

# *Validity of Problem Based Learning Oriented Learning Tools For Senior High School*

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**Abstract** - Based on the data collected through observations, interviews with teachers and some students, and learning tools used in schools it is known that there are problems in learning. One of the problem is the unavailability of learning tools such as lesson plans and students' worksheet that are in accordance with the 2013 curriculum. Therefore, it is necessary to develop problem based learning oriented learning tools in accordance with the 2013 curriculum in order to be able to facilitate students to develop their thinking skills through problem solving activities and improve students' learning competencies. The purpose of this study was to develop a learning tool oriented problem based learning for valid. This type of research is development research using the Plomp model. The development stage of the Plomp model consists of 3 stages, namely 1) the preliminary research phase, 2) the development or prototyping stage, and 3) the assessment phase. The results showed that the learning tool that based on problem based learning for senior high school was valid.

**Keywords** – Validity; Development Research; Learning Tools, Problem Based Learning, Plomp.

## **I. INTRODUCTION**

The curriculum is an important component in the education system (Rusman, 2011:1). According to Law Number 20 of 2003 Article 1 Paragraph 19, the curriculum is a set of plans and arrangements regarding the objectives, contents, and learning materials as well as the methods used as guidelines for the implementation of learning activities to achieve certain educational goals. The aim of national education in the Law of the Republic of Indonesia Number 20 of 2003, chapter II Article 3 is to form a dignified national civilization in order to educate the life of the nation, aiming to develop the potential of students to become faithful and devoted to God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become a democratic and responsible citizen.

Education can take place in the family, school and community. Education carried out in the school environment aims to bring students towards behavioral change both intellectually, morally and socially so that students can live independently as individuals and social beings. The process of education in schools is the most important activity to achieve the educational goals that have been formulated. One of the government's efforts to achieve educational goals is through changes and curriculum development. Changes and curriculum development need to be done because the curriculum has a dynamic nature to be able to answer the development and challenges of the times (Mulyasa, 2013). The development of the 2013 curriculum that currently applies in Indonesia is a further step in the development of the KBK initiated in 2004 and the 2006 KTSP (Kemendikbud, 2013: 66).

The results of preliminary studies that researchers conducted through interviews with students, biology teachers and direct observation of biology learning in class XI Science on January 10, 2017 at SMA Negeri 3 Pariaman, obtained information from the results of interviews with students that in the process of biology learning, the teacher explained material by using a blackboard, charta, and students' worksheets made by the teacher. Learning resources that used by students is KTSP printed books from publishers. Regarding printed books used in learning, students say that the books are less attractive in terms of their appearance and language are difficult to understand. In terms of interest, students are known to like biology because they discuss living things and problems that occur in the environment, even though students have difficulty memorizing scientific language and names on biological material.

Mrs. Fera Elza Asmi, S.Si., one of the biology teachers at SMAN 3 Pariaman, said that although students generally enjoyed biology, only a few of the students dared to express their opinions. This is because most students feel embarrassed if their statements or questions are wrong. In addition, the teacher has developed teaching materials such as simple students' worksheet contain discussion sheets related to the concept of the subject and have not fulfilled all the components of students' worksheet. From the worksheet analysis, it is known that the questions contained in worksheet have not facilitated students to develop their thinking skills through problem solving activities, this has an impact on the activities of students in the classroom, when given questions that require analysis and reasoning only one or two students who are able to answer, the others are just silent and look hesitant. This illustrates that the activity of students in the classroom is still low and students' high-level think needs to be improved.

In terms of learning plan, teachers have designed it, but there are still some shortcomings, such as the scientific approach to learning steps as expected by the 2013 curriculum, the absence of KI in learning plan and KD that is in line with the 2013 curriculum requirements, and the learning plan does not include regular, remedial, and enrichment subject designs, as well as incomplete assessments made by the teacher. Assessment is still focused on the cognitive domain, even though in the learning plan the teacher includes affective domain assessment, but from the interview it is known that the teacher does not have a written and appropriate affective assessment format, but only by marking on the student attendance book for students who are active in certain

activities in the class, so that for affective competence, some aspects of attitude cannot be grown optimally. From the interview with the biology teacher it was known that when carrying out examinations or posttest, there were students who cheated, and in the collection of tasks there were many students who were less disciplined and responsible, then the aspects of working together in groups were still lacking because they tended to be only one or two students who are active and do assignments in the group.

From the interview it was also known that the teacher did not carry out the assessment for psychomotor except on the material that could be practiced. The teachers felt confused to assess the psychomotor in the learning process. The learning applied by the teacher in the classroom will affect the average score of the students' daily tests, most of the participants are still below the minimum completeness (75) which is determined by the teacher.

The same problem was found when observing at Uswatun Hasanah High School. From the interviews with one of the biology teachers, Ms. Domi Yarti, S.Pd., on December 2, 2016, it was known that she use simple students' worksheet in learning process, in the form of theoretical questions that had not led to problem solving activities. She explained that students' worksheet is very useful in learning, because it make students more enthusiastic in learning than to hear the explained from the teacher without using worksheet. Furthermore, the biology teacher stated that she was slightly constrained in designing students' worksheet that was interesting for students. In terms of the learning plan, it is known that the learning plan that are made by the teachers already referred to the curriculum in 2013, but have not use the learning model that recommended in the 2013 curriculum. For teaching materials teachers and learners are already using printed books from publishers that are in accordance with 2013 curriculum.

Based on the observations, it is known that there has not been fully seen the suitability of the learning tools that the teacher has made with the demands of the curriculum and students' need. Learning tools that used have not used the right learning model in accordance with the subject matter, have not been able to develop high-level thinking skills of students. The alternative that can be used to overcome the problems mentioned above is to design learning tools oriented to problem based learning. The learning tools that developed are learning plan and student's worksheet.

PBL empowers students to be independent individuals and able to deal with every problem. Using PBL in learning provides opportunities for students to develop reasoning

skills and design their own learning. The empirical study from PBL has shown that students who have learned using PBL are more able to apply their knowledge to solve problems and more effectively develop their own learning strategies than students who learn with conventional curricula (Hmelo-Silver & Barrows, 2006).

The use of PBL-oriented learning tools will be more effectively used in learning because PBL is able to direct students to authentic problems so that students can develop their own knowledge, foster higher skills, and increase students' self-confidence. The ability to solve problems will encourage students' enthusiasm and desire to learn (Amisyah, 2013:91). The problems that are designed in the PBL are perceived to be able to provide challenges for students to develop critical thinking skills and solve problems effectively so that these abilities can be used by students when facing real problems in society.

Based on the description above, the author has conducted research on the development of PBL-oriented learning tools for high school.

## II. RESEARCH METHOD

This research was a development research that adopts a development model from Plomp (2013). Plomp's development model design has three stages or phases, namely (1) the initial investigation stage (*preliminary research*), (2) the stage of development or prototype (*development or prototyping stage*), (3) *assessment stage*. The validation phase is carried out at the development or prototype (*development or prototyping phase*). The validation phase uses the Plomp model as follows.

### 2.1 Prototype The prototype

Design is focused on the process of formulating / preparing the learning tools design, in the form of learning plan design and PBL-oriented students' worksheet. After that, the learning tools design is realized into a product so that the prototype 1. Prototype I is then evaluated by using a check list to check for errors in writing and product design. Prototype I was revised to produce prototype II.

### 2.2 Design of Prototype II

Prototype II is the development stage in consultation with experts (expert review). PBL-oriented learning devices are valid based on several aspects, namely, content aspects, linguistic aspects, presentation aspects, and graphic aspects. Based on the results of the validation and subsequent revisions the development of learning tools was carried out.

## III. RESULTS AND DISCUSSION

Results obtained at the preliminary research are used as guidelines in developing PBL-oriented learning tools. The results of the development carried out at this stage are as follows.

### 3.1. Prototype I

Development starts with the design and manufacture of PBL-oriented learning plan and students' worksheet. The learning plan is designed with attention to its constituent components based on Permendikbud number 22 of 2016 concerning Process Standards for Primary and Secondary Education, Permendikbud Number 103 of 2014 concerning Learning in Basic Education and Secondary Education, and refers to the 2013 Implementation Training Module issued by the Ministry of Education and Culture in 2014. Learning plans use A4 size paper. Learning plan is designed using *Microsoft Office Word* 2010, the type of font is Time New Roman writing size 12 and spaces 1 and 1.5. The learning plan that has been developed has the following format; (1) *Cover*, (2) *Identity*, (3) *Core Competencies*, (4) *Basic Competencies*, (5) *Indicators*, (6) *Learning Objectives*, (7) *Materials*, (8) *Learning Strategies*, (9) *Media, Tools and Learning Resources*, (10) *Learning Activities*, (11) *Assessment*.

PBL-oriented students' worksheet is created using *Microsoft Power Point* 2010. The worksheet is adjusted to the steps of the PBL model. In phase 1 (orienting students on the problem), the researcher presents a problem in accordance with the sub topics studied. In phase 2 (organizing students to learn), students are asked to form groups, wherein the students are expected to work on the worksheet and carry out learning activities in their respective groups. In phase 3 (guiding individual and group investigations), the teacher guides students in groups to answer the questions in the worksheet and problem solving activities. In phase 4 (developing and presenting the work), students are asked to present their work in front of a class guided by the teacher. Phase 5 (analyze and evaluate the problem solving process), students are asked to pay attention to the teacher's explanation related to problem solving activities and then students are asked to analyze and evaluate the problem solving process.

The characteristics of students' worksheet are arranged based on several aspects, such as content and graphics, aspects of presentation, and aspects of language. The components of student's worksheet that are designed are (1) *Cover*, (2) *Foreword*, (3) *Preliminary Sheet Introduction to*

the worksheet, (4) Learning Instructions, (5) Competencies to be achieved, (6) Supporting Information, (7) Task and Work Steps, (8) Assessment.

The design of PBL-oriented biology learning devices produce prototypes I. Furthermore, the self-evaluation to prototype I. In this activity carried out a review of the learning device that has been created. Self-evaluation activities use sheets in the form of check lists. This self-evaluation activity focuses on the completeness aspects of the PBL-oriented learning tools in the form of developed learning plan and students' worksheet. The results of self-evaluation are analyzed and if there are deficiencies, then a revision is made. The results of the self evaluation show that the components of the learning tool developed in terms of the aspects of feasibility of content, presentation, language, and graphics are complete.

### 3.2. Prototype II

This phase was conducted to see the validity of PBL oriented learning tools that was developed based on the assessment of experts on aspects of the learning plan component and feasibility aspects of the content, language, presentation, and the graphics on LKPD.

The validation of PBL oriented learning tools is validated by experts and education practitioners in accordance with the field of study consisting of 5 validators. The validator consists of 3 lecturers in Universitas Negeri Padang and 2 biology teachers in high school. To assessing learning devices, validators were also asked to provide suggestions for improvements to the learning device. The suggestions given by the validator are then used as a basis for consideration to revise PBL-oriented biology learning tools.

The results of the validation of PBL-oriented learning tools developed can be seen in Table 1.

Table 1. Validation Results of PBL-Oriented Learning Tools

| No | Devices / Aspects of assessment | Average Validity Values (%) | Criteria          |
|----|---------------------------------|-----------------------------|-------------------|
| 1  | <b>RPP</b>                      | <b>89.10</b>                | <b>Very valid</b> |
|    | Identity Subject                | 95.00                       | Very valid        |

|   |                                    |              |                   |
|---|------------------------------------|--------------|-------------------|
|   | KI and KD                          | 100          | Very valid        |
|   | Formulation of Learning Indicators | 76.25        | Valid             |
|   | Formulation of Learning Objectives | 83.75        | Very valid        |
|   | Learning Material Selection        | 93.75        | Very valid        |
|   | Selection of Learning Strategies   | 100          | Very valid        |
|   | Selection of Learning Sources      | 83.33        | Very valid        |
|   | Selection of Learning Media        | 87.50        | Very valid        |
|   | Steps of Learning Activities       | 76.43        | Valid             |
|   | Rating                             | 95.00        | Very valid        |
| 2 | <b>LKPD</b>                        | <b>90.72</b> | <b>Very valid</b> |
|   | Feasibility Content                | 94.17        | Very valid        |
|   | Linguistic Components              | 88.57        | Very valid        |
|   | Components Presentation            | 92.14        | Very valid        |
|   | Components of Integrity            | 88.00        | Very valid        |

The results of the validity of PBL-oriented biology learning tools as shown in Table 1 shows that the value of RPP validity, the average value of LKPD validity has very valid criteria. This means that PBL-oriented biology learning tools that have been developed have been valid both from the aspects of learning plan components and from aspects of content, linguistic, presentation, and graphic aspects of students' worksheet so that they can be used in learning.

Each learning plan component which is used as an assessment aspect in validity testing also gets a score with very valid criteria. Arikunto (2013: 80) states that "valid conditions are considered fulfilled because the instrument in question is well designed, follows the existing theories and provisions". This shows that PBL-oriented learning plan has been developed in accordance with Permendikbud No. 81 of 2013 concerning the implementation of the curriculum. Core Competencies (KI) and basic competencies (KD) subject selected in accordance with the 2013 curriculum. Likewise with indicators of cognitive achievement, indicators of affective achievement, and indicators of psychomotor achievement that have been elaborated according to the established KD. Learning objectives include aspects of *Audience, Behavior, Condition, and Degree*. In addition, learning objectives are also in accordance with indicators of achievement of competencies.

Subjects in learning plan have been systematically compiled and contain material problems that can stimulate students to think further. Learning subject can be disseminated between regular, enrichment and remedial subject. The strategy used includes a scientific approach in accordance with the guidance of the 2013 curriculum. Related to the scientific approach, Sudrajad (2013) states that "many experts believe that through a scientific approach, in addition to making students more active in constructing their knowledge and skills, it can also encourage learners to conduct an investigation to find facts from a phenomenon or event. "The learning method used is a method of discussion, lecture, and question and answer, and using PBL models that are expected to increase the activities of students to think critically, solve problems, learning independently, and demanding skills to participate in teams (Riyanto, 2010: 285).

Learning steps consisting of preliminary activities, core activities, and closing. In the core activities, the syntax of PBL explained clearly including the characteristics of the scientific approach. By applying PBL, students can build their own knowledge through the problems given. This process is bridged by a scientific approach that refers to investigative techniques on phenomena or symptoms, acquiring new knowledge, or correcting and integrating prior knowledge (Rosana, 2014: 3). In terms of assessment, the learning plan includes a complete assessment including three competencies of students and the instruments.

From the content service aspect, PBL-oriented students' worksheet has a validity value of 94.17% with very valid criteria. This shows that PBL-oriented students' worksheet

developed in accordance with the 2013 curriculum includes conformity with KI, KD, indicators, and learning objectives. The truth of the substance of the subject presented in the worksheet can be accounted for. This needs to be considered to avoid misconceptions and understanding for the users so that students can meet the learning objectives of the subject on target.

In terms of language, PBL-oriented students' worksheet has a validity value of 88.57% with very valid criteria. This shows that the language used in the presentation of biological subject and the presentation of questions / exercises on PBL-oriented students' worksheet that have been developed already use good and true Indonesian language. In addition, the composition of the sentence both the presentation of the subject and the questions / exercises in the PBL-oriented students' worksheet also does not have double meaning and is consistent in using the term. The use of clear and easily understood language will help students to understand the concepts of the body's defense system subject. This is in line with Islamiyah (2011: 1) which states that "language has a central role in the intellectual, social and emotional development of students and is a supporting success in learning all fields of study."

In terms of presentation, PBL-oriented students' worksheet has a validity value of 92, 14% with very valid criteria. This shows that the presentation of subjects in PBL-oriented students' worksheet has been systematic and contains problems related to the material. Likewise, the presentation of questions / exercises on the worksheet which contains problems of the body's defense system and must be solved by students to help their own knowledge and reach the level of learning. This is in accordance with Trianto (2009: 111) which states that "students' worksheet contains a set of basic activities that must be carried out by students to maximize understanding in the effort to establish basic abilities according to indicators of achievement of learning outcomes that must be taken." This can motivate students to learn because the problems presented close to everyday life so that students are active in learning. In addition, students' worksheet also contains steps for learning activities that are in accordance with the PBL syntax. With the syntax / steps of learning, the whole process in learning will be directed according to the planning that has been designed so that the learning objectives will be well achieved.

In terms of graphics, PBL-oriented students' worksheet has a validity value of 88.00% with very valid criteria. This shows that the type and size of the letters used in the worksheet has been proportional, the picture is clearly



presented with an interesting layout between learning material and relevant images. The selection of relevant images is important because images make it easier for students to understand the material and play a role in *recalling* information. In a study found that children who read a story with pictures, can provide the best performance when *recall* of more detailed information and can be concluded that the image can enhance children's understanding (Jalilehvand, 2012: 331).

The use of colors in the worksheet is interesting so that the overall design of the worksheet display can attract students' interest to learn. With respect to color, Dzulkifli and Mustafar (2013:3) state that "color serves as a powerful information channel in the cognitive system of humans and has an important role in improving memory work." Similar to images, color also helps students remember and *recall* information. This is the basis for selecting the right color in the design of students' worksheet related to efforts to help students in understanding the material of the reproductive system and the body defense system.

After testing the validity of the PBL-oriented biological learning tools consisting of learning plan and students' worksheet it is said to be valid by the validator. Biological learning tools that are said to be valid means that biological learning devices are developed to carry out the function of its size or provide measurement results that are in accordance with the purpose of the measurement (Putra, 2013: 166-167). In connection with the validity of the biology learning device developed, Arikunto (2009: 58) states that "if a data is produced from a valid product, then it can be said that the product developed has provided an overview of the development objectives correctly and in accordance with the actual situation". However, there are suggestions for improvement in the biology learning tools developed. These suggestions become the revised material for PBL-oriented biology learning tools. After revision and valid criteria, the research continued in the next stage, namely practicality test.

#### IV. CONCLUSION

From the results of the study it can be concluded that the PBL-oriented learning for senior high schools is said to be very valid by experts (lecturers and teachers) as evidenced by the results of validity analysis obtained learning plan validity value with average of 89.10% and the validity of students' worksheet is 90.72% , both devices are included in very valid criteria that are determined based on aspects of content, linguistic, presentation and graphic aspects of feasibility.

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