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Development of Powerpoint Multimedia Based on Quided Inquiry Learning on Oxidation Reduction Reaction Materials on Ability Thinking High Level

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Abstract: The purpose of this research is to develop a powerpoint media for oxidation and reduction reactions based on quided inquiry learning towards high-level thinking abilities of X-grade Senior High School students. The model used is the RND (Research and Development) development model with the 4D method, namely the stages of definition (Define), design (Design), development (Develop) and dissemination (Disseminate). The limitation of this research is only up to the development stage. This development assessment is valid and practical. There are two categories of validation, namely material validation with content, construct, linguistic and graphic validation elements, while media expert validation uses display and media elements. Elements of practice can be seen from the questionnaire conducted by 36 students and 2 teachers. The results of this study are powerpoint media that meet valid and practical criteria, so that they can be used for learning oxidation and reduction reactions to high-level thinking skills in senior high school.

Keywords: Powerpoint; Quided inquary learning; Oxidation reduction reaction

Introduction

In essence, the use of media in the learning process is very influential, because the use of media in the learning process can generate motivation and trigger the learning process and even bring influence and will greatly help the effectiveness of the learning process (Hakim, 2005; Daryanto, 2016). When viewed from the learning media, there are several types of media used in the learning process, namely media like *Macromedia Flash, Powerpoint,* picture cards, Crosswords and more. The use of this learning media will have an impact on the achievement of chemistry learning objectives (Rohman, 2015; Gulo, 2008). One of the uses of learning media is to enable students to learn independently (Maimunah, 2016). The powerpoint program is on of the software specificially designed to be able to display attractive multimedia programs (Kurniawan et al., 2022; Arnita, 2021) and the powerpint program has advantages such as being practically usable for all class sizes (Sanaky et al., 2009). Learning using powerpoint media can be done 4 hours of lessons so that learning time can be shortened and more effective (Arsyad, 2015). Besides that, the use of symbol or icons is commonly known in powerpoint learning (Stemler, 1997).

Learning is said to be effective if the objectives of learning chemistry are achieved, in accordance with the objectives of learning chemistry in Senior High School according to the 2013 curriculum which includes 3 aspects, namely cognitive, affective, and psychomotor aspects. In the cognitive aspect, students must understand chemical concepts and their interrelationships as a provision for studying chemistry in college, then in the affective aspect, applying chemical concepts to solve problems in everyday life, and in the psychomotor field, namely gaining experience in applying the scientific method through experiments. or experiments, where students test hypotheses by conducting experiments. Based on this, in the cognitive field, the goal that must be possessed by students is for students to understand concepts in learning chemistry (Permendiknas, 2006).

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However, the reality in the field of chemistry learning objectives in this cognitive aspect has not been achieved optimally. This the author found during the initial research at Senior High School 1 Rambatan in October 2021. Based on the results of the Daily Test above, it can be said that the score obtained by students is below the minimum completeness criteria. This can be seen from the large percentage of students who do not achieve completeness, which is more than 50%. Based on this, the low student learning outcomes can be categorized: Low understanding of chemistry learning concepts. and Errors in calculations.

Based on this, the low understanding of the concept of chemistry learning and the occurrence of errors in calculations, this is what has an impact on the low learning outcomes of students caused by students' interest in learning, because in the learning process only books are used, and all material is obtained from explanations. subject teacher only (Sagita, 2017; Christianto, 2021). The fact that occurs in schools, most learning practices still emphasize passive learning, where only the teacher explains using the blackboard and book media (Salamah, 2013). Besides that there are 3 level of representation of understanding chemical consepts, namely macroskopic, submicroscopic and symbolic (Jansoon, 2009).

In chemistry, there is a need for interactive media (Febriani, 2020) such as oxidation-reduction reactions. The material for oxidation-reduction (redox) reactions is one of the materials in chemistry learning for class X Senior High School in the second semester.

Oxidation-reduction (redox) reactions are material that contains facts, concepts, principles and procedures (Dewi et al., 2013). The characteristics of the material are factual and abstract, factual material can be seen and learning can be done using experimental methods, while abstract material is submicroscopic that cannot be seen, learning can be done using learning media that can display submicroscopic so that students can understand the concept (Hartono, 2013).

Kozma and Russell stated that submicroscopic representation is a key factor, meaning that the inability to represent submicroscopic aspects will hinder the ability to solve problems related to macroscopic and symbolic level phenomena (Kozma, Russell, 1997). Therefore, (Chandrasegaran, 2008) suggests using strategies and conditions for learning chemistry in the form of macroscopic, microscopic, and symbolic representations simultaneously.

Learning media development powerpoint based on quided inquiry is one alternative that can be used to help smooth the learning process. Students can investigate, analyze so that later they can find their own concepts by following the steps of the learning model quided inquiry. These steps aim to guide students to find their own concepts in the material for oxidation-reduction reactions as well as a solution for teachers in choosing learning models according to demands 2013 curriculum. General objectives of learning quided inquiry to help students develop intellectual thinking skills and other skills such as asking questions and finding answers that start from student curiosity (Haviz, 2016).

In addition, in a 21st century learning ability in higher-level thinking height or Higher Order Thinking Skill (HOTS) as a demand or need to respond to technological advances that are increasingly open, modern and global in a scope of society and environment so that students can construct appropriate and effective arguments in making a decision (Nugroho, 2012). Technological advances bring a change among students, the increasingly widespread use of technology brings various changes ranging from patterns of thinking and ways of acting. In order for undesirable things to happen, there must be an action that can bring students to be more open in analyzing and responding to information wisely. In learning, educators cannot only measure higher-order thinking skills with typed assessments HOTS at the end of the lesson without doing the lesson HOTS first. HOTS must be carefully designed to fit the context of the learners (Nugroho, 2012; Usman, 2002; Ariyana, 2011).

Higher-Order thinking ability is thinking process that involves mental activity in a effort to explore complex, reflective, and creative experiences that are carried out consciously to achieve goals, namely acquiring knowledge that includes analytical, synthetic, and evaluative thinking levels (Wardana 2010). According to (Cohen, 1971). HOTS are divided into four group aspects, namely: decision making, problem solving, critical thinking and creative thingking.

Based on the above, the author feels the need to conduct research to develop learning media powerpoint with learning model *quick inquiry* by title "Development of Powerpoint Multimedia based on Quided Inquiry Learning on Oxidation Reduction Reaction Material on High-Level Thinking Skills for Senior High School".

Method

Types of research conducted in developing learning power point based on quided inquiry learning on the material of the oxidation-reduction reaction on the high-level thinking skills of class X Senior High School students is research and development (R&D) (Sugiyono, 2013). The development model used in the 4-D development model research (four D models). The 4-D development model consists of 4 stages, namely: (1) definition. There are five stages carried out, namely: (a) Front end analysis; (b) Student analysis; (c) Task analysis; (d) Concept analysis; (e) Analysis of learning objectives. (2) design, is done to design learning powerpoint quided inquiry learning on the material of the oxidation-reduction reaction on the high-level

thinking skills of class X Senior High School students. The design of this learning media consists of a cover, menu power point self-profile, components of learning media power point, instructions for using media, Basic Competencies and Competency Achievement Indicators, as well as materials. (3) development, two things were assessed on the learning media, namely the assessment of the validity of the learning media and the practicality of the learning media. Validity test can be known the level of validity of learning media power point, and a practical test to determine the level of ease of use of learning media, time efficiency and the benefits of the designed media. The practicality test involves the teacher and the high school student concerned. and (4) deployment (Latisma, 2011).

A guided inquiry learning model in an interactive multimedia was consisting of five syntaxes including orientation syntax, exploration syntax, concept formation syntax, application syntax, and closing syntax (Hanson, 2005; Hanson, 2000).

However, this research is limited only to thedevelop namely by testing the level of validity and practicality of learning media, while the dissemination stage was not carried out due to time and cost limitations. The subjects of this study consisted of 4 chemistry lecturers at FMIPA UNP, 1 lecturer in Educational Technology at UNP, 2 chemistry teachers at SMAN 1 Rambatan, and 36 students in class X at SMA 1 Rambatan. While the object of research is a learning power point based onquick inquiry learning on the material of the oxidation-reduction reaction on the high-level thinking skills of senior high school.

The instrument used in this study is a validity instrument and a practical instrument in the form of a questionnaire. The data obtained from the product validity test results were analyzed using the Aiken's V formula as shown in the Equation 1.

$$V = \frac{\Sigma s}{n[c-1]} \quad (1)$$
$$s = r - lo$$

Information:
lo = The lowest score in the category (scoring) (in this case = 1)
c = Number of categories chosen by the rater (in this case = 5)
r = Score given by rater
n = Many raters

The validity criteria are based on the Aiken's V scale as follows (Retnawati, 2016).

Table 1. Aiken's V Scale Validity Assessment Criteria

Aiken's V Scale	Validity
$V \leq 0.4$	Less.
$0.4 < V \leq 0.8$	Medium
$0.8 < V$	Valid.

The data generated from the practicality test were analyzed using the following equation 2.

$$P = \frac{Q}{R}\ x\ 100\% \quad (2)$$

Information:
P = Practicality value
Q = Score obtained
R = Highest score
The level of practicality of the developed e-module can be seen in Table 2 (Riduwan, 2010).

Table 2. Practicality Assessment Criteria

Value of Practicality	Criteria
80% < x ≤ 100%	Very Practical
60% < x ≤ 80%	Practical
40% < x ≤ 60%	Quite Practical
20% < x ≤ 40%	Less Practical
0% < x ≤ 20%	Impractical

Result and Discussion

Define Stage (definition)

In the frontend analysis stage, it is known that: (1) The teaching materials used by the teacher are in the form of printed books that only display one level of representation, namely the symbolic level. While the macroscopic and submicroscopic levels are not shown**.** (2) Have not used computer-based media such as powerpoint. (3) In learning the teacher still uses the lecture and discussion method, while the experimental method cannot be carried out due to limited time and facilities. (4) The obstacle faced by the teacher in teaching the material for oxidation and reduction reactions is the characteristics of the material that are difficult for students to understand if they are only explained without looking at the sub-microscopic.At the student analysis stage, know that on Students like learning to use powerpoint media which is equipped with pictures, videos and animations. (2) Difficulties faced by students on the material of oxidation and reduction reactions is the absence of practicum due to limited time and facilities so that the teacher only conveys the material by the lecture method. (3) Students easily forget the concepts learned in the material of oxidation and reduction reactions because students are accustomed to memorizing concepts. In the task analysis, basic competency analysis is carried out. 3.9 Analyzing oxidation and reduction reactions using the concept of elemental oxidation numbers. 4.9 Analyze several reactions based on changes in oxidation number obtained from experimental data and or through experiments.

From the basic competency analysis, the indicators of competency achievement were formulated in accordance with the conditions at SMAN 1 Rambatan, namely the concept of the development of oxidation-

reduction reactions consisting of differentiating oxidation and reduction reactions in terms of the binding and release of oxygen, determining the oxidation and reduction reactions in terms of the release and acceptance of electrons, determining the number oxidation of atoms in molecules or ions, identify oxidation and reduction reactions in terms of decreasing and increasing oxidation numbers, distinguishing reductants and oxidizing agents in oxidation-reduction reactions, analyzing oxidation and reduction reactions and not oxidation-reduction reactions. In the concept analysis, the main concepts to be taught are identified, based on the indicators that have been described in the task analysis stage. analysis of learning objectives is formulated based on indicators of competency achievement and concept analysis.

Based on the frontend analysis, student analysis, task analysis, concept analysis and analysis of learning objectives, a learning media is developed, namely learning mediapower pointbased onquick inquiry learning in the oxidation-reduction reaction. This media guides students to find and build concepts by exploring the models and key questions presented.

Design Stage (design)

*Bas*ed on the data and problems that have been found in the define stage, learning media is produced powerpoint using models quided inquiry learning which corresponds to the chemistry textbook used by Moog. Example of learning powerpoint on the material of the oxidation-reduction reaction:

Orientation

At the orientation stage it contains the title, Competency Achievement Indicators (GPA), and students are given motivation and preliminary questions related to learning materials where students are invited to think about a problem related to the material to be studied. An example of the orientation stage display on the material the oxidation-reduction reaction can be seen in Figure 1.

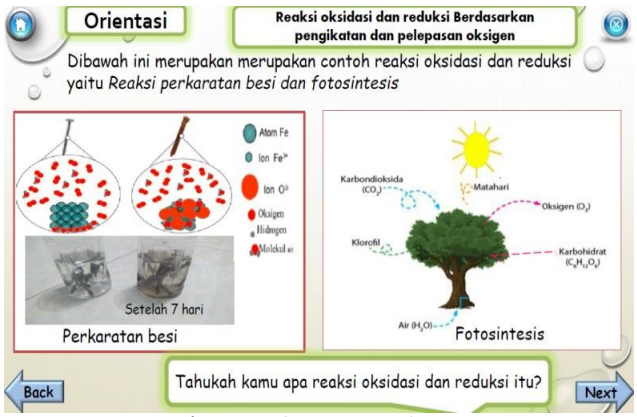

Figure 1. Orientation Stage

Concept Exploration and Formation

The exploration stage displays a model, a model presented on the *power point* Interactivity can be in the form of videos and animations. Students are directed to explore the given model, and are given key questions that will guide students to understand the concept (Hanson, 2006). An example of the display of the exploration and concept formation stage in the oxidation- reduction reaction material can be seen in Figure 2.

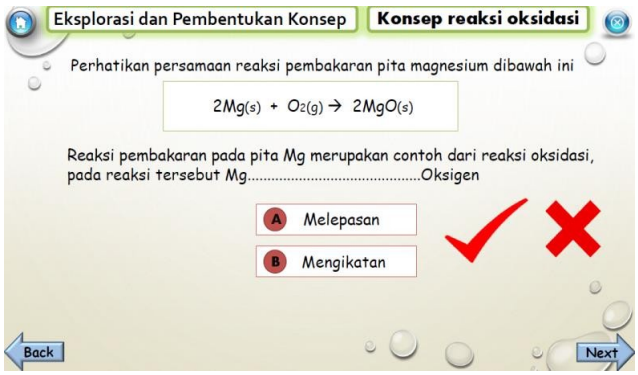

Figure 2. Stage Of exploration and concept formation

Application

At the application stage, students' understanding of the concepts that have been obtained at the exploration stage and concept understanding is tested by answering the practice questions contained in the application stage. An example of the application stage display on the oxidation-reduction reaction material can be seen in Figure 3.

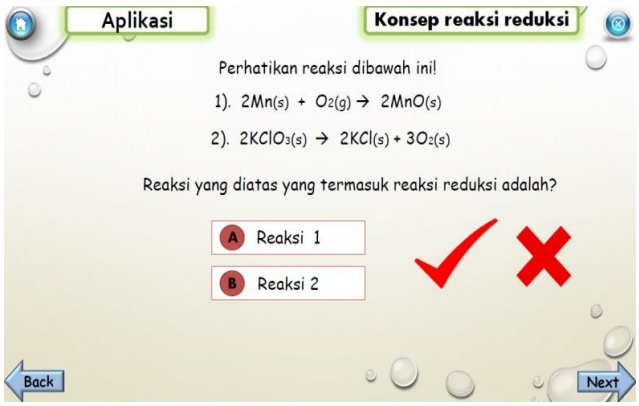

Figure 3. Application Stage

Clossing

At the closing stage, students conclude by answering the questions contained in the closing stage and then choosing the correct answer. Students are considered able to conclude the material after going through the process of exploration and concept formation as well as exercises at the application stage. An example of the closing stage of the oxidation-reduction reaction material can be seen in Figure 4.

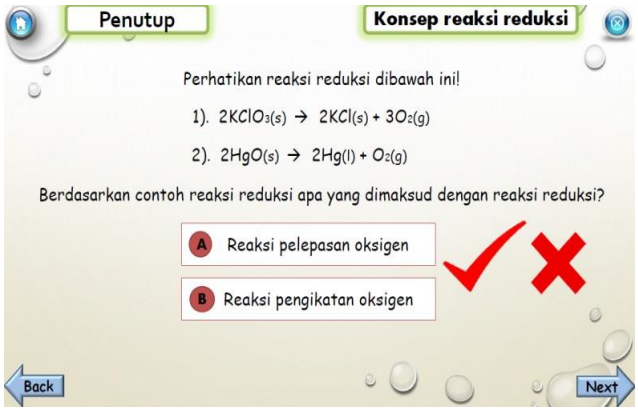

Figure 4. Clossing

Development Stage

1. Validity test.

The media validation test consists of a content component, a presentation component, a linguistic component and a graphic component and the media expert validity test consists of a display aspect and a media aspect. Based on the results of the media validation data analysis, the average V Aikens was 0.90 with a very high validity category, and the media expert validation obtained an average of 0.92 with a very high validity category which indicates that the learning powerpoint based on quided inquiry learning the material for oxidation-reduction reactions to higher-order thinking skills developed is valid and in accordance with the assessment components contained in the Ministry of National Education (Depdiknas, 2008). Learning media validation test results powerpoint which consists of these components can be seen in table 2 and the results of the media expert validity test can be seen in Table 3.

Table 2. The result of the analisys of the validity of media by the validator.

Rated aspect	V Aikens	Category Validity
Content Component	0.89	Very high
Construct Component	0.88	Very high
Language Component	0.90	Very high
Gravity Component	0.95	Very high
Average	0.90	Very high

Table 3. The results of the analysis of the validity of the Media Expert by the validator.

Rated aspect	V Aikens	Category Validity
Display Aspect	0.93	Very high
Media Aspect	0.90	Very high
Average	0.92	Very high

2. Practical Test.

Based on the results of the teacher response questionnaire with 2 chemistry teachers at SMAN 1 Rambatan, an average practicality of 0.95 was obtained with a very practical category and students who had validated that were distributed to students in class X Science with 36 students obtained the results of media powerpoint learning with an average quded inquary learning on the material of the oxidation-reduction reaction with very practical criteria. Media powerpoint learning based on quided inquiry learning on the material of the oxidation-reduction reaction, when viewed in terms of time, it is very effective and efficient where the media powerpoint learning based on quided inquiry learning the material for the oxidation-reduction reaction is presented in a fairly short time so that it can help the limited time in the learning process, and is efficient to use. As for the ease of use, media powerpoint learning based on quided inquiry learning the material for the oxidation-reduction reaction is very practical to use. Due to media powerpoint media based on quided inquiry learning the material for this oxidation-reduction reaction can be accessed on a laptop that can be studied anywhere and anytime. Based on the description of the media powerpoint media based on quided inquiry learning on the good oxidation-reduction reaction material that the author, it can be concluded that the learning media powerpoint media based on quided inquiry learning the material for oxidation-reduction reactions is feasible and practical to use as an alternative medium of learning for high school students.

The results of processing the teacher's practicality questionnaire assessment data on media powerpoint media based on quided inquiry learning the redox reaction material for each component can be seen in Figure 5. The results of the data processing of the student practicality questionnaire assessment of the media powerpoint media based on quided inquiry learning. The material for the oxidation-reduction reaction for each component can be seen in Figure 6.

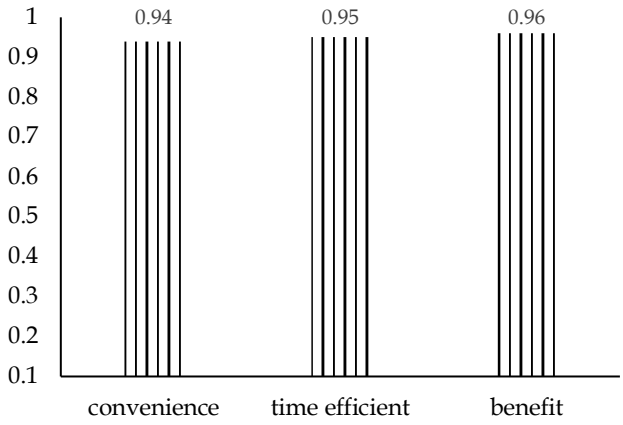

Figure 5. Practicality Value of Each Component of Teacher Practicality

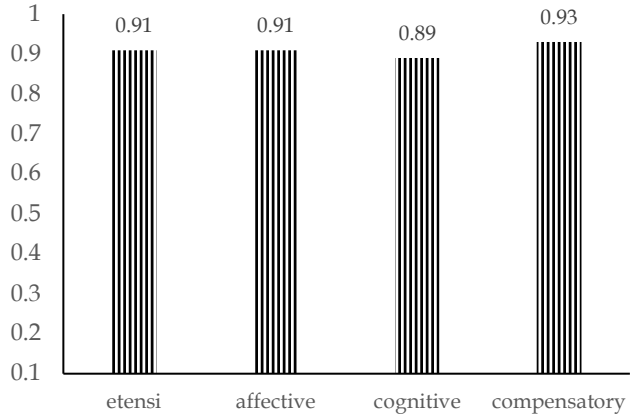

Figure 6. Practicality Value of Each Component of Students Practicality

Conclusion

Based on the data obtained, it can be concluded that the learning media*power point* based on*quaded inquiry learning*the material for the oxidation-reduction reaction on the high-level thinking ability of senior high school students which was developed has very high validity and practicality. Media powerpoint Learning can assist teachers in delivering material and assist students in finding and understanding lesson concepts, because it contains pictures, practicum videos, and submicroscopic animations as well as guiding questions in each *slides*which is displayed.

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