

Development of Chemical Learning Module Based Learning Cycle 5E to Improve Students Learning Outcomes in Equilibrium Chemical Content in Class XI MAN 2 Ground Flat

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Abstract – This research starts from the problem of the low critical thinking skills of students in Chemistry learning. Chemistry learning is one of the lessons that are difficult, for students to understand. This is because many chemical materials are abstract and the lack of student references to strengthen the theory of chemistry being studied. Chemical materials is a difficult, material equilibrium. The main difficulty is experienced by students when solving problems related to dissociation equilibrium. Therefore, it is Necessary to develop a learning module that is Appropriate to the characteristics of students. The purpose of this research is to describe the development of a chemical learning module for chemical equilibrium based on the Learning Cycle 5E that is valid, practical, and effective for students of class XI MA.

The research subjects were students of class XI MIA 1 in MAN 2 Tanah Datar, amounting to 34 students. This type of research is research development (R & D) with a models of development by Plomp, the which consists of four phases of development items, namely the phase of the initial investigation (preliminary investigation), the phase of design, the phase of realization / construction, and the testing, evaluation, and revision phases (test, evaluation, and revision). This study uses a quantitative approach. This type of research the data in the form of quantitative Data consists of three types of the data items, namely the Data Validation results by experts, assessment data results by practitioners, and effectiveness of data in the form of activity of data and student learning outcomes.

The results Showed that the chemistry learning modules based on Learning Cycle 5E for Class XI MA students developed was valid, practical, and effective. This can be seen in the module validity of 81.11 with valid criteria. The module practicality by the teacher is 98.18 with very practical criteria and the module practicality by students is 74.80 with practical criteria. The effectiveness of the module, the which consists of student activities has a value of 92.16 with very active criteria and student learning outcomes have a classical average of 85.88.

Keywords – Chemistry learning modules, Learning Cycle 5E, Results Learning, Chemical Equilibrium.

I. INTRODUCTION

Education is an effort to develop the potential of students, so that they can adapt to the environment so it can be beneficial to themselves can be proved with better learning outcomes.

Learning Cycle (learning system) is one model of learning which are learner (student centered). Learning Cycle the stages self, family, and society (Wahyuni and Hardeli 2019). Education starts from childhood to college.

Schools as educational unit provides learning opportunities to teachers and participants learners in tiered and continuous (Inspire et al. 2019).

Implementation of the current learning this still there are problems such as: lack of interest in learning, lack of understanding of the concept and the lack of reference learners to reinforce the theory. Learning chemistry has characterize different, so it is difficult to understand, it is necessary to develop innovative teaching materials in hopes of increasing the activity of learners and

understanding existing concepts, and activity (Phases) that organized, so that learners can master the competencies that must be achieved in learning. The use of chemical modules on the learning model Learning Cycle 5E is expected to help learners to be more active, so as to solve the problem. Learning model Learning Cycle 5E has several stages or phases: engagement, exploration, explanation, elaboration, and evaluation.

Use of models Learning Cycle by learners are expected to improve learning outcomes that have a low ability. with models Learning Cycle The learners are trained to think for themselves, so understanding the concept will be better learners.

II. LITERATURE REVIEW

The module is designed teaching materials systematically based on specific curriculum, packaged in the form of units of learning, and can enable studied independently in a certain time in order to master the competencies that are directed (S.Sirate and Ramadhana 2017). Good module is a module that has been tested for validity, practicalities and effectiveness. Validity conducted by experts / specialists in order to get the module as expected. practicalities of a level practical learning modules related to ease of use and efficiency.

Effectiveness is level keefektivits models learning viewed from two aspects, namely learning outcomes and learner activity when using modules The learning model is a plan or pattern to be used / developed in the classroom (Marsh et al. 2016). Model learning made by teachers so that the targets in the learning achieved both targets for itself and the target teacher educators to learners. Learning model Learning Cycle 5E is one of the innovative learning model that is able to facilitate learners in constructing their own knowledge, in accordance with the name of the 5E learning cycle.

Learning Cycle 5E Whittaker suggests learning is a process where behavior is caused or altered by training or experience to mempero le h change Act The new behavior is Overall, as a result of the individual's own experience in interaction with the environment.

Learning outcomes are the result of an interaction acts

and acts of teaching and learning (Marsh et al. 2016). According to (Santoso 2009) of learning outcomes is the ability gained after going through the learning activities. Of learners, learning outcomes is the result of the achievement of the learning process (Marsh et al. 2016). Learning outcomes can be divided into two general categories:

- (1) The impact of learning (Achievement) were measured in each subject and looked in eport cards and diplomas.
- (2) Impact Bridesmaids (results) that appear in the knowledge and abilities in other fields.

III. RESEARCH METHODS

Research this use model Plomp on chemistry learning development with materials-based chemical equilibrium Learning Cycle 5E. Steps being taken, namely (1) Phase investigation early, to do a preliminary investigation in developing chemistry learning modules. A preliminary investigation seen from the analysis of the problem and an analysis of the content / context. The analysis carried out in has five stages each of the stages starting with the letter E, namely: engagement, the school issues related to the needs of teachers and learners' exploration, explanation, elaboration and evaluation (Wahyuni and Hardeli 2019).

From the analysis results obtained by using the learning required learning modules based chemistry Learning Cycle 5E which can improve learning outcomes of students (Irfandi, Linda, and Erviyenni 2018).

Then in terms of the context analysis curriculum analysis and analytical concepts. (2) the design phase, is done using an instrument that has been prepared in advance in accordance with the needs of the students to understand the material of the chemical equilibrium. (3) Phase realization / construction, dilakuakn with the modeling and the necessary instruments. (4) phase of the test, evaluation and revision. After all stages done, then obtained based chemistry learning modules Learning Cycle 5E on the matter of chemical equilibrium is valid, practical, and effective.

Table 1. Summary Study on Learning Model needs.

Phase / Stage	Activity	
	Teacher	student
Generation interests (engagement)	1. Generating interest and curiosity (curiosity) students. 2. Factual processes in everyday life (Related to the topic). - nt) 3. Linking the topics covered by the the student experience. Encourage students to remember the daily experiences and demonstrate relevance to the topic being discussed learning	1. develop interest / Curiosity about the topic. 2. responds to the teacher's question. 3. trying to remember everyday experiences and connect with learning topics to be discussed.
Exploration (exploration)	1. Forming a group, give the opportunity to work together in small groups on the material being studied by giving about exploration on the LK S. 2. Viewing the work of students in the group, if students have difficulty teachers give direction.	1. Forming groups and trying to work in groups. (as do the lab work, the study of literature or doing LKS). 2. Asking things considered difficult
Explanation	1. Selecting a group (by way of raffle). The selected group describes the results of their discussion. 2. Directed that the case of class discussion, that is by asking other students to respond and give a rebuttal. Then give a strengthening of the concept and justify the concepts that have been obtained by the students in case of misconceptions about the material being studied. 3. Asking students concludes discussion.	1. Explaining the results of discussions group in front of the class. 2. Respond and give refutation of the results of the group discussions appear. 3. Concludes the discussion

Implementation concept (elaboration)	1. Guiding students to apply concept by providing elaboration on the matter of LKS. 2. Asking students to collect LKS and checked.	1. Applying concepts has studied wit h LKS work. 2. collecting LKS
Evaluation (evaluation)	n) 1. Provide issues to work on students	1. Evaluating knowledge student

Source: Made Wena.

Products tested in the Supreme State 2 Tanah Datar, to look at the practicalities and effectiveness of the learning modules developed chemical. The population is all students of class XI MAN 2 Tanah Datar. The samples used were XI MIA learners 1 MAN 2 Tanah Datar. Some of the instruments used in the development of chemical-based learning module Learning Cycle 5E namely sheet of expert validation, test sheets practicality, and test the effectiveness of the module learning.

Data collection techniques drawn from the results of the validation made by the validator, the results of testing the practicalities by teachers and learners, as well as the effectiveness of the module through the observation of the activities of learners. Data were analyzed using quantitative descriptive analysis techniques. Steps - steps that are used in the data analysis are as follows:

1. Validity Analysis Products

In analyzing, the validity of the product is done using a Likert scale:

$$\text{Validity Value} = \frac{\text{score obtained}}{\text{maximum score}} \times 100\%$$

2. Analysis of the practicalities of Products

In analyzing the practicalities done with a questionnaire sheet menganalisis paraktikalitas using Likert scale.

$$\text{Value practicalities} = \frac{\text{score obtained}}{\text{maximum score}} \times 100\%$$

3. Effectiveness Analysis Products

Effectiveness analysis seen from the student activity when using the module compared with student data without using a module. Percentage of activity expressed by Sudijono (2005: 43).

The formula is as follows:

$$p = \frac{f}{n} \times 100\%$$

Information:

p = the percentage of activity

f = frequency activity

n = total students

As percentage of the activity of each - each obtained. The next step arithmetic average looking. The formula used to determine the average count, as follows:

$$\bar{X} = \frac{\sum X}{N}$$

Information:

X= mean (average) percentage of student activity

$\sum X$ = the total percentage of all aspects of

N = number of aspects of the observed

4. Analysis of student learning outcomes

Data on student learning outcomes in the form of test objetif. The study uses a model design Randomized Control Group Posttest Only Design can be seen in the following table.

Table 2. Randomized Control Group Posttest Only Design

	<i>treatment</i>	<i>Posstest</i>
<i>Experimental Group</i>	X	T
<i>Control Group</i>		T

Notes: X = treatment (treatment)

T = posttest (Last)

$$Score = \frac{score\ obtained}{maximum\ score} \times Scale$$

5. *Determining the value - average learning outcomes student*

-Rata determine the average value of student learning outcomes by the formula:

$$\bar{X} = \frac{\sum X}{N}$$

Notes: X = mean (average)

$\sum X$ = total value of all students

N = the number of students

6. *Doing Normality Test*

Normality test is done by testing Lilifors

7. *Homogeneity test carried out by F test*

To test the homogeneity of the data test F, with steps as expressed by (Irhamna, Rosdianto, and Murdani 2017) as follows.

$$F = \frac{S_1^2}{S_2^2}$$

Description:

F = Variance of the data group

S_1^2 = Variance of the first data

S_2^2 = Variance second data

8. *Comparing the data on the learning outcomes control class and experimental class menggunakan -t test.*

9. *Determine student learning outcomes analysis Minimum Criteria exhaustiveness seen Darri*

IV. RESULTS AND DISCUSSION

The data analysis of learning outcomes systematically known by knowing the score difference from the experimental class and control class, normality test, homogeneity test and t-test. Both of these classes in its data capture based on the scores of learning outcomes following the learning modules that make use of the model Learning Cycle 5E. Scores are given after a given treatment. During the learning process the average - average posttest higher grade than the control class.

The resulting scores are used posstest taken to normality test, homogeneity test and t test. Normality test is done is Lilifor test, whether the test acyl normal distribution or not. Results of normality can be observed from Table 3.

Table 3. Uji Normality Data

No	Group	amount (N)	Mean	Taraf Real	L o	L t	Information
1	Claass control	34	78.35	0.05	.1406	.1519	Distributed Normal
2	Class Experiment	34	85.88	0.05	.1435	.1519	Distributed Normal

Based on the above table, the sample data has a significant value of 0.05 standard real $\alpha = 0.05$, obtained both normally distributed data. Based on the table, it was concluded that the data were normally distributed data for $L_0 < L_t$ ($0.1406 < 0.1519$) as well as the normal distribution of data for the experimental class $L_0 < L_t$ ($0.1435 < 0.1519$). Comparison between L_0 and L_{table} seen

that $L_0 < L_{table}$. This means that the data were normally distributed student learning outcomes.

Homogeneity of the result data tests were conducted to knowing whether the control class and experimental class have variances were homogeneous. Results of homogeneity can be observed from table 4.

Table 4 Homogeneity Test Data

No g	Group	Number (N)	Taraf Real	F arithmeti c	F table	Information
1	Control	34	0.05	1.04	1.84	Homogeneous
2	Experiment	34	0.05			

Based on the data homogeneity test, the result for $F_{arithmetic}$ 1.04 and F_{table} 1.84 at significance level 0.05 ($n_1 - 1, n_2 - 1$). Then Have variance homogeneous because $F_{count} < F_{table}$. ($1.04 < 1.84$).

Comparing the data of student learning outcomes in the control class and experimental class, digunakan t -test. Based on the results perhitungan t -test, t value

diproleh = 6.1 If the terms of t_{table} the significant level of 95% (0.05) is 1.67. This means that the value of $t > t_{table}$.

Analysis of the results of students' views of completeness Minimum Criteria (KKM). KKM determined from individual mastery. KKM for this material is 80. Berdasarkan results of the analysis, the percentage of complete learn student obtained as follows.

Table 5. Criteria for Mastery Learning

Kriteria Nilai	Total students	Percentage (%)	Mastery	Conversion
< KKM (80)	4	11.76	not Completed	Ineffective
$\geq$ KKM (80)	30	88.24	Complete	Effective

Based on the above table the percentage of learners who complete that is 88.24%, and the percentage of participants who have not completed didi is 11.76%. Based on the results of tests of learning outcomes of students who use the module pesetas.

V. CONCLUSION

Based on the results of research and discussion, we can conclude the following matters. First, learning modules developed is valid. Process model development module chemical equilibrium of learning materials that are valid

for students of class XI SMA / MA is by analyzing the data sheets of validity by experts. Based on the results sheets of validity by experts, it can be concluded that the validity of the module that was developed is at 82.46 with a valid category. Second, module learning that developed is very practical. Process development of chemistry learning modules on practical equilibrium material for class XI student of MA use is by analyzing data sheet practicalities by teachers and students. based on the analysis of the practicalities sheets by the teachers, the value of the practicalities of 98.18 categorized as very

practical. Based on the analysis of the practicalities sheet by students, the value of the practicalities of 74.80 with a practical category. Third, module learning that developed is effective. The process module development Learning chemistry on material The equilibrium that is effective for use class XI MA is to analyze data on the learning and student activities. Based on the analysis of class XI student learning outcomes MIA 1 MAN 2 Tanah Datar, the test results can be concluded that in the classical, the average results of student learning is at Holq IöHolq 85.88.

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