



DEVELOPMENT OF STUDENT WORKSHEETS BASED ON POE (PREDICT, OBSERVE, AND EXPLAIN) WITH SCIENCE LITERATURE APPROACH

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ABSTRAK

Lembar kerja merupakan sarana untuk meningkatkan kemampuan berkomunikasi peserta didik. Penelitian ini bertujuan untuk mengetahui kelayakan, kepraktisan serta keefektifan dari produk Lembar Kerja Peserta Didik (LKPD) yang dikembangkan dalam meningkatkan kemampuan berkomunikasi peserta didik. Metode penelitian yang digunakan yaitu metode *Research and Development* dengan menerapkan beberapa tahapan model Borg and Gall. Instrumen penelitian yang digunakan yaitu lembar validitas ahli, tes kemampuan berkomunikasi serta angket respon peserta didik. Kemudian data yang diperoleh dianalisis menggunakan uji validitas ahli, uji validitas dan reliabilitas, uji *N-Gain* dan uji *t* meliputi uji *independent t-test two tailed* dan uji *t-test one tailed*. Hasil penelitian ini yaitu produk lembar kerja peserta didik berbasis POE dengan pendekatan literasi sains layak untuk diterapkan dalam pembelajaran IPA, praktis dan efektif digunakan untuk meningkatkan kemampuan berkomunikasi peserta didik dengan perolehan nilai *N-Gain* sebesar 66,67 pada taraf signifikansi ($\alpha = 0.05$).

Kata kunci: LKPD, POE, literasi sains, kemampuan berkomunikasi.

Abstract

Worksheets are a means to improve students communication skills. This study aims to determine the feasibility, practicality, and effectiveness of the Student Worksheet (LKPD) product developed in improving students' communication skills. The research method used is the method of *Research and Development* by applying several stages of the Borg and Gall model. The research instruments used were expert validity sheets, communication skills t-tests, and student response questionnaires. Then the data were analyzed using the validity test expert, validity and reliability test, test *test-Gain N*, and t include test *independent t test two tailed* and *t-testone-tailed*. The results of this study are POE-based student worksheets with a scientific literacy approach that are feasible to be applied in science learning, practical and effective to improve students' communication skills with the acquisition of an *N-Gain* value of 66.67 at the significance level ($\alpha = 0.05$).

Keywords: LKPD, POE, scientific literacy, communication skills

INTRODUCTION

Technology is advancing in century 21, which requires students to be able to keep up with the current progress of the times but must still equip themselves with various existing abilities. Reply from the *National Education Association* that the current generation must not only be able to master abilities in the cognitive field, but also must be able to communicate well and proficiently (Wicaksono, Susilo, and Sueb 2019). Meanwhile, according to data from an investigation conducted by PISA, it shows that in 2015 Indonesia recorded an average scientific literacy score below the OECD standard. This shows the low scientific literacy skills of students, one of which is in the indicators of the ability of the science process, especially in communication OECD explains that students' communication skills in scientific literacy are not only about how to speak, exchange insights, and opinions, but also include the ability to explain scientific truths from research that has been carried out both in written and oral form (Nugraheni et al., 2017). Thus, it can be understood that the ability to communicate is very important for students to have.

Preliminary observations made by researchers at one of the public junior high schools in Ponorogo shows that the average communication skills of students at the junior high school age level are still not good. This can be seen from the results of the analysis of the worksheet value of students' communication skills obtained by researchers during observations, which shows that only 11 out of 24 students are able to get scores above the maximum specified criteria. This statement is also corroborated by the results of interviews that have been conducted with one of the science teachers who explained that the level of communication skills possessed by students still needs to be improved. This can be seen from the need for guidance from teachers so that students are more courageous and able to express their ideas and ideas. The resource person also explained that in learning activities, teachers have tried to implement constructive learning activities such as conducting discussions. However, the worksheet that is applied in learning activities so far is still focused on cognitive abilities only so that it is only to see the level of students' understanding of the material being studied, it has not led to worksheet that is able to focus on improving students' scientific abilities, especially the ability to communicate science.

Based on results of interviews and observations that have been made, the researcher intends to develop learning products to improve communication skills, namely the development of student worksheets-based POE (*Predict, Observe, and Explain*) with a scientific literacy approach. Worksheet was chosen to be developed in this study, because worksheet is one of the learning tools that is able to support the course of teaching and learning activities, especially in learning 2013 curriculum which is oriented to students. As the opinion of Kosasih who stated that K-13 is very focused on a series of processes that must be passed by students in order to be able to increase insight and skills through learning experiences so that they are able to grow the attitude of science scientists in students (Sinaga et al., 2019). Widjanti revealed that one of the learning resources that can be developed by educators by adjusting the conditions and situations as well as existing problems is worksheet. In addition, Prastowo also stated that worksheet that was prepared by educators themselves was better able to have

its own charm and was more in line with the socio-cultural environment of students (Hartati & Azizah, 2019; Suhendar, 2018).

The hallmark of this worksheet-based POE is that there is a unified process of *predict*, *observe* and *explain* that must be taken by students to solve the problems that have been presented. As research conducted by Budiono et al (2018) showed that the ability of students to argue was better with the implementation of POE-based *worksheets* (*predict*, *observe* and *explain*) (Budiono et al., 2018; Erniwati & Sukariasih, 2020). The results of research conducted by Tina (2017) also showed that the application of the POE method (*predict*, *observe* and *explain*) in learning activities was able to improve students' mathematical communication skills with the stages *predict*, *observe* and *explain* (Sumartini, 2017).

The scientific literacy approach was also chosen to support students' communication skills through the preparation of worksheet-based POE because there are positive things that can be obtained when students are able to master scientific literacy. Kek et al., stated that mastering scientific literacy can add insight, expertise in digging up information and increase a responsible attitude in everyday life (Wicaksono et al., 2019). In addition, the Ministry of Education and Culture also stated that ways of thinking, attitudes and caring characters for the surrounding environment can be grown through scientific literacy. Learners who are able to master scientific literacy skills will be better prepared and able to face the problems that exist in a society that relies heavily on technology in modern times like this. In addition, someone who is able to master scientific literacy will be better able to create products that are very useful to solve problems around him (Armas et al., 2019).

There are several indicators that serve as a basic reference in measuring students' communication skills. The indicators applied in this research are the ability to dig up information, the ability to process research data, and the ability to convey ideas and opinions. The ability of students to explore information can be seen from the ability to narrate the previously studied material in writing and to be able to relate the problem to previously studied material (Asminah & Rukmi, 2020; Baharun & Dini, 2019; Zulfa & Rosyidah, 2020). Then the ability of students to process data can be seen from the ability to narrate research data in the form of pictures, tables, graphs and so on into scientific narratives, and vice versa, namely describing research in the form of text or small notes into pictures, tables, graphs, and so on according to with the need for research reporting (Sari et al., 2016) While the ability to convey ideas and opinions can be seen from the ability of students to express their opinions on the problems around them by using good language, as well as mentioning the causes of an event based on the phenomena that have been described (Gainau, 2009; Salfera, 2017; Zulfa & Rosyidah, 2020).

METHOD

The method used in this study is the Research method *and Development* by applying several stages of the Borg and Gall model due to time and cost constraints. This research took place at MTs 1 Muhammadiyah which is located on Jalan Stadion Timur, No. 20 B Kertosari, Ponorogo Regency, East Java. The sample in this study was taken using a technique, *saturated sampling*

namely all students of class VII MTs Muhammadiyah 1 Ponorogo which will later be divided into a control class and an experimental class.

The instruments used in this study were expert validity sheets consisting of material/content validity, construct validity (specificity) and readability validity, communication skills tests consisting of *pretest* and *posttest*, and student response questionnaires. The data analysis technique used is descriptive qualitative and descriptive quantitative. Qualitative descriptive analysis technique was applied to analyze the criticisms and suggestions given by the validator on the construct validity sheet (specificity). While the quantitative descriptive analysis technique is applied to analyze the results in the form of numbers.

To see the effectiveness of the worksheet applied, it can be seen from the acquisition of students' on the *scores pretest* and *posttest* which were analyzed using the *N-Gain* test and t test with *SPSS version 25.0*. If the results of the test *N-Gain* are in the range of 0.30 g 0.70, then the product developed can be said to be quite effective in improving students' communication skills (Lestari & Mujib, 2018). If the results of the t test show a significance value of less than 0.05 then there is a significant difference in the values in the experimental class and the control class. Meanwhile, if the results of the t test are more than 0.05, there is no significant difference in values in the experimental class and control class (Zulfa, 2020).

To see the feasibility of the developed worksheet product, it can be seen from the analysis of the expert validity sheet, which has been filled out by two validators, namely Mr. Khoirul Anwar, M.Pd, and Mrs. Aldila Candra Kusumaningrun, M.Pd. as a Tadris IPA lecturer at IAIN Ponorogo. The eligibility criteria of the developed worksheet product are.

Table 1. Product Feasibility Category Development

Score	Criteria Eligibility
81%-100%	Very feasible
61%-80%	Eligible
41%-60%	Fairly feasible
21%-40%	Less feasible
0%-20%	Very inappropriate

(Fatmawati & Agustina, 2016)

Worksheet developed can be said to be practical if the percentage of student responses 61%. So if the percentage of student responses is 41%, then the worksheet developed is still in the impractical category and requires improvement (Susiawan, 2013).

RESULTS AND DISCUSSION

Feasibility of the developed worksheet can be reviewed in three aspects, namely the material/content aspect, the uniqueness aspect and the readability aspect. The characteristics of the worksheet developed are the determination of the POE learning model (*predict, observe and explain*) and the scientific literacy approach in the worksheet which is reflected in the features contained in the worksheet. There are four features in the worksheet, namely the

scientific literacy feature, the *predict*, feature the *observe* and *feature the explain feature*. As research conducted by Budiono et al (2018) showed that the ability of students to argue was better with the implementation of POE-based *worksheets predict, observe and explain* (Budiono et al., 2018) stated that mastering scientific literacy can add insight, expertise in digging up information and increase a responsible attitude in everyday life (Wicaksono et al., 2019).

Assessment on the material/content aspect serves to measure the suitability of the content and material listed in the worksheet with the basic competence that must be achieved by students. Table 2 shows the results of the validator's recapitulation of the worksheet that has been developed on the aspect of content validity.

Table 2. Recapitulation of Content

Validity Aspects of Assessment	Validity Level	Percentage (%)
Eligibility of Material according to BSNP	Very feasible	87,5%
Feasibility of presentation according to BSNP	Very feasible	87,5%
Eligibility Language according to BSNP	Eligible	80%
Assessment of Science Communication Ability	Very feasible	97,5%
Average number		88%

The assessment on the specificity aspect serves to measure the feasibility level of determining the characteristics of POE and the scientific literacy approach on the worksheet that has been developed. Table 3 shows the results of the validator's recapitulation of the worksheet that has been developed on the aspect of construct validity.

Table 3. Construct Validity Recapitulation

Construct	Comment
1. The scientific literacy feature aims to foster a sense of concern for students on scientific issues in the surrounding environment	It is good
2. Features <i>predict</i> (predict) aims to improve the ability of learners in digging up information.	It is good, because it is able to stimulate learners to be able to dig for information. Rather, his description should be more appreciated.
3. The feature <i>observe</i> aims to improve the ability of students to process research data.	Well, there's only a few revisions on experiment purposes and bound variables.
4. The feature <i>explain</i> aims to improve the ability of students to convey ideas and opinions and process research data.	It's been good. However, for the description of stimulus given it is best to go into detail so that the learners will be more focused and detailed.

Assessments on the reading aspect serve to measure the selection of type of letters, font size, layout in the learner's worksheet, and color (Table 4) demonstrates the validator recapitulation on an aspect of the validity of reading.

Table 4. Recapitulation Results of the Validity of Reading

Aspects of Feasibility Assessment	Eligibility Level	Percentage (%)
Design	Very decent	89 %
Typography	Very decent	97 %
Illustration	Decent	83 %
	Mean	90%

The level of practicality of the student worksheets can be seen from the positive responses obtained in the student response questionnaire. There are 3 aspects of assessment that must be assessed by students in this student worksheets, namely the interest aspect, the material/content aspect and the language aspect. Positive responses were obtained from the results of the responses strongly agree and agree. While the negative responses were obtained from the results of the responses that were less agree and disagree. The average result of student responses to student worksheets based on POE (*predict, observe and explain*) with a scientific literacy approach is 83% giving a positive response, while 17% gives a negative response. Table 5 shows the results of the student response questionnaire recapitulation.

Table 5. Recapitulation of Student Response Questionnaire Results

Assessment aspect	Assessment			
	Strongly agree	Agree	Lesagree	disagree
Facets of attraction	42%	42%	12%	4%
Material aspects	36%	52%	8%	4%
Language aspects	21%	56%	19%	4%
Average	33%	50%	13%	4%

In addition to being viewed from the student response questionnaire, the level of practicality is also seen from the performance of students in solving problems and experiments contained in the student worksheets that has been developed. The diagram of the results of students' abilities in completing student worksheets based on POE (*predict, observe and explain*) with a scientific literacy approach can be seen in Figure 1.

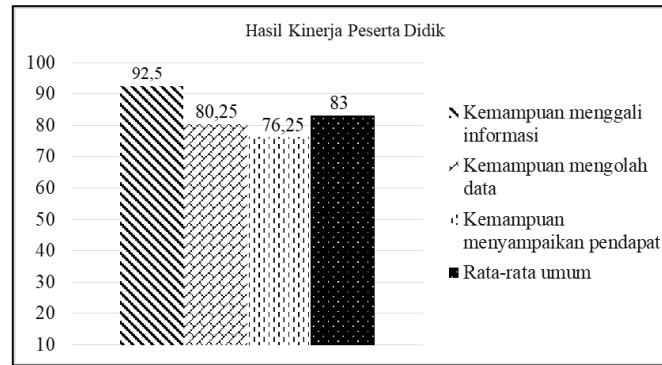


Figure 1. Diagram of student ability results

Based on the results of the analysis that has been carried out (Figure 1.) shows that the average communication ability of students is 83. This average can be seen from the results of the analysis of students' abilities in completing POE-based LKPD with a scientific literacy approach. in which there are 3 indicators of achievement of communication skills, namely indicators of the ability to explore information, indicators of ability to process data and indicators of the ability to convey ideas and opinions.

First, the indicator of the ability to explore information is an indicator that measures the ability of students to narrate the material that has been previously studied, both from textbooks, learning videos, and other learning resources. In addition, the ability to explore this information can also be seen from the ability of students to be able to relate the problems presented to the material that has been studied previously (Zulfa & Rosyidah, 2020). Based on the recapitulation of the results of student performance in (Figure 1), it can be seen that the average value obtained by students on the indicator of the ability to explore information at the stage *predict* shows an average of 92.5. This average value is included in the high category when compared to other indicators of communication skills. The average of 92.5 consists of two categories, namely the medium category and the high category (Figure 2).

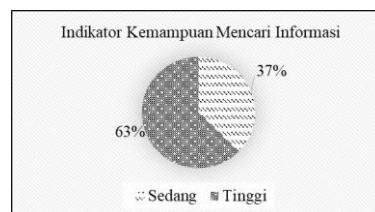


Figure 2. Diagram of Student Performance Results on Ability Indicators to Explore Information

Figure 2 show that 63% of learners fall into high categories and 37% of them fall into moderate categories (Figure 3) is an illustration of one of the learner's answers in the indicator of the ability to dig for information at the intermediate stage.

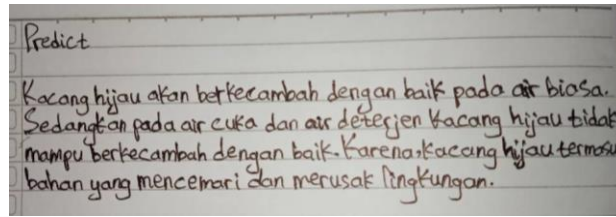


Figure 3. Students' answers on information digging indicators

As described previously, through indicators of the ability to explore information, students are expected to be able to narrate the previous material, and relate the phenomena presented to the material being studied. From (Figure 3.) it can be seen that students are able to relate the phenomena contained in the LKPD, namely the influence of different types of water (plain water, soapy water and vinegar) on the quality of mung bean germination with the news of water pollution listed on the feature. scientific literacy. This ability can be seen from the answers given by the students are clear and complete. Reading pollution news on the scientific literacy feature has an influence on the answers that will be given by students at the stage *predict*. Aslamiyah said reading is one of the activities that directs students to be able to dig up information from existing readings so that they can add to their insights (Ismayani, 2017; Kamsari, 2013; Patiung, 2016a).

Second, the indicator of the ability to process data is the ability of students to narrate research data in the form of pictures, tables, graphs and so on into a scientific narrative that can be understood by many people, and vice versa, namely describing research in the form of text or small notes into pictures, tables, graphs, and so on according to research reporting needs (Sari et al., 2016) Based on the recapitulation of the results of student performance, the average value obtained by students on the indicators of the ability to process data at the stages *observe* and *explain* shows an average of 80,25. The average of 80.25 if categorized consists of two categories, namely the medium category and the high category (Figure 4).

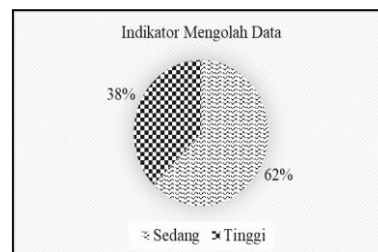


Figure 4. Diagram of student performance results on data processing ability indicators

Based on Figure 4, it can be seen that 38% of students belong to the high category and the remaining 62% fall into the medium category. Figure 5 is an

illustration of an example of a student's answer on the indicator of the ability to process data.

Melakukan percobaan			
Hari ke	Jenis air	Stratifikasi biji kacang hijau (Tumbuh dan tidak / tidak)	Ukuran (cm)
1	Gelas A Air tawar	Tidak	tidak tumbuh
	Gelas B Air deterjen	Tidak	tidak tumbuh
	Gelas C Air kotor	Tidak	tidak tumbuh

Hari ke	Tanggal	Jenis air	Berapa biji kacang hijau yang tumbuh / tidak	Berapa biji kacang hijau yang tidak tumbuh / tidak (cm)
2	Sabtu 23 Feb 2021	Gelas A Air tawar	Tidak	tidak tumbuh
		Gelas B Air deterjen	Tidak	tidak tumbuh
		Gelas C Air kotor	Tidak	tidak tumbuh

Figure 5. Students' answers on data processing indicators

As described previously, through this data processing ability indicator students are expected to be able to narrate research data into tables, graphs, diagrams and vice versa, namely presenting research data in the form of tables, graphs, diagrams to in a scientific narrative that can be understood by many people (Sari et al., 2016; Permanasari & Fitriani, 2016). From Figure 5 it can be seen that students are able to present data from activities *experimental* simple that have been carried out on the effect of water types (regular and polluted) on green bean germination. This can be seen from the completeness of the table of observations presented by students. In addition, students are also able to answer the existing questions completely and clearly in accordance with the results of observations that have been made. The purpose of these questions is for students to be able to explain the table of observations of the effect of the type of water (regular, polluted) on mung bean germination well through the answers to the questions. So, other people are able to understand the meaning of the research data. The ability of students to present observational data as well as the completeness of answers to the questions given indicate that students have good science communication skills, especially on indicators of data processing ability.

Third, the indicator of the ability to convey ideas and opinions is the ability of students to express their thoughts by using good language, expressing their opinions on the problems around them by using good language, and being able to analyze the causes of the phenomena that have been described (Suranti et al., 2017; Zulfa & Rosyidah, 2020). Based on the recapitulation of the results of student performance, the average score obtained by students on the indicator of the ability to convey ideas and opinions at the stage *explain* shows an average of 76.25. In contrast to the score achieved by students in the two previous indicators, the average score on the indicator of the ability to convey ideas and opinions is 76.25 if it is categorized into three categories, namely low, medium and high categories (Figure 6).

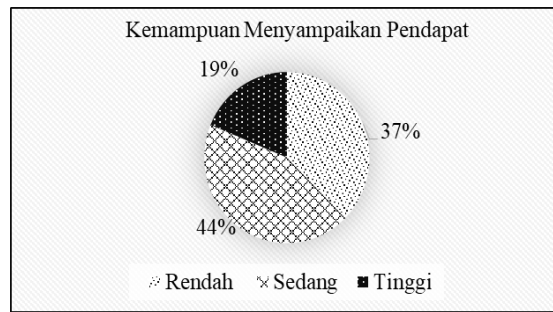


Figure 6. Diagram of student performance results on indicators of ability to convey ideas and opinions

Based on Figure 6. it can be seen that 19% of students are in the high category, 44% are in the medium category and the remaining 37% are in the low category (Figure 7.) is an illustration of one example of student answers on indicators of the ability to convey ideas and opinions.

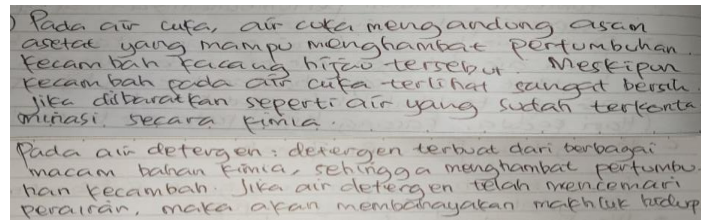


Figure 7. Students' answers on indicators of conveying ideas and opinions

As previously explained, through the indicator of the ability to convey ideas and opinions, students are expected to be able to express their opinions and analyze the causes of the phenomena around them using good language (Admin, 2017; Zulfa & Rosyidah, 2020). From Figure 7 it can be seen that students are able to analyze the factors that cause green beans to not germinate properly in vinegar and detergent water. In addition, students are also able to provide ideas and opinions as a form of strategy that can be applied to overcome environmental pollution that occurs in the vicinity. The ability of students to analyze the causes of the problems presented shows that students have the ability to convey ideas and opinions well.

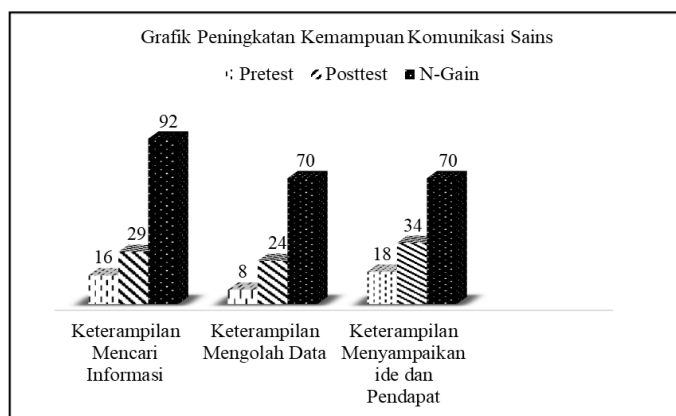
The worksheet based-POE effectiveness test is seen from the scores *pretest* and *posttest* students' which are then analyzed using the *N-Gain* test and t-test. The analysis using the test *N-Gain* serves to determine the increase in the value obtained by students from the initial results, namely the *pretest* to the second result, namely the *posttest*. Table 6. represents the *pretest* and *posttest* overall values after being analyzed by the *N-Gain* test.

Table 6. General Test Results

	N-Gain Score	
	Control	Eksperimental
Minimum	47,3389	70,2083
Maximum	80,00	100,00
Average	0,00	66,67

Based on Table 6. it can be seen that there is a difference in the average the average science communication skills of students in the control class and the experimental class. The average increase in students' communication skills in the control class reached 47.3389. While in the experimental class the increase reached 70.2083. Thus, it can be seen that the POE-based *student worksheets (predict, observe and explain)* with a scientific literacy approach applied in science learning can improve students' ability to communicate.

This increase can be seen from 3 indicators, namely the indicator of the ability to explore information, the indicator of the ability to process data and the indicator of the ability to convey ideas and opinions. The assessment criteria given for the *pretest* and *posttest* questions are a score of 10 for the correct answer and a score of 0 for incorrect answers. The average *pretest*, *posttest* and N-Gain test for each indicator in the experimental class can be seen in (Figure 8).

**Figure 8.** The graph of Science Communication Ability Improvement

In Figure 8. contains the average scores *pretest* and *posttest* the average N-Gain percentage obtained by students on each indicator of communication skills. There are 3 indicators that are applied to support students' communication skills. The highest increase in students' communication skills was obtained on the indicator of the ability to explore information with an average *pretest* obtained by students of 16, *posttest* of 29, and an average percentage of N-Gain of 92%.

8. Air disekitar rumah Sinta tercemar oleh limbah rumah tangga dan sampah. Sedangkan air yang digunakan setiap hari adalah air dari sumur di sekitar rumahnya. Beberapa hari kemudian, Sinta mengalami sakit perut yang berlebihan sehingga menyebabkan Sinta buang air besar berulang kali. Setelah Sinta memeriksakan diri ke dokter ternyata penyakit Sinta ini disebabkan oleh bakteri *Escherichia coli* atau sering dikenal dengan bakteri *E. coli*. Bakteri *E. coli* ini paling sering dialami oleh orang yang mengonsumsi air yang tercemar. Berdasarkan uraian diatas, jenis penyakit yang diderita Sinta jika dikaitkan dengan materi pencemaran lingkungan adalah.... *

a. Diare
 b. Hepatitis A
 c. Disentri amoeba
 d. Paratifus

Figure 9. Students' answers on indicators of ability to explore information

Figure 9 show that students have been able to develop one indicator of communication skills, namely the indicator of the ability to dig up information well. This can be seen from the selection of the right answer which shows that students are able to read and understand the meaning contained in the question properly and carefully. Abidin said that one of the purposes of reading is to explore the information or meaning contained in a reading (Nazilah et al., 2017). The existence of the ability to understand the meaning and information contained in reading well, is able to direct students to obtain broader information (Patiung, 2016b). So that students' communication skills can develop optimally.

Improved communication skills on the indicators of the ability to process data as well as indicators of conveying ideas and opinions have the same average N-Gain percentage, which is 70%. on the indicator of the ability to process data, the average value of the *pretest* obtained by students is 8, *posttest* 24

5. Perhatikan hasil penelitian di bawah ini! *

Pengaruh detergen terhadap perkecambahan kacang hijau

No.	Konsentrasi detergen	Rata-rata panjang akar
1.	Kontrol	4
2.	3,1 %	3
3.	6,25%	2
4.	12,5%	1
5.	25%	0
6.	50%	0
7.	100%	0

Kesimpulan dari tabel diatas adalah, **kecuali**...

a. Detergen mempunyai dampak negatif terhadap organisme yaitu ditandai dengan terhambatnya pertumbuhan
 b. Detergen dengan konsentrasi yang tinggi mampu mengakibatkan organisme tidak mampu bertahan hidup
 c. Detergen dalam kadar tertentu mampu mengganggu kehidupan organisme
 d. Detergen mampu meningkatkan pertumbuhan akar perkecambahan

Figure 10. Students' answers on the indicator of ability to process data

Figure 10 show that students have been able to develop one of the indicators of ability communication is an indicator of the ability to process data properly. This can be seen from the selection of the right answer which shows that students are able to read and understand the research data contained in the table which is then described into sentences that can be understood. As the theory from the OECD explains that in

scientific literacy, students' communication skills are not only about how to speak, exchange insights, scientific truths, and opinions, but also include students' abilities in paraphrasing scientific truths that exist from research that has been carried out. in the form of narratives and manuscripts et al., 2017).

Furthermore, on the indicator of the ability to convey ideas, the opinion of the average *pretest score* obtained by students is 18 and the *posttest is* 34. Figure 11 is a description of one of the students' answers on the indicator of conveying ideas and opinions.

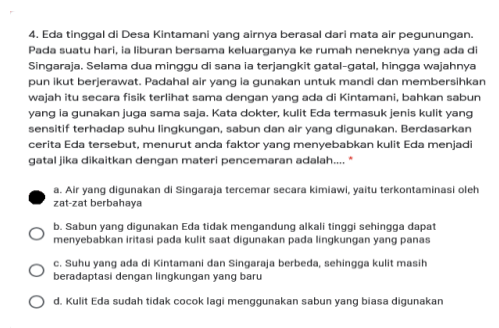


Figure 11. Students' answers on indicators of ability to convey ideas and opinions

Figure 11 show that students have been able to develop indicators of ability to convey ideas and opinions well. This can be seen from the selection of the right answer as the cause of the problems presented. The alternative answer choices provided are a challenge for students. This is because the four alternative answers could be a factor in the problems presented if students do not read and understand the questions properly and thoroughly. The choice of the right answer shows that students have the ability to convey ideas and opinions well. Learning activities that provide direct experience to students are an effort to train students in developing their communication (Cintia et al., 2019; Pujiati et al., 2013; Zulfa, 2020).

Table 7. Results of Independent T-Test Two-Tailed

T Test	Values Calculated	Significance Level	DecisionsTest
Experimental-control	0.024	0.05	H ₀ rejected

Table 7 show that the significance value (*t-tailed*) obtained reached $0.024 < 0.05$. This shows that there are differences in the scores of students in the control class and the experimental class. Thus, further tests are needed to find out the better increase in scores between the control class and the experimental class, using the *one-tailed t-test*.

Table 8. Hasil Uji T-Test One Tailed

T Test	Values Calculated	t table ($\alpha.v$)	DecisionsTest
Experiment-control	3.105	2.131	H ₀ rejected

From the results of *the one-tailed t-test* in Table 8, it can be seen that the results of t count $<$ t table are $3.105 < 2.131$, with a significance level of 0.05. Thus obtained test decisions H₀ is rejected, which means an increase in the value of the experimental class is better than the control class. Thus it can be understood that the application of Student worksheets based on POE with a scientific literacy approach is applied in science learning to improve students' ability to communicate science.

CONCLUSION

Based on the results of data analysis and discussions that have been carried out by researchers in this research and development, it can be concluded that, (1) Student worksheets based on POE the scientific literacy approach developed by researchers are declared feasible both from the aspect of material/content and readability with a percentage of 89%, so that the Student worksheets based on POE with a scientific literacy approach is declared suitable for use with improvements. (2) Practically, Student worksheets based on POE scientific literacy approach get a positive response from students with a percentage of 83%. (3) The level of effectiveness of the Student worksheets based on POE the scientific literacy approach, in terms of 3 aspects, namely (a) POE-based *student worksheets (predict, observe and explain)* The scientific literacy approach was concluded to be able to help students to improve their communication skills with an average N-Gain score included in the medium category, namely 66.67 at the significance level ($\alpha = 0.05$) (b) The results of *the two-tailed independent t-test* resulted in a significance value (*t-tailed*) of $0.024 < 0.05$, which means that there is a difference in the scores of students in the control class and the experimental class. (c) The results of *the one-tailed t-test* obtained the results of t count $<$ t table, namely $3.105 < 2.131$ at the significance level ($\alpha = 0.05$), which means that the increase in scores in the experimental class is better than the control class.

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