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Development of Student Worksheets (LKPD) Based on Discovery Learning to Improve Students' Critical Thinking Ability on Movement System and Digestive System Materials in Class XI SMA/MA

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ABSTRACT: The type of research conducted by the researcher is research development (*research development*). The product developed is LKPD based on *Discovery Learning* (DL). The aim is to improve the critical thinking skills of class XI students of SMAN 1 XI Koto Sungai Lasi The LKPD trial was carried out to obtain data that would be used in revising the product. The development model used in this research is the P lomp model. This model consists of three stages, namely the initial investigation stage (*prelimenary research*), the development or prototyping phase (*development or prototyping phase*) and the assessment phase (*assessment phase*). Evaluation of the prototype is carried out by means of *formative evaluation* as described in. The trials carried out consisted of a one- *to-one evaluation* , *small group evaluation* and large *field test.* The next step is to revise the product based on the results of a one-on-one evaluation. Then the revised DL-based LKPD product was re-tested in a *small group.* The results of the revision were tested again on a large group (*field test*) of students in one class. The trial aims to identify product deficiencies if used in actual conditions, see the effectiveness and practicality of the product. Research results The validation results by the validators show that *discovery learning -based worksheets* on the movement and digestive system material show a very valid category with a value of 84.05%. The results of the practicality test obtained from teachers and students showed that *discovery learning -based worksheets* on the movement and digestive system material showed a very practical category with a value of 95.00 % from teachers and 90.34 % from students. The results of the effectiveness test of *discovery learning -based worksheets* on the motion and digestive system material show that it is effective in improving students' critical thinking skills.

KEYWORDS- development, discovery learning, critical thinking

I. INTRODUCTION

Learning is a process carried out by a person to obtain a new behavior change as a whole, as a result of his own experience in interaction with his environment (Slameto, 2010). Rusman (2012) said learning is a process carried out by individuals to obtain changes in personality, while the learning process is a process that contains a series of actions of teachers and students on the basis of reciprocal relationships that take place in educational situations to achieve certain goals . a teacher activity programmed in instructional design to make students learn actively which emphasizes providing Learning Resources. Supriadie and Darmawan (2013) said it should be in learning activities there is a communication process to convey messages from educators with the aim of so that messages can be well received and affect understanding and behavior change, thus learning success activities are very important depends on the effectiveness of the communication process that occurs in learning that .

Biology is a branch of natural science that studies the symptoms, phenomena of living things, both animals, plants and humans. Biology in school learning is an interesting lesson because the learning process is not only carried out in the classroom but also outside the classroom (Ridhayani and Manurung, 2010). Lufri (2007) said that learning biology demands scientific and conceptual learning. The curriculum is a set of plans and arrangements regarding the objectives, content and learning materials as well as the

methods used as guidelines for the implementation of learning activities to achieve the objectives of certain learning activities (Susilo and M. Joko, 2007).

The implementation of the 2013 Curriculum in the education system in Indonesia led to the implementation of several things in the world of education, including the application of a scientific approach or a scientific approach. Based on the results of an interview with a biology teacher at SMAN 1 XI Koto Sungai Lasi, Mr. Afrinaldi S.Pd, on August 16, 2021, it was known that at the time of learning there were still many students who had not followed the lesson well. During the biology learning process, the teacher still applies conventional learning that does not refer to the students' critical thinking skills. Teachers also have not used attractive worksheets that can help train students' critical thinking skills so that there are still many students who have not been able to process their reasoning, questioning, and analysis skills.

During the learning process, the teacher only uses questions in printed books and questions that are made directly by the teacher. The LKPD has not been compiled using the learning model in the 2013 Curriculum that directs students to practice critical thinking skills towards a developing phenomenon. The teacher provides theoretical learning without being faced with problems that develop in the everyday environment. In addition, in teacher learning still leads to teacher centeredness which makes students only receive information from a teacher, which causes students' critical thinking skills are not yet trained and are still very low. The LKPD questions made by the teacher only contain questions related to ongoing learning with a few pictures related to the material so that students are less interested in participating in the learning. The LKPD made by the teacher has not been attractive and has not helped students to train critical thinking. Lack of teaching materials in learning can make students' critical thinking skills low.

Low critical thinking skills can have an unfavorable impact on further education. This is in line with Anwar's statement (2020) which states that critical thinking skills must be possessed by all students at every level of education, therefore critical thinking skills need to be trained. Then it is also supported by the opinion of Yuliati (2013) which states that critical thinking can be taught and requires practice to be able to have it. One way to train students' critical thinking skills is through questions based on critical thinking skills.

Based on these problems, there are several shortcomings that exist in the LKPD used, namely the existing LKPD has not been compiled according to the model recommended in the 2013 Curriculum, the LKPD which is compiled directly leads students to carry out activities or investigations without presenting a problem to students to think critically, LKPD which is compiled does not train students to think critically when conducting discussions and the compiled LKPD does not yet present interesting pictures or colors related to discussions on subject matter that can attract the attention of students.

Discovery learning is an active learning model in which students build their own knowledge by conducting an experiment and discovering a principle from the experiment. This discovery learning model is considered suitable for overcoming the problems that exist in students because it can train students' critical thinking skills to solve a problem related to ongoing material and relate it in everyday life. Based on the results of observations on 22 students, 63% of students assessed the motion system material including material that was difficult to understand and 77% of students rated the digestive system material as difficult to understand. The LKPD that will be developed consists of 2 KD, namely KD 3.5 on the movement system and KD 3.7 on the digestive system.

Based on the problems that have been stated above, it encourages researchers to conduct research on student worksheets using discovery learning -based learning models to improve students' thinking skills which are made for motion system material and digestive system material. Based on this, a research will be conducted on “Development of Student Worksheets (LKPD) Based on Discovery Learning to Improve Students' Critical Thinking Ability on Movement System and Digestive System Materials in Class XI SMA/MA ''.

II. RESEARCH METHODS

This DL-based LKPD development research uses the Plomp model which consists of three stages, namely the preliminary research phase, the development or prototyping phase , and the assessment phase . The results of the research conducted can be described as follows.

Initial Investigation Phase (Preliminary Research Phase)

This stage is carried out to get an overview of the conditions regarding the characteristics of the product that is developed and can be used in learning.

Results of Analysis of Problems and Needs of Teachers and Students

Based on the results of the needs analysis on 22 students, interviews and questionnaires were distributed on the needs of students for teaching materials. It was found that the problem with the students was that 50% of the students had difficulty

understanding the material. As many as 63% of students said the motion system material was difficult to understand and 77% of students said the digestive system was difficult to understand. The presentation of the material has not linked the material with the problems that exist in everyday life and the LKPD used also has not trained the thinking skills of these students. From the results of the questionnaire given, 86% of students wanted LKPD that was interesting and had clear pictures, colors and materials.

Student Analysis Results

Based on the results of the questionnaire given to students, the tendency of students to respond to difficult learning is that as many as 77% of students choose to listen to the teacher's explanation to understand a material. students choose to listen to the teacher's explanation to understand a material. Most of the students said that learning biology was rather difficult and complicated to understand, so that when the learning took place, the students did not listen well what the teacher said. To help students during the learning process, most students want LKPD that is interesting and easy to understand and displays relevant pictures related to the material being studied.

Results of Student Worksheet Analysis (LKPD)

Based on the results of the analysis, it is known that there are weaknesses in the activity sheet from the teacher used by students ie 63% of students said the LKPD had not been prepared according to the model recommended in the 2013 curriculum, namely the DL model. There are as many as 45.5% of students saying the LKPD used by the teacher is not interesting and difficult to understand. There are as many as 91% of students agree that class learning is more understandable if using DL-based worksheets.

Curriculum Analysis Results

Curriculum analysis is focused on the analysis of Core Competencies (KI) and Basic Competencies (KD) which have been determined in the standard content of Biology subjects in accordance with the 2013 curriculum. This analysis aims to serve as a guide in developing Discovery Learning (DL) based worksheets for SMA class XI MIPA. The results of the KI and KD analysis contained in the content standard are translated into Competency Achievement Indicators. Based on the curriculum analysis that has been carried out, students are required not only to be able to explain but also to be able to analyze the motion and digestive system material, collect information and present data and propose ideas in solving problems related to the material.

Development or prototyping stage (Prototyping phase)

The results obtained at the initial investigation stage are used as guidelines in developing Discovery Learning (DL) based worksheets on the motion and digestive system material. The results of the development activities carried out at this stage are as follows.

Didactic Aspect

LKPD development refers to the 2013 curriculum which is adapted to KI and KD. Indicators and learning objectives are made based on KI and KD. The development of each activity in the DL-based LKPD is adjusted to achieve the learning objectives. The LKPD components that have been made refer to the LKPD disclosed by Prastowo (2011), which consists of instructions for use, subject matter, student worksheets, evaluation and assessment sheets.

Construct Aspect

At this stage, students are faced with something that causes confusion and a desire arises to investigate on their own. Teachers can start learning activities by asking questions, recommending reading books and other learning activities that lead to the preparation of problem solving. ***Technical Aspect***

LKPD is made using Microsoft Word 2010 on the cover and content. The type of writing used on the cover of the LKPD is Candara with sizes varying from 12-20. The selection of the type of writing is an important aspect to form an impression on the product being developed (Tinarbuko, 2012). According to Pujirianto (2005) the use of this type of writing can give a formal, classic, and elegant impression, so it is suitable for use in the headline.

Assessment Phase

The activities carried out at this stage of the assessment are LKPD assessments which were developed in actual conditions. The test was carried out on two test classes, namely the experimental class and the control class. The purpose of the large group assessment is to determine the level of practicality and effectiveness of the developed LKPD.

Table. 1 Practicality Assessment by Teacher

No.	Aspect	Score (%)	Criteria
1	Ease of Use	88.00	Very practical
2	Efficiency	87.5	Very practical

3	Attractiveness	100	Very practical
4	Easy to interpret	100	Very practical
5	Have Equivalence	100	Very practical
Average Practicality Score		**95.00**	**Very practical**

Based on Table 1. above, it is known that the average practicality value of the DL-based LKPD which is filled by the teacher is 95.00% with very practical criteria.

Table. 2 Student Practicality Assessment

No.	Aspects	Score (%)	Criteria
1	Ease of Use	89.58	Very practical
2	Efficiency	86.93	Very practical
3	Attractiveness	95.45	Very practical
4	Easy to interpret	89.39	Very practical
5	Have Equivalence	90.34	Very practical
Average Practicality Score		**90.34**	**Very practical**

Based on Table. 2 it is known that the average practicality value of the DL-based LKPD on the motion and digestion material filled out by students is 90.34% with very practical criteria. This shows that the LKPD developed is practically used by students.

Table. 3 Results of Critical Thinking Skills Assessment

Class	N	Xmin	Xmax	$\bar{x}$	Standard Deviation
Experiment	22	52	92	78.00	10,600
Control	22	40	84	60.36	11,704

Based on Table 3. it can be seen that the average critical thinking ability of the experimental class students is higher than the control class average. The experimental class is a class that is given treatment in the form of DL-based worksheets on motion material, while the control class is a class without treatment. The average value of critical thinking skills in the experimental class is 78.00 with a critical category with a standard deviation of 10,600, while the average value of critical thinking skills in the control class is 60.36 with a fairly critical category with a standard deviation of 11,704.

The next stage is hypothesis testing, but first the normality test and homogeneity test are carried out as a condition for data analysis. Based on the results of the analysis prerequisite test, it was found that the value of critical thinking skills was normally distributed and homogeneous. Furthermore, this critical thinking ability data was tested using the *Independent Samples T Test* .

Table. 4 Prerequisite Test Results for Normality and Homogeneity of Critical Thinking Skills

No.	Parameter	Significance	Information
1	Normality	0.200	Normal
2	Homogeneity	0.707	Homogeneous

Based on the results of the normality test, it shows greater significance, namely 0.200> 0.05 and the homogeneity test is 0.707> 0.05, meaning that the value of critical thinking ability is normally distributed and homogeneous. Furthermore, this critical thinking ability data was tested for hypotheses using the *Independent Samples T Test* or t-test.

Table. 5 Calculation Results of Critical Thinking Skills t-test

Class	Significance	Conclusion
Control Experiment	0.000	H_0 rejected

Based on Table 5. it is known that the significance value of students' critical thinking skills is 0.000. This indicates that the significance value is <0.05, which means that H0 is rejected and H1 is accepted . Thus, it is known that the use of DL-based LKPD in motion and digestion material affects the critical thinking skills of class XI students of SMAN 1 XI Koto Sungai Lasi.

III. CONCLUSION

Based on the development of LKPD based on Discovery Learning for class XI students of SMAN 1 XI Koto Sungai Lasi, the validation results obtained by the validators show that LKPD based on discovery learning on the material of the movement and digestive system shows a very valid category with a value of 84.05%. The results of the practicality test obtained from teachers and students showed that discovery learning -based worksheets on the movement and digestive system material showed a very practical category with a value of 95.00 % from teachers and 90.34 % from students. The results of the effectiveness test of discovery learning -based worksheets on the motion and digestive system material show that it is effective in improving students' critical thinking skills.

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