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BLENDED LEARNING METHOD ASSISTED BY GOOGLE FOR EDUCATION AND PhET INTERACTIVE SIMULATION TO TRAIN SCIENCE PROCESS SKILLS FOR JUNIOR HIGH SCHOOL STUDENTS

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Abstract

The research, which was conducted in Jombang while still adhering to the health protocol, aims to produce high-quality learning tools using the blended learning method assisted by Google for education and PhET interactive simulation to train science process skills in terms of validity, practicality, and effectiveness. The research was carried out in two stages by adapting the 4D model from Thiagarajan followed by the implementation of learning with One Group Pretest-Posttest Design. The results obtained include the validity of the device of 3.68 with a very valid category,practicality in terms of the implementation of learning is very good with an assessment of 3.8. As for the effectiveness in terms of science process skills, students are in the high category with an N-Gain of 0.77 with an average science process skill of 83.33. In practicing science process skills, students still need to deepen in determining variables and defining variables. In addition to an increase in the aspect of science process skills, there is an increase in the cognitive assessment aspect of the product at an N-Gain of 0.78 with an average of 81.67. The obstacle to the application of theblended learning model is that students have not received full permission to operate the device, so there is a need for alternatives to reduce these obstacles. Based on the results of the data analysis, it is concluded that the blended learning device developed is able to train students' science process skills, but requires adjustments to the situation and conditions of students and education units.

Keywords: Blended learning, Google for Education, PhET interactive simulation, Science process skills

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INTRODUCTION

The issue of 21st century skills has become one of the focuses of discussion in the world of education in Indonesia. This issue needs to be taken seriously in the midst of the Covid-19 outbreak, which has a fairly large impact on the world of education in Indonesia. The demographic bonus that will occur in Indonesia in 2035-2045 should be a great opportunity for Indonesia to become a developed country with potential citizens at that time (Nizam,2020).

Six competencies in 21st century skills will be achieved when learning focuses on students.However, teacher-centered learning is still found. Such as the lecture method of learning (Ilham & Muhammad, 2013). In addition, learning that still focuses on knowledge is also found (Sudibyo, et al., 2018). By applying such a learning method, it will not hone students' logical and rational thinking. Burn, et al. (1985) stated that students will think logically, rationally critically, and build mental learning by practicing process skills. This is closely related to the expertise competence of 21st century skills.

The readiness of students to face 21st century education by applying a process skills approach needs to be improved again. Sudibyo, et al. (2018) found that the achievement of students' science process skills in one private junior high school in Surabaya was 0.11. Yunita, et al. (2017) found that the achievement of science process skills was 0.13 in a private junior high school in Surabaya. Apart from private schools, Wijayaningputri, et al. (2018) found that the achievement of science process skills was 0.24 in one of the Pasuruan public high schools. The achievement of science process skills of 0.13 was found in one of the public junior high schools in Surabaya (Jannah, et al., 2016). The data shows that the students' science process skills are quite weak. This was triggered by several factors. Teachers do not use Worksheet based on science process skills (Yunita, et al., 2017). The learning method still uses the lecture method (Hartanti, et al., 2017).

The outbreak of Covid-19 in Indonesia in mid- March 2020 made the education sector in Indonesia change drastically (Herliandry, et al., 2020).Learning that was previously carried out face-to- face must change to online in order to reduce or even stop the spread of the virus. Mastery of technology is one of the things that hinders online learning. Over time, it is felt that the spread of the virus has decreased. So that the government gives permission for face-to-face learning with several limitations, such as the number of students, time to gather in one place, strictly adhere to health protocols.

The phenomenon of lost learning is widely circulating among Indonesian education because of the impact of less effective learning in the midst of the Covid-19 pandemic. UNICEF said that 66% of students are not comfortable doing full online learning. From this, its necessary to have learning innovations that combine face-to-face and online methods that the spread of the virus is controlled and even reduced.

Blended learning has started to exist again since the implementation of limited face-to-face learning.This is an opportunity for researchers to practice science process skills with the heassessment sheet of Google for Education and PhET. Blended learning was chosen by researchers because it can improve student learning outcomes (Rosmiati, et al., 2013). Students have wider access to information that is part of media literacy (Handoko & Waskito, 2018). In addition, students can discuss and share discussion materials more easily with other students or with the teacher (Khoiroh, et al., 2018). So, its necessary to believe that by applying blended learning with the help of Google for education and PhET, its possible to train scince process skills that will help students achive 21st century educational competence in the midst of Covid-19 pandemic in Indonesia.

METHOD

This research is a development research. The developed device received validation from two experts. Then it was tested to get the results of the practicality and effectiveness of using the developed device.

Research Design

This type of development research uses a 4D development model from Thiagarajan, Semmel, & Semmel (1974). The development process takes place on learning tools which include syllabus, Lesson Plans, worksheets, and assessment sheet. Then the implementation was carried out at Budi Utomo Perak Middle School, Jombang.

Research Object

Blended learning tools are the target of research feasibility. The device was applied at Budi Utomo Perak Middle School to 12 students in class IX in the even semester of the 2020/2021 academic yearfor 8 meetings.

Data Collection Technique

The research data was obtained by obtaining validation of device development. Validation is carried out to obtain a good quality device in theory and format. Then it was implemented at Budi Utomo Perak Middle School in class IX students in the even semester of the 2020/2021 academic year with One Grou Pretest-Posttest Design in order to obtain data on the practicality and effectiveness of the devices developed. The initial data is then analyzed and evaluated to get a better formula to improve the developed device.

RESULT AND DISCUSSION

This research aims to obtain a blended learning learning materials with the help of Google for Education and PhET to train appropriate science process skills in terms of validity, practicality, and effectiveness (Plomp & Nieveen, 2013), that these three aspects are things that need to be considered in assessing the quality of a research development product. In terms of validation, it was found that the validation results of the learning materials (Figure 1).

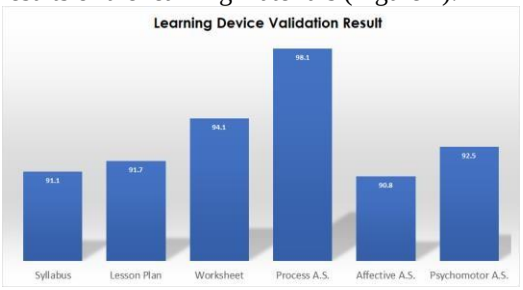

Figure 1. Learning Device Validation

Results The developed syllabus obtained a score of 91.1 which is included in the very valid ategory. There are additional metacognitive skills in the developed syllabus. Metacognitive development aims so that students are able to have the science process skills which lead to critical thinking skills which is one of the competencies in facing the challenges of 21st century education. This is provision for students tostill have a deep understanding of processes and products in the midst of lost learning issue during the Covid-19 pandemic.

The score of 91.7 in the development of this lessonplan uses a mixed learning method or blended learning with a direct learning model syntax. The direct learning model was chosen because the dynamic electricity material is a performance- oriented material. As stated by Nur (2008), that thedirect learning model needs to be applied to performance-oriented learning topics. In addition, with students doing learning performance independently, students will get a very meaningful learning experience. This was conveyed by Widodo, et al. (2018) about the nature of science learning which should be something that students must do, not what is done to students.

The implementation of the lesson plan can be seen in Table 1. In Table 1, the category of lesson plan implementation is obtained with a very good predicate with an average score of 3.8 from observers.

Table 1. Results of Lesson Plan Implementation

Phase	Evaluation		Average	Pradicate
	P1	P2		
Phase 1 Motivate and clarify learning objectives.	4	3	3,5	VG
Phase 2 Demonstrate knowledge and skills.	4	4	4	VG
Phase 3 Provide guided training.	4	4	4	VG
Phase 4 Check understanding and feedback.	4	4	4	VG
Phase 5 Provide advanced training.	3	4	3,5	VG
Average	19	19	3,8	VG

Ket: P1 = Observer 1; P2 = Observer 2

In the first and second phases, learning activities are carried out offline with a duration of 40 minutes which refers to a circular from the Education and Culture Office of Jombang Regency regarding the implementation of limited face-to-face learning. This phase is presented again in the form of text and video in Google Classroom. Likewise with phases three to five, carried out online with guided practice materials and videos presented in the Google Classroom. After students watch the guided exercise video in completing the process worksheet, students immediately practice it with the PhET application. After that, students will discuss with groups using Google documents, as well as reports in the form of presentations using Google Slides. In phase 5, it is carried out by using google meet so that students are able to convey the results of the discussion in the form of a presentation. Then further training is given by using the google form with a predetermined duration of time.

Figure 1 in the worksheet section gets a value from the validator of 94.1 with a very valid category. The worksheets developed are in accordance with the stages of integrated science process skills. The Worksheet that was developed accommodates students to practice science process skills. The benefits of mastering science process skills are able to develop critical, rational, authentic thinking, and increase collaboration. Supported by the results of Pradana's research (2020) which states that practicing science process skills is able to develop critical thinking. And from Kohar, et al. (2017) stated that worksheet science process skills were able to reduce misconceptions experienced by students. These benefits are several components to face the challenges of 21st century education. The developed worksheets has features, namely formulating problems and hypotheses, determining variables, operationally defining variables, conducting experiments, recording results, analyzing, and drawing conclusions. The developed worksheets are able to improve students cognitive learning outcomes and the achievement of science process skills as shown in Figure 2 and Figure 3.

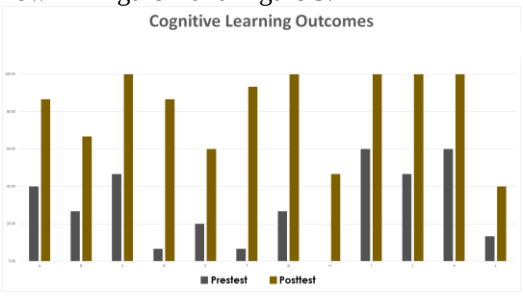

Figure 2. Cognitive Learning Outcomes

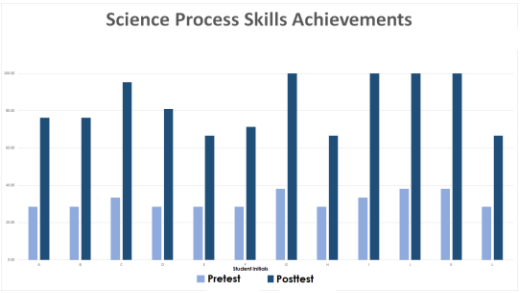

Figure 3. Science Process Skills Achievements

Figure 2 shows the cognitive learning outcomes before and after the implementation of the developed worksheet. Before applying he developed worksheet, students got an average cognitive learning outcome of 29.44. There was abig difference after the worksheet was implemented, which was 81.67. So that the sensitivity obtained is 0.78 with the interpretation of N-Gain is high. Based on these results, it can be seen that the developed worksheet can be used to determine students' ability to understand dynamic electrical material. The results of this cognitive learning are one of the references that the learning carried out is successful and able to train science process skills.

After the treatment was carried out to train students in science process skills, it was found that the achievement of students' science process skills hadincreased as shown in Figure 3. Before the implementation of the developed Worksheet, the achievement of science process skills was 31.75. Meanwhile, after the worksheet was applied, the achievement of science process skills reached 83.33 with high sensitivity and N-Gain 0.77. The type of science skills that are trained are integrated science skills which include namely formulating problems and hypotheses, determining variables, operationally defining variables, conducting experiments, recording results, analyzing, and drawing conclusions. Thus, the developed worksheets can be used to practice science processskills and even provide an increase in students' science process skills.

CONCLUSION AND SUGGESTION

Conclusion

Based on the results and discussion, it can be concluded that the blended learning tool developed is declared valid because it meets the needs and up- to-date, practical because the implementation of blended learning assisted by Google for education and PhET can be carried

out well, and declared effective because it can improve cognitive learning outcomes and science process skills. in the midst ofthe Covid-19 outbreak in order to face the challenges of 21st century education. So it can be concluded that the developed device has a high quality.

Suggestion

The suggestion that the researcher conveys is to implement more science process skills-oriented learning tools in order to face the challenges of 21st century education. In addition, the application of blended learning needs to be encouraged again so that students and teachers are able to better master information technology which is developing very rapidly in the world of education due to the impact of the Covid-19 outbreak.

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