

Validity and Practicality of Mole Concept LKPD Based on Structured Inquiry on Liveworksheet for Phase E of Senior High School

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Abstract— Liveworksheet is a website that is integrated with technology so that it can turn student worksheet (LKPD) into an interactive which affects students' learning motivation. This research aimed to specify the validity and practicality of mole concept LKPD based on structured inquiry on liveworksheet for phase E of Senior High School (SMA). This research was a Educational Design Reasearch (EDR) using the Plomp model. The research instruments were validity and practicality questionnaires. The mole concept LKPD based on structured inquiry on liveworksheet was validated by five validators. Practicality test subjects were 15 students and two teachers of SMAN 2 in Padang. Aiken's V formula was used to determine the validity of the LKPD. The practicality of the LKPD was based on teacher and student responses to questionnaires and analyzed using percent practicality. The validity results showed an average Aiken's V of 0.90 with a valid category. The results of the data analysis of teacher and student practicality were 91% and 83%, respectively, with a very practical category.

Keywords—LKPD; Mole Concept; Structured Inquiry; Liveworksheet.

I. INTRODUCTION

The mole concept is center of all calculations in chemistry^[1]. The mole concept is a basic of chemistry that is abstract, and many calculations. The mole concept is very important to understanding other materials in chemistry^[2]. Problem solving related to calculations is the most difficult part for students^[1]. Therefore, a suitable learning model is needed to overcome these problems.

A suitable learning model that used in accordance with the characteristics of the mole concept material is structured inquiry. Structured inquiry has four stages: observation, hypothesis, data collection and organization, and conclusion^[3]. In this model, students investigate questions through procedures that have been provided by the teacher and receive explicit instructions in each procedure, which leads to the result that has been specified^[3].

The application of structured inquiry learning model can improve students' basic science process skills^[4]. The structured inquiry learning model is potential and effective in improving students' science process skills and cognitive learning outcomes in biology subjects^[5].

In addition to the use of the right learning model, the teaching materials used also affect students' concept understanding. LKPD are teaching materials designed to help students participate more actively in problem-solving activities. LKPD can be used by students to learn independently^[6].

The preparation of the mole concept LKPD is guided by the independent curriculum. The Independent Curriculum has a policy that requires teachers to be able to develop learning that motivates students. Teachers must have new skills and innovations in compiling teaching materials and utilizing technology as a learning resource^[7].

The LKPD used at this time is still in print form. Printed LKPD are considered ineffective as teaching materials both in terms of content display and practicality^[8]. Printed LKPD can be integrated with technology and switch functions to interactive LKPD. This is related to the learning demands of the independent curriculum.

Liveworksheet is a web that is integrated with technology so that it can turn LKPD into interactive. LKPD on liveworksheet utilizes new technology that is implemented in the world of education because it contains text, images, sounds, animations and videos that are more effective so that students do not feel bored^[9]. LKPD liveworksheet affects student learning outcomes and processes so that it can be used in learning^[10].

The mole concept LKPD has previously been developed. However, the LKPD still refers to the '2013 curriculum'. The existing LKPD is still in printed form and has not utilized technology that can motivate students.

The results of teacher interviews at two High School in Padang (SMAN 2 and SMA Pembangunan UNP) stated that there were misconceptions in the material of the mole concept, namely students were not able to distinguish atoms and molecules, distinguish index and reaction coefficients. Therefore, teaching materials that contain three levels of chemical representation are needed, which can improve students' ability to understand concepts^[11]. In addition, teachers want inquiry learning that is integrated with technology so that students can explore learning.

The results of student questionnaires at two High School in Padang (SMAN 2 and SMA Pembangunan UNP), were obtained the results of 60% of students stating that the concept of mole is difficult material. It's because of characteristics of the material are abstract and mathematical, and the teaching materials used are less interesting. Teaching materials expected by students are teaching materials that utilize technology / internet, accompanied by images and use language that is easy to understand and has a brief and clear presentation of the material.

This research aims to determine the validity and practicality of mole concept LKPD based on structured inquiry on liveworksheet to be used in learning chemistry for phase E of high school.

II. METHOD

The type of research used is *Educational Design Research (EDR)* using the *Plomp model*. This research was conducted to produce a mole concept LKPD based on structured inquiry on liveworksheet. This research was conducted in December 2023 to January 2024 in high school in Padang. The development model used is Plomp's development model with three development steps including: preliminary research, prototyping phase, and assessment phase. This research is limited to the prototyping phase, namely the practicality test in small groups.

The research instruments were validity and practicality questionnaires. Mole concept LKPD based on structured inquiry on liveworksheet was validated by five validators. Practicality test subjects were 15 students and two teachers of SMAN 2 in Padang.

Validity data is analyzed using Aiken's V. Aiken's V formula is as follows^[12].

$$V = \frac{\sum s}{n(c-1)}$$

$$s = r - lo$$

Description:

V = transaction index validator

lo = the lowest score in the category (in this case=1)

c = the highest score in the category (in this case = 5)

r = validator's selection score

n = many validators

The validity assessment category using Aiken's V can be see in Table 1.

TABLE 1. CRITERIA OF AIKEN'S V SCALE VALIDITY ASSESMENT

Aiken's V Scale	Validity
$V \geq 0,8$	Valid
$V < 0,8$	Invalid

Practicality data analysis techniques use the following formula^[13].

$$\% \text{ practicality} = \frac{\text{total value}}{\text{maximum value}} \times 100\%$$

Practicality assessment categories can be seen in Table 2.

TABLE 2. CRITERIA OF PRACTICALITY ASSESMENT

Interval	Category
80% - 100%	Very Practical
60% - 70%	Practical
40% - 59%	Moderately Practical
20% - 39%	Less Practical
$x \leq 19\%$	Not Practical

III. RESULT AND DISCUSSION

This research was carried out to determine the validity and practicality of the product developed, namely mole concepts LKPD based on inquiry structured on liveworksheet for phase E of high school. LKPD was developed using the Plomp development model which has three stages namely the initial investigation stage (preliminary research), the prototyping phase, and the evaluation phase (assessment phase) so that a valid and practical LKDP is produced^[12].

3.1. Preliminary Research

The preliminary research was carried out through four stages, including:

3.1.1. Need Analysis

The needs analysis aims to find out the problems experienced by teachers and students during the chemistry learning process. At this stage, interviews were conducted with teachers and questionnaires were distributed to students of two high school in Padang (SMAN 2 and SMA Pembangunan Laboratorium UNP). The results of interviews and distributing questionnaires obtained problems experienced by teachers and students, including:

1. The concept of mole is a difficult material because it is abstract and mathematical.
2. The learning model used by the teacher is not appropriate.
3. Teacher innovation is still lacking in learning.
4. The teaching materials used have not been integrated with technology so that they have not been able to motivate students.

Student learning motivation can be increased by creating interesting, innovative and fun learning^[13]. Liveworksheet has features that can be used to display learning materials in various forms such as audio, video, animation, or other interesting symbols^[14]. LKPD on liveworksheet allows teachers to use various types of questions, such as matching, drag and drop, drop and down, short form, and description, so that students don't feel bored^[13].

3.1.2. Context Analysis

Context analysis aims to identify, detail, and systematically organize curriculum-based material. This phase begins with curricular analysis, in the form of learning access, learning objectives and learning objective trajectory as well as concept analysis.

3.1.3. Literary Studies

Literature studies are carried out to explore the basic knowledge research. Result of literature studies relate to research, the following:

1. The concepts of moles have abstract characteristics of matter and many calculations^[2].
2. Liveworksheet can convert printed LKPD to interactive LKPD. Using liveworksheet LKPD can improve student learning outcomes and motivation^[15].

3.1.4. Development of the Conceptual Framework

The conceptual framework refers to all the opinions underlying product development, namely:

1. The problems experienced by teachers and students, among them the difficulty of students in understanding the material of the mol concepts, the learning model used by the teacher is not appropriate, the innovation of teachers is still lacking in learning, and the lack of integrated technology LKPD resulting in a lack of motivation of the students.
2. The proposed solution to solve the problem is the development of a molar conceptual material based on a structured inquiry on a liveworksheet.
3. The stages used to develop such products are the stages of the Plomp development model carried out to validity and practicality testing.

3.2. Tahap Pembentukan Prototipe

3.2.1. Prototype I

The result of the prototype I is a material mole concepts LKPD based on inquiry structured on liveworksheet for phase E of high school. The formative evaluation carried out is self-assessment using checklists. The evaluation results show that the components that are present on the LKPD include: cover, instructions for use, curriculum analysis, introduction, concept map, activity sheet, worksheet, evaluation, library list and key answers.

3.2.2. Prototype II

At this stage, formative evaluation is carried out in the form of expert review and one-to-one evaluation. The tests were carried out by three chemistry lecturers of Universitas Negeri Padang (UNP) and two chemistry teachers high school, SMAN 2 in Padang. Validity tests were conducted using validity instruments that assessed aspect of the content components, presentation components, language components and graphics components.

The results of the validity assessment of mole concepts LKPD based on structured inquiry based liveworksheet on each aspect can be seen in Figure 1.

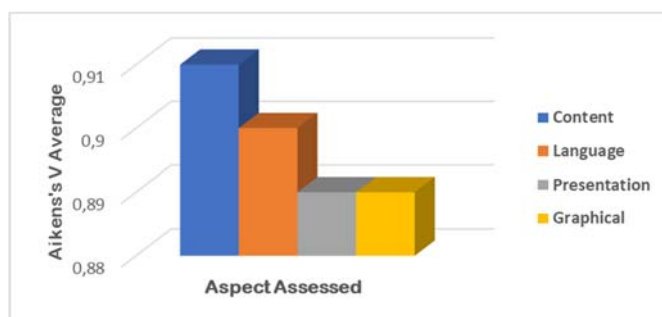


Fig. 1. Validity Test Result

Overall, the validity of the mole concepts LKPD based on structured inquiry on the liveworksheet have an Aiken's V average of 0.90 with a valid category. As for the details of each aspect as follows

1. The contents components have an Aiken's V value of 0.91 with a valid category. This data shows that the LKPD developed is already in line with learning access, learning goals, and learning objectives.
2. Language components have Aiken's V value of 0.90 with a valid category. This data shows the development of LKPD in accordance with PUEBI.
3. The presentation components have Aiken's V value of 0.89 with a valid category. This data shows the systematic compatibility of the preparation of the LKPD with the stages of the structured inquiry learning model.
4. LKPD used the type and size of fonts, layouts, illustrations, images, designs and colors that correspond to the value of Aiken's V of 0.89 with a valid category.

One-to-one evaluation was done by filling in a sheet of interviews by nine students. Students argue that the LKPD developed has an interesting design and color and already represents the contents of the mole concepts LKPD. The LKPD can motivate students and help students understand the material of mole concept.

The suggestions of the validator and the one-to-one evaluation from the basis for the revision. The revision resulted in a prototype III of mole concept LKPD based inquiry structured on a valid liveworksheet. One of the revisions can be seen in Fig. 2.

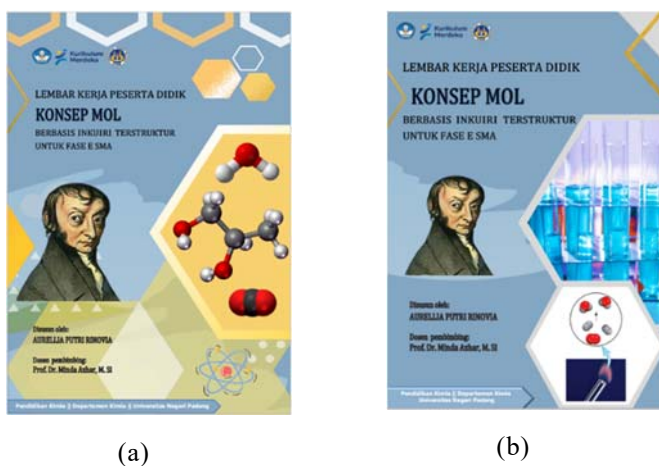


Fig. 2. Cover : (a) Before Revision and (b) After Revision

3.2.3. Prototype III

A valid LKPD tested its practicality in small groups. The instruments used in practicality is a questionnaire to two chemistry teachers and 15 students of SMAN 2 in Padang.

The practicality result acquired from filling out the teacher's practicality questionnaire had an average percentage of 91% with a very practical category and an average student's 83% with a very practical category. The practical results of teachers and students can be seen in Figure 3 and Figure 4.

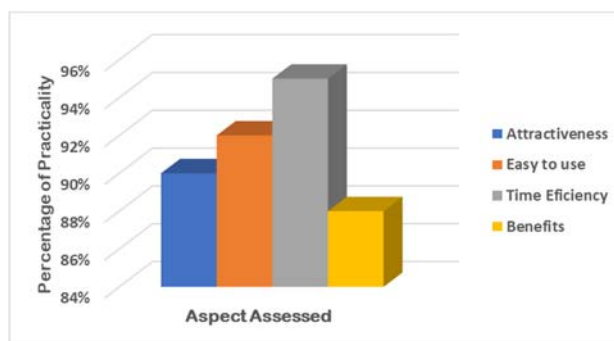


Fig. 3. Practicality Result of Teachers

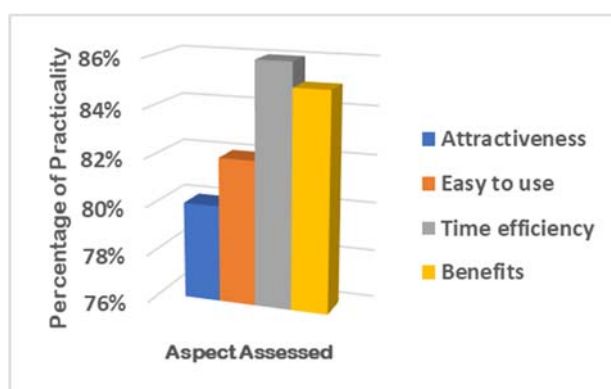


Fig. 4. Practicality Result of Students

The aspects assessed on practicality are attractiveness, easy to use, time efficiency and benefits. Formative evaluation at this stage produces practis media that used in small groups.

3.2.4. Prototype IV

The advice and assessment given to the prototype III was used for further product revision and the production of the Prototype IV. The revision aims to enhance the quality of the Prototype III produced a valid and practical prototypes IV

IV. CONCLUSION

The research produced a mole concepts LKPD based on structured inquiry on liveworksheet for phase E of high school. The validity results showed that the LKPD was valid with Aiken's V value of 0.90. The practicality results of small group showed that the LKPD was very practical with a percentage of teacher and student questionnaires of 91% and 85%, respectively.

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