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Effectiveness of E-Supplement Mobile Android Application toward Science Literacy Skills on Minimum Competency Assessment Oriented in Respiratory System of Junior High School Students

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Article Info	Abstract
	Learning on 21st century is supported by sophisticated technology, where the demands on situations and conditions require people to be able in adjusting all experiences possessed to solve problems scientifically in everyday life. Students' analytical skills and scientific thinking in daily life become one of the important aspects that support the achievement of educational goals. This research aims to analyze the science literacy skills of students grade 8 at State Junior High School 2 Tulung, Klaten while learning Respiration System applied by E-Supplement Mobile Android on Minimum Competency Assessment-Oriented. This study used method of Research and Development for 102 students of respondents from 4 classes. The research is designed by ADDIE. The results of the pot-test scores were higher than the pre-test scores with an average of 82.74% with classical completeness of 81.37% and the N-Gain test results of 56% in the high category. In addition, the application of the e-supplement mobile android application effectively improves students' scientific literacy skills in terms of knowledge and competence.

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INTRODUCTION

Learning oriented to higher order thinking skills (HOTS) implemented in the 21st century is reflected in the Curriculum 2013 (KEMENDIKBUD, 2019). The development of technology in education in the 21st century requires people to adjust in all aspects of life, one of which is "science literacy". This happens because "science literacy" makes a person use the information and experience he has to solve problems scientifically in everyday life (Nofiana, 2017).

Science literacy according to PISA is a person's ability to understand and make conclusions using knowledge and scientific identification (Toharudin, 2011). According to Ashari (2017), science literacy is defined as the capacity to use scientifically possessed knowledge, identify a problem and draw scientific conclusions to make decisions in everyday life. According to the Organisation for Economic Co-operation and Development (OECD) since 2000 the first time Indonesia became a PISA participant, students' science literacy skills never get above average results (OECD, 2019). Improving students' literacy skills, innovative and literacy-oriented learning in the form of reasoning is not just limited to memorization needs to be applied in every subject.

Science is one of the subjects at the junior high school level. Science subjects are one of the aspects that become the main assessment in the learning process to know the ability of students. This happens because in the learning process in school as a determining component of the success of competency achievement (Nabilah, 2020). The application of science literacy in Science learning can be developed from a problem, event and issue that is developing in the surrounding environment. So, students are able to apply knowledge and provide solutions in solving a problem (Ardianto, 2016).

In accordance with the new policy of the Ministry of Education and Culture regarding the implementation of the Minimum Competency Assessment instead of the National Examination which aims to improve the quality of education in Indonesia. The National Examination tends to test content mastery, not reasoning competence. In addition, Minimum Competency Assessment is expected to be able to provide a strong impetus for innovative learning and literacy development oriented in the form of reasoning, not just rote memorization (Kemendikbud, 2019).

This is affected since 2000 for the first time Indonesia has become a PISA participant, the literacy rate of students has never been above average (OECD, 2015). The results of student literacy skills in 2018 measured the ability of 600 thousand 15-year-old students from 79 countries, Indonesia was ranked 6th from the bottom (74) with an average score of 371 (OECD, 2019). The process used to determine the benchmark of student success in learning by conducting an assessment. Assessment of students' scientific literacy skills can be determined through several components, namely context, competence, knowledge and attitudes (OECD, 2016). According to Shofiyah (2015), there are 3 aspects of competence in scientific literacy, such as students are able to identify scientific problems that occur in the surrounding environment. Students are able to explain phenomena or issues that occur scientifically and students are able to use scientific evidence in solving a problem.

Students still have difficult to understand and apply science concepts in everyday life. This happens because teachers do not familiarize and train and develop students' knowledge regarding issues and phenomena that occur in accordance with PISA demands (Izzatunnisa, 2019). There is a need for learning media innovations to help improve students' scientific literacy skills in applying science concepts in science learning (Betari, 2016). In accordance with the opinion of Nurhidayah (2015), providing direct experience to students with the aim of developing student competence in understanding the surrounding environment scientifically is the essence of learning science.

There is a need for innovative teaching materials that are able to provide understanding and apply science concepts in learning that can shape students' scientific literacy skills. The teaching material developed in this study is an android mobile e-supplement oriented to the Minimum Competency Assessment on the Human Respiratory System subject. The Minimum Competency Assessment -oriented e-supplement mobile android application contains a complete picture of the respiratory system disorder material,

so that learning can be applied in everyday life. In addition, there are other features in the form of learning videos as material reinforcement and practice questions for Minimum Competency Assessment-oriented pre-test and post-test.

Students' scientific literacy is measured by the components of knowledge and competence. The analysis carried out on aspects of knowledge and competence can basically be done during the learning process (Kao, 2014). Students' understanding in each item given is adjusted to the criteria of scientific literacy that are adapted to real life contexts and are not limited to the surrounding environment (PISA, 2012). Science literacy is applied to science learning because science learning can be developed from a problem, event and phenomenon that develops in the surrounding environment. In addition, science learning is more meaningful and students are able to apply their knowledge to solve a problem by providing solutions in everyday life (Ardianto, 2016). Based on this description, it is deemed necessary to conduct research on the effectiveness of Minimum Competency Assessment-oriented e-supplement mobile android application on students' scientific literacy skills.

METHODS

The type of research used is research and development (R&D). The R&D method is a research method that produces products and the effectiveness of the resulting product is then carried out a test (Sugiyono, 2015). Teaching and learning process applied by the Minimum Competency Assessment-oriented e-supplement mobile android application. This study aims to analyze the effectiveness of the Minimum Competency Assessment-oriented e-supplement mobile android application on the scientific literacy skills of class VIII students of SMP Negeri 2 Tulung Klaten which consists of 102 students from 4 classes as subjects in research on science learning material on the Respiratory System. The research design used in this study used the ADDIE development research design (Analysis, Design, Development, Implementation, and Evaluation).

Table 1. Research Design

Class	Pre-Test	Treatment	Post-Test
Treatment	0_1	X	0_2

The data on the effectiveness of the implementation of the e-supplement mobile android application were obtained from the results of student test scores (pre-test and post-test) and the N-Gain test. The classification category of percentage analysis results was adapted from (Ridwan, 2010), presented in Table 2.

Table 2. Effectiveness of E-Supplement Applying Category

No	Category	Description
1	$0.00 < \text{N-Gain} \leq 0.29$	Low
2	$0.30 < \text{N-Gain} \leq 0.69$	Moderate
3	$0.70 < \text{N-Gain} \leq 1.00$	Excellent

RESULTS AND DISCUSSION

Students' science literacy abilities can be determined through several aspects. There are cognitive (knowledge), affective (attitude) and psychomotor (skills) obtained by students during the course of learning (Wulandari, 2016; Purnomo, 2013). According to PISA (2015), the science literacy component consists of 4 components. There are context, competence, knowledge and attitudes (OECD, 2016). The ability of science literacy measured in this study is reviewed from the components of knowledge and competence. Aspects of knowledge in science literacy is understanding the environment based on scientific knowledge that includes knowledge about nature and knowledge about science itself. In the other hand, the competency aspect in science literacy shows scientific competence, such as identifying scientific phenomena and using scientific evidence in every activity (Ashari, 2017).

The results of the research on the analysis of students' scientific literacy skills in doing pre-test questions for class VIII SMP Negeri 2 Tulung Klaten in science learning material on the Human Respiration System are presented in Figure 1.
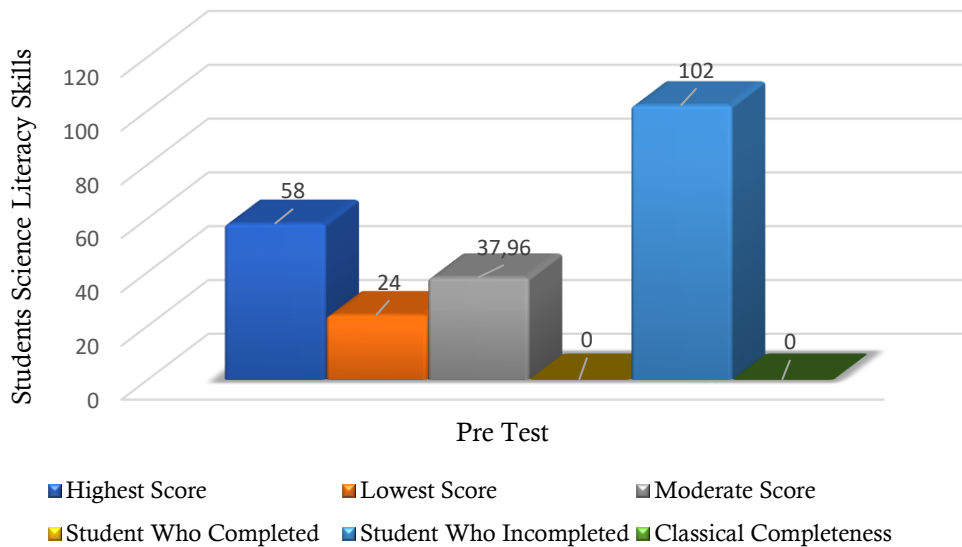
Figure 1. The Result of Students Science Literacy Skills *(Pre-Test)*

The results obtained by students in working on pre-test problems based on science literacy in students grade 8 in State Junior High School 2 Tulung, Klaten IPA lessons of Respiration System material can be seen in Figure 1. The results of students' science literacy pre-test scores are still below the Minimum Completion Criteria (KKM = 70). The determination of The Minimum Completion Criteria is adjusted to the characteristics of learners, the characteristics of science subjects and the condition of the education unit in SMP Negeri 2 Tulung Klaten. The number of students who completed is 0 students, while students who are not complete in doing pre-test problems are 102 students (all students are not complete). The lowest science literacy pre-test score is 24, while the highest score is 58 with an average score obtained which is 37.96 with a classic completion of 0%. The results are certainly an unsatisfactory result, considering the science literacy analysis ability of State Junior High School 2 students in the science of Respiration System obtained in very low categories.

Low ability of science literacy students can be caused by several influencing factors. One of the factors is the understanding of a process, the content and context of science obtained is still weak, low ability to read students and low analysis of data (Lucky, 2019; Ardianto, 2016). In addition, students still have difficulty in understanding and applying the concept of science to everyday life. It can be affected by the factor of teachers who do not train and develop student knowledge with the phenomenon that is happening and developing in the community with the demands of PISA (Izzatunnisa, 2019). In line with Artati's opinion (2013), the low ability of science literacy students is influenced by teacher-centered learning, low willingness of students in studying science. There is content, processes and context on basic competencies that are not preferred by students.

Based on the results of interviews conducted in this study, students have difficulties to understand the material that has been provided by teachers, especially on online learning. According to Gusty (2020), students' difficulty in understanding the material given to online learning because the learning carried out is only limited to the provision of assignments or assignments only and makes students feel exhausted in learning it.

In addition, teaching materials used during online learning must have creative and innovative elements based on the needs of students in carrying out learning in the Covid-19 pandemic. The lack of teaching materials supporting learning makes it difficult for students to understand the concept of the material provided. Teaching materials used in learning during this time using student handbooks (Package Books) and Student Worksheets (LKS). The role of teachers in building science literacy skills to be embedded in the ability to understand and make conclusions and scientific identification in students is very important (Betari, 2016; Afriana et al., 2016).

The results of the research on the analysis of students' scientific literacy skills in doing post-test questions for class VIII SMP Negeri 2 Tulung Klaten in science learning material on the Human Respiration System are presented in Figure 2.
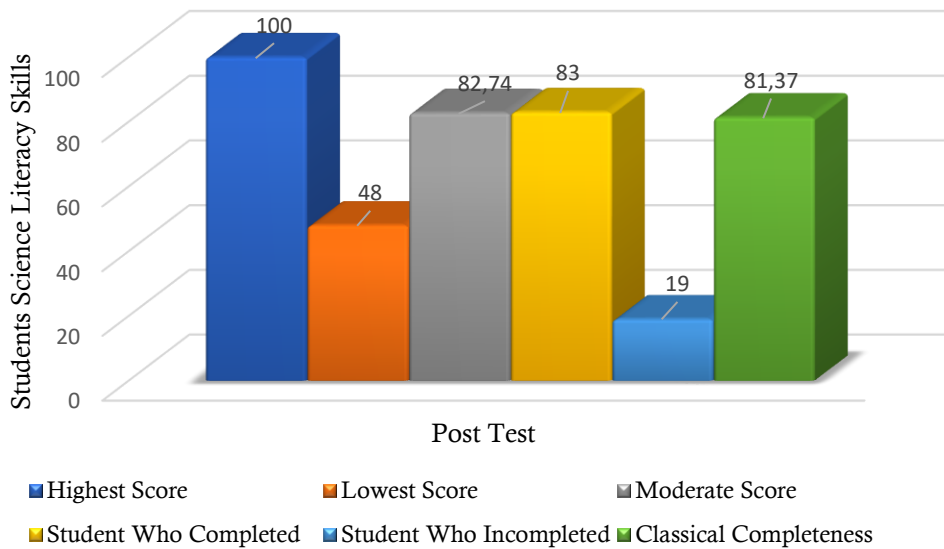
Figure 2. The Result of Students Science Literacy Skills *(Post-Test)*

The post-test scores obtained after implementing the Minimum Completion Criteria-oriented mobile android e-supplement showed that the post-test average value was higher than the pre-test average value, which was 82.74. The highest score obtained, the score was 100, while the lowest score was 48. There are 102 students who participated in this study, 19 students did not complete and 83 students completed the pilot application of the Minimum Completion Criteria-oriented mobile android e-supplement on the Respiration System material on literacy outcome of student science. However, the results of student scientific literacy obtained from the aspect of knowledge and competence meet one of the indicators of learning effectiveness on the material of the Respiratory System by applying the Minimum Completion Criteria-oriented android mobile e-supplement, namely the results of student scientific literacy achieving classical completeness of 81.37%. Then, the results of students' scientific literacy before and after being treated were carried out by the N-Gain test. The average score of the N-Gain test to prove that there was an increase after being given treatment. The results of the N-Gain test are presented in Figure 3.
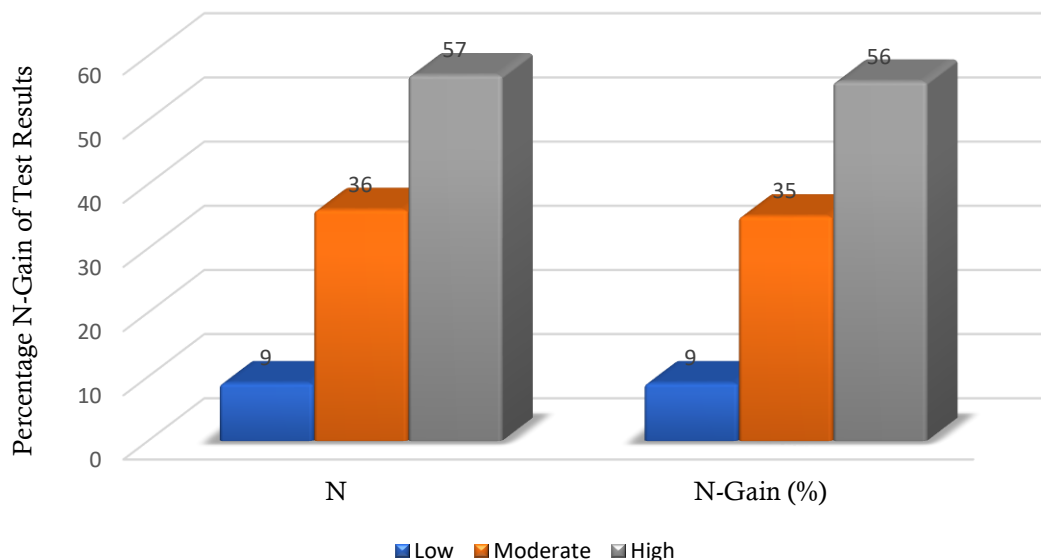
Figure 3. The Results of Percentage N-Gain Test Applied E-Supplement Mobile Android

The increase in students' scientific literacy results can be seen in Figure 3. The results of the N-Gain test are 56% in the high category, 35% in the medium category, while 9% in the low category. These results indicate that the application of the Minimum Competency Assessment-oriented e-supplement mobile android application on Respiration System materials at the junior high school level at SMP Negeri 2 Tulung Klaten is effective in improving students' scientific literacy skills in terms of knowledge and competence. In accordance with Junaedi's opinion (2018), Harianto (2017), Fajartia (2017) and Ismail (2016), learning carried out by applying teaching materials based on Android mobile effectively improves students' scientific literacy outcomes.

Improving student learning outcomes and students' scientific literacy skills are influenced by several factors. One of the factors is supported by fun teaching materials. Teaching materials that can be accessed through the android mobile application can increase students' independence and enthusiasm in solving a problem, so students are able to improve students' understanding of concepts (Kharisma, 2019). In addition, learning using mobile android e-supplements is student-centered, making it easier for students to find concepts more contextually. According to Hamid (2013), learning using contextual teaching materials based on Android mobile can provide a positive response to the completeness of student learning outcomes.

CONCLUSION

The effectiveness of the Minimum Competency Assessment-oriented e-supplement mobile android application on the Respiratory System material is obtained from the pre-test, post-test and N-Gain test scores. The results of the post-test scores were higher than the pre-test scores with an average of 82.74% with classical completeness of 81.37% and the N-Gain test results of 56% in the high category. In addition, the application of the Android mobile e-supplement effectively improves students' scientific literacy skills in terms of knowledge and competence.

REFERENCES

Afriana, J., Permana, S., & Fitriani, A. (2016). Project Based Learning Integrated to STEM to Enhance Elementary School's Students Scientific Literacy. *Jurnal Pendidikan IPA Indonesia,* 5 (2), 261 – 267.

Ardianto, D. (2016). Literasi Sains dan Aktivitas Siswa pada Pembelajaran IPA Terpadu Tipe Shared. *Unnes Science Education Journal,* 1167-1174.

Artati, J. (2013). Analisis Kemampuan Literasi Sains Siswa SMP dalam Pembelajaran IPA Terpadu pada Tema Cuaca Ekstrim. Bandung: FMIPA Universitas Pendidikan Indonesia.

Asyhari, A. (2017). Literasi Sains Berbasis Nilai-Nilai Islam dan Budaya Indonesia. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni,* 6(1): 137-148.

Betari, M. E. (2016). Peningkatan Kemampuan Literasi Sains Siswa Melalui Penerapan Model Pembelajaran Berorientasi Masalah Pada Pembelajaran IPA di SD. Bandung: UPI.

Gusty, S. (2020). *Belajar Mandiri: Pembelajaran Daring di Tengah Pandemi Covid-19.* Yayasan Kita Menulis.

Harianto, A., Suryati., & Khery, Y. (2017). Pengembangan Media Pembelajaran Kimia Berbasis Android untuk Penumbuhan Literasi Sains Siswa pada Materi Reaksi Redoks dan Elektrokimia. *Jurnal Ilmiah Pendidikan Kimia.* 5(2), 35-47.

Ismail, I., Permanasari, A., & Setiawan, W. (2016). STEM Virtual Lab: An Alternative Practical Media To Enhance Student's Scientific Literacy". *Jurnal Pendidikan IPA Indonesia,* 5(2), 239-246.

Izzatunnisa. (2019). Pengembangan LKPD Berorientasi Pembelajaran Penemuan Untuk Meningkatkan Kemampuan Literasi Sains Peserta Didik Pada Materi Kimia SMA. *Jurnal Pijar MIPA,* 49-54.

Junaedi. (2018). Aplication Program Learning Based on Android For Students Experiences. *International Journal of Engineering and Technology,* 194- 198.

Kao, C. Y., (2014). Exploring the relationships between analogical, analytical, and creative thinking, Thinking Skills and Creativity, 13, pp. 80-88.

Kemendikbud. (2019). *Pokok-Pokok Merdeka Belajar.* Jakarta: Kementrian Pendidikan dan Kebudayaan.

Kharisma, G. (2019). Pengembangan Media Pembelajaran Berbasis Mobile Learning untuk Memahami Teks Prosedural. *Jurnal Ilmu Pendidikan Bahasa dan Sastra Indonesia*, 1-9.

Lucky. (2019). Analisis Kemampuan Literasi Sains dan Teknologi Guru IPA SMP Negeri dan Swasta Se-Kecamatan Poasia Kota Kendari. *Jurnal Penelitian Pendidikan Fisika*, 56-59.

Nabilah, M., & Stepanus Sahala, H. (2020). Analisis Kemampuan Kognitif Peserta Didik dalam Menyelesaikan Soal Momentum dan Impuls*, Jurnal Inovasi Penelitian dan Pembelajaran Fisika,* 1(1), pp. 1-7.

Nasution, T. A., Purba, A., & Afrinda, V. (2020). The Influence of Jigsaw Cooperative Model toward Writing Exposition Text Ability of Class X At SMK Negeri 1 Pematang Siantar. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences, 3*(3), 2349-2356.

Nofiana, M., & Julianto, T. (2017). Profil Kemampuan Literasi Sains Siswa SMP di Kota Purwokerto Ditinjau dari Aspek Konten, Proses, dan Konteks Sains. *Jurnal Sains Sosial dan Humaniora.* 1(2). 77-84.

Nurhidayah, R. (2015). Pengembangan Modul Berorientasi Inkuiri Terbimbing Pada Materi Larutan Elektrolit dan Non-Elektrolit. *Edusains,* 36-47.

OECD. (2015). *PISA 2015 Assessment and Analytical Framework*. Paris: PISA, OECD Publishing.

OECD. (2016). *PISA 2015 Assessment and Analytical Framework*. Paris: PISA, OECD Publishing.

OECD. (2019). *Assessment and Analytical Framework.* Paris: PISA, OECD Publishing.

Purnomo, Dwito., Indrawati, M & Karyanto, P. (2013). "Pengaruh Penggunaan Modul Hasil Penelitian Pencemaran di Sungai Pepe Surakarta Sebagai Sumber Belajar Biologi Pokok Bahasan Pencemaran Lingkungan Terhadap Hasil Belajar Siswa". *Pendidikan Biologi,* 5(1), 59-69

Ridwan. (2010). *Skala Pengukuran Variabel-Variabel Penelitian*. Bandung: Alfabeta.

Toharudin, U. (2011). *Membangun Literasi Sains Peserta Didik.* Bandung: Humaniora.

Wulandari, N. (2016). Analisis Kemampuan Literasi Sains Siswa pada Aspek Pengetahuan dan Kompetensi Sains Siswa SMP pada Materi Kalor. *Edusains,* 1(8), 66-73.