

Analysis of Students Problem Solving Skill from Online Worksheets with Integration of Video Demonstration

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Abstract

This study aims to determine the profile of students' problem solving skills using online worksheets with integration of physics demonstration videos. The demonstration video used comes from YouTube that open accessed. The method used is descriptive research method with research instruments in the form of online worksheets. The research was conducted at a university in arrowroot in the physics education department. The results showed that the students' ability to focus on problems obtained 76% with high criteria. The score for the indicator describing the problem is 68% with high criteria. The score on the indicator of designing a problem solution is 64% with sufficient criteria. For indicators of doing problem solutions, a score of 52% with low criteria. In addition, for indicators of evaluating the results of the answers obtained a score of 49% with low criteria. The total average score obtained is 62%, which is sufficient. The results of this study can serve as an introductory source for research related to online worksheets and problem solving skills.

Keyword: Demonstration Videos, Online Worksheets, Problem-Solving Skills

Introduction Section

One of the new things in the policy of free learning is the change in assessment, which initially tends to be oriented towards mastering content into reasoning skills. The National Examination (UN), which is usually carried out by students in grades 6, 9, and 12, will be converted into Minimum Competency Assessment (AKM) and Character Survey starting in 2021 (Tohir, 2019). This assessment includes three aspects, namely literacy, numeracy, and character. In the aspects of literacy and numeracy, students will be assessed for their reasoning abilities in language and mathematics. Aspects in the new assessment are oriented towards international standard assessment such as PISA. The questions in PISA do not focus on understanding concepts, but rather on how to apply the concept in various situations (Kurniati, et al., 2016). The ability to apply this concept can be contained in the student's ability to solve problems.

One of things to improve problem-solving skills is through problem-based learning (Simanjuntak & Sudibjo, 2019). However, with the current pandemic conditions, we have to study online. So that the learning model that is usually carried out in person must be adapted so that it can be implemented online. One of alternative way to adapt direct learning to online learning is to modify student activity sheets.

Currently, many online learning media can be used as a learning resource for students. This media can be integrated into student worksheets so that learning activities become more systematic. In science materials such as physics, learning media in the form of videos will greatly assist students to observe and analyze physical phenomena that occur in everyday life. In addition, based on Hernawati's research (2018) the use of video or audio-visual media can improve student-learning outcomes. Likewise, Putri's research results (2019) state that the use of demonstration videos in learning can improve science process skills and learning outcomes.

Departing from the description above, the researcher wants to know how the profile of students in solving problems through analysis of answers on online worksheets integrated with demonstration videos.

Method

The method used in this research is descriptive research method. According to Rukajat (2018) descriptive research is used to create descriptions, descriptions in a systematic, factual, and accurate manner regarding the facts being investigated. The description referred to in this study is the result of analyzing student answers on an

online worksheet. The worksheets used are designed for problem-based learning with the help of demonstration videos and virtual labs. The demonstration video used is a parabolic demonstration video that can be accessed directly through the YouTube site. Meanwhile, the virtual lab used is the projectile motion lab from PhET (Sudjito, 2020).

The purpose of this study was to determine the profile of students' problem-solving abilities after implementing learning using online worksheets integrated with demonstration videos. The population of this study were students of the second level of physics education program at Garut. The number of students involved was 21 students.

In the student worksheet, there is one problem presentation and three observation activities. The problem is designed based on indicators of problem solving stages according to Heller (Dewi, et al., 2018), namely (1) focusing on the problem, (2) describing the problem in the concept of physics, (3) designing problem solutions, (4) doing problem solutions, and (5) evaluate the results of the answers. The problems presented in the worksheet are related to the problem of throwing a javelin, which uses the concept of parabolic motion. The assessment of the answers on the worksheet used a problem-solving ability test that the assessment rubric prepared by Dewi et al. (2018). The vulnerability of the total score for all stages of solving is 0 to 15. This total score will be converted into a percentage value. According to Harahap and Surya (2017) this score is used to determine the criteria for students' problem solving abilities with the interpretation in Table 1.

Table 1. Problem Solving Skill Category

Score (%)	Category
80 – 100	Very High
66 – 79	High
56 – 65	Average
40 – 55	Low
30 - 39	Very Low

There are three core activities contained in the student worksheets. In the first activity, students were asked to observe the motion of a basketball on the parabola trajectory then analyze its motion on the x-axis and y-axis projections. In the second activity, students were asked to observe the motion of the bullet when it reached its highest point. And in the third activity, students are asked to explore the variables that affect the motion of the parabola. An example of displaying student worksheets can be seen in Figure 1.

Kegiatan 1

1. Perhatikan gerak bola basket pada video berikut:
<https://www.youtube.com/watch?v=BEUPJZAU7Hs&t=39s>
2. Perhatikan hingga detik ke 0:48 !
3. Perhatikan pada video yang lebih lambat berikut: <https://youtu.be/ntm9RAukr-Q>
4. Bayangkan bahwa gerak bola basket tersebut berada dalam koordinat kartesian dua dimensi yang dibatasi oleh sumbu x dan sumbu y!
5. Jika kamu stop video tiap 1 detik maka akan terbentuk titik-titik dimana posisi bola basket berada. Gambarkan titik tersebut di lembar pengamatanmu!
6. Proyeksikan titik-titik yang kamu buat di poin 4 terhadap sumbu x dan sumbu y!
7. Bagaimana jarak yang ditempuh bola pada sumbu x pada setiap waktu?
8. Bagaimana jarak yang ditempuh bola pada sumbu y pada setiap waktu?
9. Perhatikan titik-titik pada sumbu x dan sumbu y yang kamu buat, pola titik-titik tersebut mirip dengan pola jejak pada gerak apa?
10. Perhatikan gerak bola tenis yang dilempar pada video berikut:
<https://www.youtube.com/watch?v=BEUPJZAU7Hs&t=1m8s>
11. Perhatikan hingga detik ke 1:14 !
12. Jika kita amati jejak bola tenis pada tiap selang waktu yang sama, pola jejak apa yang terbentuk?
13. Jika pada tiap selang waktu yang sama kita geser jejak bola ke sumbu x, perhatikan video berikut: <https://www.youtube.com/watch?v=BEUPJZAU7Hs&t=1m16s> bagaimana lintasan bola yang terbentuk?
14. Simpulkan gerak parabola jika diproyeksikan pada sumbu x dan sumbu y!

Figure 1. Examples of online worksheet sections

Result and Discussion

The results of students' problem-solving abilities at each indicator of the problem-solving stage are shown in Figure 2 below.

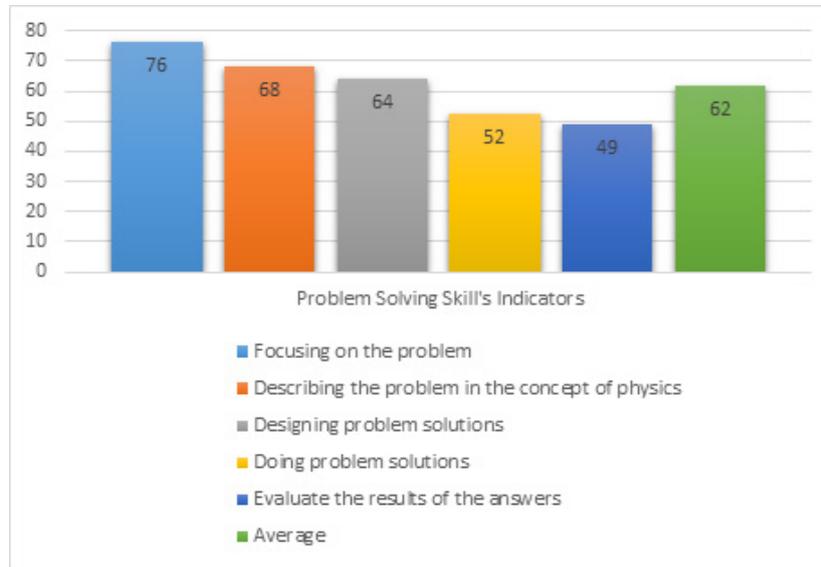


Figure 2. The average result of students' problem solving skills

Based on Figure 2, it show that the ability of students to focus on problems obtained 76% with high criteria. The score for the indicator describing the problem is 68% with high criteria. The score on the indicator of designing a problem solution is 64% with sufficient criteria. For indicators of doing problem solutions, a score of 52% was obtained with low criteria. And for indicators of evaluating the results of the answers obtained a score of 49% with low criteria. The total average score obtained is 62%, which is sufficient.

The results of the answers to the problem solving questions on the worksheet showed that on average the students' skills in solving problems were sufficient. Even though the students' understanding of the concept is quite good. This can be seen from the answers to the observation activities on the worksheet. As a sample the answers from one of the students (S₁) can be seen in Figure 3.

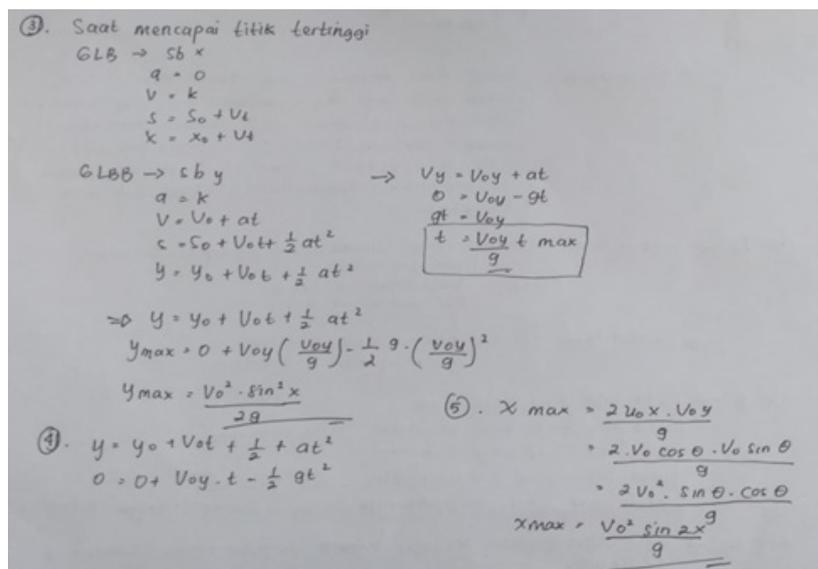


Figure 3. One sample of student answers on the worksheet

Based on Figure 3, it can be seen that the students understand enough in analyzing the motion of the parabola and putting it into mathematical equations. When looking back at the results of problem-solving skills, the low indicator is doing problem solutions and evaluating the results. Therefore, from this we can conclude that students already understand the concept but cannot use or apply the concept to solve problems in real life. This means that students' ability to process information is still lacking. This finding is reinforced by the results of research conducted by Harahap & Harahap (2020) which states that students' problem solving abilities can be improved through inquiry learning which trains students in finding and processing information related to given problems. This is in line with the research results of Elisa, et al. (2019) which state that increasing problem-solving skills can be done through experimental activities. In this experimental activity students were trained to process information.

In the first and second of problem solving indicators, the average results obtained high criteria. This means that students can focus on the problem and describe it in the concept of physics. According to Apiati & Hermanto (2020), this ability is included in the indicator of critical thinking skills. Therefore, those students have provisions to hone other critical thinking skills that are expected in the minimum competency assessment of the independent learning policy (Tohir, 2019).

Based on the results of the five indicators of problem solving ability, only two indicators obtained the high category. One indicator is sufficient and the remaining two are in the low category. This shows that there needs to be more treatment for students so that students' problem solving abilities can increase. Several studies show ways to improve students' problem solving abilities. Among them are the results of research by Malik, et al. (2019) which states that problem-solving abilities can be improved through a problem-solving laboratory model. Efforts to improve problem-solving abilities can also be done by using other learning models such as the Ubiquitous Flipped Classroom learning model with a scientific learning process (Srilaphat & Jantakoon, 2019), group science learning models (Fuad, et al., 2019), guided inquiry models through virtual laboratories (Gunawan, et al., 2019), and other learning models.

Conclusion

The profile of students' problem-solving skills based on online worksheet analysis showed that they were in the sufficient category. Students are good at understanding and describing problems, but are still low in solving problems and evaluating the results of problem solving. The low ability to solve problems and evaluate this problem. This is due to the low ability of students to apply concepts to real problems.

Acknowledgement

Acknowledgments are addressed to DIKTI for funding this research through a PDP program in 2020. Research scheme in accordance with the research implementation contract (044.17/lemlit/uniga/IV/2020).

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