

# Students' Problem Solving Skills in Learning Using Physics E-Learning Based on Google Classroom

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**Abstract** - This study aims to improve students' problem-solving skills in circular motion material using Google Classroom-based e-learning physics blended learning. The type of research used is (Research & Development) which refers to the 4D model (Define, Design, Develop and Disseminate). The results obtained at the limited trial stage in the form of data on students' problem-solving abilities during learning activities obtained from student worksheets (LKPD) and data on students' problem-solving abilities after participating in learning activities as a whole obtained from the results of pretest and posttest. to 20 students of class X MIPA 2 SMAN 2 Taliwang. The results of the assessment using a Likert scale on students' problem-solving abilities during learning activities have an average percentage of 78.5% with practical criteria. The results of students' problem-solving abilities after participating in learning activities as a whole were analyzed using the N-Gain test and obtained a significant increase in problem solving abilities, namely 61.3% with quite effective criteria. So, it can be concluded that the e-learning based on google classroom which was developed is quite practical and effective to improve students' physics problem solving ability.

**Keywords:** E-Learning; Google Classroom; Blended Learning Model; Problem Solving Ability.

## INTRODUCTION

The extremely rapid development of 21st-century technology is built on the foundation of science. Due to technological advancements, human resources must possess a variety of skills to fulfil 21st-century requirements (Aripin, *et al.* 2021). The 21st century is known as the century of globalization, which indicates that compared to the 20th century, human life has undergone significant changes. The need of the twenty-first century is to achieve high human resources, both in terms of attitude, concept writing, and action that can compete in the global industry. Changes in the curriculum are one of the learning paradigms that the 21st century may bring about as a result of changes in the development of science and technology (Rahmawati, *et al.* 2020). In Education, the application of the 2013 curriculum which is expected to be implemented in 21st century learning reflects four things, including: 1) critical

thinking and problem solving; 2) creativity and innovation; 3) communication; and 4) collaboration (Makhrus, *et al.* 2019). Students' ability to solve problems, including in physics classes, is anticipated to improve with the use of the 2013 curriculum in learning activities. The act of solving a problem is regarded as a process that comprises the relationships or concepts discovered when resolving an existing problem (Sambada, 2012).

Based on the results of interviews conducted by researchers, learning physics is considered a difficult and boring lesson. According to actual data, students feel bored more easily when learning is boring, which undoubtedly impairs their capacity to solve or respond to HOTS (High Order Thinking Skill) questions. Additionally, in order to restrict teacher-student interaction due to the current Covid-19 pandemic, students are only permitted to complete a minimal quantity of face-to-face learning. Therefore,

it is necessary to develop learning media that can be used by teachers in limited face-to-face and online teaching during a pandemic to train and improve students' problem-solving skills. One of the media that can be used is Google Classroom-based E-learning media.

E-Learning is a type of teaching and learning media that distributes teaching materials to students using internet media, intranets or other computer network media (Imaduddin, 2018). Internet access that is currently available makes it easier for students to be able to access e-learning anywhere and anytime.

Google classroom is an online learning platform (online) on a smartphone or computer (PC) with an internet connection (Su'uga, et al. 2020). The use of google classroom makes it easy for students and educators to stay connected both inside and outside the classroom. Google classroom which contains modules (learning materials), learning videos, quizzes, practice questions and assignments (homework) can be a solution so that teachers and students can continue to interact online despite the limitations of face-to-face (offline) learning activities. The combination of limited face-to-face learning systems (offline) and through e-learning (online) is known as the blended learning model. The learning process using e-learning instructs students to learn actively and independently, in this case students can construct their own knowledge based on natural phenomena that occur

The research instruments used include; student response questionnaires, student worksheets (LKPD) and problem solving skill test instruments. According to Yusup (2018) , An instrument used to collect data or assess the subject of a research variable is known as a research instrument.

At the define stage, observations are made in the form of initial analysis, students,

around them, so that learning can shift from teacher-centered learning to learning that is centered on the learner itself (student centered) (Rosita, *et al.* 2020). Based on the findings of Bibi's research (2015), it can be concluded that when blended learning is used instead of traditional learning, students' knowledge improves. Combining face-to-face instruction with online instruction is known as blended learning (Aeni, *et al.* 2017).

According to the definition above, learning models and media play a significant part in enhancing problem-solving skills. The aim of using Google Classroom as an online learning platform was to enable students and teachers to communicate and collaborate outside of the constricted face-to-face learning time. During the Covid-19 pandemic, a combined system between online (remote) and offline (face to face) is urgently needed, thus it is expected that the blended learning model would help teachers and students more easily teach and learn, particularly on circular motion material.

## RESEARCH METHODS

The type of the research is Research and Development (R&D). Research and development is a process used to create new products or enhance existing ones. The development procedure in R&D is called the Four-D Model (4D) which consist of four stages, namely: (1) Define; (2) Design; (3) Develop; and (4) Disseminate (Sukmadinata & Syaodih, 2008).

assignments and concepts on the subject to be studied. Furthermore, the design of the research instrument in the form of e-learning which was produced and revised based on input from experts will then go through a trial phase. At the trial stage, an assessment of the problem-solving abilities of students will be carried out during learning using e-learning on circular motion material in the

form of student worksheets (LKPD) that are worked on while participating in learning activities. The percentage obtained will be calculated using the following equation.

$$\% \text{ practicality} = \frac{\text{the number of assessor scores}}{\text{maximum score}} \times 100\% \quad (1)$$

The criteria are established based on Table 1 and the percentage that has been calculated, followed by the search for the average number (Hodiyanto, *et al.* 2020).

**Table 1.** Practicality Criteria

Percentage Range (%)	Tingkat Kepraktisan
80 < score ≤ 100	Very practical
61 < score ≤ 80	Practical
41 < score ≤ 60	Quite Practical
21 < score ≤ 40	Less Practical
0 < score ≤ 20	Not Practical

In addition, an assessment of students' problem-solving abilities was also carried out after participating in learning activities as a whole using e-learning through pretest activities (before testing) and posttest activities (after trials) to determine whether there was an increase in students' problem-solving abilities. . The problem solving ability instrument given to each student was done within 60 minutes, containing 15 questions, namely 12 multiple choice questions and 3 descriptions based on indicators of problem solving ability. The percentage obtained will be calculated using the N-Gain test. The amount of N-gain is calculated using the following equation.

$$N_{gain} = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} \times 100\%$$

Description:

$S_{post}$  = Post Test Score

$S_{pre}$  = Pre-test Score

$S_{max}$  = Maximum Score

The criteria are established based on Table 2 and the percentage that has been calculated,

followed by the search for the average number (Solikha, *et al.*, 2020).

**Table 2.** N-gain Criteria

No	Persentase (%)	Kriteria
1	>76	Effective
2	56 – 75	Quite Effective
3	40 – 55	Less Effective
4	<40	Not Effective

## RESULT AND DISCUSSION

### Result

The results were obtained in the trial phase of e-learning physics based on google classroom which was carried out at SMAN 2 Taliwang class X MIPA 2. After receiving expert feedback, the finalized e-learning design underwent a trial phase. Students who received circular motion material in the form of student worksheets, which were completed by 20 students while taking part in learning, were given the opportunity to test their problem-solving skills during the trial stage. The worksheets worked on by students in the tryout included 2 trial sheets (experiments) at meeting 1 and discussion sheets at meeting 2. Based on student responses on a scale of 1-4, 17 out of 20 students felt motivated and showed more interest and their curiosity while working on the worksheet given because of the attractive appearance of the worksheet, the illustrations on the worksheet are clear and easy to understand. The results of the average percentage of students' problem-solving skills when carrying out learning using e-learning are 78.5%. The acquisition of student worksheet scores at learning activities 1 and 2 can be seen in Figure 1.

Additionally, assessments of students' problem-solving skills were collected through the use of e-learning after the learning process had been completed. These evaluations came in the form of pretest and

posttest results. A total of 12 multiple-choice questions and 3 description questions with indicators of problem-solving skills compensate these instruments for students' problem-solving skills. According to Polya, indicators of problem-solving skills include: 1) comprehension of the issue; 2)

formulation of a solution plan; 3) execution of the plan; and 4) reevaluation (Mairing, 2018). The graphic in Figure 2 depicts the acquisition of pretest and posttest scores for 20 class (Tenth Grade Students for Science 2) at SMAN 2 Taliwang.

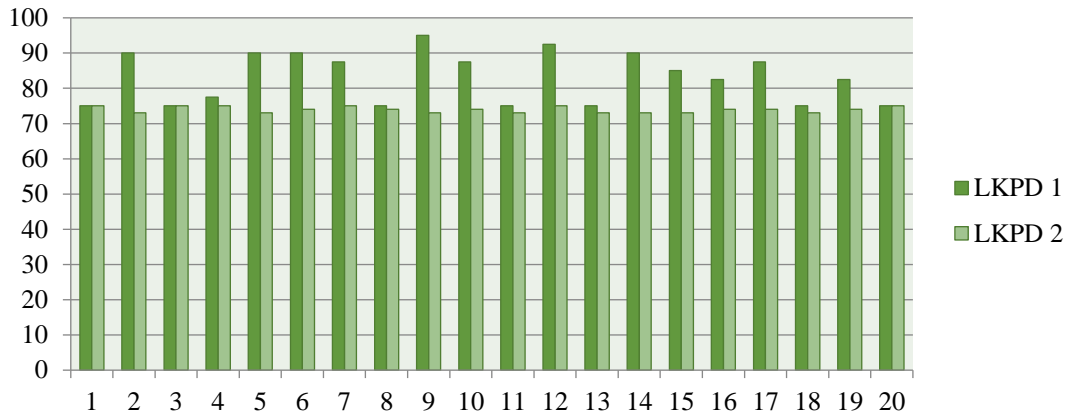


Figure 1. Scores of Problem Solving Skills

Table 3 shows the average N-Gain exam results for tenth grade students in Science 2, which includes 20 students, for

enhancing students' problem-solving skills after learning the entire course.

**Table 3.** Average N-gain Score for Problem Solving skills' Test

$\bar{X}_{pre}$	$\bar{X}_{post}$	$\bar{X}_{post} - \bar{X}_{pre}$	$\bar{X}_{max} - \bar{X}_{pre}$	% N-Gain	Criteria
25,3	71,1	45,8	74,7	61,3	Quite Effective

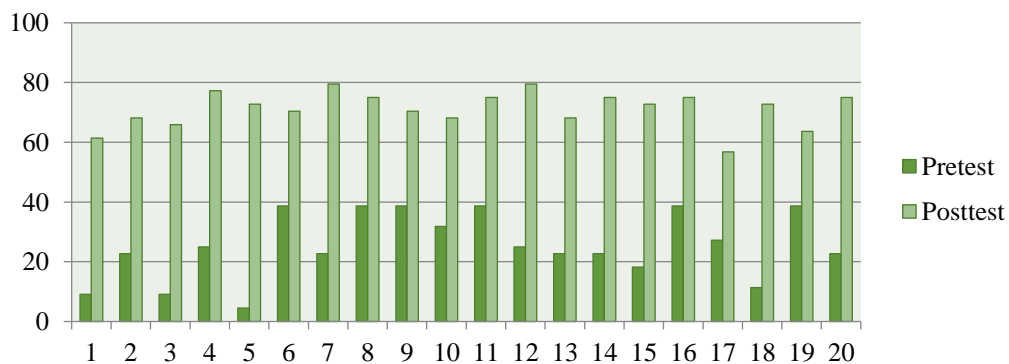


Figure 2. Score of Students' Problem Solving Skill after learning the entire course

**Discussion**

Based on the result of the research, student activity worksheets were used to calculate data on the evaluation of students' abilities for problem-solving while engaging in classroom instruction. Students'

worksheets are an instrument used to support the development of their problem-solving skills. Students' worksheet was an experimental task that students completed on their own time from home during the first meeting. The second meeting featured a

group discussion activity with five essay questions and a 60-minute time limit that was then determined using a Likert scale. According to the calculations, 83.1% of the experimental and discussion activities were assessed as being "very practical" in the first meeting and 73.9% as being "practical" at the second meeting. Eight students were placed in the practical category and twelve others in the very practical category in the first meeting with worksheet. In contrast, 20 students' results from the second meeting of the LKPD were grouped into the practical category. When carrying out learning, students' problem-solving skills have an average percentage value of 78.5%, which is categorized in practical criteria.

Additionally, students' problem-solving skills were evaluated using the N-Gain test results following the administration of a pretest and posttest to science 2 students in the tenth grade at Taliwang Senior High School. The offered test for problem-solving skills comprises of 12 multiple-choice questions and 3 essay questions. The test has a 60-minute time limit. According to the calculations, the average pretest score was 25.3 and the average posttest value was 71.1. The N-Gain test was used to examine this number, and the calculation result was 61.3%; this indicates that the value meets the criteria for moderate improvement and is fairly successful. 20 students must meet the requirements in order to receive pretest and posttest scores in the moderate category (all students in the class).

N-Gain calculations for the students' pretest and posttest have produced better results. The maximum scores of 10 to 13 for 12 persons saw an increase that was pretty significant, while the increases for the remaining 8 participants were not as significant. The constructed e-learning was shown to be able to improve students'

problem-solving skills, even though the rise was in the moderate category, according to the N-Gain test calculations. This indicates that students' problem-solving abilities are quite good, but require more time to continue to increase their problem-solving skills. As stated by the expert, the ability of students is trained through problems, so that students are able to improve the various competencies they have (Sumartini, 2016).

The most common error made by students is reevaluating work results which are in the fourth indicator and shown a less optimal result. Researchers have challenges when testing students' problem-solving skills when they provide orientation about problems that arise in daily life because most students would rather not speak than ask questions that are not understood. Additionally, some students don't seem to be particularly motivated to work on worksheet issues with their friends. This undoubtedly contributes to students' varied problem-solving skills. Due to their inability to distinguish between the mention of symbols in circular motion and the numerous new concepts they come across, some students also have a tendency to understand the material more slowly. However, the blended learning model used in the learning course using Google Classroom media demonstrates that there is a procedure to train students' problem-solving abilities because these skills will not grow if they are not constantly practiced.

## CONCLUSION

Based on the results of the research and discussion, it can be concluded that the google classroom-based e-learning developed in this study is practical and quite effective in learning to improve students' problem-solving abilities.



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