THE VALIDITY OF INTERACTIVE MULTIMEDIA ON IONIC BOND MATERIAL

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Abstract. *Interactive multimedia is needed to improve student's understanding of certain material. The purpose of this study is to analyze the validity of interactive multimedia on ionic bonding material. The type of research used in this study is 4D research model (Define, Design, Development, and Disseminate) but in this study only limited on Developmentstep which adapted from Ibrahim (2014). The validity results showed that: (1) The content validity and construct validity obtained highly valid criteria with average percentage range gradually 90% and 91,04%. From the results, it can be concludedthat the developed media was declared valid to be used as interactive multimedia on ionic bond materials.*

Keywords: *Interactive Multimedia, The Validity, Ionic Bond*

INTRODUCTION

Chemistry subjects are classified asquite difficult subject for some senior high school students (1). The number of abstract concepts makes it difficult for students to understand the material if only by imagining the material presented. It happens because students cannot directly observe what the chemical bonding process is like, so students are more easily confused by a concept (2). Without understanding basic knowledge such as chemical bonds, the other material such as reaction rates, acids and bases, electrochemistry, chemical equilibrium, and chemical solutions becomes difficult to understand too(3).

Students must have representational abilities to understand chemistry subject. Representational ability is the ability to visualize things that cannot be seen by the eye and something that cannot be touched (4).

Chemistry can be explained through three levels of representation, namely macroscopic, submicroscopic and symbolic levels. The macroscopic level is the level of representation in the form of real phenomena and can be seen, such as chemical phenomena that occur in everyday life that can be observed directly. The submicroscopic level is a level of representation based on real observation but still requires a theory to explain what happens at the molecular level and use representations of theoretical models, such as microscopic particles that cannot be seen directly. The symbolic level is a level representation of a reality, such as symbol representation of atoms, molecules and compounds, both in the form of images, algebra, and the results of computer processing (5).

Based on the pre-research results, it was found that 52% of students experienced difficulties in understanding ion bond matter, 84% answered incorrectly about the definition of ionic bonds, 76% of students incorrectly explained the process of forming ion compounds, 88% answered incorrectly in classifying compounds that have ionic bonds, and 56% of students were unable to identify the properties of compounds that have ionic bonds.

The selection of appropriate media will be able to attract the attention of students so that students will be more focused in receiving

information (6). The use of teaching materials as enrichment is proven to be able to increase learning motivation and encourage student'scuriosity on chemistry subjects (7). The usage of interactive multimedia proved to increase the classical score as much as 100% (8).

Based on the explanation above, the researcher develops Interactive Multimedia on Ionic Bond Materials.

METHOD

This research was conducted using 4D research model which only limited on Development step(9). This research was conducted at SMA 1 Krian in class XI as many as 12 students who had received Ionic bond material. The stages carried out in this study is validation sheet.

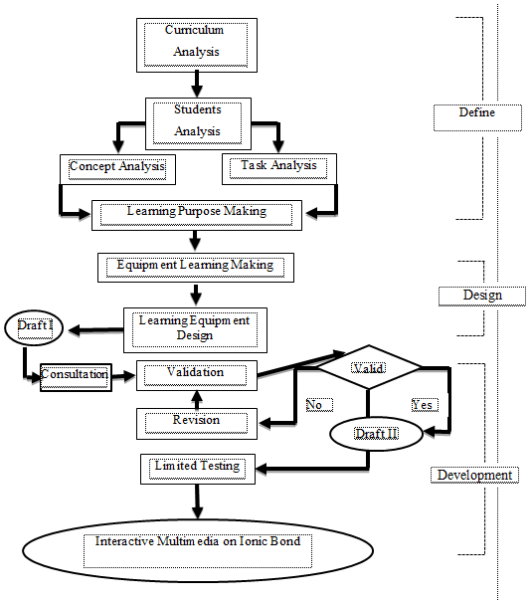

Figure 1. 4D (3D) Research Model, adapted from Ibrahim (2014)

The validity of media was viewed from content validity and construct validity. Validation was carried out by two chemistry lecturers and one chemistry teacher. Then analyzed by quantitative descriptive method through percentages which obtained by comparing scores from the results of data collection from all validators with criteria scores. Assessment uses calculations from the Likert scale in Table 1.

Table 1.Likert Scale

Value Scale	Category
1	Not appropriate
2	Less appropriate
3	Appropriate Enough
4	Appropriate
5	Highly appropriate

(10)

Furthermore, the calculated data with a Likert scale is calculated using the formula:

$$\text{Percentage (\%)} = \frac{Total\ score}{\text{Scoring criteria}} \times 100\%$$

Scoring criteria were obtained from criteria scores = highest score × number of aspects × number of respondents.

The results of the analysis from the validation sheet are used to determine the feasibility of the media developed using interpretation of the scores in Table 2.

Table 2. Score Interpretation Criteria

Percentage (%)	Category
0 – 20	Not valid
21 – 40	Less valid
41 – 60	Valid Enough
61 – 80	Valid
81 – 100	Highly Valid

(10)

The content validity of media are the suitability of the material with the curriculum and suitability of learning material substance and construct validity which includes criteria for presentation, language, and graphics. The media that was developed was said to be valid if the validator's assessment fulfilled the percentage results of ≥61% with a valid to highly valid category.

RESULTS AND DISCUSSION

This study uses 4D (3D) research model as **figure 1**.This model consists of four stages of development, namely Define, Design, Develop,

and Disseminate. It only carried out until the limited testing phase and does not reach the stage of Disseminate. The research stages 4D (3D) are: (1) Define; (2) Design; (3) Development. These stages are described as follows:

A. Define

This stage is conducted by analyzing core competencies and basic competencies. The purpose of this stage is to define learning conditions. The curriculum used in SMAN 1 Krian is a revised 2013 curriculum. The subject of this research are 12 students in 2nd degree which at about 17 years old. Those subject will be given tasks as follows; (1) Answer the Pretest question; (2) Operate interactive multimedia; (3) Answer each question in each sub-section of the material; (4) Answering practice questions at the end of the material; (5) Answering the Posttest question. Subject will be given media which its content is ionic bond. The indicator that are used in this media as follows; (a) Defines ions and ion compounds; (b) Analyze the classification of ion compounds; (c) Explain the character of ion compounds; (d) Explain the Lewis structure of ion compounds; (d) Explain the formation of ion compounds; (e) Describe the properties of ion compounds.

B. Design

At this stage the learning media design is carried out. This stage consists of two stages: (1) Design stage; (2) Making interactive multimedia ion bonds stage.

At first stage, the making of interactive multimedia component of ion bonds is made. These components are in the form of assessment instruments that can be used to limit the scope of concepts to be presented to the media. At this stage, components created in the preparation of interactive multimedia ion bonds include the creation of assets, 2-dimensional images and 3-dimensional images, animation, and backsound. Then, at second stage, the components that have been made are compiled. The design appearance as shown as below:

Figure 2. Opening Page

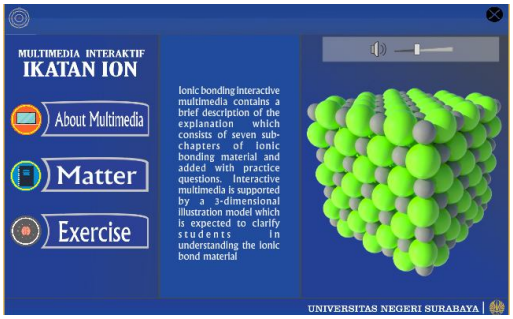

Figure 3. Home Page

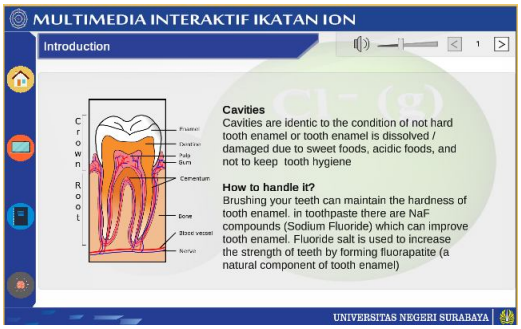

Figure 4. Introduction Page

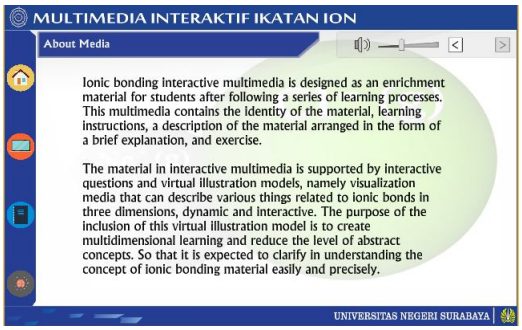

Figure 5. About Media Information Page

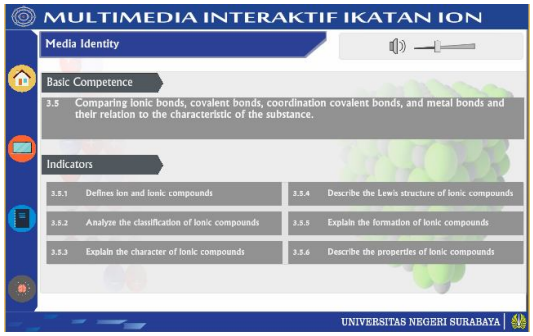

Figure 6. Identity of Media Page

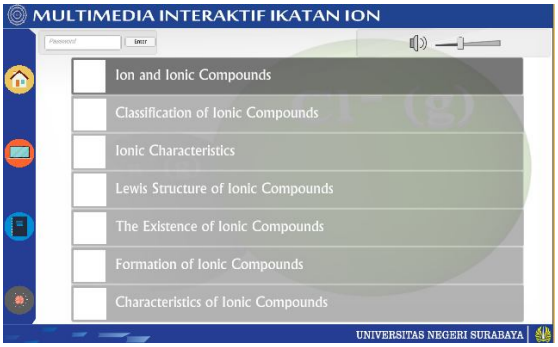

Figure 7. The Ionic Bond Materials

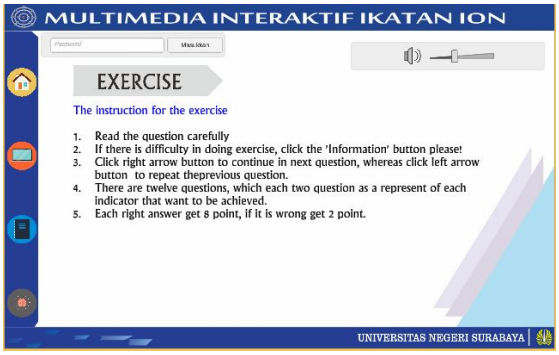

Figure 8. The Exercise

C. Develop

At this stage it aims to produce revised media based on expert advice. There are 3 steps; which are (1) consultation; (2) Review; (3) Validation.

(1) Consultation

The consultation conducted to chemistry lecturer to revise product.

(2) Review the media

Media will be reviewed by chemistry lecturer. The results of the study were obtained based on a review sheet which included the suitability of the material with the curriculum, suitability of the substance of the learning material, presentation criteria, linguistic criteria, and graphic criteria.

(3) Validation of the media

The revised media based on the review results will be validated. The aim is to get the value of the feasibility of the media which is developed. Ionic bond interactivemultimedia was validated by 2 chemistry lecturers and 1 Chemistry teacher. The validity of the media is viewed in terms of content validity and construct validity. Content validity included the suitability of the material with the curriculum and the suitability of the learning material substance. Whereas, construct validity is included the criteria for presentation, language, and graphics. The validation results are as follows in Table 3.

Table 3. The results of media Validation

Nu	Assessment Aspect	Percentage and Criteria
1	**Content Validity**	
	The suitability of material with the curriculum	93.33% (Highly Valid)
	The suitability of the learning material substance	86.67 % (Highly Valid)
2	**Construct Validity**	
	Presentation criteria	90.47% (Highly Valid)
	Language criteria	89.33% (Highly Valid)
	Graphics criteria	93.33% (Highly Valid)

Content Validity

The percentage whish is get by content validity as shown as picture below:

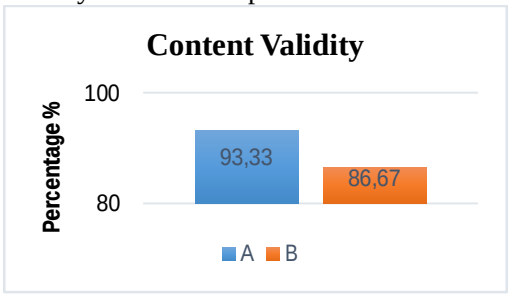

Figure 9. Content Validity Percentage

Explanation:

A : The suitability of material with the

curriculum
B : The suitability of the learning material substance

a) The suitability of material with the curriculum

The suitability of the material with the curriculum is viewed from several components, namely the suitability of learning indicators with basic competencies (KD) 3 and the suitability of chemical materials in the interactive multimedia ion bonds to learning indicators. Overall, the suitability of the material with the curriculum obtained a percentage of 93.33% with highly valid categories. Suitability of learning indicators with KD 3 is 3.5 Comparing ion bonds, covalent bonds, coordination covalent bonds, and metal bonds and their relation to the nature of the substance.

The suitability of chemical material in interactive multimedia ionic bond is chemical bonding material which is limited to ionic bonding material. This component is said to be highly valid because the material in interactive multimedia ion bonds is in accordance with the indicator. The material mapping with learning indicators can be seen in **Table 4.**

Table 4. The Mapping of materials in media with learning indicators

Learning Indicators	Learning Materials
3.5.1 Defining ion and ionic compound	Ion and ion compound
3.5.2 Analyze the classification of ion compounds	Classification of ion compound
3.5.3 Explain the character of ion compounds	Ion characteristic of binercompound
3.5.4 Explain the Lewis structure of ion compounds	Lewis structure of ion compounds
3.5.5 Explain the formation of ion compounds	Existence of ion compound
	Formation of ion compound
3.5.6 Explain the properties of ion compounds.	Properties of ion compound

b) The suitability of the learning material substance

The suitability of the learning material substance is reviewed from several components, namely the breadth of material in the media, the depth of material in the media, and the accuracy of concepts and definitions. For the breadth aspect of the material get valid criteria because in the media only the ion bond material is raised in chemical bonds. But overall the components of the suitability of the learning material substance obtained a percentage of 86.67% with very valid criteria. This score is lowest than other validity aspects. It is caused by the material content has higher difficulty level than learning material of ion compound in school. The reason is the media developed as enichment for students. The enrichment has a prerequirement that it must be higher difficulty level than main material (11). It is purposed to make student more critic in thinking process or applying some concept that have been got before.

Construct Validity

Construct validity is viewed from several components, which are presentation criteria, linguistic criteria, and graphic criteria. The percentage of construct validity as shownin picture below:

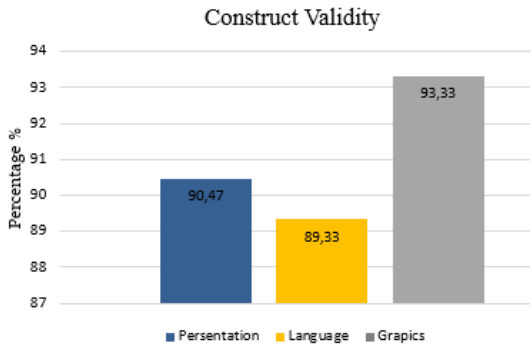

Figure 10. Construct Validity Percentage

a)Presentation Criteria

The validity of the presentation criteria get a percentage of 90.47% or with highly valid criteria.

The presentation criteria in the media are stated to be highly valid because the problems presented in the media are in accordance with the subject matter, the problems presented in the media about the content in toothpaste containing ion compounds. Then, the presentation of illustrations or images is relevant to the subject matter, each 2-dimensional and 3-dimensional image, animation, and video are adapted to ionic bonding material. There is also a picture that lists the three levels of representation (Macroscopic, Submicroscopic, and Symbolic).

b)Graphical Criteria

The validity of graphical criteria get a percentage of 89.33% with very valid criteria. This is because the design of the presentation of the material is classified into several submissions that enable students to know what material is being studied, besides the harmony of the letters using the *Narkisim* font, and the size that can be read clearly by the students, as well as the selection of illustrations, layout and functions images in the media are adapted to aesthetics and ease of reading.

c)Linguistic criteria

The validity of linguistic criteria get a percentage of 93.33% with highly valid criteria. This is because the media developed using language and terms according to the level of knowledge and age of students is easy to understand, the media has also used good and correct Indonesian, and the use of less efficient words is omitted on several pages in the media.

Based on the results of validation, it is known that all components of validation, namely content validity and construct, have a percentage with a range of 86.67%-93.33%. So that the developed media can be said to be valid because the percentage of the overall component is ≥ 61% and in a highly valid category.

CONCLUSION

Based on the formulation of the problem and discussion it can be concluded that the Ionic bond interactive multimedia is declared valid in terms of content validity and construct validity. For content validity which consists of the suitability of the material with the curriculum and the suitability of the substance of the learning material in succession, the average percentage of validity is 93.33% and 86.67% with highly valid criteria. While construct validity which consists of criteria for presentation, graphics, and language, respectively obtained a percentage of average validity of 90.47%, 89.33%, and 93.33%.

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