ASEAN Journal of Community Service and Education

Journal homepage: https://ejournal.bumipublikasinusantara.id/index.php/ajcse

Distance Teaching of Stress Materials to Junior High School Students Using Digital Media

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ABSTRACTS

The purpose of this study was to analyze the teaching of pressure remotely using digital media to junior high school students. This research was conducted on fifty junior high school students (2nd grade) at junior high school 11 Tangerang City, Indonesia using online teaching methods in the form of power points and learning videos displayed through Google Meet and Google Classroom as digital media to explain pressure material. The success of second-grade junior high school students in understanding the stress material was evaluated using pre-test and post-test questions of ten multiple-choice questions. The results showed that students experienced an increase in grades after being given power points and learning videos. The main reason for the success of the remote teaching process is due to the use of power points and experimental demonstrations displayed in video form.

ARTICLE INFO

Article History:
Submitted/Received 03 Jan 2022
First revised 05 Feb 2022
Accepted 25 Feb 2022
First available online 28 Feb 2022
Publication date 01 Mar 2022

Keyword:
Digital media,
Distance teaching,
Junior high school students,
Pressure.

1. INTRODUCTION

Pressure is an object that is subjected to a force where the force is pointing in a certain area of it. In the junior high school curriculum, students study stress material in the second grade. In general, there are three types of pressure, namely the pressure of solids, liquids, and gases (Mao *et al*., 2018). During the COVID-19 pandemic, many schools implemented online teaching using various digital learning media to prevent wider transmission (Unger & Meiran, 2020).

Online learning is a challenge for teachers and students, especially learning about exact sciences such as mathematics and physics (IPA). This is because the teaching of exact sciences requires direct teaching and is difficult to do online (Azhari & Fajri, 2021).

Currently, many studies discuss the effectiveness of online teaching methods for junior high schools (Asvial *et al*., 2021), the use of digital learning media (Agustina & Nandiyanto, 2021), the application of pressure in everyday life (Jin, 2021), and how to build critical thinking in junior high school students regarding natural science lessons (Ekamilasari *et al*., 2021). Although many articles discuss the natural science learning process (Koizumi, 2004; Chang *et al*., 2020; Riyanti *et al*., 2018), articles on distance learning, especially regarding pressure for junior high school students, are still rarely found, especially about the complete distribution of pressure types.

Therefore, the purpose of this study is to analyze the teaching of pressure remotely from its definition, types, and calculation formulas using digital learning media to junior high school students. This research was conducted on fifty junior high school students (2^{nd} grade) in Tangerang City, Indonesia using an online teaching method in the form of Google Meet as a digital medium to explain material and display PowerPoints. At the end of the teaching session, there is interaction with students in the form of questions and answers. The success of second-grade junior high school students in understanding the stress material was evaluated using pre-test and post-test questions of ten multiple-choice questions.

The novelties of this research are:

(i) The pressure material taught to junior high school students specifically regarding the pressure of solids and liquids;

(ii) Learning is conducted online with Google Meet and Google Classroom; and

(iii) The subject of the research is the second grade of junior high school.

The results showed that students' scores increased at the post-test when compared to the students' scores at the pre-test. More than 70% of the material can be understood by students so it can be concluded that pressure material can be taught online to second-grade junior high school students. This study is suitable for covering issues in teaching science to students with special needs, providing education and training.

2. METHODS

This study uses an online teaching method in the form of Google Meet as a digital medium to explain the material and display power points. PowerPoints are made with as many attractive pictures as possible to support the presentation. Learning videos were also made by conducting experimental demonstrations on hydrostatic pressure and shared through Google Classroom. At the end of the teaching session, there is interaction with students in the form of questions and answers.

The research participants were fifty students at junior high school (2^{nd} grade) in Tangerang City, Indonesia. Then to get basic information from students such as the ability of their basic

DOI:
p- ISSN 2829-0216 e- ISSN 2828-8122

knowledge about science lessons, especially pressure material, we held a pre-test and post-test of ten multiple-choice questions regarding solids pressure and hydrostatic pressure via Google Form. The collected data is then used to develop research instruments. After that, to facilitate the analysis of students' ability levels, all information obtained was assessed using a scale of 10 for correct answers and 0 for incorrect answers.

3. RESULTS AND DISCUSSION

Table 1 describes the results of the pre-test and post-test of the fifty students who were sampled in this study. The pressure material used for the pre-test and post-test questions is solid pressure and hydrostatic pressure. This is because in the learning curriculum the pressure material taught to junior high school students does not include air pressure material. These materials have a higher level of difficulty when compared to solid pressure and hydrostatic pressure materials.

The pre-test and post-test were distributed to students regarding the google form to develop second-grade students' understanding about pressure material. Before the test was held, the material presented was first using PowerPoint to help with the presentation through Google Meet.

In the PowerPoint, many examples of pressure practice questions are included to be discussed together. Then the material was also delivered using a demo video experiment that was shared through Google Classroom. The video was made to prove one of the laws of hydrostatic pressure, namely Archimedes' Law.

All teaching activities on this pressure material are carried out online to analyze the effectiveness of distance teaching when compared to face-to-face teaching. During the distance teaching of this pressure material, there are many obstacles in the process. One of the most common obstacles is the problem of signaling and internet package quotas so that sometimes students cannot be forced to join online meetings.

Another obstacle is the difficulty of supervising students' learning in understanding the pressure material so that when students are given assignments, they are not optimal in doing these tasks. All of these obstacles can be reduced by making material in the form of power points that are interesting and fun to study independently. Videos are also made to provide a more in-depth picture of this pressure material so that students can study independently effectively.

Exact science lessons such as mathematics and physics need teaching with a high enough intensity because a lot of the material in these lessons is numeracy so students have to do a lot of practice questions to better understand the material. This can happen if the teacher provides a lot of practice questions to students and conducts intensive guidance such as teaching a lot of new calculation formulas.

Based on the data table, the pre-test score shows that students' understanding of the application of distance teaching regarding pressure material is 57.8%. After students were given material in the form of power points and learning videos about pressure, students' understanding increased to 77.3%. It can be seen that learning media in the form of power points and videos through digital media can make it easier for students to learn about exact science lessons (Azhari & Fajri, 2021).

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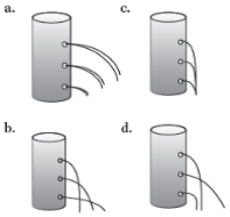
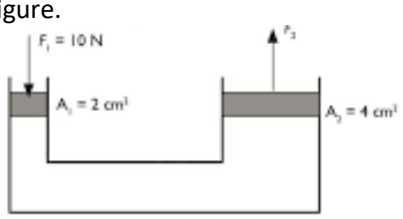
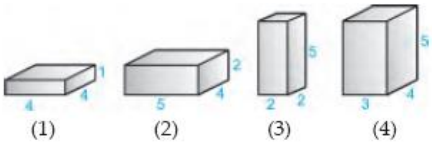
p- ISSN 2829-0216 e- ISSN 2828-8122

Table 1. Percentage of Pre-test and Post-test Results.

No.	Questions	Pre-test	Post-test
1.	Traditional divers who dive in the ocean are often hearing impaired. This is caused by...	86%	94%
2.	The following image is a liquid in a container. The greatest stress is in... 	18%	86%
3	A jar is filled with water. If the tube is given 3 holes, the correct picture is... 	52%	62%
4	A pressure of 10 Pa is equal to...	62%	82%
5	Pay attention to the questions below. A hydraulic jack with a schematic is shown in the figure.  From the data shown in the figure, we can obtain a force F, equal to...	60%	62%
6	The hydraulic car lifter in the picture above has suckers of area A1 = 15 cm2 and A2 = 600 cm2, respectively. If the small sucker is given a force F1 of 500 N, then the weight of the load that can be lifted is ….	56%	82%
7	The factors that affect the amount of pressure are...	80%	84%
8	The pen is pushed into the fingers, the pressure on the pointed end of one feels greater than the blunt end. This is because...	54%	70%
9	Efforts that can be made to get a lot of pressure are...	76%	82%
10	Look at the following picture. The four blocks above are placed on the table and given the same force. The least pressure is given by the number block... 	30%	20%

DOI:
p- ISSN 2829-0216 e- ISSN 2828-8122

From ten questions given to fifty students, nine questions experienced an increase, and one question experienced a decrease in answering the pre-test and post-test questions correctly. The number that has decreased is number 10 as shown in **Tables 1 and 2**. This happens because the examples used to explain this question are slightly different when presenting the material using PowerPoint so the questions do not match the students' estimates.

Meanwhile, numbers 1-5 have increased because in presenting the material, they use many different examples of questions on power points so that students can understand the calculation for hydrostatic pressure. Then for numbers 6-10, it has increased because in presenting the material using interesting pictures in explaining the material on power points so that students can understand calculations and applications for substance pressure. Experimental demonstrations made in the form of videos are made for students so that they can better understand the application of beneficial and detrimental stress materials in everyday life (Ekamilasari *et al*., 2021).

The results of the study can be seen from **Table 2** that the value experienced after the material is delivered. As for the discussion:

(i) For question number 1 regarding "Traditional divers who dive in the ocean are often hearing impaired. This is because…", the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 43 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 47 students from 50 students.

(ii) For question number 2 regarding "The following image is a liquid in a container. The greatest stress is in...", the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 9 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 43 students from 50 students.

(iii) For question number 3 regarding "A jar is filled with water. If the tube is given 3 holes, the correct picture is...", the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 26 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 31 students from 50 students.

(iv) For question number 4 regarding "A pressure of 10 Pa is equal to...", the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 41 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 32 students from 50 students.

(v) For question number 5 regarding "Pay attention to the questions below. A hydraulic jack with a schematic as shown in the figure. From the data shown in the figure, we can obtain a force F, equal to...", the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 30 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 32 students from 50 students.

DOI:
p- ISSN 2829-0216 e- ISSN 2828-8122

(vi) For question number 6 regarding “The hydraulic car lifter in the picture above has suckers of area A1 = 15 cm2 and A2 = 600 cm2, respectively. If the small sucker is given a force F1 of 500 N, then the weight of the load that can be lifted is...”, the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 28 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 41 students from 50 students.

(vii) For question number 7 regarding “The factors that affect the amount of pressure are...”, the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 40 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 42 students from 50 students.

(viii) For question number 8 regarding " The pen is pushed into the fingers, the pressure on the pointed end of one feels greater than the blunt end. This is because...", the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 27 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 35 students from 50 students.

(ix) For question number 9 regarding "Efforts that can be made to get a lot of pressure is...", the result showed an increase.
These results were obtained because there was an increase in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 38 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 41 students from 50 students.

(x) For question number 10 regarding " Look at the following picture. The four blocks above are placed on the table and given the same force. The least pressure is given by the number block...", the result showed a decrease.
These results were obtained because there was a decrease in the number of students who answered correctly during the post-test. In the pre-test, the number of students who answered correctly was 10 students out of 50 students. Then in the post-test the number of students who answered correctly increased to 15 students from 50 students.

Table 2. The score of Pre-test and Post-test Results.

Question No.	Pre-test Score	Post-Test Score
1	43/50	47/50
2	9/50	43/50
3	26/50	31/50
4	32/50	41/50
5	30/50	32/50
6	28/50	41/50
7	40/50	42/50
8	27/50	35/50
9	38/50	41/50
10	15/50	10/50

DOI:
p- ISSN 2829-0216 e- ISSN 2828-8122

4. CONCLUSION

Distance teaching of stress material to junior high school students using digital media experienced significant success based on the graphs of the students' pre-test and post-test scores. This research was conducted on 50 second-grade junior high school students. One of the success factors for this research is the online teaching method in the form of Google Meet as a digital medium to explain the material and display power points. Power points are made with as many attractive pictures as possible to support the presentation. Learning videos were also made by conducting experimental demonstrations on hydrostatic pressure and shared through Google Classroom. The success of second-grade junior high school students in understanding the stress material was evaluated using a pre-test and post-test of ten multiple-choice questions. This study provides information that online teaching methods regarding exact sciences to junior high school students can be done by video and PowerPoint via google meet or google classroom.

5. ACKNOWLEDGMENT

The authors would like to thank the schools that have become partners in the research, LPPM UPI, KJP UPI, as well as the field supervisors for KKN who have guided the completion of this paper.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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DOI:
p- ISSN 2829-0216 e- ISSN 2828-8122