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Development of Scientific-Based Student Worksheets (LKPD) Using the Discovery Learning Model to Improve Science Skills of Sixth Grade Elementary Students

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Abstract

This research aims to develop scientific-based student worksheets (LKPD) using the Discovery Learning model to improve the scientific literacy and learning outcomes of sixth-grade elementary students. The study employed a Research and Development (R&D) approach with the ADDIE model, consisting of the stages of analysis, design, development, implementation, and evaluation. The research was conducted at SDN 173662 Naga Timbul, focusing on plant reproduction material as the subject matter. Data were collected through validation sheets for material, language, and learning experts, as well as teacher and student response questionnaires. The findings revealed that the developed LKPD fulfilled the criteria of validity, practicality, and feasibility. Validation by material experts resulted in an average score of 81.7% (Very Good), validation by language experts reached 95% (Very Good), and validation by learning experts achieved 86.7% (Very Good). Teacher responses scored 90% (Very Feasible), while student responses were 96% (Very Good), indicating a high level of acceptance and usability. The practicality assessment also showed a high average score of 4.8, categorized as Very Practical. In conclusion, the developed LKPD was proven to be valid, practical, and feasible as a learning resource in elementary school science education. Its structured activities, based on scientific steps and Discovery Learning principles, help students engage actively in the learning process and foster the development of scientific literacy. The results suggest that scientific-based worksheets have strong potential for broader application in supporting inquiry-based science learning in elementary schools.

Keywords: Student Worksheets (LKPD), Discovery Learning, Scientific, Scientific Literacy

Introduction

The industrial revolution 4.0 in the 21st century is an era of openness or the era of globalization in all lines of social life. The rapid development of science and technology in the field of life in society, especially information and communication technology, has made Indonesian people begin to realize the importance of education to be able to explore their potential in order to be able to compete in the midst of today's progress.

The development of an increasingly advanced and complex world means that every individual must improve the quality of human resources. The 21st century skills needed are "4C skills (Collaboration, Critical Thinking, Creativity and Communication) which must be prepared to face increasingly complex challenges" (Azizah et al., 2022:31). Apart from that, "the main element in 21st century learning is ICT literacy which can influence mindsets in validating information" (Mulyani, et al., 2022:55).

One of the things that needs to be considered in preparing the quality of human resources in Indonesia is the quality of education. The education in question ranges from primary education to tertiary education. "Education is an effort to improve the quality and potential of every individual. In other words, improving and developing human resources on an ongoing basis is

very important, especially in the current era of globalization. There is a need for high quality human resources, capable of developing their potential and able to solve problems in the future" (Sari, 2021:1).

The facts on the ground are that elementary school students in Toba Regency have low scientific literacy skills. This is indicated by data from the 2023 National Science Olympiad (OSN) which was released in July on the Pusatprestasinasional.kemdikbud.go.id page, that the 5 participants representing Toba district were not able to continue to the provincial level. This shows that scientific literacy skills in Toba district are still low. The low scientific literacy abilities of students in Toba district are generally "caused by learning activities that are not yet oriented towards developing scientific literacy" (Sutrisna, 2021: 12). Therefore, elementary schools in Toba district must work together to find the best solution to improve students' scientific literacy skills. In this case, teachers are at the forefront of the science learning process who should design learning to improve students' scientific literacy skills in Toba district. One way to improve good scientific literacy skills in learning is to apply a scientific approach to LKPD media. Scientific-based LKPD is a learning tool that serves as a guide for students in solving problems. The science teaching and learning process using LKPD must be designed in accordance with the principles of a scientific approach. So far, the Student Worksheets (LKPD) used in schools have not been appropriate to students' daily lives, even though in science learning learning activities can also be created and linked based on facts in the student's own activity environment.

Scientific-based Student Worksheets (LKPD) are worksheets containing lessons that can be used as tools or other alternative learning resources in the science learning process. Scientific-based Student Worksheets (LKPD) are teaching materials that can be used by educators in the learning process which contain material, summaries and instructions for carrying out assignments for students related to the students' daily environment, so that students can understand the living environment, and have a high attitude and sensitivity in solving problems with themselves and their environment.

However, in reality the LKPD used at SDN 173662 Naga Timbul is not scientifically based. This was found from observations that the researcher made on March 19 2024. The researcher asked permission to see the LKPD sheets that the teacher used in learning. The LKPD used does not contain elements that can support increasing students' scientific literacy skills, such as understanding or mastering concepts, application of concepts in certain contexts, process skills and students' scientific attitudes. If it's like this, it means that the child's memorization skills are still improving, not yet reaching the child's scientific literacy skills. Not mention the learning outcomes of class VI students at SDN 173662 Naga Timbul, especially in science learning, which are still low.

For this reason, based on the explanation above, researchers are interested in conducting research in accordance with the problems of class VI students at SDN 173662 Naga Timbul entitled "Development of Scientific-Based Worksheets with Discovery Learning Models on Plant Breeding Material to Improve the Scientific Literacy Ability of Class VI Students at SDN 173662 Naga Timbul". It is hoped that the development of this LKPD can help educators and the science learning process in schools where research is conducted.

Method

Based on the proposed title, development, this type of research is in the form of a reset and development model or Research and Development (R&D). Development research is used to produce a product and is used to test the level of effectiveness of the product that has been developed (Sugiyono, 2019:752). This is in accordance with the objectives of the development

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research carried out by researchers, namely to produce products in the form of LKPD to improve scientific literacy skills and student learning outcomes. The model used is the ADDIE model (analysis, design, development, implementation).

The place of this research is SDN 173662 Naga Timbul Sibadihon, Kec. Bonatua Lunasi, Kab. Toba Province North Sumatra. It is one of the educational units at elementary school level in Sibadihon village. The instrument used in this research was a validation sheet. There are several types of validation sheets that will be used, namely validation sheets for material experts, learning experts, language experts and test sheets (questions) for validity, reliability, level of difficulty and distinguishing power.

Results

This study applied the ADDIE development model, which includes analysis, design, development, implementation, and evaluation stages, with the aim of producing scientific-based student worksheets (LKPD) on plant reproduction material that were valid, practical, and feasible for classroom use. Each stage produced detailed findings which collectively demonstrate the success of the development process.

The first stage, analysis, was crucial in identifying the problems and needs in the learning process. The analysis covered several aspects, including problem analysis, student needs, curriculum review, and the objectives of product development. The findings revealed that many students showed low reading interest, which limited their comprehension of science concepts. Furthermore, learning activities outside the classroom that connected students with their environment were rarely implemented, which deprived students of opportunities to practice observation and inquiry skills that are fundamental in science education. Another major issue identified was the low level of scientific literacy among students in Toba Regency, as reflected in the results of the 2023 District Science Olympiad (OSN). None of the five participants representing the district advanced to the provincial level, clearly indicating that students had not yet developed adequate literacy and process skills. At SDN 173662 Naga Timbul, where this research was conducted, the worksheets previously used by teachers were not scientific in nature and did not encourage observation, experimentation, or problem-solving. Instead, they emphasized rote memorization, which resulted in low student test scores, particularly in plant reproduction material. Based on these findings, the researcher determined that developing scientific-based worksheets was an urgent necessity. The product would aim to guide students through structured scientific activities, encourage critical thinking, and connect learning to everyday contexts, thus improving literacy and comprehension.

At the design stage, the researcher drafted the framework and initial form of the LKPD. This draft included several key sections: a cover page to give identity to the product, user instructions to guide both teachers and students, a list of basic competencies and indicators derived from the curriculum, clearly stated learning objectives, a structured presentation of plant reproduction material, student activities aligned with scientific steps, exercises in the form of multiple-choice and essay questions, simple experiments, and finally a summary to help students review the lesson. The design ensured that each part of the worksheet had a specific purpose in guiding students through the process of observing, questioning, collecting data, analyzing, and communicating. To support the evaluation of the product, the researcher also prepared instruments such as validation questionnaires for experts, teacher and student response questionnaires, interview guides, and test questions for pretest and posttest. All of these instruments were tested for validity and reliability, with pretest-posttest questions analyzed for difficulty level and discrimination index. The result of the design stage was a draft

version of the LKPD for plant reproduction (Lesson 4, Sub-material 2), ready to be validated and refined.

The development stage involved producing the LKPD and validating it through expert review. Three groups of experts—material experts, language experts, and learning experts—were engaged to evaluate the draft according to their fields of specialization. Each group provided both numerical scores and qualitative feedback, which the researcher used to revise and improve the worksheets. Material experts focused on content accuracy, sufficiency, relevance, and examples. Their evaluation covered eight indicators: competence, presentation of material, exercises, summaries, tests, references, content, and examples. The results showed that competence scored 80%, presentation of material 88%, exercises 70%, summaries 73%, tests 73%, references 70%, content 88%, and examples 80%. Overall, the worksheets were considered *Very Good*, although the experts recommended revising some exercises and test items to better align them with real-life situations faced by students. These revisions improved the relevance and practical value of the product.

Language experts assessed the worksheets on four indicators: language suitability, language use, clarity of symbols, and readability. The results were exceptionally strong, with language suitability scoring 92%, language use 96%, clarity of letters and symbols 100%, and readability 95%. These findings indicated that the worksheets used simple, clear, and correct language, making them easy for sixth-grade students to understand. The very high scores placed the product in the *Very Good* category, showing that the worksheets successfully met the standards of readability and clarity.

Learning experts evaluated the LKPD on two main indicators: conformity with scientific syntax and presentation of learning. The results revealed that conformity with the scientific syntax received a score of 80%, while the presentation of learning scored 91.4%. These results confirmed that the worksheets successfully guided students through the five main steps of scientific learning—observing, questioning, collecting information, analyzing data, and communicating results. The logical sequence of activities and inclusion of experiments encouraged students to be actively involved in learning, work collaboratively, and learn scientifically. The evaluations of the learning experts further confirmed that the worksheets were effective for use in inquiry-based science instruction.

After revisions based on expert feedback, the worksheets were subjected to limited field trials to assess their practicality. Teacher responses to the use of the LKPD reached an average score of 90%, categorized as *Very Feasible*. Teachers reported that the worksheets were easy to implement in the classroom, supported structured science teaching, and provided relevant and engaging tasks for students. They also highlighted that the LKPD allowed them to manage learning more effectively by providing step-by-step guidance to students in carrying out scientific activities.

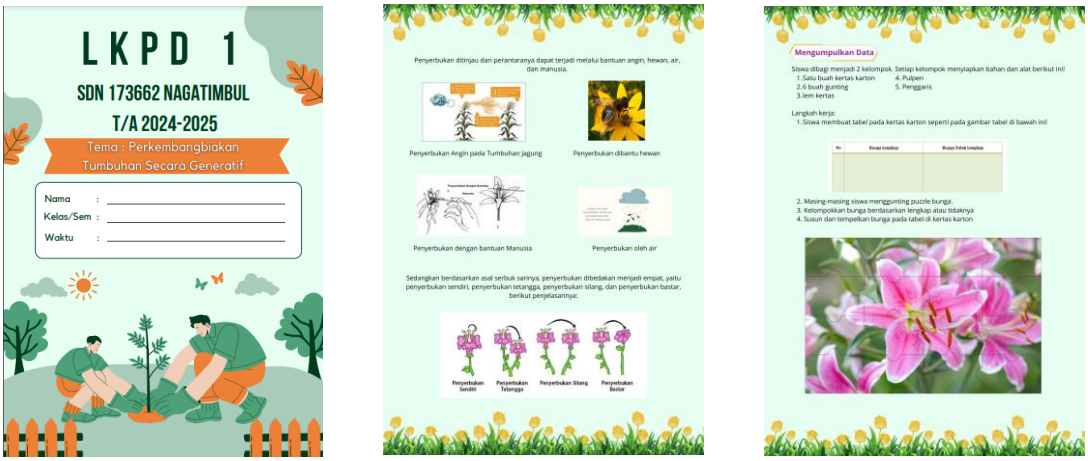
Student responses to the worksheets were equally positive. The average response score was 96%, categorized as *Very Good*. Students expressed that the worksheets made it easier to understand concepts related to plant reproduction and made the learning process more enjoyable and meaningful. They particularly valued the opportunity to carry out observations, experiments, and problem-solving activities. The practicality assessment derived from the student questionnaire showed an average score of 4.8, which placed the worksheets in the *Very Practical* category. These findings indicated that the LKPD was not only valid according to expert judgment but also practical and engaging for classroom use.

Overall, the findings showed that the scientific-based worksheets developed through the ADDIE model met the standards of validity, practicality, and feasibility. The validation results were high across all expert groups, with 81.7% from material experts, 95% from language

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experts, and 86.7% from learning experts. Teacher responses at 90% confirmed that the worksheets were feasible and helpful in teaching practice, while student responses at 96% confirmed that the worksheets were effective, enjoyable, and meaningful. The practicality score of 4.8 reinforced that the product was highly suitable for use in elementary school science learning. Importantly, the LKPD also fulfilled the eligibility standards for teaching materials as defined by the National Education Standards Board (BNSP, 2014), covering content accuracy, appropriate language, and effective presentation.

In addition to meeting technical standards, the worksheets provided distinctive advantages compared to previously used materials. They included structured scientific activities, multiple forms of evaluation, contextual examples, and integration with daily life situations. These features not only supported concept mastery but also promoted scientific literacy, encouraging students to think critically, analyze data, and communicate their findings.



Picture 1. Student Worksheets View

In conclusion, the results demonstrated that the scientific-based worksheets on plant reproduction developed using the ADDIE model were valid, practical, and feasible for sixth-grade science learning. The combination of strong expert validation, positive teacher evaluations, and enthusiastic student responses confirmed that the worksheets could be effectively integrated into science instruction. By incorporating structured scientific syntax and the Discovery Learning model, the product helped address the problems identified at the analysis stage and contributed to improving the scientific literacy and learning outcomes of elementary school students.

After the validation process, the worksheets were tested through teacher and student responses to assess their practicality. Teacher responses showed a percentage of 90%, categorized as Very Feasible. Teachers stated that the worksheets were easy to use, supported the teaching process, and encouraged students to engage in scientific learning.

Finally, student responses indicated a percentage of 96%, categorized as Very Good. Students felt that the worksheets helped them better understand plant reproduction concepts and made the learning process more enjoyable and meaningful. The practicality test also resulted in an average score of 4.8, which fell into the Very Practical category. These results confirmed that the developed scientific-based worksheets using the Discovery Learning model were suitable to be applied in sixth grade science learning.

Discussion

The findings of this study demonstrated that the developed scientific-based student worksheets (LKPD) using the Discovery Learning model fulfilled the criteria of validity, practicality, and feasibility. Validation by subject matter experts resulted in a score of 81.7% in the *Very Good* category, language experts provided a score of 95% in the *Very Good* category, and learning experts gave a score of 86.7% in the *Very Good* category. These results confirmed that the worksheets met the requirements in terms of content accuracy, language clarity, and learning design.

The practicality of the developed worksheets was also supported by teacher and student responses. Teachers gave a score of 90% (*Very Feasible*), indicating that the worksheets were considered effective and easy to integrate into classroom practice. Students responded even more positively, with a score of 96% (*Very Good*), and the practicality test showed an average score of 4.8, categorized as *Very Practical*. These findings suggest that the developed worksheets not only meet expert standards but also gain strong acceptance from both teachers and students as effective learning tools.

The results of this study are in line with previous research that highlights the importance of scientific-based worksheets in enhancing the quality of learning. According to Nahria (2019), the development of teaching materials through research and development methods enables the creation of products that are not only valid but also practical for use in classroom instruction. Similarly, Widiyanti and Nisa (2021) emphasized that worksheets designed with a scientific approach can support students in better understanding learning material, particularly when the content is directly connected to their daily environment. The findings of this study confirm these arguments, as the developed worksheets were proven to be valid and feasible for classroom application.

From another perspective, the research by Widiyarini and Wilujeng (2015) demonstrated that student worksheets based on scientific approaches significantly contribute to students' attitudes, process skills, and mastery of knowledge. The present study supports this evidence, since the worksheets guided students through the main stages of scientific learning such as observing, questioning, collecting information, analyzing data, and communicating results. This structured guidance helped learners to not only understand the subject matter but also practice scientific thinking in a systematic way.

The role of worksheet design is also essential in determining its effectiveness. Supriyadi (2017) stated that a well-prepared worksheet should contain clear objectives, material summaries, and instructions for implementation that are easy for students to follow. In this research, the developed worksheets incorporated these components, ensuring that the activities were not only informative but also engaging. In addition, the process of developing valid instruments through questionnaires and interviews resonates with Margoo's (2010) view that collecting structured responses from experts and users is crucial to evaluate the practicality and relevance of educational products.

Finally, the methodology applied in this study reflects the systematic approach suggested by Sugiyono (2019), who stressed that development research must go through stages of analysis, design, development, implementation, and evaluation. The application of the ADDIE model in this study ensured that the product was developed in a structured and evidence-based manner. Therefore, the findings of this research not only confirm earlier studies but also provide additional empirical support that scientific-based worksheets designed with Discovery Learning principles can enhance students' scientific literacy and problem-solving skills.

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The practical implication of this research is that the developed worksheets can be used as an alternative learning resource for sixth grade science, particularly in the topic of plant reproduction. Teachers can apply these worksheets to facilitate inquiry-based activities and strengthen students' scientific literacy. In a broader sense, this study supports the integration of scientific-based approaches with active learning models to foster essential 21st-century skills, such as critical thinking, collaboration, and communication.

Despite these promising results, the study has certain limitations. The trial was conducted in a limited setting with a small group of teachers and students, which may affect the generalizability of the findings. The focus of the worksheets was restricted to plant reproduction material, so further research is needed to adapt and test the worksheets in other science topics. Additionally, the evaluation of effectiveness was mainly based on validation scores and responses; future studies could include experimental designs to measure direct impacts on student achievement and scientific literacy skills.

Conclusion

This research has successfully developed a scientific-based student worksheet (LKPD) on plant reproduction material using the ADDIE development model. The process began with a comprehensive analysis that identified low student interest in reading, the lack of contextual and inquiry-based learning, and weak scientific literacy skills as key problems. Based on these findings, a draft worksheet was designed with structured activities aligned to scientific steps, and instruments were prepared to evaluate its quality.

The development stage produced a worksheet that underwent rigorous validation by material, language, and learning experts. The validation results showed high scores across all aspects, with material experts giving an average of 81.7%, language experts 95%, and learning experts 86.7%, all of which were categorized as *Very Good*. Teacher responses confirmed the feasibility of the worksheet at 90%, while student responses demonstrated a strong level of acceptance at 96%. The practicality test also yielded a high score of 4.8, placing the product in the *Very Practical* category.

Overall, the developed LKPD met the criteria of validity, practicality, and feasibility, fulfilling the eligibility standards for teaching materials. It offers significant improvements over previously used worksheets by incorporating structured scientific syntax, contextual examples, and a balance of exercises and experimental activities. The findings demonstrate that scientific-based worksheets designed through Discovery Learning can effectively enhance students' scientific literacy, critical thinking, and engagement in science learning.

This study implies that the developed LKPD is not only appropriate for classroom practice in plant reproduction material but also has potential for broader application in other science topics. However, as the field trial was limited in scope, further research is recommended to test the effectiveness of the worksheets on larger samples and in varied contexts to strengthen their generalizability.

References

Asmaranti, Widuri. (2018). Desain Lembar Kerja Peserta Didik (LKPD) Matematika dengan Pendekatan Saintifik Berbasis Pendidikan Karakter. Prosiding Seminar Nasional Etnomatnesia, 640.

Asyhari, A. (2015). Profil Peningkatan Kemampuan Literasi Sains Siswa Melalui Pembelajaran Saintifik. Jurnal Ilmiah Pendidikan Fisika Al-Biruni, 4(2), 179. https://doi.org/10.24042/jpifalbiruni.v4i2.91

Balım, A G. 2009. The Effects of Discovery Learning on Students' Success and Inquiry Learning Skills. Egitim Arastirmalari-Eurasian. Journal of Educational Research, (Online), 35 (1): 1-20.

Fitria. (2020). Pengembangan Model Pembelajaran Pbl Berbasis Digital Untuk Meningkatkan Karakter Peduli Lingkungan dan Literasi Sains. Deepublish.

Fuadi, H. (2020). Analisis Faktor Penyebab Rendahnya Kemampuan Literasi Sains Peserta Didik. Jurnal Ilmiah Profesi Pendidikan. (Online). (https://doi.org/10.29303/jipp.v5i2. 122, diakses 14 Maret 2024)

Gito Supriadi. (2021). Statistik Penelitian Pendidikan. UNY Press.

Hammer, D. (2012). Discovery Learning and Discovery Teaching. Cognition and Instruction, 15 (4), 485-529.

Hanafiah. (2009). Konsep Strategi Pembelajaran. Refik Aditama.

Hasan. (2022). Pengembangan LKPD Berbasis Literasi Sain Terhadap Hasil Belajar Peserta Didik Pada Energi Listrik Tema Globalisasi Kelas VI UPT SPF SDN Mangkura 1 Makassar. (Tesis, Program Pascasarjana Magister Pendidikan Dasar Universitas Muhammadiyah Makassar)

Hidayati, A. N. (2021). Development of conceptual framework for cyber fraud investigation. Register, 7(2), 125-135.

Hosnan. (2016). Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21: Kunci Sukses Implementasi Kurikulum 2013. Ghalia Indonesia.

Jamaluddin, J. (2019). Profil Literasi Sains Dan Keterampilan Berpikir Kritis Pendidik Ipa SMP. Jurnal Penelitian Pendidikan IPA, 5(1).

Kelana, J. B. (2019). Bahan Ajar IPA Berbasis Literasi Sains. Lekkas.

Kementerian Pendidikan dan Kebudayaan, Badan Pengembangan Sumber Daya Manusia Pendidikan dan Kebudayaan dan Penjaminan Mutu. (2013). Pendidikan tentang Model Pembelajaran Penemuan (Discovery Learning). Jakarta: Kementerian Pendidikan Nasional.

Khasinah, S. (2021). Discovery learning: definisi, sintaksis, keunggulan dan kelemahan. Jurnal MUDARRISUNA: Media Kajian Pendidikan Agama Islam, 11(3), 402-413.

Kosasih, Engkos. (2021). Pengembangan Bahan Ajar. Bumi Aksara.

Lestari, E. T. (2020). Pendekatan Saintifik Di Sekolah Dasar. Deepublish.

Martinez-Hernandez, K. (2015). Perspectives on Science Literacy. A comparative study of United States and Kenya. Educational Research International, 4(2), 25-30.

Nadifatinisa, N. (2021). Pengembangan lembar kerja peserta didik (LKPD) berbasis higher order thingking skill (HOTS) pada pembelajaran IPA materi ekosistem kelas V. Jurnal Pedagogi Dan Pembelajaran, 4(2), 344-351.

NF, I. A. Roesminingsih, (2022). Pengembangan LKPD Interaktif Berbasis Liveworksheet untuk Meningkatankan Hasil Belajar IPS Sekolah Dasar. Jurnal Basicedu.

Nurbayani, Anisa, et al. (2021). Sosialisasi Penggunaan Aplikasi Liveworksheets sebagai LKPD Interaktif Bagi Guru-guru SDN 1 Tegalmunjul Purwakarta. Indonesian Journal of Community Services in Engineering & Education (IJOCSEE).

Nurfaidah, S. (2017). Analisis aspek literasi sains pada buku teks pelajaran IPA kelas V SD. Mimbar Sekolah Dasar, 4 (1).

Prahastiwi, F. A. (2019). Keterkaitan Pembelajaran Literasi Sains dengan Keterampilan Berpikir Kritis Siswa dalam Pembelajaran IPA SD. Seminar Nasional Pendidikan

Rahmawati, L. H. (2020). Pengembangan Lembar Kegiatan Peserta Didik (LKPD) Berbasis Scientific Approach Pada Mata Pelajaran Administrasi Umum Semester Genap Kelas X OTKP di SMK Negeri 1 Jombang. Jurnal Pendidikan Administrasi Perkantoran.

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Rozi. (2022). Modul Pembelajaran IPA SD. Medan: Bina Guna Press.

Rusli, M. (2021). Discovery Learning. Hak Cipta Buku Kemenkum dan HAM Nomor: 000259240, 268.

Salirawati, Das. (2011). Penyusunan dan Kegunaan LKS dalam Proses Pembelajaran. Alfabeta.

Sugiono. (2019). Metode Penelitian Pendidikan (Kuantitatif, Kualitatif, Kombinasi, R&D dan penelitian Pendidikan). Alfabeta.

Suparsawan, I. K. (2020). Kolaborasi Pendekatan Saintifik dengan Model Pembelajaran STAD Geliatkan Peserta Didik. Tata Akbar.

Sutrisno, Nana. (2021). Analisis Kemampuan Literasi Sains Peserta Didik SMA Di Kota Sungai Penuh. Jurnal Inovasi Penelitian, (https://doi.org/10.47492/jip.v1i12.530, Diakses 13 Maret 2024)

Triana, Neni. (2021). LKPD Berbasis Eksperimen: Tingkatkan Hasil Belajar Siswa. Guepedia.

Wahono. (2022). Pengembangan E-LKPD dengan pendekatan saintifik untuk meningkatkan keterampilan berpikir kritis siswa sekolah dasar dalam pembelajaran IPA. Jurnal Basicedu 6.5: 8331-8340.

Zamilah, Z. (2024). Pengembangan Lembar Kerja Interaktif Berbasis Literasi Sains untuk Melatih Kemampuan Berpikir Kritis Peserta Didik Materi Fotosintesis. Ideguru: Jurnal Karya Ilmiah Guru, 9 (1), 294-304.

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