Volume 5 Number 3 (2023)
September-December 2023
Page: 299-310

E-ISSN: 2656-4491
P-ISSN: 2656-4548
DOI: 10.37680/scaffolding.v5i3.3585

SCAFFOLDING
Jurnal Pendidikan Islam dan Multikulturalisme

DEVELOPMENT OF STUDENT WORKSHEETS BASED ON SCIENTIFIC LITERACY FOR HIGH SCHOOL

Dinda Syafitri[1], Nirwana Anas[2]
[12]Universitas Islam Negeri Sumatera Utara Medan; Indonesia
Correspondence email; dindasyafitri@uinsu.ac.id

Submitted: 11/01/2023 Revised: 19/05/2023 Accepted: 18/07/2023 Published: 13/09/2023

Abstract

This study aims to determine the validity, practicality, and effectiveness of LKPD based on scientific literacy. The research method uses development or R&D, which is applied to the 4D model, which includes Define, Design, Develop, and Disseminate. Sources of data were obtained through questionnaires or distributed questionnaires to determine validation and practicality tests, while data obtained through pretest and posttest were used to determine the effectiveness analysis of the developed LKPD. Data analysis techniques use quantitative methods, namely by calculating using Likert scale values and N-gain. The population in this study were 30 students of class X IPA 1 at Prima Tembung Private High School. The sampling used in this study is probability sampling, where every student has the same opportunity. The validity test of LKPD is used to evaluate the developed LKPD, which is measured using instruments in the form of validation from media experts and material experts. The results of the practical test for teacher and student responses were 75% and 79.62%, respectively, indicating that LKPD was very practical. The analysis of the LPKD effectiveness test was obtained through an N-gain score of 0.44 in the moderate category in improving students' scientific literacy abilities. Thus, scientific literacy-based LKPD on ecosystem material for class X high school developed by researchers proved to be valid, practical, and effective.

Keywords Development, Ecosystem, LKPD, Science Literacy, SMA Swasta Prima Tembung

INTRODUCTION

21st-century education is education that is based on science and technology. Educators are the key to developing a country where their role is to prepare students through the ability to survive and contribute actively in various ways. Scientific literacy is the ability to interpret science in everyday life, not only to understand theory but also to apply it and find solutions to problems encountered (Firdahus & Asmali, 2021).

According to the OECD in 2018, scientific literacy is defined as the ability to use scientific knowledge, identify questions, and draw conclusions based on facts to understand the universe and make decisions based on changes caused by human activities. Scientific literacy involves students' ability to identify scientific issues that occur in Indonesia or abroad related to knowledge of science and technology (Fibonacci, 2022). In maximizing scientific literacy, teaching materials are needed that can increase scientific literacy, one of which is student worksheets (LKPD). This scientific literacy-based LKPD was created so that students can develop their potential to improve scientific literacy. During the learning process, scientific literacy can meet the needs of students in learning biology and various situations every day (Toharudin et al., 2011).

The scientific literacy achievements of students in Indonesia are currently not satisfactory. This can be seen in the results of student assessment studies carried out by PISA (Program for International Student Assessment). PISA (Program for International Student Assessment) is an international study of student achievement in reading literacy, mathematics literacy, and science literacy. Based on the results of the PISA study on students' scientific literacy, which is held every three years, it can be seen that the level of scientific literacy of Indonesian students is always at the bottom rank. In 2000, Indonesia was ranked 38 out of 41 countries with a score of 393, until in 2018, Indonesia was ranked 70 out of 78 countries with a score of 396. The acquisition of scientific literacy ability scores of students in Indonesia from 2000 to 2018 shows that students' scientific literacy in Indonesia is still relatively low (Hindayani et al., 2016).

Learning carried out using LKPD can be in the form of training guides for developing cognitive aspects or guides for developing all aspects of learning in the form of experimental or demo guides. LKPD is printed teaching material in the form of sheets of paper containing material, summaries, and instructions for implementing learning tasks that must be carried out by students and refer to the basic competencies that must be achieved. This teaching material in the form of LKPD contains various activities that students will carry out actively. These activities can be in the

form of observations, experiments, and asking questions (Triana, 2021).

The determination of LKPD as teaching material is because LKPD can be created and developed according to the situation and conditions of activities in the learning material that will be encountered (Wardani & Mitarlis, 2018). LKPD helps students understand the material provided by the teacher optimally. By using LKPD, students will get convenience during the learning process. This is important because the suitability of teaching materials for students can provide interest so that students will be very easy to understand and achieve optimal learning outcomes (Nana, 2022).

The learning process at Prima Tembung Private High School in class X Science usually uses science books and science worksheets as learning materials at school. The use of textbooks and worksheets really helps students in the learning process by achieving results in the learning process. This shows that the worksheets used by class X science students are effective in the learning process.

However, LKS, which is used as teaching material for students, cannot increase students' scientific literacy. Therefore, it is necessary to develop LKPD based on students' scientific literacy in order to increase students' scientific literacy in class X IPA of Prima Tembung Private High School.

Previous studies have been carried out on the development of scientific literacy-based worksheets in students' critical thinking skills (Ashari & Wisnanti, 2021) (Zahro & Yuliani, 2021). Development of scientific literacy-based LKPD on biology material (Khasanah et al., 2022) (Afsani et al., 2020). Validity and Effectiveness of Student Worksheets Based on Scientific Literacy to Train Students' Higher Level Thinking (Wahyuningtias & Isnawati, 2019). Based on the limitations of previous research, a scientific literacy-based worksheet that is practical and focuses on improving students' scientific literacy skills in learning is needed. However, the development of student worksheets (LKPD) based on scientific literacy to improve students' science literacy skills is still little carried out by other researchers. Therefore, it is necessary to develop student worksheets (LKPD) based on scientific literacy for the high school level that suits the needs of students, which can improve students' scientific literacy skills so that students are able to relate to the knowledge they have by applying it in everyday life (Afsani et al., 2020).

This research aims to determine the validity, practicality, and effectiveness of the developed LKPD. Based on the problems that have been described, students' scientific literacy in Indonesia is very low, so the author developed a scientific literacy-based LKPD, in which it is hoped that students can solve problems related to issues that occur in ecosystems, especially in rice fields ecosystems. Students are directed to solve problems found in LPKD based on scientific literacy with scientific

knowledge and understanding of events so as to increase students' scientific literacy.

METHOD

The research location was Prima Tembung Private High School, with a population of class X IPA 1 as many as 30 students as the sample of this study. The sampling technique uses a probability sampling technique, where each student has the same opportunity to be selected as the sample. In this study, research and development or R&D methods were applied with the 4D model. The 4D model used in this study consists of four stages: Define, Design, Develop, and Disseminate (Thiagarajan, 1974). (1) Define, which is to define the problems and identify the needs that exist in the school. (2) Design, namely the planning stage, which aims to prepare the product to be developed. (3) Delovep, namely, development carried out on LKPD to produce LKPD that is valid and practical. (4) Dessminate, that is, after the product has been revised and its validity is known, the product is disseminated to find out the response of teachers and students and to find out the practicality and effectiveness of LKPD based on scientific literacy. The quality of the resulting LKPD is known through trial activities. Trials were carried out to obtain validation from material and media experts.

A validity data test is data collection carried out using a product validity instrument that was developed in the form of an evaluation of the product with an assessment rubric of the media expert validator and material expert validator.

This Science Literacy Based LKPD feasibility questionnaire is intended for material and media experts to find out expert input or suggestions for the product being developed before conducting a trial in learning. The results obtained from the questionnaire are then used as material for evaluation and revision of the product being developed so that the product can be used properly for trials in learning (Benhadj et al., 2023). Validity data test with a Likert scale is calculated using the following formula:

$$\text{Validity}(\%) = \frac{\text{score obtained}}{\text{maximum score}} \text{ x } 100\%$$

Table 1. LKPD Validity Categories

Average Score Percentage (%)	Category	Description
100 – 76	Valid	No Revision Needed
75- 51	Quite Valid	Minor Revision
50 – 26	Less Valid	Major Revision
25 – 0	Invalid	Cant be used

Source: (Kristanti, 2017)

Student worksheets (LKPD) are said to be valid if they have reached a validity level above 80%. Student worksheets were given to material experts and media experts to analyze the level of validity of the LKPD based on a questionnaire.

The practicality test was carried out by taking the biology teacher's response questionnaire data and the student response questionnaire and then describing it quantitatively by assessing the percentage score on the Likert scale. Students will provide feedback regarding the practicality of the Science Literacy Based LKPD. The feedback is carried out by conducting a pretest and posttest, and then the results will be calculated using the N-gain test to determine the effectiveness of the developed scientific literacy-based LKPD. Meanwhile, the teacher will provide feedback regarding the practicality of the Science Literacy LKPD in ecosystem learning (Zulkarnain & Tanjung, 2023). Calculation of the percentage of data obtained using the formula:

$$\text{Practicality (\%)} = \frac{\text{Total score for each question}}{\text{Number of respondents}} \text{ x } 100\%$$

Table 2. LKPD Practicality Categories

Average Score Percentage (%)	Category
100 - 76	Very Practical
75 - 51	Practical
50 - 26	Less Practical
25 - 0	Impractical

Source: (Setyaningsih, 2022)

Student worksheets (LKPD) are said to be practical if they have reached a validity level above 80%. To analyze the practicality level of LKPD based on a questionnaire given to biology teachers and students. Posttest and pretest effectiveness test data will be analyzed and calculated using the following N-gain formula:

$$N - gain = \frac{\text{Score posttest} - \text{Score pretest}}{\text{Maximum score} - \text{Score pretest}}$$

Table 3. *N-gain* Value Criteria

Value Range	Category
N – gain 0,3	Rendah
0,3 ≤ N – gain ≤ 0,7	Sedang
N – gain > 7	Tinggi

Source: (Sundayana, 2014)

This questionnaire uses a Likert scale with four rating scales: Very Good, Good, Adequate, and Poor.

Table 4. Likert Scale

Category	Score
Not enough	1
Enough	2
Good	3
Very well	4

Source: (Sugioyono, 2019)

Sources of data in research conducted at Prima Tembung Private High School can be obtained through questionnaires or questionnaires, pretest, and posttest, which are distributed to research objects in order to determine the results of validation, practicality, and effectiveness of LKPD based on scientific literacy. Data collection techniques can be obtained through the results of questionnaires or questionnaires, pretest, and posttest, which have been distributed to research objects using Likert scale values and N-gain. The higher the results of the trials obtained, the higher the scientific literacy of class X students at Prima Tembung Private High School.

FINDINGS AND DISCUSSION

Findings

This study aims to produce valid, practical, and effective Scientific Literacy-Based Worksheets. Based on input from expert validators, development was carried out, which was then obtained input and revisions, redeveloped the description of the flow of student learning activities with scientific literacy. After the second stage of revision, it was concluded that the validity of the Science Literacy-Based LKPD by the two experts is shown in Table 5 and Table 6.

Table 5. Material Expert Validation

Validated Aspects	Total Score	Validity Level
Content Quality Aspects Presentation Quality Aspects Quality Aspects Language Aspects of Scientific Literacy	95,83%	Valid or can be used without revision

Table 6. Media Expert Validation

Validated Aspects	Total Score	Validity Level
Aspects of LKPD Size LKPD Design Aspects Illustrated Aspects of the Contents Aspects of LKPD Content Design	100%	Valid or can be used without revision

Based on the results of the material expert validation analysis, it can be seen in the table above that the overall score is 95.83% with the valid category, and the media expert analysis can see that the overall score is 100% with the valid category. The results of the expert validation analysis were obtained through a questionnaire or questionnaire that was given to the expert as a result of the analysis of the validation test on the developed scientific literacy-based LKPD. These results mean that the scientific literacy-based LKPD that was developed is valid and suitable for use as a learning medium.

Data on the practicality of using the LKPD based on scientific literacy was then analyzed through the responses of teachers and students after the LKPD based on scientific literacy was used in learning. The practicality data is shown in Figure 2. The LKPD developed is used by students so that students' responses to the use of LKPD are very important to produce results. LKPD that is practical, the number of students who are respondents to the practical LKPD trial developed is 30 students. After getting the LKPD practicality questionnaire score, the percentage of LKPD practicality is calculated, which can be concluded in Figure 2.

Figure 1. Teacher Response Questionnaire Score.

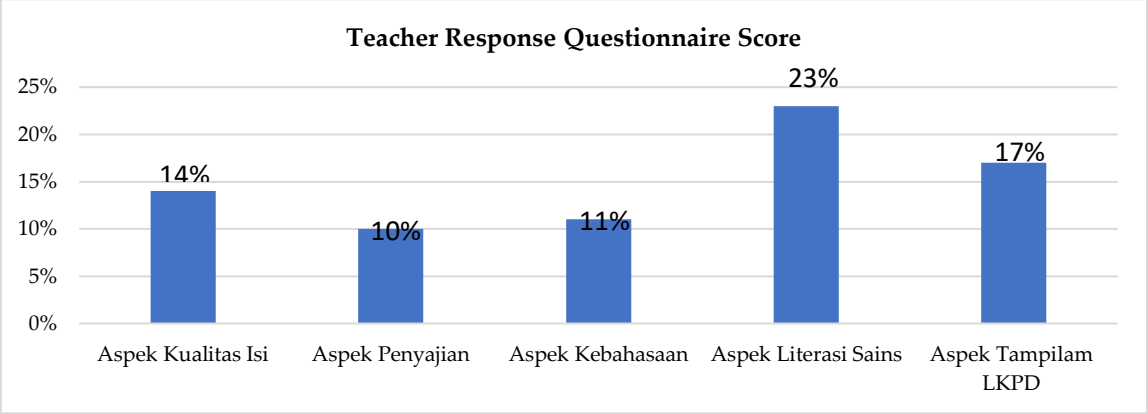
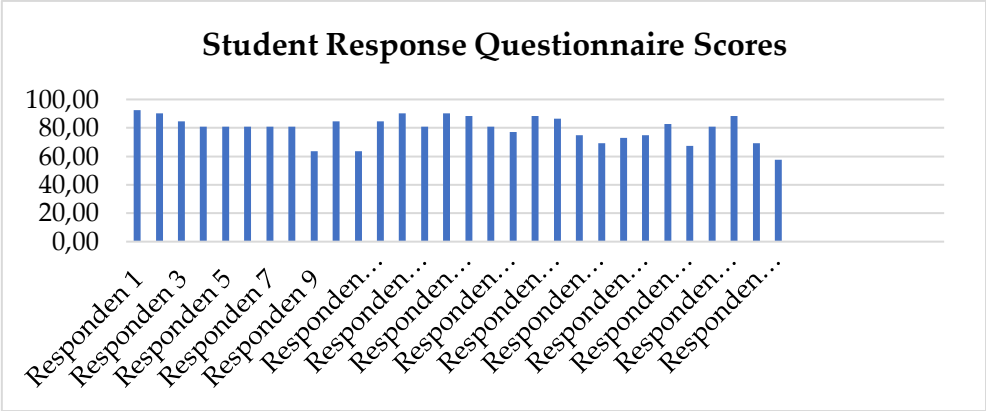


Figure 2. Student Response Questionnaire Scores.



Based on the results of the practicality validation analysis, it can be seen in the table above that the overall score of the educator's response is 75% in the very practical category, and the student's response can be seen that the overall score is 79.62% in the very practical category. The results of the analysis of the practicality test of scientific literacy-based LKPD were obtained through the distribution of questionnaires. Thus, the developed scientific literacy-based LKPD is very easy to use as a biology learning medium.

Next, analysis of the pretest and posttest on Science Literacy LKPD by 30 students in class X Science 1 of Prima Tembung Private High School. The average score or N-gain pretest and posttest for 30 students in class X IPA 1 can be seen in Table 9.

Table 9. The Average Value or *N-gain*

Science Literacy Skills Assessment	Average	N-gain	Criteria
Pretest	42.83	0.44	Currently
Posttest	69.66		

Based on the results of the effectiveness test using the pretest and posttest on students, it can be seen that the overall score at the pretest was 42.83, and the posttest was 69.66, so the N-gain value was 0.44 with moderate criteria.

Discussion

A person's scientific literacy after the learning process varies depending on previous understanding, understanding during the learning process, and student's ability to associate their understanding with other concepts or situations (Narut & Supardi, 2019). The PISA measurement aims to evaluate the education system by measuring student performance in secondary education, especially in three main areas, namely mathematics, science, and literacy. So, to improve students' scientific literacy skills, scientific literacy-based worksheets are necessary for the learning process (Fuadi et al., 2020).

Before the LKPD is designed to meet the specifications of the product to be developed, the initial design is used as the basis for development before it is validated by an expert validator (Sari et al., 2021). Based on the final results of validation by material expert validators on each validated aspect, it shows that the developed Science Literacy Based LKPD obtained an average percentage of 95.83% in the "Valid" category or can be used without revision so that the LKPD that has been developed is declared suitable for use. In addition, the results of the media validation test carried out by media expert volunteers showed that the developed Science Literacy Based LKPD obtained an average percentage of 100% in the "Valid" category or could be used without revision so that the developed LKPD was declared suitable for use.

In addition, the results of the media validation test carried out by media expert volunteers showed that the developed Science Literacy Based LKPD obtained an average percentage of 100% in the "Valid" category or could be used without revision so that the developed LKPD was declared suitable for use (Khair et al., 2021).

Validation is not only an activity to assess LKPD products but is also part of the process of producing quality LKPD so that it can be used effectively in the learning process. The responses of teachers and students indicated that Science Literacy-Based LKPD was practical to use in the learning process. The results of the practicality test of the teacher's response obtained a percentage of 75%, while the results of the practicality test of student response obtained a percentage of 79.62%. Based on the results of the questionnaire response, it is known that the use of LKPD makes it easy

for students to develop their knowledge.

Based on data analysis, the effectiveness of LKPD can be determined through limited trials (pretest and posttest). The pretest was carried out to determine students' knowledge before learning was carried out, while the posttest was carried out after learning using scientific literacy-based LKPD (Gunaria Siagian et al., 2022), which in this study obtained an average test score in the initial test (pretest) was 42.83 and in the final test (posttest) was 69.66. The results of the two scientific literacy tests produced an N-gain value of 0.44 in the medium category. This research resulted in very low scientific literacy scores for class X Science students before the use of scientific literacy-based LKPD. After conducting research using LKPD in the learning process, scientific literacy scores increased. This states that the LKPD based on scientific literacy is said to be effective and can improve scientific literacy skills.

Students' scientific literacy skills are lacking due to their lack of interest in reading and understanding discourse. Apart from that, the learning process in class is also very influential. The learning objectives are still to focus students on memorizing facts and science concepts. There are still few teachers who pay attention to aspects of scientific literacy. Teacher habits also provide routine questions that are rarely associated with scientific literacy (Mellyzar et al., 2022).

Basically, the characteristics of LKPD developed to increase scientific literacy have an interactive nature. The interactive nature is adapted to the individual features of each LKPD. This interactive nature is expected to facilitate students in understanding the scientific knowledge described in accordance with learning (Maksum & Rusdiyana, 2022). Scientific literacy has four dimensions, namely: 1) science competency/process; 2) scientific knowledge/content; 3) context of science application; and 4) science attitude (OECD, 2018).

CONCLUSION

Scientific Literacy Based LKPD was developed using validity testing, practicality testing, and effectiveness testing. Based on material expert validity test data, it is known that the Scientific Literacy-Based LKPD was developed "validly" with a presentation of 95.83%. Meanwhile, in the media expert validity test, it was found that the scientific literacy-based LKPD was developed "validly" with a 100% presentation. Then, the practicality test obtained through the biology teacher's response revealed that the LKPD based on Science Literacy that was developed was "very practical" and had a percentage of 75%, and the response of students to the LKPD Based on Science Literacy

that was developed was "very practical" with a percentage of 79.62%. Next, an effectiveness test was carried out to determine the effect of using Science Literacy-Based LKPD on increasing students' scientific literacy, which was stated to have increased and was found to have an N-gain percentage value of 0.44 with "medium" criteria. As a result, Science Literacy Worksheets were developed that were valid, practical, and effective for students to use in learning.

REFERENCES

Afsani, N., Daud, F., & Adnan. (2020). Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Literasi Sains Pada Materi Biologi Semester Genap Kelas X SMA Negeri 1 Parepare. *Prints UNM*, 1–15.

Ashari, S. E., & Wisnanti. (2021). Kelayakan Teoritis Lembar Kerja Peserta Didik (LKPD) Berbasis Literasi Sains Untuk Melatihkan Keterampilan Berpikir Kritis Peserta Didik. *BioEdu*, *10*(1), 95–101.

Benhadj, N., Hairida, Ulfah, M., Masriani, & Lestari, I. (2023). Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Literasi Sains Pada Materi Pencemaran Lingkungan Di SMP Negeri 2 Tanah Pinoh. *Jurnal Education and Development*, *11*(02), 255–261.

Fibonacci. (2022). *Literasi Sains Dan Implementasinya Dalam Pembelajaran Kimia*.

Firdahus, M., & Asmali. (2021). *Pengembangan Instrumen Penilaian Berbasis Literasi Sains*.

Fuadi, H., Robbia, A. Z., Jamaluddin, & Jufri, A. W. (2020). Analisis Faktor Penyebab Rendahnya Kemampuan Literasi Sains Peserta Didik. *Jurnal Ilmiah Profesi Pendidikan*, *5*(2), 108–116.

Gunaria Siagian, Sirait, D. E., Situmorang, M. V., & Silalahi, M. V. (2022). Pengambangan E-LKPD Berbasis Etnosains Untuk Melatih Keterampilan Literasi Sains Pada Materi Zat Makanan. *Jurnal Penelitian Dan Pengabdian Masyarakat Nomensen Siantar (JP2NS)*, *02*(02), 63–87.

Hindayani, F., Rusilowati, A., & Masturi. (2016). Pengembangan Bahan Ajar Berbasis Literasi Sains Materi Fluida Statis. *Unnes Physics Education Journal*, *5*(3), 25–31.

Khair, B. N., Astria, F. P., Wardani, K. S. K., Nurwahidah, N., & Sriwarthini, N. L. P. N. (2021). Pengembangan LKPD Literasi Sains Berbasis Lesson Study for Learning Community (LSLC). *Jurnal Pijar Mipa*, *16*(1), 136–141. https://doi.org/10.29303/jpm.v16i1.2297

Khasanah, N. U., Arnentis, Sayuti, I., Daryanes, F., & Wahyuni, A. (2022). Pengembangan Lembar Kerja Peserta Didik (LKPD) Pada Materi Sistem Respirasi Kelas XI SMA. . . *JEUMPA*, *09*(02), 777–783.

Maksum, & Rusdiyana, A. F. (2022). Studi Literatur : Penggunaan Lkpd Literasi Sains Dalam Pembelajaran Tingkat Sma. *Teacher : Jurnal Inovasi Karya Ilmiah Guru*, *02*(01), 84–91.

Mellyzar, Zahara, S. R., & Alvina, S. (2022). Literasi Sains Dalam Pembelajaran Sains Siswa SMP. *Pendekar : Jurnal Pendidikan Berkarakter*, *5*(02), 119–124.

Nana. (2022). *Pengembangan Bahan Ajar Pendidikan Fisika Berbasis Model Pembelajaran Poe2we*.

Narut, Y. F., & Supardi, K. (2019). Literasi Sains Peserta Didik Dalam Pembelajaran Ipa Di Indonesia. *Jurnal Inovasi Pendidikan Dasar*, *3*(1), 61–69.

OECD. (2018). *First Results From Pisa*.

Sari, I. P., Abadi, S., & Nawawi, S. (2021). Pengembangan Modul Pembelajaran Biologi Berbasis Problem Solving Pada Materi Ekologi. *BEST : Journal of Biology Education, Science & Technology*, *4*(01), 25–31.

Setyaningsih, N. (2022). Pengembangan Instrumen Hinge Order Thingking Skils (Hots) Berbasis Literasi Matematika Materi SPLDV. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, *11*(03), 1739–1748.

Sugioyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*.

Sundayana, R. (2014). *Statistik Penelitian Pendidikan*.

Toharudin, U., Hendrawati, S., & Rustaman, A. (2011). *Membangun Literasi Sains Peserta Didik*.

Triana, N. (2021). *LKPD Berbasis Eksperimen : Tingkatkan Hasil Belajar Siswa*.

Wahyuningtias, H., & Isnawati. (2019). Lembar Kerja Peserta Didik Berbasis Literasi Sains Pada Materi Fungi Untuk Melatihkan Berpikir Tingkat Tinggi Siswa Kelas X SMA. *BioEdu*, *8*(02), 145–151.

Wardani, D. A., & Mitarlis. (2018). Pengembangan Lembar Kerja Peserta Didik (Lkpd) Untuk Meningkatkan Keterampilan Literasi Sains Pada Materi Hidrokarbon Dan Minyak Bumi. *UNESA Journal of Chemical Edition*, *7*(02), 123–128.

Zahro, D. A., & Yuliani. (2021). Pengembangan e-LKPD Berbasis Literasi Sains Untuk Melatihkan Keterampilan Berpikir Kritis Peserta Didik Pada Materi Pertumbuhan Dan Perkembangan. *BioEdu*, *10*(03), 605–616.

Zulkarnain, T. S., & Tanjung, I. F. (2023). Modul Ekosistem Berbasis STEM : Upaya Dalam Meningkatkan Kemampuan Siswa Keterampilan Proses Sains. *Jurnal Pendidikan Dan Pengajaran*, *56*(1), 33–44.