLS assessments in science subjects. TOSLS has 2 indicators and 9 Sub Indicators. The test was given by seventh grade students in science subjects on natural phenomena and scientific work. Class VII has 8 classes, the average test results based on indicators and sub indicators can be seen in table 2 below

Table 2. Test Results

Indicators	Sub Indicators	Test Results			Average	Category
		1	2	3		
Understand scientific research methods	1. Identification of scientific arguments	86,2	85,9	86,2	86,1	Very good
	2. Literature search based on scientific method	58,7	57,9	57,3	58,0	Enough
	3. Evaluation of the use					

	of scientific method						Good
	4. Understand scientific discoveries	66,9	65,5	65,9	66,1		Good
		75,6	74,6	74,1	74,8		
Analyzing quantitative data and scientific information	1. Creating graphics	68,7	65,7	65,1	66,5		Good
	2. Interpret data	64,2	64,1	63,2	63,8		Enough
	3. Problem solving	74,3	75,8	75,3	75,1		Good
	4. Understand to interpret basic statis	50,1	50,1	51,9	50,7		Less
	5. Presenting conclusions	68,5	67,2	69,9	68,5		Good

Based on the Table 2 above, the test results of the online-based TOSLS assessment instrument were carried out 3 times, this was replicated so that the results were more accurate. The effectiveness of the assessment referred to in this study is (1) the TOSLS assessment instrument can be used to measure scientific literacy skills, (2) the average score of the test results meets the good criteria, (3) the assessment is carried out online, does not use examination paper, this will save costs so that it can be said effectively. Effectiveness means successful or effective (Listiana, 2013). Effectiveness is a measure of how far the success of the goals that have been determined is a benchmark or indicator where the target has been achieved in accordance with what has been planned. Assessment is part of learning at school which aims to determine students' mastery of facts, concepts, principles, and laws in science and their application in everyday life. It is hoped that students will be able to use their understanding and skills to make decisions and be able to compete in the industrial revolution 4.0 (Utami, 2019).

Scientific literacy according to PISA is a student's skill in scientific knowledge, which includes identifying questions and drawing conclusions in order to be able to make decisions about problems in life. This definition of scientific literacy involves scientific literature as a reference, not only an understanding of scientific knowledge, but the ability to solve everyday problems. PISA also assesses students' skills in scientific inquiry, awareness of how science and technology shapes material, intellectual and cultural environment, and willingness to engage in science-related problems and solve them (OECD, 2006). Students who have scientific literacy skills have a better chance in real life such as the world of work and the global community. This means that students are able to think critically, creatively, able to formulate strategies, and be able to be responsible for the decisions taken (Yuenyong, 2009).

This is reinforced by the results of student observations in working on TOSLS which include students receiving test questions well online, students doing test questions independently, students collecting their work online, and students filling out student response questionnaires. Student observations are shown in Table 3

Based on table 3, the results of student observations obtained an average of 78 which can be categorized as high, this is in accordance with the criteria for student activity. Student observation indicators include students being able to receive test questions well online, this can be seen from the activeness of students when researchers provide TOSLS questions through the WAG application, so this indicator has the highest average score of 80%. Students collect the results of their work according to the

specified time, namely 76%, the researcher gives 60 minutes to work on 40 TOSLS questions

Table 3. Students Observation Results

Indicators	Percentage (%)
Students receive test questions online (Whatsapp)	80
Students submit their work on time	76
Students fill out a student response questionnaire	79
Average	78

. After the students worked on the questions, the researcher gave a student response questionnaire through the Google Form application. Students responses are obtained in Table 4 below

Table 4. Students Response Results

Indicators	Percentage (%)
The use of language that is easily understood by students is in accordance with EYD	79
Readability of the picture in the problem	81
The benefits of questions can measure scientific literacy skills	87
Average	82,33

Based on table 4 above, the results of student responses obtained an average of 82.33 which can be interpreted as very good. Student response indicators include 3 indicators, namely (1) The use of language that is easily understood by students, namely obtaining 79%, which means that the TOSLS questions are easy to understand, the readability of the questions is clear, and in accordance with clear language writing. (2) Readability of the pictures in the questions obtained 81%, meaning that the pictures contained in the questions could be read and understood by students, so that students were able to analyze the images well. (3) The benefits of the questions can measure the scientific literacy skills by 87%. In this case, it can be concluded that 87% of students answered TOSLS can assess scientific ability by online. The importance of the student response instrument is to evaluate the TOSLS questions that have been given by researchers to students, from the results of student responses the researchers can conclude that in the TOSLS questions the use of language is in accordance with the rules of good and correct Indonesian, clear image readability, and TOSLS questions are able to measure science learning, especially in the material of natural phenomena and scientific work.

Teachers must be able to create and develop innovative assessment instruments to measure learning targets achieved even in pandemic conditions. In science learning, one of the targets that must be mastered is scientific literacy and online implementation techniques. There are many benefits of doing tests online, including allowing tests

wherever they are, reducing time for test assessment work to make written reports, eliminating logistical work such as distributing, storing and using paper tests, test participants can immediately find out the results. Assessment in learning is a process or an effort to obtain a number of information about student development during learning activities as material in decision making by teachers to find out and improve the process and student learning outcomes. In the context of education, the implementation of the assessment in schools is part of the learning process, namely a reflection of the understanding of the development or progress of individual students. The implementation of assessments in schools can include activities to observe, collect, score / assess, describe, and interpret information about the student learning process (Imania, 2019).

States that through science, people can learn not only how to solve problems in everyday life using science and technology, but also to assess the application and effects of those findings. The hope is that science learning can shape the character of students who are literate in science and technology (Chabalengula, 2008). Therefore, students must be equipped with scientific knowledge or science activities at school in order to be able to equip students to be able to solve everyday problems. Teachers must be able to facilitate and create assessment instruments to measure students' scientific literacy skills, one of which is the TOSLS instrument.

4. Conclusion

The results of this study indicate that the effectiveness of the assessment using the online-based TOSLS is that the first trial has an average of 68.17, the second trial is 67.45, and the third trial is 67.67. Based on the indicators, indicator 1 gets an average of 71.26 and the second indicator gets an average of 64.97. This is reinforced by the results of observations and student responses, namely 78% and 82.33% with high criteria.

Acknowledgements

The researcher would like to thank LPPM Universitas PGRI Banyuwangi which has supported and assisted in the smooth running of this research.

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Jurnal Petik Volume 5, Nomor 1, Maret 2019-32 ISSN: 2614-6606

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