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Online learning with multi-representation worksheets for oral and written communication skills on light reflecting material

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Abstract

To fulfill 21st-century skills, one of the skills needed is communication skills in oral and written form. This study aims to practice oral and written skills through learning multi-representation worksheets on light-reflecting material. By using the experimental method, namely one group pretest-posttest design. The sample in this study used a purposive sampling technique, which is the sample was selected based on certain reasons with a total of 36 students. The research instrument is a questionnaire of oral and written communication skills that have been tested for validity and reliability. The results of the study stated that the learning process following the needs, and representation activities in the learning process designed by researchers functioned to encourage students to develop physical representation abilities, especially in light-reflecting material. Improved oral and written communication skills can be seen during the process as the results of student assignments and are shown by the results of the N-gain of 0,48 (medium category) and the paired t-test of Asymp. Sig (2-tailed) 0,000, therefore Asymp. Sig (2-tailed) < 0,05 then Ho is rejected and H1 is accepted. This research can be innovative and used by teachers in the online learning process.

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INTRODUCTION

Education is currently focused on the challenges of the industrial revolution 4.0 (Ariyani et al., 2018; Ciffolilli & Muscio, 2018), where students are required to master 21st-century skills that focus on information technology (Mishra & Mehta, 2016; Subekti et al., 2018). In line with these demands, the current conditions are very supportive of the equalization of mastery of technology and information. Since the Covid-19 pandemic and learning policies emerged to be implemented online or hybrid (Fitriyana et al., 2018; Gleason & Greenhow, 2017; Shen & Ho, 2020). The learning process must continue to prioritize the achievement of the goals and indicators that have been set even though the process is online. The skills that are a challenge for students today are critical thinking, problem-solving, creativity, innovation, communication, and collaboration (Farisi, 2016; Sagala et al., 2019).

Communication skills are important. The importance of having communication skills in human life is in line with the statement (Saekhow, 2015). This states that just as an educator must teach academic skills, communication and collaboration skills should also be given to students, because this action will benefit them to improve group work, and determine the success of community social relations (Saekhow, 2015; Worrell et al., 2015). Communication skills are

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considered effective if they can meet one's needs, namely expressing a series of communications or being able to create a communication situation that is conducive to the development of creative thinking skills (Kaps & Voges, 2007). Communication, which is the main element, holds a very crucial function in the teaching and learning process. In an integrated science curriculum, one of the competencies that students must possess is being able to communicate information, ideas, analyses, and arguments effectively in various media to the public (Daga, 2022; Zubaidah, 2019).

In physics material, learning has been developed and innovated by using various media or supporting teaching materials such as worksheets, modules, models, and other approaches. The research in the field of physics includes, among others, worksheets with PBL (Asrori & Suparman, 2020), module digital interactive (Irwandani et al., 2017), the use of a multi-representation approach (Suhandi & Wibowo, 2012), learning videos (Surya et al., 2022) and multi-representation-based learning models in the physics learning process (Setyandaru et al., 2017). The effectiveness of the physics learning process will continue to be researched to find other innovations that can be used as a reference in designing a better learning process in the future. As a reference, this research finally chose to learn media in the form of worksheets.

In fact, in the process, the needs referred to in communication skills have not been met. Communication skills have been studied previously in various fields. Several studies that have examined communication skills include: using learning models to improve scientific communication (Nurhayati et al., 2013), mathematical communication skills and their relationship to intrapersonal intelligence (Marfiah & Pujiastuti, 2020), improving mathematical communication with a scientific approach (Deswita et al., 2018), and use communication skills to solve problems (Erozkan, 2013). Based on this research, no one has studied especially oral and written communication skills in the learning process.

Seeing the facts, the writer will examine the online learning process using worksheets to practice communication skills. Due to the current condition that distance learning is being carried out (online), it is hoped that as a novelty and contribution the research will use multi-representation worksheets in electronic form, which are trained in oral and written communication skills.

METHOD

This study uses an experimental method, namely a one-group pretest-posttest design. According to (Fraenkel & Wallen, 2009) this design only uses one class as the experimental class, then the dependent variable is measured in one group by being given a pre-treatment and post-test after treatment as shown in Table 1.

Table 1. Experiment design one-group pretest-posttest design

Pretest	Treatment	*Posttest*
O_1	X_1	O_2

Information:
O1 : experimental class pretest
O2 : experimental class posttest
X1 : Treatment with multi-representation worksheets

The sample in this study used a purposive sampling technique, the sample was selected based on certain reasons. The sample in this study was class XI with a total of 36 students. The instrument used is a questionnaire of oral and written communication skills which before being used will be tested for validity and reliability. The analysis of the results of communication skills is carried out with two analyzes, namely:
1. descriptive analysis, calculating the average pretest, posttest, and N-gain. The average pretest and posttest of communication skills can be calculated by the formula:

$$Total\ score = \frac{Total\ score}{Total\ number} x\ 100\%$$

N-gain can be calculated with the formula:

$$N - gain = \frac{Posttest\ score - Pretest\ score}{Maximal\ score - pretest\ score}$$

The *N-gain* interpretation criteria proposed by Meltzer (2005) are as in Table 2.

Table 2. Criteria for interpretation of *N-gain*

Average Normalized Gain (1)	Interpretation Criteria (2)
g > 0,7	Height
0,3 <g ≤ 0,7	Medium
g ≤ 0,3	Low

2. interference analysis that will be used is the paired sample t-test. Paired sample t-test was used to determine the average increase before and after the implementation of learning using multi-representation worksheets. The research hypotheses used are:

H_0 : There is no significant average increase in learning to use multi-representation worksheets to practice oral and written communication skills..
H_1 : There is a significant average increase in learning to use multi-representation worksheets to practice oral and written communication skills.

RESULTS AND DISCUSSION

To see the effectiveness of the learning process in improving communication skills, several tests were carried out such as the normality test, paired t-test, and N-gain test. However, previously the collaboration skills instrument whose indicators were adapted from (UHD GEC, 2014), consisted of oral communication skills and written communication. Previously, the following are the results of the validation of the communication skills instrument.

Table 3. The results of the validity test of the communication skills

No Soal	Correlation Coefficient	Criteria
1	0,887	Valid
2	0,844	Valid
3	0,872	Valid
4	0,878	Valid
5	0,908	Valid
6	0,887	Valid
7	0,891	Valid
8	0,853	Valid
9	0,863	Valid
10	0,872	Valid
11	0,900	Valid
12	0,852	Valid
13	0,889	Valid
14	0,883	Valid
15	0,874	Valid
16	0,914	Valid
17	0,884	Valid
18	0,885	Valid
19	0,912	Valid

Based on Table 3 with the number of respondents N=100 and α = 0,05 it is obtained r table = 0, 195, and it can be seen in the table that 19 items have a Pearson correlation > 0,195, so 19 items are declared valid and used as communication skill instruments. Based on the analysis of the reliability test using the SPSS 22 program, the reliability test gives the final result in the form of SPSS output which shows the Cronbach alpha number. Cronbach alpha number for testing the reliability of the communication skills questionnaire obtained a value of 0,992 with a very high degree of reliability category. Therefore, it can be concluded that the instrument of oral and written communication skills is reliable.

Table 4. The results of the normality test of communication skills

Result Data	*Assymp. Sig (2-tailed)*	Description
Pretest	0,238	Normal
Posttest	0,116	Normal

Based on Table 4 (sig value) > 0,05, it means that the data group is normally distributed. The results obtained from this normality test are a requirement to carry out a paired sample test using the paired sample t-test. The results of the statistical analysis of the paired t-test also show that representation-based e-LKPD can train students' communication significantly with Asymp. Sig (2-tailed) 0,000, therefore Asymp. Sig (2-tailed) < 0,05 then Ho is rejected and H1 is accepted. The Data are represented and can be seen in Table 5.

Table 5. Results of paired t-test communication skills

Value	Mean	t	df	*Asymp. Sig (2-tailed)*
Pretest-posttest	-13,472	-13,799	35	0.000

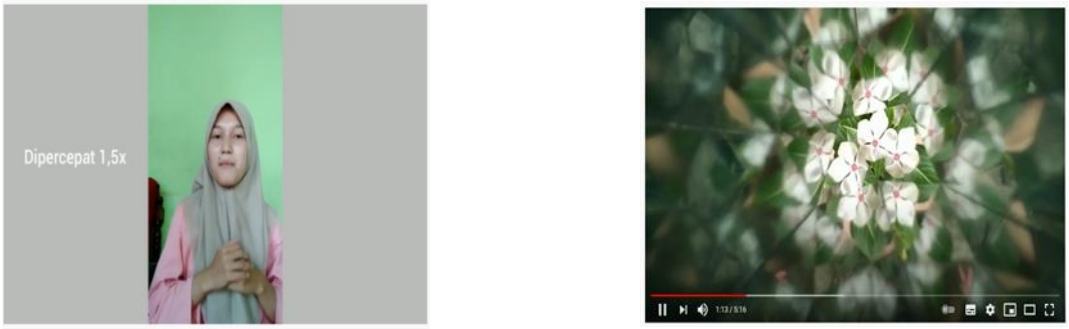
The improvement of students' communication skills can be seen from the difference between the results before learning (pretest) and the results after learning (posttest). The data on the average N-gain learning outcomes on aspects of communication skills through pretest and posttest can be seen in Table 6.

Table 6. Average data of n-gain communication skills

	N-gain			
	Value Minimal	Value Maximal	Average	Criteria
Communication Skills	0,56	0,90	0,48	Medium

The results of the data in Table 6 show the average N-gain value of communication skills is 0,48 in the medium category. Thus, it can be said that the improvement of students' oral and written communication skills is in the medium category. This is in line with Ika's research (2018) which states that communication skills require more attention so that students can convey information orally and in writing clearly and precisely. In practice, communication skills play a role from the beginning to the end of the learning process. In the beginning, it is necessary to be able to communicate the problems that will be solved, write down data, and analyze and communicate the results orally (Wulandari et al., 2019). Because of all that, this research provides learning innovations that can assist in practicing communication skills orally and in writing

This research was conducted during the Covid-19 pandemic; therefore, the learning process was carried out online and with a limited time. For experimental activities, students are directed to do it outside of learning hours by making videos and uploading them to YouTube as evidence of the implementation of learning. snippets of pictures as video evidence of students carrying out learning activities according to the activities on the worksheets can be seen in Figure 1.

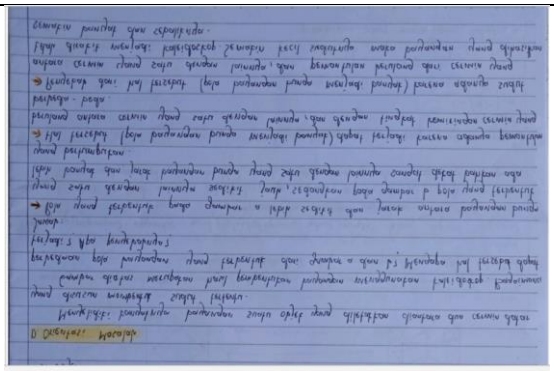
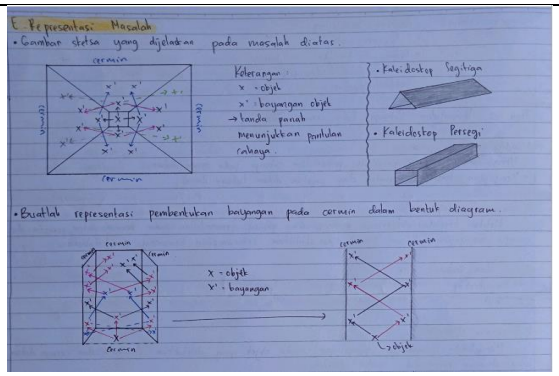
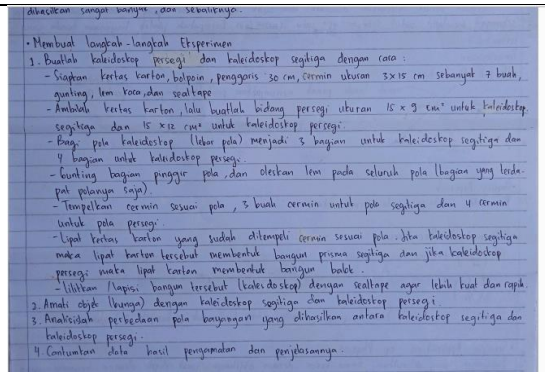


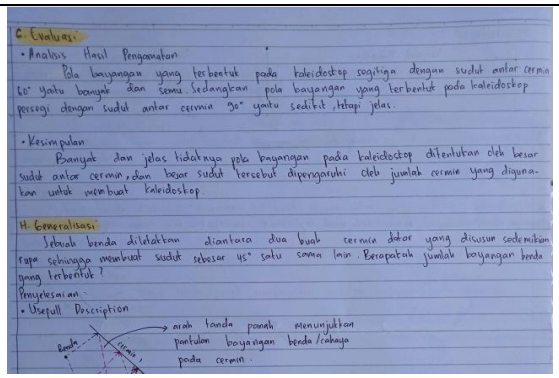
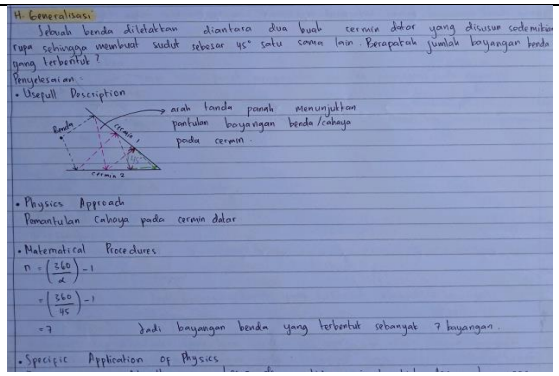
(a) (b)

Figure 1. (a) Presentation of students in the video; (b) Students-designed kaleidoscope

During the learning process, students do it in groups and they divide their respective tasks. They share opinions and discuss to be able to complete each activity on the worksheet. In addition, students are also required to make presentations and upload them via YouTube. The following presents the results of student work which are presented in table 7.

Table 7. Student work results using worksheets with multiple representations

Steps of Worksheets	Results of Student Worksheets	Explanation
Orientation		Students can convey ideas conceptually. The skill to be trained is *oral communication.*
Expression		Students can make representations in the form of sketches, ray diagrams, and mathematical equations. The skills to be trained are *written communication.*
Investigation		Students can design tools based on relevant and valid sources and arrange experimental activities. The skills to be trained are *oral communication and written communication*.

Steps of Worksheets	Results of Student Worksheets	Explanation
Evaluation		Students can process data, analyze, conclude and present it. The skills to be trained are *oral communication and written communication.*
Generalization		Students can complete the practice questions according to the procedure.

Improved communication skills can be seen during the process how the results of student assignments. This is by Sheftyawan et al., (2018), that the difficulty of students understanding the concept is due to the lack of reference materials for learning. Students are accustomed to sticking with one book as a reference. Creating a learning process that is by the needs and expectations of students and teachers will greatly help overcome students' learning difficulties. As research conducted by Bunawan et al., (2015), difficulties are generally when solving physics problems in graphical representation and equations. These difficulties are because students are unable to relate their mathematical abilities in the context of physics. Therefore, representation activities in the learning process designed by researchers function to encourage students to develop physical representation abilities, especially in light reflecting material. This is in line with the increase in written communication skills according to Lynn, (2009), where written communication skills go hand in hand with the ability of students to represent answers in answering the questions given. The representation ability in question is that students can answer any questions in written form, and communicate them orally (Ika, 2018), this includes activities that train oral and written communication skills.

CONCLUSION

Based on the research and analysis conducted, the effectiveness is indicated by the results of the N-gain of 0,48 (Medium category) and the paired t-test of Asymp. Sig (2-tailed) 0,000, therefore Asymp. Sig (2-tailed) < 0,05 then Ho is rejected and H1 is accepted. This value means that there is an increase in oral and written communication skills which states that learning with multi-representation worksheets is effectively applied to students, especially light reflecting material. The results of these findings can be innovative and used by teachers in the online learning process. Suggestions for further research could cover a wider sample, and examine its relationship with other skills.

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