



The Effectiveness of Distance Learning Media Based on Augmented Reality Technology on Covalent Bonding Material for Class X at SMAN 1 Dawarblandong

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Abstract: The Effectiveness of Distance Learning Media Based on Augmented Reality Technology on Covalent Bonding Material for Class X at SMAN 1 Dawarblandong. The purpose of this research was to determine the effectiveness of learning media based on augmented reality technology in covalent bonding in terms of learning outcomes and student motivation in class X-IPA 1 SMAN 1 Dawarblandong. The research method used is One Group Pretest-Posttest Design. The data obtained in this study the following data: student learning outcomes have increased. The value of the pretest and posttest with the acquisition of N-Gain of 0.84 in the high category and 0.61 in the medium category showed the increase of student learning outcomes. Meanwhile, student learning motivation from the response questionnaire obtained an average result of 83.975 with the predicate very effective. This proves that teaching materials based on augmented reality technology in covalent bonding material are declared effective as a medium for chemistry learning

Keywords: Augmented Reality, Covalent Bonding, Motivation to Learn.

Abstrak: Keefektifan Media Pembelajaran Jarak Jauh Berbasis Teknologi Augmented Reality pada Materi Kovalen Bonding Kelas X di SMAN 1 Dawarblandong. Tujuan dari penelitian ini untuk mengetahui keefektifan media pembelajaran berbasis teknologi augmented reality pada submateri ikatan kovalen ditinjau dari hasil belajar dan motivasi belajar siswa kelas X-IPA 1 SMAN 1 Dawarblandong. Metode penelitian yang digunakan yaitu One Grup Pretest-Posttest Design. Data yang diperoleh pada penelitian ini didapatkan data sebagai berikut: hasil belajar peserta didik mengalami peningkatan. Hal ini dapat ditinjau dari nilai pretest dan posttest dengan perolehan N-Gain sebesar 0,84 pada kategori high dan 0,61 pada kategori sedang. Sedangkan motivasi belajar siswa diperoleh dari angket respon diperoleh hasil rata-rata sebesar 83,975 dengan predikat sangat efektif. Hal ini membuktikan bahwa bahan ajar berbasis teknologi augmented reality pada materi ikatan kovalen dinyatakan efektif sebagai media pembelajaran kimia

Kata kunci: Augmented Reality, Ikatan Kovalen, Motivasi Belajar.

▪ INTRODUCTION

In this era of globalization, education is very important for human life, especially the technological aspect. The development of technology in the world increase rapidly, starting from technology in the field decision support system (Sukmana, F, 2018), document processing (Rozi, F, 2015), to the field education precisely in learning technology (Harahap, S. H, 2015). Education is not just preserving and passing on from generation to generation, but also expected to change and develop. For this reason, it is necessary to increase the quality of education and technology in the world. The development of learning technology in Indonesia has been increasingly advanced with the existence of various media learning. Learning media is a tool to demonstrate or convey a material for facilitate a teaching and learning activity (Harahap, S. H, 2015).

Learning media is not only physical, but everything involved which already contains learning materials such as text books, modules, real objects, newspapers, interactive videos, multimedia systems and others, which allow a person to use them to study sequentially (Susilo, J et al, 2017).

Less effective the use of learning media and involving students in the learning process causes students do not understand the material, Chemistry is one of the compulsory subjects for high school students, especially high school students who choose science program. Chemistry is a difficult subject because it is abstract and complex so it requires high-level reasoning and thinking that causes learning difficulties for students. Learning difficulties can be overcome by creating a learning media. Learning media that are often used in learning is power points. Commonly, the power point only contain a lot of text and images with lots of slides and difficult to be understood by students so another media is needed for learning process. One of them is by using augmented media Reality (Kurniawan, Fi. M, 2017).

The current use of Augmented Reality technology in education is still being developed. There is several studies that develop Augmented Reality applications for learning media such as Application of Laboratory Facilities and Infrastructure Selection is an application used to organize spatial planning goods in the laboratory (Utomo, D.S et al, 2017), a home catalog application that is an application to display houses in 3D for house sales (Rifa'i, M et al, 2014), Resistor learning media application is an Augmented-based learning media Reality with resistor material (Kurniawan, Fi. M, 2017). The application of introduction to the temple is an application about the introduction of insights ins and outs of temple images (Barkah & Agustina, 2017), and Applications Introduction to electromagnetic control system components, namely applications augmented reality with 3D objects about the components of the electromagnetic system (Setiawan & Nugraha, 2017)

Augmented Reality has quite number of benefits that can be applied in various fields, such as health, manufacturing and repair, entertainment, military, and education. Augmented Reality can provide description or information that can be more easily understood by the users. Because of its advantages, Augmented Reality can be used to create learning applications that can support teaching and learning process (Widodo et al, 2016).

Chemistry learning about chemical reactions is usually felt boring by children. This is because of the child only know the theory from the book and the teacher's explanation only. Because of it is by making applications that take advantage of

Augmented Reality, children are expected to be more interested and enthusiastic to study chemical reactions due to its utilizing Augmented Reality children can be seen in 3D models of these chemical elements and their incorporation between elements.

Difficulties in understanding abstract chemistry occurs because students cannot witness materials directly, such as the chemical bonding process. In fact, understanding chemical bonding materials is a support for further chemicals (Ilyasa, 2020).

Chemical bonding materials describe the process by which atoms form any bond, whether with the same or different atoms. Chemical bonds occur because a group of atoms exhibits more stable entities. However, it has a lower energy level than the energy level of the atoms that compose it in a separate state (Effendy, 2013). The material in chemical bonds is abstract, so it is difficult to learn contextually. A good understanding of the provided material will make students easier to understand chemical bonding materials (Widarti et al., 2018).

Teachers have an important role in the learning process to create conducive learning conditions so that learning objectives can be achieved. In practice, teachers can use various supporting media, methods and models, as well as instruments learning assessment. Another factor that determines the success of the learning process is an originating factor of the students themselves, such as levels intelligence, readiness to learn, motivation, and learning style. Some of these factors aspects are important enough to improve the quality of learning is motivation student learning (Mulyasa, 2007).

Motivation to learn is overall power the psychic activator in the student give rise to learning activities. Motivation learning is a form of encouragement from inside the student that is displayed in the form of active student participation for carry out a series of use activities get a change in behavior as a result of his learning experience which concerns cognitive abilities, affective, and psychomotor (Winkel, 1996).

Based on the results of observations at SMA Negeri 1 Dawarblandong class X-IPA 1 for three months from early January to March 2021, researchers get a picture of student motivation in learning activities. The results of the observations show that students' learning motivation towards chemistry subjects are varies. Indications of the its variation can be seen from the enthusiasm of students in participating in learning, where there are students who are often late to class during chemistry class hours and leave the classroom during learning activities.

In addition, during the learning process some students tended to pay less attention on what the teacher said, for example talking to peers, not taking notes and not being active in asking questions. Meanwhile, some others show a high willingness to learn which can be seen from the activeness of students in answering teacher questions and asking questions that are poorly understood. Based on this, researchers need to use interactive and interesting learning media so that they can motivate students to be enthusiastic about learning which later can improve student learning outcomes.

Based on the description of the above problems, the researcher needs to carry out learning innovations in the form of the application of learning media based on augmented reality technology to the covalent bonding material of class X-IPA 1 at SMA Negeri 1 Dawarblandong to increase the learning motivation of students whose learning outcomes have increased

▪ **METHOD**

The research was conducted with using a descriptive method aims to describe the systematic facts and characteristics of objects or the subject to be researched appropriately (Sukardi in Cici, 2012). Data is obtained from this research in the form of data qualitative which is then described to get a clear picture and details about learning motivation students in learning activities based on augmented reality technology. The subjects in this study are students of class X-IPA 1 SMA Negeri 1 Dawarblandong, totaling 36 students which consists of 12 male and 24 female.

The instrument used in this research is a motivation questionnaire learn. This questionnaire is used to know the students' motivation after participate in learning activities by applying learning media based on augmented reality technology. Assessment on the questionnaire includes indicators of interest, deep persistence learning, active participation in learning, effort in studying, and great care in study.

The improvement of learning outcomes can be seen from the one group pretest-posttest research design as follows:

$$\frac{O1 \times O2}{X}$$

Information:

O1: pretest before using augmented reality technology-based learning media

X: Treatment (Use of learning media based on augmented reality technology)

O2: posttest after using learning media based on augmented reality technology

(Sugiyono, 2015)

Student learning outcomes are declared complete if a minimum score of 70 is obtained. The formula pretest and posttest used to calculate the value of learning outcomes is as follows:

$$\text{Value} = \frac{\sum \text{true}}{\sum \text{number of questions}} \times 100\%$$

After getting the pretest and posttest learning outcomes, the values are processed using the N-gain formula as follows

$$\langle g \rangle = \frac{(\text{posttest score} - \text{pretest score})}{(\text{maximum score} - \text{pretest score})}$$

(Hake, 1998)

If the n gain value already exists, the next step is to find out the category of improving student learning outcomes by converting the n-gain value in table 1 below:

Table 1. N-Gain Criteria

Value	Criteria
$\langle g \rangle \geq 0,7$	High
$0,3 \leq \langle g \rangle < 0,7$	Moderate
$\langle g \rangle \leq 0,3$	Low

Based on the criteria for the conversion of n-gain, the learning media based on augmented reality technology is said to be effective if the n-gain category gets the "medium" or "high" criteria.

The measurement scale in this questionnaire using a Likert scale which has alternative answer grading from the very positive to very negative. According to Sugiyono (2013) used a Likert scale to find out attitudes, opinions, and one's perception of phenomena. The responses to the motivation questionnaire that have been answered by students are converted in Table 2.

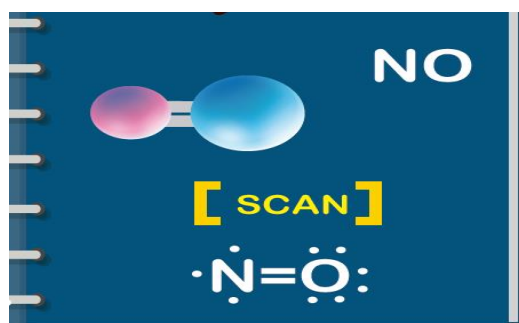
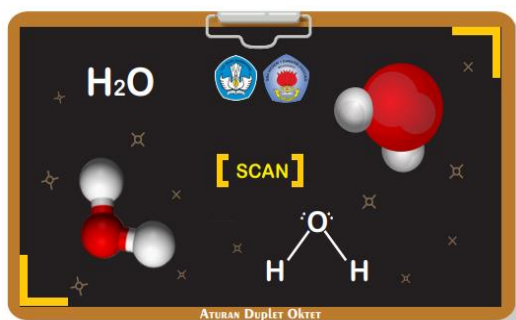
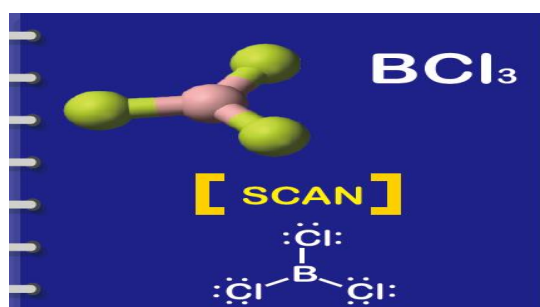
Table 2. Likert Scale of Motivation

Assessment	Score Value	
	Positive statement	Negative Statement
Totally Disagree	1	5
Disagree	2	4
Doubtful	3	3
Agree	4	2
Totally Agree	5	1

After students answer the response questionnaire, the student work data is obtained. Then the percentage is calculated which is then interpreted according to Riduwan (2015). This Interpretation Score is to determine the effectiveness of learning media based on augmented reality technology on covalent bonding material

▪ RESULT AND DISCUSSION

Media was developed to help understand covalent bonding sub material learning, before starting learning students print media images that have been sent by the teacher on Google Drive, following the display of the media:

**Figure 1.** Cover**Figure 3.** Covalent bonds obey the octet rule**Figure 2.** covalent bonds obey the duplet rule**Figure 4.** Covalent bonds deviate from the octet rule

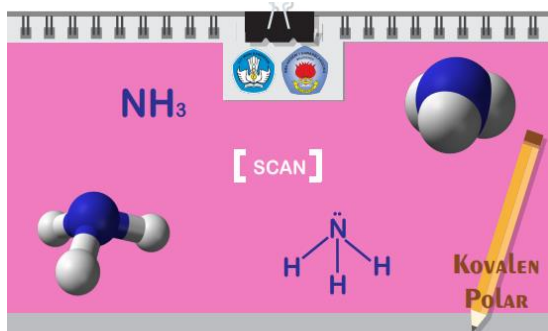


Figure 5. Covalent bonds are polar

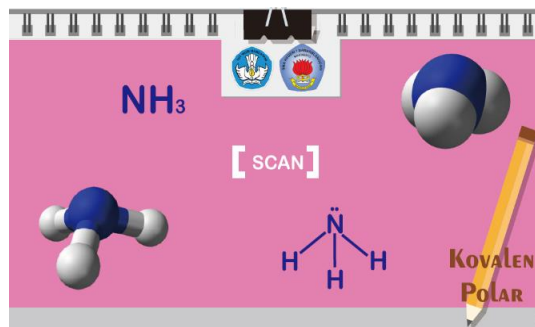


Figure 6. Covalent bonds are non polar

The effectiveness of learning media based on augmented reality technology can be seen from the trial of class X-IPA 1 SMA Negeri 1 Dawarblandong, totaling 36 students consisting of 14 male students and 22 female students using distance learning or online learning while the learning media used in the form of teaching materials developed to obtain data on student learning outcomes. The effectiveness of a learning media can be measured through student learning outcomes.

Student learning outcomes can be seen the improvement through the one group pretest-posttest design method. The learning outcomes are as follows Table 3:

Table 3. Student Learning outcomes

	Category	
	Medium	High
Students	3	33
N-gain Average	0,61	0,84

Based on Table 3, it can be seen increasing student learning outcomes through the results of the analysis using n-gain. The pretest and posttest questions were developed from KD 3.5 Permendikbud No. 37 of 2018 with the type of High Order Thinking Skills (HOTS) questions that have been validated by material experts, namely 2 chemistry lecturers at the state university of Surabaya and 1 chemistry teacher at SMA Negeri 1 Dawarblandong.

All students in class X-IPA 1 did not complete or the score was below <70 and the average pretest 1 class result was 29.16. Then after being given learning treatment using augmented reality technology-based media on covalent bonding material for two meetings, a posttest was carried out using the same questions as the pretest, the results of all students were complete and the average posttest was 87.2.

In addition to improving learning outcomes, the effectiveness of using augmented reality technology-based media is also measured by student learning motivation after implementing learning using augmented reality-based learning media. The following below are the results of student motivation data which can be seen in Table 4:

Table 4. Student Motivation Level

Aspects Assessed	Percentage & Criteria
Self Confidence	83,4 % (Very Effective)
Attention	85,6 % (Very Effective)
Relevance	82,2 % (Very Effective)
Satisfaction	84,7 % (Very Effective)
Average	83,975 (Very Effective)

Based on Table 4. the learning motivation of X-IPA 1 class students of SMA Negeri 1 Dawarblandong in the real of self-confidence obtained a very effective category result with a percentage of 83.4%. Meanwhile, in the attention aspect, the response was categorized as very effective with a percentage value of 85.6%. for the relevance aspect, it got a percentage value of 82.2% with the very effective category. Then the last aspect of learning motivation is the satisfaction which gets a value of 84.7% in the very good category. So that the average student learning motivation is 79.34%, and media based on augmented reality technology can be declared effective when viewed from the motivation of students after learning because the percentage of learning motivation is $\geq 61\%$. if students can increase learning motivation, the learning that has been done will be meaningful (Lutfi, 2013)

▪ CONCLUSION

Based on the objectives and discussion, it can be concluded that the learning media based on augmented reality technology are declared effective as evidenced by an increase in student learning outcomes using data n gain analysis as much as 91.66% obtained a high category of increase and 8.34% obtained a moderate increase category and student learning motivation also increased evidenced by the analysis of the results of the questionnaire response to learning motivation which got an average of 83.975 with the very effective category

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