A HOTS-Based Digital Measuring Instrument for Reading Literacy Skills in the Indonesian Context

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Abstract. The COVID-19 pandemic has brought major changes and has had a wide impact on the education system in Indonesia, including the assessment system. An assessment instrument is needed to overcome distance and time constraints, especially for the assessment of reading literacy. This study aims to develop a digital-based measuring instrument for reading literacy that can be used for students to practice anywhere and anytime. The method used in this study is research and development through a 4-D model (define, design, develop, and disseminate). The participants are instrument experts and junior high school students. The data collected are processed qualitatively and quantitatively according to the types of data. The findings indicate that based on the expert judgment, the HOTS-based digital assessment instrument for reading literacy developed in this study has been declared valid. The instrument that has been developed can be used to measure the reading literacy skills of junior high school students. Based on this conclusion, the developed instrument can be used by students to practice to answer HOTS-based reading literacy questions.

Keywords: higher order thinking skills · reading literacy · digital measuring instrument

1 Introduction

The COVID-19 pandemic has brought major changes and has had a wide impact on the education system in Indonesia, even in almost all countries. Nearly 1.7 billion students from more than 190 countries and 94% of the world's student population are affected by the pandemic [1, 2]. Restrictions on study space, on interaction, and on communication have changed the educational practice. The school closures and the regulation of social movements in the school environment have implications for traditional educational practices. In fact, the recent reopening of schools after the policy for easing restrictions on learning activities poses new challenges for the operational procedures of the education system.

Meanwhile, educational activities must continue and cannot be separated from reading literacy. A person will gain access to the world of knowledge and gain success in education with reading literacy [3]. [4] A well-known person in reading education,

W. Yunita and M. Fadhli (Eds.): ICETeP 2021, ASSEHR 680, pp. 52–61, 2023.
https://doi.org/10.2991/978-2-494069-19-0_7

argues that reading is the heart of education. If people want to be educated, then they must read. No one can be educated without reading.

Reading activities will not be completely replaced by other activities in many educational activities which are carried out by processing information. By strengthening reading literacy, education can lead students to understand information that comes quickly for the right life [3]. Printed educational media, such as books, articles, newspapers, magazines, papers, and online media contain information that must be understood through reading literacy. Reading literacy is not only the basis of achievement in the education system but also a prerequisite for successful participation in most areas of life [5].

To see their achievement, an assessment activity is needed. Reading literacy assessment is an important part of learning decision making [6]. The use of assessment data is important to make decisions about learning to achieve the expected goals. [7] Show that assessment is a process of collecting data to identify and understand student learning.

The basis for the assessment that can be chosen to determine a person's ability to understand reading information is the principle of higher-order thinking. [8] States that higher order thinking occurs when a person reads. It is when he takes new information and stored information in memory which are interconnected. Various reading literacy goals can be achieved through higher order thinking.

In relation to the impact of the COVID-19 pandemic, the challenge faced is that reading activities in the educational process must be able to adapt to space restrictions and to the choice of learning media. This condition has an impact on the way of independent learning, learning by distance interaction, and the choice of digital-based media. Likewise, the reading literacy assessment process must be in line with the educational process. How is a reading literacy measuring instrument in the context of the COVID-19 pandemic developed?

1.1 HOT-Based Reading Literacy Assessment

Before moving on to the description of the reading literacy assessment, the definition of reading literacy itself is first conveyed. PISA 2018 [9]. Defines reading literacy as understanding, using, evaluating, contemplating and engaging with texts to achieve one's goals, to develop one's knowledge and potential, and to participate in society. This definition becomes the alignment for determining the principles of literacy assessment and literacy assessment parameters.

Reading literacy assessment is an important part of learning decision making [6]. The use of the assessment data is to make decisions about teaching and supports for learners in achieving the expected goals. A more complete explanation is put forward by [7] that assessment is a process of collecting and analyzing data to identify and to understand student learning. Assessment is important since it allows teachers to discover each student's strengths and weaknesses in order to plan appropriate teaching, to communicate student progress effectively, and to evaluate the effectiveness of teaching strategies. Assessing student learning should be an integral part of teaching. This acts as a basis for designing appropriate intervention plans that become the learning scaffold.

For the coverage of reading literacy assessment materials, several theorists have developed their assessment indicator formulations. Each formulation is in accordance

with the basis that it refers to. Several formulations that identify reading literacy parameters are similar to Bloom's Taxonomy formulations, such as being able to describe, explain, analyze, and evaluate which are spread across all grade levels. However, to achieve the goals of meaningful learning in the context of reading literacy, an assessment framework is needed that combines more specific dimensions and is in line with the objectives of reading learning.

Many studies have proved that there is a relationship between learning objectives to achieve reading skills and higher order thinking skills. For example, [10] clearly show that reading is a thought process to construct meaning. Good readers are able to remember and discuss in depth what they have read. Readers who are at the stage of deep reading comprehension must carry out the understanding process at a higher level of thinking.

The explanation of higher order thinking (HOT) in [8] occurs when a person retrieves new information and information stored in memory which are interconnected. It can also be seen that HOT occurs through rearranging and expanding information to achieve goals or to find possible answers even in unclear contexts.

Readers who are at the stage of deep reading comprehension must carry out the understanding process at a higher level of thinking. Higher order thinking includes critical, logical, reflective, metacognitive, and creative thinking. These skills are activated when students of all ages face unfamiliar problems, uncertainties, questions, or dilemmas [11].

1.2 Reading Literacy Assessment Through Digitalization

Educators can use digital tools for assessment, including reading literacy assessments. The reading literacy assessment has an interest in choosing digital as part of its implementation. It was offered as an optional component of PISA in 2009 and 2012 [9].

Online assessments allow students to work on computers or with a wide variety of devices. They can choose the questions that will be done first more easily. They can focus more on the texts. Computers can be used to more easily scan the results of answers that have been completed by students. The computer can automatically analyze students' answers thereby freeing the teacher from this task. According to [12], presenting readings and items through a computer provides a visually engaging experience that will motivate students and increase operational efficiency.

Taking a test via the web is done by searching, understanding, and studying information from the internet involving understanding information that can be arranged in a complex context. Traditional printed texts are usually read linearly while reading web-based texts can be done by searching several texts related to questions/tasks online. Then test takers/students create their own reading path. Firstly, the reader must access the appropriate website. Next, they use navigational strategies (for example, some navigation and subnavigation menus and links) to move efficiently across one web page or site to the next site. Basically, reading for the purpose of understanding information on the internet requires all reading comprehension skills when they read printed texts. However, on the internet students can be exposed to more and more complex information

[14], Therefore, online text readers must use very different reading comprehension skills and strategies.

2 Research Methodology

2.1 Research Methods

This study is carried out based on the Research and Development steps through a 4-D model, namely define, design, develop, and disseminate [13]. This model is chosen because the concept is in line with the steps of developing learning tools, including a learning measuring instrument as the product that will be produced by this study. There are four research steps carried out, as shown in Fig. 1.

2.2 Research Site

The study is conducted in various regions in Indonesia. To ease the identification of the classification of research areas, two operational research areas are determined, namely Java and outside Java. For development studies, schools are from West Java, East Java, Bali, East Kalimantan, and Bangka Belitung.

2.3 Research Subject

In relation to the research steps, the data collected come from the results of expert appraisal, reading literacy test results, and participant responses. The experts are literacy experts and learning experts. Junior high school students who are tested for the limited test come from 4 schools, for the extensive test come from 7 schools, and for the dissemination test come from 8 schools. User responses are obtained from the students and the teachers from 6 schools. The Junior high school code tested in the limited test, extensive test, and dissemination test can be seen in Table 1, with the names recorded by the author (Table 2).

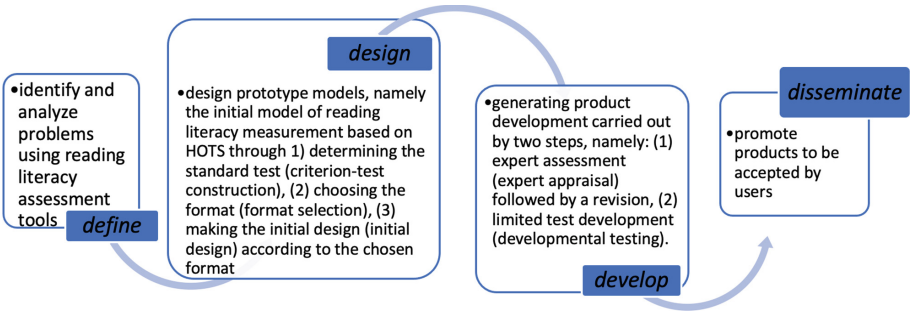

Fig. 1. 4D model

Table 1. Research Subject

Schools	Treatment
SMPN A Bandung	Limited test
SMPN B Malang	Limited test
SMPN C Bali	Limited test
SMP D Bandung	Limited test
SMP E Kabupaten Bandung	Extensive test
SMP F Malang	Extensive test
SMP G Bali	Extensive test
SMP H Bandung	Extensive test
SMP I Bandung	Extensive test
SMP J Bandung	Extensive test
SMPN K Padang	Extensive test
SMPN L Kabupaten Nganjuk	Dissemination test
SMPN M Kabupaten Nganjuk	Dissemination test
SMPN N Kabupaten Blora	Dissemination test
SMPN O Bontang	Dissemination test
SMPN P Bontang	Dissemination test
SMPN Q Bangka Belitung	Dissemination test
SMPN R Bangka Belitung	Dissemination test
SMPN S Bangka Belitung	Dissemination test

Table 2. HOTS-Based Reading Literacy Measuring Instrument

Aspect	Description
Indicators of Higher Order Thinking Skills	cognitive, comprehension, critical thinking, creative thinking, scaffolding, schemata, inquiry or discovery, metacognition, scripts, graphic frame, transfer
Text type	argumentation, narrative, fantasy story, exposition, advertisement, observation report, short story, procedure, transactional
Question types	Multiple choice, short answer

3 Findings and Discussion

This study is conducted to develop a reading literacy assessment product based on higher order thinking skills. To meet the needs of this COVID-19 pandemic, products are made through digitalization using Android app.

3.1 HOTS-Based Reading Literacy Measuring Instrument Product

The following is an overview of the research product in the form of an example of questions used in Android app (Fig. 2).

This instrument consists of three products, 1) SET A with focusing on Indonesian cultural content, 2) SET B with focusing on future perspectives content, and 3) SET C with focusing on life skills content. The three content materials are presented in nine types of texts with material on Indonesian issues, including actual problems, such as the COVID-19 pandemic and online learning. The product is displayed through digitalization and used by users using Android devices. The following is an example of a product display (Figs. 3 and 4).

Application Name: HOTS-Based Reading Literacy Measuring Instrument
Application description: Application to calculate Reading Literacy Skills
Application link: app1.kemhots.id.

3.2 Test Results of Effective Reading Literacy Skills

The results of the reading literacy effectiveness test of junior high school students are obtained through the use of the HOTS-Based Reading Literacy Measuring Instrument. The following graph shows the test result data (Fig. 5).

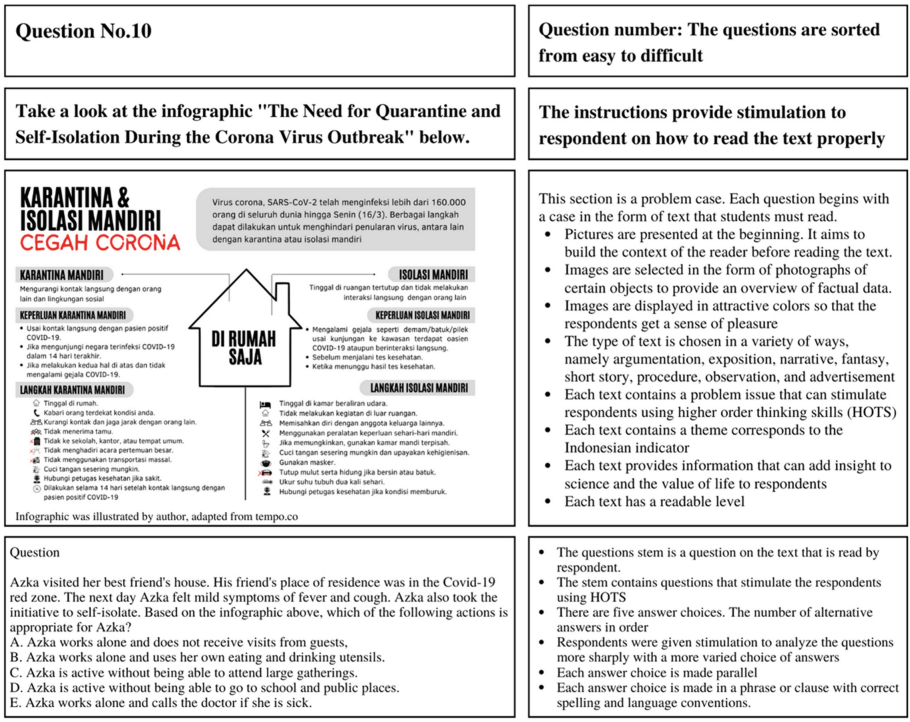

Fig. 2. Reading literacy assessment instrument with HOST-based development process flow

Fig. 3. Android application visualization of HOTS-Based Reading Literacy Measuring Instrument (illustrated by author)

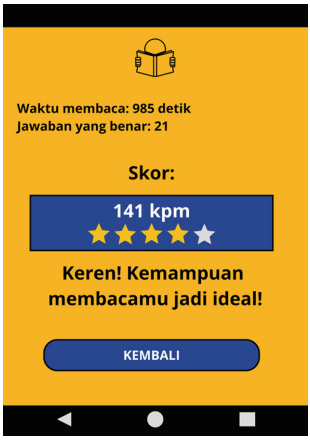

Fig. 4. Implementation of the use of the instrument (illustrated by author)

3.3 Discussion

This study shows that the highest reading literacy skills are knowledge ability. It means the ability that most students master is the ability to identify and remember factual data that is exposed to the text. The ability to read this level of knowledge is the ability with the lowest level [15].

The Reading Literacy Measuring Instrument also proves that the junior high school students have low abilities in understanding reading critically and creatively. Cognitive, critical, and creative abilities are in the hierarchy of high and complex cognitive levels [16]. According to PISA, critical readers are usually able to make several complete

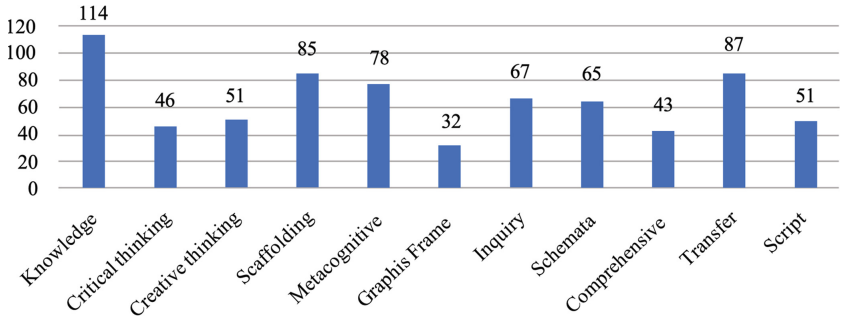

Fig. 5. Reading Literacy Skill Test Results of Junior High School Students

and detailed conclusions, comparisons, and understandings. They can hypothesize or critically evaluate complex texts on previously unknown topics [9] économiques, O. de coopération et de développement, 2019). To understand the reading thoroughly, one must be able to use the information to draw conclusions and apply ideas to the actual situation [7]. It shows that indeed, junior high school students in Indonesia do not have higher order thinking skills in understanding and dealing with problems in reading. The Reading Literacy Measuring Instrument developed is able to accurately determine reading ability.

However, different from other literacy measuring instrument results, this Reading Literacy Measuring Instrument developed proves that the reading literacy skills of junior high school students are not at a very low level of ability. Their reading literacy skills, both critical reading skills and creative reading skills, are close to achieving 50% of the expected abilities. The research data shows that the reading literacy skills of junior high school students in Indonesia are not at worrying situation. The instrument developed has an accurate measure of readability, the right context, and content that is in accordance with the Indonesia personality. The factors that build the measuring instrument can show a more factual situation on the level of reading literacy skills of junior high school students in Indonesia.

4 Conclusion

Learning assessment, especially in reading learning in a time that is still affected by the COVID-19 pandemic, cannot be ignored. The loss of information on the results of the assessment will delay the recognition of students' potential and understanding of students' difficulties in reading learning. The neglect of assessment can have harmful long-term consequences for students.

The obstacles to the assessment process during the COVID-19 pandemic can be overcome with the HOT-Based Literacy Measuring Instrument. It has been proven that the instrument can accurately measure students' reading literacy skills. In addition, students and teachers positively appreciate the usefulness of the instrument. Thus, it is hoped that the reading literacy assessment process can be continued and can improve students' reading literacy skills, especially reading literacy with higher order thinking skills.

References

1. UNESCO. (2020). *Half of world's student population not attending school: Launches global coalition to accelerate deployment of remote learning solutions.* https://en.unesco.org/news/half-worlds-student-population-not-attending-school-unesco-launches-global-coalition-accelerateGoogleScholar
2. Pokhrel, S., & Chhetri, R. (2021). A Literature review on impact of COVID-19 pandemic on teaching and learning higher education for the future. *8*(1), 133–141. © 2021 The Kerala State. https://doi.org/10.1177/2347631120983481journals.sagepub.com/home/hef
3. Damaianti, V. S. (2021). *Literasi Membaca: Hasrat Memahami makna Kehidupan.* [Reading Literacy: Desire to Understand the meaning of Life]. PT Refika Aditama.
4. Farr, R. (1984). *Reading: Trends and Challenges.* National Education Association.
5. Development, O. for E. C. and *OECD skills outlook 2013: First results from the survey of adult skills*. OECD Publishing Paris (2013).
6. Damaianti, V. S., Abidin, Y., & Rahma, R. (2020). *Higher order thinking skills-based reading literacy assessment instrument: An Indonesian context. Indonesian Journal of Applied Linguistics*, *10*(2), 513–525.
7. Roe, B., Smith, S. H., & Kolodziej, N. J. (2018). *Teaching reading in today's elementary schools.* Cengage Learning.
8. Mitani, H. (2021). Test score gaps in higher order thinking skills: Exploring instructional practices to improve the skills and narrow the gaps. *AERA Open, 7*, 23328584211016470.
9. économiques, O. de coopération et de développement. (2019). *PISA 2018 assessment and analytical framework*. OECD Publishing, 2019.Liu, Y. *Application of schema theory in teaching college English reading.* Canadian Social Science, 2010, 6(1), 59–65
10. Liu, Y. (2010). Application of schema theory in teaching college English reading. *Canadian Social Science*, *6*(1), 59–65.
11. King, F. J., Goodson, L., & Rohani, F. (2012). *Higher-order Thingking skills: Definitions, Teaching strategies, assessment*. Retrieved from http://www.cala.fsu.edu
12. I. V. S. Mullis, & M. O. Martin (Eds.). (2021). PIRLS. *Assessment frameworks.* TIMSS & PIRLS International Study Center and International Association for the Evaluation of Educational Achievement (IEA), 2019.
13. Thiagarajan, S. (1974). *Instructional development for training teachers of exceptional children: A sourcebook*.
14. White, S., Chen, J., & Forsyth, B. (2010). Reading-related literacy activities of American adults: Time spent, task types, and cognitive skills used. *Journal of Literacy Research, 42*(3), 276–307.
15. Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice, 41*(4), 212–218.
16. Noble, T. (2004). Integrating the revised Bloom's taxonomy with multiple intelligences: A planning tool for curriculum differentiation. *Teachers College Record, 106*, 193–211. https://doi.org/10.1111/j.1467-9620.2004.00328.x