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Development Of Science Literacy-Based Electronic Learner Worksheets (E-Lkpd) With The Context Of BatikCloth Coloring On Chemical Bonding Material

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Abstract: Development Of Science Literacy-Based Electronic Learner Worksheets (E-Lkpd) With The Context Of Batik Cloth Coloring On Chemical Bonding Material. This study aims to measure the results of expert validation of e-LKPD, review teacher responses to e-LKPD, and review student responses to e-LKPD conducted at SMA Swasta Nurul Iman Tanjung Morawa. This type of research uses the Research and Development (R&D) method, namely the 4D development model. This study used a sample of 35 students in 1 class, 2 chemistry teachers, and 4 expert validators. The data collection methods used were (1) interviews, (2) teacher response questionnaires and student responses, and (3) expert validation. The results showed that the development of science literacy-based e-LKPD with the context of batik cloth coloring on chemical bonding material is feasible to use with the results of material expert validation of 84.1%, which is in the very feasible category, and the results of media expert validation of 87.75%, which is in the very feasible category. The results of the teacher response questionnaire were 96.8% in the very feasible category, and the results of the student response questionnaire were 89%, which fell into the very feasible category.

Keywords: e-LKPD, Science Literacy, Batik Fabric Coloring, Chemical Bonding, Researchand Development

Abstrak: Pengembangan Lembar Kerja Peserta Didik Elektronik (e-LKPD) Berbasis Literasi Sains dengan Konteks Pewarnaan Kain Batik pada Materi Ikatan Kimia. *Penelitian ini ditujukan untuk mengukur hasil validasi ahli terhadap e-LKPD, meninjau respon guru terhadap e-LKPD, dan meninjau respon peserta didik terhadap e-LKPD yang dilakukan di SMA Swasta Nurul Iman Tanjung Morawa. Jenis penelitian ini menggunakan metode penelitian dan pengembangan Research and Development (R&D) yaitu dengan model pengembangan 4D. Penelitian ini menggunakan sampel sebanyak 35 peserta didikdalam 1 kelas, 2 guru kimia, dan 4 validator ahli. Metode pengumpulan data yang digunakan yaitu (1) wawancara, (2) angket respon guru dan respon peserta didik, dan (3) validasi ahli. Hasilpenelitian menunjukkan bahwa pengembangan e-LKPD berbasis literasi sains dengan konteks pewarnaan kain batik pada materi ikatan kimia layak digunakan dengan hasil validasi ahli materi sebesar 84.1%, yang masuk dalam kategori sangat layak, dan hasil validasi ahli media sebesar 87,75%, yang masuk dalam kategori sangat layak. Hasil angket respon guru diperolah 96.8% masuk dalam kategori sangat layak, dan hasil angket respon peserta didik sebesar 89%, yang masuk dalam kategori sangat layak.*

Kata kunci: *e-LKPD, Literasi Sains, Pewarnaan Kain Batik, Ikatan Kimia, Penelitian dan Pengembangan*

▪ INTRODUCTION

In Indonesia, there are several educational issues that are taken into consideration, starting from the curriculum, students' ability to work independently, learning efficiencyin the application of learning models, learning media, school facilities and infrastructure, and the use of technology in learning, this can be seen through comparing the education system in Indonesia with the quality of education in various countries (Agustang et al., 2021). In an effort to improve the quality of education in Indonesia, various innovations in the use of technology in education have been developed. Digital technology in education can change conventional learning methods into non-conventional learning methods that can improve learning quality and improve student learning outcomes (Sihaloho, 2021).

Digital technology in education can improve cognitive functions and students' thinking skills. One of the uses of digital technology in improving learning media innovation is the change in the presentation of LKPD in paper form to e-LKPD which is one of the LKPD developments with the use of digital technology (Andryani, 2023). This development is expected to help students understand chemistry material by displaying subject matter in the form of graphics and videos, thus saving time and costs (Saprina, 2022).

The material contained in chemistry learning is mostly (Zahro et al., 2021) abstract (Safitri & Sari, 2022). Chemistry subjects are considered difficult (Yakina et al., 2017). Which is seen in Field that students are active In learning is very lacking (Irfandi et al., 2018) and is still considered low (Khorunnisa et al., 2020) and requires analysis to solve chemical problems (Mezia, 2016). One material that is difficult for students to understand is chemical bonding (Safitri et al., 2018).

Teachers as facilitators are expected to be able to assist students in understanding abstract chemical concepts by linking chemical material to everyday life. One of the applications of chemistry in everyday life is the coloring of batik cloth which is often encountered and closely related to the formation of chemical bonds in the manufacturing process. In the batik cloth dyeing process, when the paint can color the fabric or fiber, there is an interaction or bond between the dye component and the fabric component. Thus, the dissolution process of batik dyes is an application of chemistry learning materials in the form of polar and nonpolar covalents, such as napthol which is nonpolar. The number of problems with the reasoning of knowledge and technology in chemistry material makes the habituation of science literacy a very important and necessary skill in today's world of education. Science literacy is a person's ability to understand science, communicate science, and use science to solve problems based on scientific attitudes and foster a positive attitude towards the problems to be solved (Wulandari et al., 2016). In general,chemistry or science learning emphasizes the provision of direct experience with the aim of increasing the competence of students to be able to explore and understand the surrounding environment scientifically (Nurhidayah et al., 2015).

Based on the results of an interview with one of the Xth grade high school chemistry teachers conducted on September 20, 2023, it was found that teachers still use teaching material textbooks as a source of learning chemistry subjects, schools have not used LKPD as a source of teaching materials, so the teaching materials used are still not enough to train and develop students' habits.

Based on the results of research conducted (Yuzan & Jahro 2022), it shows that students need LKPD based on the guided inquiry learning model. Furthermore, Asri's (2023) research shows that literacy-based LKPD is effectively used in the learning

process. e-LKPD based on scientific literacy is effectively used in learning (Yahya et al., 2023). Thus, the scientific literacy-based e-LKPD developed is suitable for improving critical thinking skills (Sumanik, 2022).

Based on the description of the problems above, it is necessary to conduct a study entitled "Development of Science Literacy-Based Electronic Learner Worksheets (E-Lkpd) with Batik Fabric Coloring Context on Chemical Bonding Material" with innovations that are more interesting and help students' awareness to more easily understand the relationship between chemical bonding material and everyday life, so that students can gain an understanding of science in science literacy and provide a meaningful connection between chemistry learning and everyday life.

▪ METHOD

The research method used in this research is Research & Development, which is a process or steps to develop or produce a product using the 4D development model, namely Define, Design, Develop, and Disseminate (Okpatrioka, 2023). This product is in the form of learning media in the form of science literacy-based e-LKPD which willbe used for chemical bonding material for class X IPA students. This research focuses on the develop stage.

That is, the research will focus on the steps of developing e-LKPD learning media products. This is because the results of this research will not be disseminated to other institutions or agencies, except for the research site itself (Karimah, et al., 2014). In addition, this study did not consider the learning outcomes of students. The reason for choosing the 4D development model is that the development steps are gradual, simple, systematic, and easy to apply in developing a learning media. The research was conducted on December 29 to January 31 at SMA Swasta Nurul Iman Tanjung Morawa using a research sample of 35 students in 1 class as well as 2 chemistry teachers and 4 expert validators which included 2 material expert validators and 2 media expert validators. The data collection methods used are (1) interviews, (2) validation of e-LKPD products, (3) questionnaire teacher response and student response. The method used is to develop science literacy-based e-LKPD with the context of batik cloth coloring on chemical bonding material. Data collection techniques used in this research were interviews and questionnaires.

▪ RESULT AND DISCUSSION

The purpose of this development research is to design and develop products in the form of science literacy-based e-LKPD with the context of batik cloth coloring aimed at class X chemical bonding material with a research focus on analyzing expert validation which includes media expert validation and material expert validation related to the feasibility of the e-LKPD developed, reviewing teacher responses related to the practicality of using e-LKPD in the context of learning chemical bonding material using the context of batik cloth coloring, and reviewing student responses related to the practicality and usefulness of e-LKPD in understanding chemical bonding material with the context of batik cloth coloring with the aim of evaluating the extent to which e-LKPD can help students in learning and improve student understanding of the material. The research method used is Research and Development with the 4D development model. The stages of the 4D model consist of 4 stages, namely: (1) Define; (2) Design; (3) Develop; (4) Disseminate.

The research stages begin at the defining stage, researchers analyze various things that will be the basis for designing and developing products, as well as analyzing the feasibility and requirements of development. The next stage in the development of e-LKPD products is the design stage. researchers analyzed the syllabus, compiled learning materials, modified the basic concepts of the material and designed e-LKPD designs, The stage of completing the e-LKPD product continues at the development stage, which begins with the activity of making e-LKPD products, The components contained in the e-LKPD product include; preface, description, instructions for using e-LKPD, introduction to the context of batik cloth coloring, table of contents, concept map, material, interactive activities, practice questions, and glossary. Further activities in the development stage are as follows:

Results of Expert Validation Analysis

Validation carried out by experts aims to determine the validation weight of the products produced and to determine the quality of the products developed by consulting 2 material expert lecturers and 2 media expert lecturers who will become validators of the products produced through filling out material assessment questionnaires by material experts and media assessment questionnaires from media experts.

Table 1. Material expert instrument validation results

No.	Assessment Aspect	Validator	
		V1	V2
1.	Content quality	70%	80%
2.	Language	80%	100%
3.	Science literacy	75%	100%
Average Percentage		75%	93.3%
Criteria		Worth it	Very Worthy
Average Percentage		**84.1%**	
Criteria		**Very Worthy**	

Based on the assessment by the two material experts on the e-LKPD product, the assessment results obtained by the two material expert validators were converted using the validity test table, where the percentage level of achievement of the P value obtained was 84.1%, which was included in the very feasible category.

Table 2. Media expert instrument validation results

No.	Assessment Aspect	Validator	
		V1	V2
1.	Size of LKPD	90%	100%
2.	Desain Cover	76%	84%
3.	Illustration of Contents	80%	80%
4.	Content Design of LKPD	96%	96%
Avarage Percentage		85.5%	90%
Criteria		Very Worthy	Very Worthy
Avarage Percentage		**87.75%**	
Criteria		**Very Worthy**	

Based on the assessment by the media expert validator, the assessment questionnaire obtained the assessment results which were converted using the validity test table, and the percentage level of achievement of the P value obtained was 87.75%, which was included in the very feasible category.

Teacher Response Analysis Results

The development product submitted to chemistry teachers at SMA Swasta Nurul Iman is a science literacy-based e-LKPD with the context of batik cloth coloring with a questionnaire assessment instrument.

Table 3. Teacher Response Analysis Results

No.	Assessment Aspect	Validator	
		G1	G2
1.	Quality of e-LKPD Content	90%	100%
2.	Product Display	93.3%	96.6%
3.	Language	100%	100%
4.	Science literacy	95%	100%
Avarage Percentage		94.5%	99.1%
Criteria		Very Worthy	Very Worthy
Avarage Percentage		**96.8%**	
Criteria		Very Worthy	

Based on the teacher's response by 2 chemistry teachers of SMA Swasta Nurul Iman Tanjung Morawa to the e-LKPD product, the assessment is converted to the validity test table, then the percentage level of achievement of the P value obtained is 96.8% in the very feasible category.

Learner Response Analysis Results

The development product submitted to students is a science literacy-based e-LKPD with the context of batik cloth coloring with a questionnaire assessment instrument.

Table 4. Results of Student Response Analysis

No.	Assessment Aspect	Average Student Assessment
1.	Quality of e-LKPD Content	89%
2.	Product Display	91%
3.	Language	89%
4.	Science literacy	84%
Avarage Percentage		**89%**
Criteria		**Very Worthy**

Based on the responses of 35 students from class MIA 1 SMA Swasta Nurul Iman Tanjung Morawa to the e-LKPD product, there are several aspects that are assessed, the assessment results are converted using the validity test table, and the

percentage level of achievement of the P value obtained is 89%, which is in the very feasible category. Thisshows that this e-LKPD.

The last stage in the e-LKPD product completion stage is the disseminate stage. The researcher disseminates the final product of science literacy-based e-LKPD with the context of batik cloth coloring on chemical bonding material to class X MIA 1 at SMA Swasta Nurul Iman Tanjung Morawa. The dissemination was carried out on a limited basis due to the limitations possessed by the researcher. The e-LKPD product can be seen through access that can be received online can be found on the website provided below: https://www.liveworksheets.com/c?a=s&t=hqZ6zHNvqR&sr=n&l=54

Based on the results of research conducted by (Yuzan & Jahro 2022) it can be concluded that the results of the needs analysis show that students need LKPD based on the guided inquiry learning model. The research results show that students need LKPD based on an inquiry learning model that is in accordance with chemistry learning principles. Furthermore, research by Adriani, et al. (2021) shows that 89% of students require the use of educational materials that discuss the concept of molecular interactions and their relationship to inkjet printers. Literacy-based e-LKPD has been declared valid, practical and effective for application in the learning process (A'yunin et al., 2023).

The final result of this research is a science literacy-based e-LKPD with the context of batik cloth coloring on chemical bonding material that is valid and very feasible to use in chemistry learning. The presentation of e-LKPD is made with an attractive design, with the presence of colored animated images and learning videos that help in understanding the material. In addition, e-LKPD is also equipped with interactive activities that involve students actively in the learning process, thus increasing student involvement and understanding of the material presented. Therefore, this e-LKPD is expected to be one of the effective and fun learning tools for students in learning chemical bonding material with the context of batik cloth coloring.

▪ CONCLUSION

Based on the discussion that has been described, the conclusion of this study is the results of expert validation of science literacy-based electronic student worksheets (e- LKPD) with the context of batik cloth coloring on chemical bonding material conductedby 2 lecturers of material experts and 2 lecturers of media experts who will be validators of the products produced through filling out an assessment questionnaire. Based on the assessment by the two material experts on the e-LKPD product, the result is 84.1%, which is included in the very feasible category. Furthermore, the results of the assessment by media expert validators, through an assessment questionnaire, obtained an assessment result of 87.75%, which is included in the very feasible category. The teacher's response to the e-LKPD showed a positive response to the e-LKPD product. Based on the teacher'sresponse by 2 chemistry teachers, a result of 96.8% was obtained in the very feasible category. Students' response to e-LKPD through a questionnaire assessment instrument given to 35 MIA 1 class students of SMA Swasta Nurul Iman Tanjung Morawa obtained a result of 89%, which is included in the very feasible category.

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