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Development of Student Worksheets (LKPD) Based on Scientific Literacy with Flare Context in Redox Reaction Material at SMAN 1 Tanjung Morawa

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Abstract: Development of Student Worksheets (LKPD) Based on Scientific Literacy with Flare Context in Redox Reaction Material at SMAN 1 Tanjung Morawa. In this study, the validity of student worksheets based on scientific literacy with flare settings in redox reaction content will be assessed, along with the responses of teachers and students. A four-stage development model, or 4D model, is used in this development research. The stages are 1) Define, 2) Design, 3) Development, and 4) Disseminate. This is exclusive to the stage of development. This study included 33 pupils from class X Merdeka 10 as well as two material experts, two media experts, two chemistry instructors, and two chemistry teachers as subjects. Interviews, LKPD validation sheets from material experts, LKPD validation sheets from media experts, teacher questionnaires, and student response questionnaires were used as data gathering tools. According to the study's findings, the average evaluation by media experts was 93.9% in the very appropriate category, the average response from teachers was 96.8% in the very appropriate category, and the average evaluation by material experts was 87.6% in the very appropriate category. The average student response percentage for LKPD eligibility was 81.4% in the "Very Eligible" category.

Keywords: LKPD, scientific literacy, flare, redox reactions, 4D models

Abstrak: Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Literasi Sains Dengan Konteks Flare Pada Materi Reaksi Redoks di SMAN 1 Tanjung Morawa. *Dalam penelitian ini akan dinilai validitas LKS berbasis literasi sains dengan setting flare pada muatan reaksi redoks, beserta respon guru dan siswa. Model pengembangan empat tahap, atau model 4D, digunakan dalam penelitian pengembangan ini. Tahapannya adalah 1) Define, 2) Design, 3) Development, dan 4) Disseminate. Ini eksklusif untuk tahap pengembangan. Penelitian ini melibatkan 33 siswa kelas X Merdeka 10 serta dua orang ahli materi, dua orang ahli media, dua orang instruktur kimia, dan dua orang guru kimia sebagai subjek. Wawancara, lembar validasi LKPD dari ahli materi, lembar validasi LKPD dari ahli media, angket guru, dan angket respon siswa digunakan sebagai alat pengumpulan data. Berdasarkan hasil penelitian, rata-rata penilaian ahli media sebesar 93,9% dengan kategori sangat sesuai, rata-rata tanggapan guru sebesar 96,8% dengan kategori sangat sesuai, dan rata-rata penilaian ahli materi sebesar 87,6% dengan kategori sangat sesuai. . Rata-rata persentase respon siswa terhadap kelayakan LKPD sebesar 81,4% dengan kategori "Sangat Layak".*

Kata kunci: *LKPD, Literasi Sains, Flare, Reaksi Redoks, Model 4D*

▪ INTRODUCTION

Modern science is developing at a quick pace, which has an impact on human life both directly and indirectly. Science is necessary for understanding the cosmos, but it is also necessary for science to be able to address issues and occurrences that arise in daily life (Syuhada, et al., 2022). The study of matter's characteristics and composition, as well as the energy changes that occur with it, is known as chemistry. Chemistry instruction places a strong emphasis on developing students' capacity to investigate and comprehend the natural world from a scientific standpoint. (Rizalini & Sofyan, 2018).

The development of education in the 4.0 era, which leads to increased scientific literacy, has caused advances in science and technology to increase rapidly. Scientific literacy is a process of understanding science based on a question and drawing conclusions regarding human activities that obtain scientific concepts (Sutrisna, N., 2021). Scientific literacy can form students with scientific process skills to adapt to technology and science in public problems and is useful for the world of work which requires reasoning, creativity in concluding decisions and solving problems when dealing with other people and their environment (Abidin, et al., 2017) .

Teachers play the role of facilitators, encouraging students to participate actively in their education by providing them with tools and materials to help them do so. As per Hardiyanti (2020), LKPD worksheets are among the instructional resources. An educator's attempt to lead students in an organized way through engaging activities is known as LKPD. A set of tasks that students must complete and instructional materials are typically found on sheets of paper that make up LKPD. A higher level of learning activities and creative thinking among students is required in LKPD design. (2018) Rizalino & Sofyan.

The chemistry subject instructor was interviewed by researchers at SMA Negeri 1 Tanjung Morawa, and the information they gathered indicated that the teaching materials known as LKPD (student worksheets) had never been used. The reason for this is because students are not proficient in creating instructional materials, particularly those that center on scientific literacy. Additionally, teachers rather than pupils are in charge of the continuous learning process. Because they rarely employ learning settings in their daily lives, up to 15% of students struggle to understand the subject.

One chemical material that can be related to everyday life is redox reactions. Redox is closely related to combustion, so one context that can be brought up is flares or what can also be called flare gas. In the flare combustion process, something called an oxidation-reduction reaction occurs. Then the flames, colors and smoke produced can be included in the curriculum as illustrations of several basic principles of chemistry (Sitorus & Syuhada, 2023). In light of these issues, what can be done is create LKPD teaching materials that are grounded in scientific literacy and use flare contexts. These materials should be able to fulfill the established learning objectives and develop students' scientific literacy abilities, which include the capacity to explain phenomena in everyday life using a scientific explanation.

According to research by Rasmiwetti (2020), the LKPD on the topic of acids and bases for class XI SMA/MA based on scientific literacy with the MEA strategy was deemed legitimate and received an average score of 92.475% from the six feasibility elements with valid eligibility requirements. LKPD is declared practical to use based on user assessment. The average score obtained from the user practicality test was 91.67% by teachers and 90.67% by students with both criteria being very good.

In addition, additional research (Izzatunisa et al., 2019) found that the creation of scientific literacy-based LKPD is appropriate for use, with an average percentage of 89.33% for LKPD assessment aspects. It also meets the very good criteria, meaning that it is highly practicable, easy for teachers and students to use, and has an average percentage of response results of 86.79%. Thus, the LKPD, which was built using high school chemistry curriculum and scientific literacy, was deemed appropriate for educational usage. In light of the identified issues, instructional materials utilizing scientific literacy-based LKPD need to be developed in order to enhance learning innovation.

▪ METHOD

This study applies a 4D development model to the research and development process, which is known as the R&D method. Four steps make up the 4D development process, according to Trianto's (2009) research: define, design, develop, and disseminator. These stages are exclusive to the development stage. This model is a guide for designers to be able to create effective learning and achieve optimal results. This research is educational development research (educational Research and Development) which aims to develop scientific literacy-based LKPD with a flare context on redox reaction material at SMAN 1 Tanjung Morawa. This research includes the product development process, feasibility analysis validated by experts, and product trials based on teacher and student responses.

This study employed Likert scale descriptive data analysis approaches to analyze non-test instrument data. The kind of data derived from the study's findings is qualitative data that is examined through the lens of quantitative data, namely numerical data that is translated into verbal interpretations. By offering a checklist (√) for the specified range of values, the Likert scale is evaluated. On the LKPD validation form, scores can range from 1 to 5. Using a Likert scale, Table 1 displays the assessment criteria.

The Likert scale is a tool used to gauge an individual's or a group's attitudes, beliefs, and perceptions on a social issue. A score of 1 represented the lowest possible result and a score of 5 the greatest on the scale employed in this investigation. In this manner:

Table 1 Likert Scale Assessment Criteria

No	Criteria	Scale
1	Very good	5
2	Good	4
3	Pretty good	3
4	Passable	2
5	Not good	1

Source: Boone and Bone (2012)

Expert validation of product development in the form of LKPD is expressed in percentage form. Analysis is carried out by calculating the total score given by the validator on the LKPD product expert validation sheet. The total score is then calculated

into a percent value. LKPD eligibility criteria based on percent values can be seen in table 2.

Table 2 Interpretation of percent value criteria

Persen	Criteria
0 % - 20 %	not feasible
21 % - 40 %	not worthy
41 % - 60 %	quite decent
61 % - 80 %	Worthy
81 % - 100 %	very worthy

Source: Boone and Bone (2012)

1. Definition Stage

a. Preliminary Analysis
   The initial analysis began with data collection from the teacher of chemistry subjects at SMAN 1 Tanjung Morawa, the teacher stated that the teacher had previously developed LKPD primarily based on scientific literacy on redox reaction material which is related to daily life.
b. Learner Analysis
   The analysis of students' student participation was carried out using a labor analysis survey on a number of students in class Impaired printing results in students experiencing difficulties in understanding materials due to the lack of examples in daily life so that students are less interested in studying chemistry in the material of redox reactions.
c. Concept Analysis
   The concerted analysis carried out is analyzing the important and main parts that will be studied as well as reviewing relevant sources of material systematically in the teaching materials based on the basic components and learning objectives of the LKPD structure based on scientific literacy with daily activities such as redox reactions in flarer contexts.

2. Design Stage

a. Modification of Basic Material Concepts
   The basic concept of the results of literary analysis and classification of the basic concept of materials from various reliable sources is described by the context in everyday life, namely by the flarer contact which consists of 3 sub-chapters of redox reaction materials, namely oxygen bonding and release, electron release and reception, and number change. oxidation.
b. LKPD design
c. The design of the LKPD teaching materials is based on scientific literacy on redox reaction materials with flarer constructs in the form of using Canva. The LKPD consists of 19 pages which consist of a sample of the basics, introductory words, LKPD description, identity of students, performance of LKPD, material and redox reaction practicum.

3. Development Stage

A validation test on four validators, comprising two material specialists and two media experts, will be conducted on a LKPD product that has been developed thus far. In

addition, assessments were carried out from 2 chemical teacher responses and 34 student responses.

a. Expert Validation Analysis

1) Assessment Results by Material Experts

This material expert test aims to check the suitability of the contents of the LKPD from the material system, namely the redox reaction material, which is complete with the curriculum and the completeness of the LKPD based on scientific literacy using flarer contracts. The results of material expert validation can be recommended using table 3 in various ways:

Table 3 Material Expert Validation Results

Aspect	**No. Indicator**	**Validator**	
		1	**2**
Content Quality	1	4	5
	2	4	5
	3	4	4
	4	5	5
	5	3	5
	6	4	5
	7	4	4
	8	4	5
Language	9	4	5
Scientific Literacy	10	4	5
	11	4	5
	12	4	5
	13	4	4
Total Score		**52**	**62**
Average Percentage (%)		**80**	**95.3**
Overall Average		**87.6**	
Category		**Very Worthy**	

Table 3 shows that, in the "very feasible" category, the Kerdura validator's overall performance percentage is 87.6%. Therefore, it can be said that the LKPD, which is founded on scientific literacy and uses flarer context to explain the created redox reaction material, can proceed after being revised by a material expert.

2) Assessment Results by Media Experts

This media expert test aims to check the suitability of the contents of the LKPD from an appearance perspective. The results of the media expert validation can be confirmed using table 4 as follows:

Table 4 Merdia Expert Validation Results

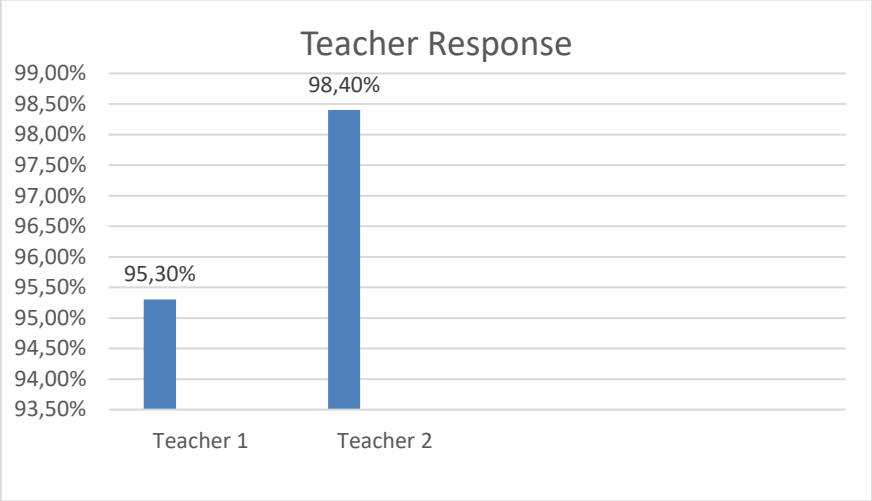
Aspect	No. Indicator	Validator 1	Validator 2
LKPD size	1	5	5
	2	5	5
Cover Design	3	4	5
	4	5	5
	5	4	5
	6	4	5
	7	5	5
Content Illustration	8	4	5
	9	5	5
	10	4	4
LKPD Content Design	11	5	5
	12	4	5
	13	5	5
	14	4	5
	15	4	5
Total Score		**67**	**74**
Average Percentage (%)		**89.3**	**98.6**
Overall Average		**93.9**	
Category		**Very worthy**	

Based on table 4. the overall performance percentage of the Kerdura validator is 93.9% in the "very feasible" category.

b. Response Questionnaire Analysis

1) Results of Teacher Responses to LKPD

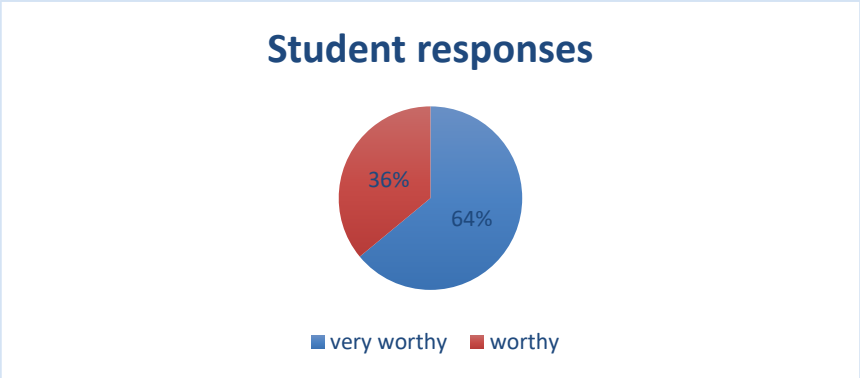
Table 5 Teacher Response Results



Based on table 5, the percentage obtained from gurrur 1 is 95.3% in the very decent category and the percentage obtained from gurrur 2 is 98.4% in the very decent category. The overall feasibility percentage of Kerdura Gurrur is 93.9% in the "very feasible" category.

2) Results of Student Responses to LKPD

The examination of students' comments demonstrates practicality because it validates students' evaluations of the LKPD's performance, its simplicity of completion, and its clarity of performance. Sixty-four percent of the kids who met the criterion had very adequate total scores, and twelve students, or 36 percent, met the appropriate standards. As a consequence, the examination of the questionnaire responses from the students revealed that the "Very Eligible" group had an average LKPD feasibility percentage of 81.4%.



▪ RESULT AND DISCUSSION

This research development created LKPD teaching materials based on scientific literacy with flarer contexts in redox reaction material for class The research methodology used is Rerserarch and Derverlopmernt with modern 4-D development from Thiagarajan. The stages of modern 4D consist of 4 stages, namely: derfiner, dersign, derverlop, and disseminater. In this research, the research is limited to the dervelop stage.

In the first step of creating the research worksheet, teachers and students are interviewed to gather information about the issues that the learning process in research schools is now facing. This information is then analyzed by the researchers. Based on the findings of the interviews that the researchers conducted, data was gathered that Researchers at SMA Ngerri 1 Tanjurng Morawa were able to get information on unused LKPD (student worksheet) teaching materials based on their conversations with one of the chemistry subject teachers.

Next, a concerted analysis is carried out to understand the important and main parts of the redox reaction material that will be studied as well as reviewing relevant material in a systematic way in teaching materials based on basic components and learning objectives for scientific literacy-based worksheet materials with daily activities such as reaction k in contex flarer. Based on the combustion and release of oxygen, the acceptance and release of ergytrons, and the rise and fall in the oxidation number, the LKPD's surb material is used to identify oxidation and reduction reactions. This is consistent with the findings of the study conducted by Amdayani et al. (2021), which state that this stage of research is done to arrange the concepts that will be covered in the material and to create the learning goals that students must meet in addition to the curriculum that will be presented in the learning materials that will be created.

The second stage is the design which consists of selecting open materials, selecting formats and initial plans. In selecting teaching materials, the teaching materials chosen are LKPD teaching materials which are intended to provide convenience for students during the learning process, because what supports the current structure is LKPD

The third stage is development (develop), namely the stage of developing the product which has been finalized in the final stage, namely the design (dersign). This stage starts from arranging the LKPD framework which consists of the LKPD cover to practical activities and developing the Canva application. During this phase, instruments are validated, materials and media experts are validated, the product is revised, teacher and student reaction surveys are collected, and valid teaching materials are created.

the findings of the LKPD's validation evaluation based on scientific literacy, which was conducted by two lecturers with expertise in materials and two in media and utilized the flarer context on redox reaction material. The LKPD material validation presentation yielded an average score of 87.6% in the very acceptable for use category, while the media validation produced a score of 93.9% in the same area in the field.

According to the flarer context on redox reaction material, teachers' responses to a LKPD test on scientific literacy yielded a percentage of results in the "very feasible" category of 93.9%. The analysis of student response questionnaires yielded an average percentage of 81.4% in the "Very Decent" category of LKPD feasibility.

▪ CONCLUSION

The conclusion of this research is that the analysis of the failure of the LKPD based on scientific literacy using flarer constructs on redox reaction material is very feasible to be developed where the use of LKPD based on scientific literacy has never been used at SMAN 1 Tanjurng Morawa school. Based on the assessment by material experts regarding the LKPD product, the percentage obtained was 87.6%, which is included in the very feasible category. The proportion reached was 93.9%, which falls into the highly possible category, according to an evaluation made by media professionals regarding the LKPD product. Then, 96.8% of the student response fell into the "very

feasible" group, and 81.4% fell into the "very eligible" category, according to the chemistry instructor at SMAN 1 Tanjurng Morawa's response.

It is hoped that the creation of a comprehensive LKPD will not only concentrate on redox reaction materials to help students become accustomed to scientific literacy, and that field trials will not only be conducted in one place with a limited number of participants to ensure accurate findings regarding the viability and efficacy of the LKPD.

▪ REFERENCES

Abidin, Y. 2017. Learning System Design in the 2013 Kurrikurlurm Context. Bandurng: Rerfika Adiatama.

Almira, Verlda. (2017). Development of the Student Activity Sheet (LKPD) on Erurbacteria Basic Material Based on Scientific Approach. Perlita Education Journal 5(3): 330-338.

Amdayani, Susilawati et al. (2021). Validity and Practicality of POEr-Based Chemical Modules (Predict, Observer, Erxplain) Colloidal Materials in Urmur Chemistry Courses. Indonesian Science Learning Education Journal. 2(1): 1-6.

BSNP, 2008. Guidelines for the Development of Curriculum Level Educational Levels at First Mernerngah School Level, Jakarta: BSNP

Boone Jr Harry N, and Derborah A Bone. 2012. Analyzing Likertt data from the Education Journal. 50(2).

Ekantini, A., & Wilujeng I. (2018). The Development of Science Student Worksheet Based on Education for Environmental Sustainable Development to Enhance Scientific Litency. *Universal Journal of Educational Research*, 6(6), 1339-1347.

Hardiyanti, P.C. 2020. Development of Student Worksheets Based on Problem Based Learning Material Hydrolysis and Development to Improve Students' Logical, Mathematical and Interpersonal Intelligence. UNNES Postgraduate.

Ikhsan, M. K., & Handayani. (2016). The Development of Students' Worksheet Using Scientific Approach on Curriculum Materials. *Proceedings of ISELT FBS Universitas Negeri Padang* 4(2),74-87.

Izzatunnisa, I., Andayani, Y., & Hakim, A. (2019). Development of LKPD based on discovery learning to improve students' scientific literacy skills in high school chemistry material. Pijar Mipa Journal, 14(2), 49-54.

Kosasih, Er. (2020). Development of Teaching Materials. Literary Earth.

Kusuma Astuti, Y. (2016). Scientific literacy in science learning. Issn., 7(3B), 1693–7945.

Purwanti, A. D. (2021). Content Analysis of Scientific Literacy and High Order Thinking Skills in Class X High School Chemistry Textbooks on Redox Reaction Material.

Rasmiwertti, R., Nitasari, F., & Anwar, L. (2020). Development of a Student Activity Sheet (LKPD) Based on Scientific Literacy with Strategic Merans-Ernds Analysis (MERA) on the Subject of Acids and Bases. Pijar Mipa Journal, 15(5), 488-492.

Rizalini, R. & Sofyan, H. (2018). Development of a Worksheet for Chemistry Students Based on Supervised Inquiries for Class XI Science SMA/MA. Journal of Educational Technology Innovation, Vol. 5, no. 2.

Safitri, N. & Syurhada, F. A. (2023). Oxidation-Reduction reactions in flares.

Samsu, N., Mustika, D., Nafaida, R., & Manurung, N. (2020). Feasibility and Practicality Analysis of Scientific Literacy-Based Practicum Modules for Science Learning.

Journal of Science & Science Learning. 4(1), 29-40, https://doi.org/10.24815ipi.v4i1.15546.

Sari, S. A. D. (2021). Development of Student Worksheets (LKPD) Based on Scientific Literacy with Terms of Classification of Living and Non-living Things for Class VII SMP (Doctoral dissertation, UrIN Fatmawati Surkarno).

Sitorurs, Y. A., & Syurhada, F. A. (2023). Students' perception of the flare con- terx in learning chemical materials, redox reactions. Journal of Social Education and Humanities, 2(3).

Sutrisna, N. (2021). Analysis of the scientific literacy skills of high school students in Surngai Pernurh City. Journal of Research Innovation, 1(12), 2683.

Syuhada, F. A. (2018). The differences of students learning outcome with numbered head together (NHT) and think pair share (TPS) in atomic structure. *Jurnal Pendidikan Kimia (JPKim), 10*(2), 377-381.

Syuhada, F., Surgiharti, G., & Syafriani, D. (2022, Dercermberr). Derverlopmernt of Chermical Modurler Baserd on Scierncer Literacy ursing ther Chermier Im Konterks Stager on Reaction Rerdox Materials. In Proceedings of the 4th International Conference on Innovation in Duration, Science and Currency, ICIErSC 2022, 11 October 2022, Merdan, Indonesia.

Toharudin, Ur., Herndrawati, S., Rurstaman, Andrian. 2011. Building Students' Scientific Literacy. Bandung: Hurmaniora.

Yuliati, Y. 2017. Scientific literacy in science learning. Pendas Cakrawala Journal, 3(2).