

VALIDITY OF LEARNING MEDIA IN REACTION RATE MATTER

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Abstract. This research aimed at knowing the validity of learning media in reaction rate matter. The type of research method that is used is ADDIE (Analysis, Design, Development, Implementation, and Evaluation.) But, in this research is limited to the Development step. The validity test was conducted by a chemistry lecturer from Unesa by filled the questionnaire. The validity of learning media can be scored from construct validity and content validity. Based on the validation result, the construct validity score average is 4.39 which is categorized into very good. The content validity score average is 4.14 which is categorized into good. Based on the validation result, it can be concluded that the learning media was declared to be used as the reaction rate of learning media.

Keywords: Learning media, The validity, Reaction rate

INTRODUCTION

Chemistry is a complex subject, teacher, and teaching subject that determine the important role in demonstrating the complexity of chemical concepts to students [1]. Visualization methods can help for learning and identify students' knowledge of specific concepts. Visualization methods are unique tools to illustrate specific chemical concepts. Students learn to look at a reaction mechanism as a phenomenon whose characterization requires both chemical and topological information [2]

Chemistry is one of science branches, studied about characteristic of matter, change of matter, and describes matter change, concept law, and principle also its theory [3]. The chemistry study about complex system scooping atom, molecule, compound also reaction equation involving those items [4]. The reaction rate is one of the subjects that explain how fast or slow a reactant is used up or a product is formed [5]. This concept needs to be explained using the media. However, according to some scientists, there is a split in the theory and practice of the media education [6], which produces a predominance of

traditional learning environment, the dominance of authoritarian school culture over interactive one [7].

Some scientist pays attention to the problem of research methods teaching in vocational Media Education environments and developing critical engagement of students [8]. Teaching is a complex activity that involves a lot of knowledge, complex cognitive skills that occur in an unstructured and dynamic environment [9]. The use of learning media can help students to figure out reaction rate process.

Based on data on Ujian Nasional (UN) scores for the 2018/2019 school year, the average value of the Chemistry is still below 60. The average national exam score in sub-matter Physical Chemistry shows 50.91 including reaction rate indicators [10].

The low score of Ujian Nasional (UN) may be affected with motivational factor. Everyone who studies is influenced by motivation [10]. The media can foster positive attitudes of students towards the subject and learning process [11]. The data obtained in several studies suggest that the adoption of trans media literacy practice as an object of

intensive educational work can be successful only if it is combined with a high motivational orientation of the student [12].

The focus of digital and technological acceleration in the socio-cultural field practically transforms education into one of the important development engines [13]. In many ways, the implementation of media education's objectives depends on the personal and active commitment of the teachers [14]; creative approach to solving educational challenges [15]; communication skills of a teacher [16].

Based on these descriptions, researchers want to develop learning media on the subject Reaction Rate.

METHOD

Research conducted is a type of research and development or R&D. Development research aims to produce learning tools, such as syllabus, teaching subjects, media, practical modules, student work exercises, tools to measure learning progress, tools to measure learning outcomes, etc. [17]. The stages of the study are illustrated in the following diagram:

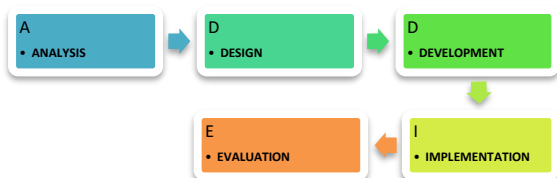


Figure 1. ADDIE development model adapted from Branch (2009).

[18]

The research started with analyzing a problem from the chemistry learning process, especially in reaction rate matter. Then, making a research design to overcome the problem. Next, developing learning media by using research method that has been selected. After that, implementing and evaluating the learning media based on questionnaire results from student and lecturer.

The learning media result must be tested using the validity process by chemistry lecturers including content and construct validity. The following stages are to obtain the results of the learning media validity score:

A. Tabulation of scoring results data

The assessment uses the Likert scale 1-5 In Table 1:

Table 1. Likert scale

Score	Information
1	Very Low (SK)
2	Low (K)
3	Enough (C)
4	Good (B)
5	Very Good (SB)

[19]

B. Calculate the average score of each aspect using the formula:

$$\bar{X} = \frac{1}{\text{sum of validator}} \times \frac{\sum X}{n}$$

Information:

\bar{X} : average score

$\sum X$: the total number of scores each aspect

n : number of items question every aspect

C. Convert the average score of each aspect into a qualitative value.

The quantities data change into qualitative data by using table 2 conversion. The conversion table using 5 scale conversion based on PAP by Widoyoko (2009), the scales are:

Table 2. Ideal evaluation criteria for each indicator

No.	Range of Scores	Quality Category
1	$\bar{X} > \frac{X_i + 1.8}{S_{bi}}$	SB (Very Good)
2	$\frac{X_i + 0.6}{S_{bi}} << \frac{X_i + 1.8}{S_{bi}}$ \bar{X}	B (Good)
3	$\frac{X_i - 0.6}{S_{bi}} << \frac{X_i + 0.6}{S_{bi}}$ \bar{X}	C (enough)
4	$\frac{X_i - 1.8}{S_{bi}} << \frac{X_i - 0.6}{S_{bi}}$ \bar{X}	K (Less)
5	$\bar{X} > \frac{X_i - 1.8}{S_{bi}}$	SK (Very Poor)

[20]

Information :

- \bar{X} : average score
 ΣX : total score
 X_i : ideal average = $\frac{1}{2}$ (score ideal maximum + score ideal minimum)
 S_{bi} : Ideal standard deviation = $\frac{1}{6}$ (ideal maximum score - ideal minimum score)

the ideal maximum score is 4 and the ideal minimum score is 1 then the learning media assessment classification is obtained in Table 3.

D. Classifying assessment of learning media according to validity guidelines

Based on Table 3, the validity of the learning media developed will be obtained.

Table 3. Guidelines for validity criteria

Score Interval	Criteria
$\bar{X} > 4.2$	Very good
$3.4 \leq 4.2\bar{X}$	Good
$2.6 \leq 3,4\bar{X}$	Enough
$1.8 \leq 2.6\bar{X}$	Less
$\bar{X} \leq 1.8$	Very Poor

Learning media are said to be valid and proper to use, if the validity results get at least the "Good" category.

RESULTS AND DISCUSSION

This research uses the ADDIE development method (Analysis, Design, Development and Implementation, Evaluation) in Figure 1. The media can be defined as valid media based on validation results. Content validity average result is 4.14, which is "Good" category. Construct validity average result is 4.39, which is "Very Good" category. The following are the results of each phase of the research carried out:

A. Analysis

In the analysis phase, researchers conducted initial data collection conducted at Surabaya 17 Senior High School and National Examination score data on the Reaction rate matter. These data are used as a reference about how the real conditions of using instructional media in schools and student learning outcomes in the Reaction rate matter.

1. Data on the use of instructional media in schools

Based on the pre-research conducted at Surabaya 17 Public High School, researchers obtained data that the use of instructional media in chemistry subjects was still quite low. In the questionnaire there are several indicators filled out by Class XII students as respondents. The indicator of the use of instructional media shows 41.2%.

2. Data on 2018/2019 National Examination scores

Based on the National Examination score data from the official website of the Educational Research Center of the Ministry of Education and Culture, the National Examination score on Physical Chemistry subject is 50.91 (10). Physical Chemistry subject also includes Reaction Rate indicators. Another indicator that is determining the reaction order shows a value of 68.43. This value is still classified as sufficient category.

B. Design

At this stage the researchers formulated the development of instructional media from the analysis phase. The results of this stage are:

1. Determining the Basic Competence of the reaction rate sub-subject refers to Permendikbud No. 37 of 2018. The Basic Competency used by reference is KD 4.7. Designing, doing, and inferring and presenting the results of experiments the factors that influence the rate of reaction and reaction order.
2. Make learning media design with worksheet.

Learning media created using the Adobe Flash Professional CS6 application. Learning media contains experimental videos about Reaction Rates that are recorded using a Mobile camera and edited using the ACDSee Video Studio 3 application. Worksheet is created in the Microsoft Word 2010 application. The design of learning media and worksheet is as below:



Figure 2. Starting page of learning media

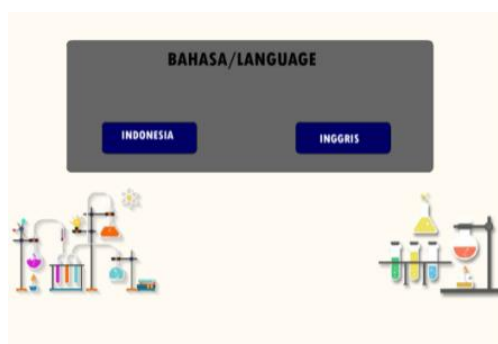


Figure 3. Selected pages language

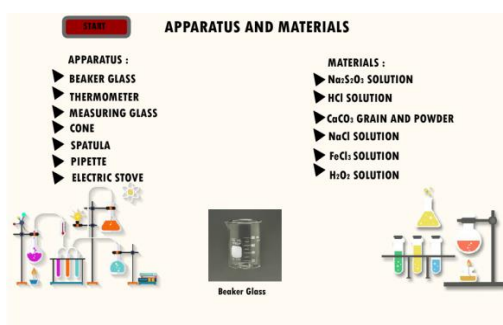


Figure 4. Tools and subjects in learning media



Figure 5. Experimental video along with time

EXPERIMENT
To proof the affect of four factors on reaction rate which is concentration, temperature, surface area and catalyst, do this experiment!

EXPERIMENT 1

A. Title : Reaction concept
B. Purpose : To know indicators of reaction
C. Apparatus and Materials :

Apparatus	Materials
1. Beaker glass	1. $\text{Na}_2\text{S}_2\text{O}_8$ solution
2. Measuring glass	2. HCl solution
3. Spatula	3. H_2O solution
4. Thermometer	4. NaCl solution
5. Electric Stove	5. FeCl_3 solution
6. Pipette	6. H_2O solution
7. Mortar and Alum	7. CaCO_3 solid

D. Procedures :

1. Open reaction rate application.
2. Choose the language.
3. Observe every video.
4. Write down every time result on each video.
5. Fill the result into each table.
6. Answer every question on worksheet.

E. VIDEO 1 (Reaction Concept)

1. The change process on experiment 1

Class A	Class B	Class C

2. The change process on experiment 2

Class A	Class B

3. The change process on experiment 3

Class A	Class B

4. Based on your observation, what are the indicator of reaction happen?
.....
.....



Figure 6. Worksheet results video observation trial

C. Development

This stage consists of 3 stages, aiming to produce valid learning media based on advice and input from experts. The stages consist of: 1) consultation; 2) study; 3) validation.

Consultations were held to review learning media in accordance with KD 4.7.

The media will be reviewed by chemistry lecturers. The review process includes evaluating aspects of knowing the quality of media presentation, knowing subject criteria and knowing the language criteria.

The results of the study media study will then be validated by 2 chemistry lecturers. The first lecturer will test the content validity and the second lecturer will test the construct validity. Content validity includes evaluating aspects of subject relevance, evaluating or practicing aspects of problems and aspects of effects for learning strategies. Construct validity includes an assessment of aspects of language, aspects of software engineering, and aspects of visual communication. Each validation value has been converted according to Table 3. Validity criteria guidelines. The results of each validation are as follows.

Table 4. Results of learning media validation according to the validity criteria guidelines

No	Assessment Aspects	Score
1	Content Validity	
	Aspect of subject relevance	3.92
	Aspect of evaluation or practice questions	4
	Aspect effects for learning strategies	4.5
2	Construct validity	
	Aspects of language	4.5
	Software engineering aspects	4.37
	Visual communication aspects	4.3

The results of the content validation by the chemistry lecturer can be seen in the image below.

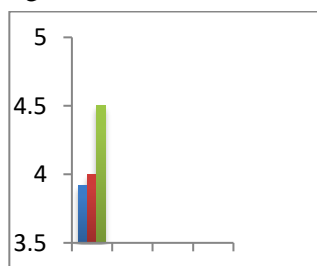


Figure 7. Graph of content validity

Information

- Aspect 1: Aspect of subject relevance (3.92)
- Aspect 2: Evaluation aspects (4)
- Aspect 3: Aspect's effect on strategy learning (4.5)

Aspects of the relevance of the subject and evaluation / practice questions show good results. Meanwhile, the effect aspect of the learning strategy showed very good results. The results are after being converted according to the validity criteria guidelines table.

The results of the learning media construct validation are as follows:

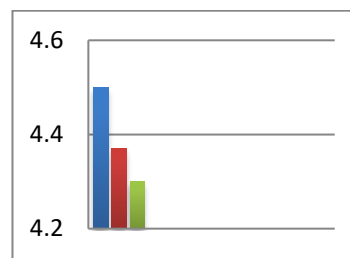


Figure 8. Graph of construct validity result

Information

- Aspect 1: Language aspects (4.5)
- Aspect 2: Software engineering aspects (4.37)
- Aspect 3: Visual communication aspects (4.3)

Based on the results of the validation shows the learning media is very good at construct validity. Very good predicates are obtained after being converted according to the validity criteria guidelines. The construct validity is about the evaluation of instructional media in terms of effectiveness and the usability of instructional media.

The use of learning media in teaching and learning process can arouse new desires and interests, motivation and stimulation of learning activities and even bring psychological effects on students (22).

CONCLUSION

Based on the results of research and assessment, it can be concluded that this learning media is valid and suitable for use. The validity is viewed in terms of content validity and constructs validity. Content validity includes the compatibility of the subject with the curriculum, evaluation and the ability of the media to support learning. The results of validation from each of these aspects are 3.92; 4 and 4.5. The construct validity contains aspects of language, software engineering and visual communication. The results of validation from each of these aspects are 4.5; 4.37 and 4.3.

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