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Development Of Chemical Learning Materials Based Pbl On The Topic Of Electrolyte And Nonelectrolyte Solutions

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Abstract: *This study aims to develop chemical learning materials based Problem Based Learning (PBL) which has valid criteria on the topic of electrolyte and nonelectrolyte solutions. The type of research used is Research and Development (R & D) with 4D design model that is modified into 3D, consisting of Define, Design and Develop stage. The results showed that the validity of chemical learning materials based PBL obtained from the assessment by four validators had a validity level of 3.18 with valid criteria.*

Key Words: *Learning Material, PBL, electrolyte and nonelectrolyte solutions.*

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I. Introduction

In the world of education, the government especially the ministries of education and culture always strives to improve the quality of education. One of the efforts that has been done by the government is to develop the Curriculum 2013 to improve the Education Unit Level Curriculum (KTSP). The change of curriculum enacted in 2013 aims to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative, and affective and able to contribute to the life of society, nation, state and civilization world.

Based on the results of field observations in one public school and one private school in the district of East Lombok, there is a tendency of teaching and learning process in the classroom is teacher centered, and learning resources used have not touched the relationship between the material with the context of everyday life. The material presented in the teaching materials used only contains the definition of concepts, formulas, and practice questions. This resulted in the learning outcomes obtained are still far from the expected KKM, evident from the classical exhaustiveness value obtained by students class X on chemistry less than 50%. Thus it can be said that learners do not understand the concept of the material he studied.

Understanding the concept of chemistry involves the study of macroscopic, submicroscopic, and symbolic aspects. These three aspects should be an integral part of the study of chemistry (Sastradewi et al, 2015). According to Anderson and Krathwohl (2001) conceptual understanding occurs when the student is able to interpret, model, classify, summarize, compare, apply, explain the problem it faces based on the concept he has learned.

One effort to minimize the problem is the teacher is expected to create teaching materials that can be used effectively by students. Based on the regulation of the Minister of Education and Culture No. 22 of 2016 on the standard process of basic and secondary education, which regulates the planning of learning process which requires for educators in educational unit to develop RPP. One of the elements in RPP is learning resources. According to the Ministry of National Education (2008) that teachers are expected to develop teaching materials as one source of learning. The ability of teachers in designing teaching materials becomes a very important role in determining the success of learning and learning process through a teaching materials (Lestari, 2013).

Prastowo (2012) states that teaching materials are all materials (information, tools, and texts) systematically arranged to show the whole figure of the competence that will be mastered by learners and used in learning with the purpose of planning and reviewing the implementation of learning. Teaching materials can affect the quality of learning including the quality of learning outcomes (Musanni et al, 2015).

In order to increase the understanding of learners' concepts, teachers are required to make learning more innovative, which can encourage learners to learn optimally, either learning independently or in a classical manner. Therefore the learning resources used must be effective and selective in accordance with the basic competencies to be taught. Development of teaching materials is expected to help solve problems in learning.

Problem-based learning is a learning model that trains and develops the ability to solve problem-oriented problems authentically from the actual life of learners and to stimulate high-level thinking skills (Ngalimun, 2014). Handika and Wangid (2013) states that PBL is a learning model that emphasizes more on problem solving or problem as a starting point or basis in the learning process.

Fitriani et al. (2016) showed that understanding of learners' concepts could increase after learning by using PBL based LKPD with an N-gain value of 0.61. Sastradewi, et al (2015) said that there has been a significant increase in students' understanding of understanding by using learning tools based on Problem Based Learning (PBL).

Based on the description on the background that has been proposed, it is necessary to prepare chemical learning materials based PBL on the topic of electrolyte and nonelectrolyte solution.

II. Method

This type of research is research and development (Research and Development). The learning materials developed in this study are LKPD based PBL on the topic of electrolyte and nonelectrolyte solutions. Development of learning materials in this study refers to the 4D model is modified into 3D, which consists of define, design, and develop.

Data validity test results obtained from the validation sheet covering aspects of structure, content and language, which is analyzed using the following formula:

$$Mean : \frac{Total\ Score}{Number\ Of\ Validator}$$

To know the quality of learning materials (LKPD) result of the development of the original data in the form of numbers, converted into qualitative data with scale 4. The reference to change the score to scale 4 can be seen in table 1.

Table 1. Criteria for Feasibility of Learning Materials

Interval	Kategori
3.26-4.00	Very Valid
2.51-3.25	Valid
1.76-2.50	Less Valid
1.00-1.75	Invalid

Widoyoko (2012).

III. Results And Discussion

LKPD design based on PBL is designed to facilitate learners in understanding and studying chemistry subjects especially on electrolyte and nonelectrolyte solution materials. The format in the preparation of LKPD is adapted to the principles and characteristics of the PBL model.

LKPD based on PBL that has been produced in the previous stage, then validated by experts. Validation is used to determine the feasibility of LKPD prior to testing. Validation done by 4 validator, while recapitulation result of validation of expert team to result of development of chemistry based on PBL material can be seen in table 2:

Table 1. Results Validation of LKPD Based on PBL

Rated aspect	Mean	Category
1. LKPD structure	3.15	Valid
2. Content	3.38	Very Valid
3. Language	3.00	Valid
Mean	3.18	Valid

Based on the above table that the average score of eligibility assessment of Student Work Sheet (LKPD) of four validator of 3.18, the average value is in the category worthy.

Similar results by Maiyuni and Maharani (2016) show that the results of LKS-based model development of PBL from the aspect of content, language, presentation, and graffiti contents have very valid criteria. In line with that, Trinanda, et al (2018) states that LKS in terms of content, language, structure, and graffiti have very valid categories.

Expert validation results on LKPD from structural aspects are categorized as valid / valid. The values are given based on several indicators: a) first, the general appearance of LKPD is made interesting by using Microsoft word 2007, where the layout placement (title, text and image) of LKPD is consistent with the specific pattern, b) second, the suitability of the presentation of the image or displaying images that help learners understand about the material of electrolyte and nonelectrolyte solutions. Prastowo (2012) states that the presentation of images is necessary to support and clarify the contents of the material, as well as explain the urainnya, can increase attractiveness and reduce the boredom of learners to learn and the image is able to provide motivation, meaning images can be used to motivate learners to learn and keep learning. The same is also expressed by Hosnan (2014) which states that the requirements in selecting media are durable, shape and color attract the attention of learners, c) third, selection of fonts, size and spacing accordingly, thus facilitating learners in reading LKPD.

LKPD from the aspect of the content is declared very valid by the validator. This shows that LKPD developed has been able to serve as a guide in teaching and learning activities. The indicators assessed on the content aspect are a) the suitability of the activities with the KD and the learning indicators, b) the suitability of activities with the needs of learners, c) the usefulness of activities to increase knowledge, and d) the suitability of the activities with the model used (PBL model).

LKPD based on PBL viewed from the validated language aspect is validated by the validator. Validation results indicate that the language used in LKPD already contains language that is easily understood by learners both in the delivery of information and instructions to be taken by learners.

IV. Conclusion

Based on the results of the analysis and discussion can be concluded that the chemical learning materials based valid or feasible to be used in the learning process on the topic of electrolyte and nonelektrolit solution.

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