



## The Implementation of Media Studies Based on 3D Visualization and Animation in Distance Learning Toward the Result Study of High School in Topic of Chemical Bonds

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### **Abstract: The Implementation of Media Studies Based on 3D Visualization and Animation in Distance Learning Toward the Result Study of High School in Topic of Chemical Bonds.**

The impact of covid-19 makes the teaching and learning process of students not direct. The learning process takes place online or PJJ. However, this shift in learning styles affects the learning outcomes obtained by most students. For this reason, the researcher wants to conduct a study to determine the increase in student learning outcomes on the subject of Chemical Bonds by using 3D visualization and animation based learning media in distance learning. The population of this study were students of class X at SMA Panca Budi which consisted of 6 classes. Each class consists of 32 to 35 students. The sample selection technique was purposive sampling. The selected sample is class X MIA-5 as an experimental class which is treated using 3D-based media and animation. While class X MIA-6 as a control class that uses conventional treatment, namely PJJ with lecture and question and answer methods. This study uses a test instrument and no test that has been tested and has been valid. Firstly, the data on student learning outcomes were tested for normality and homogeneity, where the results obtained by the two sample groups were homogeneous and normally distributed. Hypothesis testing is carried out using quasi experiment anova, namely the right side with the results of this study at a significance level of 5% ( $\alpha = 0.04$ ) indicating that  $F_{hit}$  ( $F=54.021$ ,  $P=0,000$ ) then  $H_0$  is rejected. Thus, it shows that there is an effect of learning media based on 3D visualization and animation on PJJ on learning outcomes. Correlation test was conducted to determine the relationship between student activities and student learning outcomes. The results showed that  $F_{hit}$  ( $F=19,645$ ,  $P=0,000$ ) then  $H_0$  was rejected. Thus, there is a significant correlation between student activities with 3D-based learning media and animation with student learning outcomes of 45.4%.

**Keywords:** 3D and animation, result study, PJJ and chemistry bonds.

**Abstrak: Implementasi Media Pembelajaran Berbasis Visualisasi 3D dan Animasi pada PJJ Terhadap Hasil Belajar Siswa SMA pada Sub Bahasan Ikatan Kimia.** Dampak dari covid-19 membuat proses belajar mengajar siswa tidak bisa secara langsung. Proses pembelajaran berlangsung secara daring atau PJJ. Namun pergeseran gaya belajar ini mempengaruhi hasil belajar yang diperoleh oleh kebanyakan siswa. Untuk itu peneliti ingin melakukan sebuah penelitian untuk mengetahui peningkatan hasil belajar siswa pada pokok bahasan Ikatan Kimia dengan menggunakan media pembelajaran berbasis visualisasi 3D dan Animasi pada pembelajaran jarak jauh. Populasi dari penelitian ini adalah siswa kelas X di SMA Panca Budi

yang terdiri dari 6 kelas. Masing-masing kelas terdiri dari 32 hingga 35 siswa. Teknik pemilihan sampel adalah dengan purposive sampling. Sampel yang terpilih yaitu kelas X MIA-5 sebagai kelas eksperimen yang diberi perlakuan dengan menggunakan media berbasis 3D dan Animasi. Sedangkan kelas X MIA-6 sebagai kelas control yang menggunakan perlakuan konvensional yaitu PJJ dengan metode ceramah dan Tanya jawab. Penelitian ini menggunakan instrument tes dan non tes yang telah diujicobakan dan telah valid. Data hasil belajar siswa terlebih dahulu diuji normalitas dan homogenitasnya, dimana hasil yang didapat kedua kelompok sampel homogen dan berdistribusi normal. Uji hipotesis dilakukan dengan menggunakan uji anava dengan hasil penelitian ini pada taraf signifikansi 5% ( $\alpha = 0,04$ ) menunjukkan bahwa  $F_{hit} > F_{tabel}$  ( $F = 54,021$ ,  $P = 0,000$ ) maka  $H_0$  ditolak. Dengan demikian, menunjukkan ada pengaruh media pembelajaran berbasis visualisasi 3D dan animasi pada PJJ terhadap hasil belajar. Hasil penelitian menunjukkan bahwa  $F_{hit} > F_{tabel}$  ( $F = 19,645$ ,  $P = 0,000$ ) maka  $H_0$  ditolak. Dengan demikian, terdapat korelasi yang signifikan antara aktivitas siswa dengan media pembelajaran berbasis 3D dan Animasi dengan hasil belajar siswa sebesar 45,4%.

**Kata kunci:** 3D dan animasi, hasil belajar, PJJ, dan ikatan kimia

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## ▪ INTRODUCTION

The digital revolution and the era of technological disruption are other terms for industry 4.0. It is called the digital revolution because of the proliferation of computers and automation of records in all fields. Industry 4.0 is said to be the era of technological disruption because automation and connectivity in a field will make the movement of the industrial world and job competition non-linear. One of the unique characteristics of industry 4.0 is the application of artificial intelligence.

The digital revolution or industrial era 4.0 affects various sectors of human life, one of which includes the education sector. To anticipate the industrial era in the world of education, human resources are needed, especially in terms of qualified teachers, who master science and technology, and who have creativity, are innovative, adaptive, and have a personality. Teachers must have the competence to adapt to developments in the industrial era 4.0.

One of the competencies that teachers must have to adapt to developments in the industrial era 4.0 is the transition of teaching media used by teachers to technology-based media. Learning can be said to be successful when students achieve the expected competence, because it is a reflection of the student's ability to master a material.

Chemistry is one of the compulsory subjects studied by high school students, especially those majoring in MIA. One of the materials in chemistry learning is molecular shape material. Molecular form matter is chemical material that describes how the molecule looks like when the atoms are related to one another.

Meanwhile, based on journal references, according to Suyanto (2018), regarding student learning outcomes on molecular form material, it can be seen from the results of daily tests of class XI IPA1 students at SMA Negeri 1 Rowosari in 2016 on Atomic Structure material in which there is material Molecular Forms which are obtained values The highest score is 80 and the lowest score is 10 with an average of 52, and 40% completeness. From the results of the daily tests above, based on case studies and references from journals, it can be seen that students still have difficulty learning and understanding the material form molecules and intermolecular forces. This can be seen from the percentage of student completeness in carrying out the daily test.

Based on the results of a case study at the Panca Budi Senior High School in Medan, the low learning outcomes of students on the molecular form material can occur because teachers are still unable to apply the learning model or method properly and accordingly. The teacher only applies the lecture method without any variation in it. Conditions like this will certainly result in the learning process running unhealthy or less productive because it only makes the teacher a center for students.

Monotonous learning methods that pay less attention to student situations lead to low student learning outcomes, because students are not active and are not motivated to learn the material being taught. While in the learning process, the material can be presented in various ways or methods so that the learning atmosphere becomes more interesting and enjoyable for students. During the learning process the tendency of students to lack learning motivation so that the expected learning outcomes in the learning process are not achieved optimally (Ismail. 2013).

In molecular shape material, students are required to know and understand how to determine molecular shape, hybridization and molecular polarity. In connection with the background of the problems above, it is necessary to make improvements in learning. One of the methods used is to change conventional learning methods by applying learning models and media. The learning model referred to is the STAD (Student Teams

Achievement Division) cooperative type using 3D visualization-based media and molecular animation. Where the cooperative model type STAD generally students will show enthusiasm, persistence and actively discuss and help each other in groups, and are not awkward to ask or ask for directions from teachers and peers. will make students better understand the molecular shape material in terms of visuals and animation. So that it is expected to be able to create a good and fun learning atmosphere so that it can improve student learning outcomes.

Based on the above background, the researcher is interested in conducting independent research with the title "The Implementation of Media Studies Based on 3D Visualization and Animation in Distance Learning Toward the Result Study of High School in Topic of Chemical Bonds"

## ▪ **METHOD**

### **Location and Time Research**

This research was conducted at SMA Panca Budi Medan. When the research was carried out at T.P 2019-2020 Semester Gasal for approximately four months, namely August to November years 2020. The research time stars form the preparation of proposal to reporting the research results.

### **Population and Sample**

The population in this study were all students of class X MIA who used the 2013 curriculum. There were six classes of student in class X MIA at SMA Panca Budi. Each class has an average number of 23 students. The sample in this study consisted of two class taken by purposive sampling. Class X MIA-5 experiment class and X MIA-6 control class.

### **Research Variable**

Variable is the object of research or anything that becomes a point of attention in research. As for the variable in the study are: a) Independent Variable. Independent variables are variables that affect or cause. In this study, the application models based on scientific and conventional literacy. b) Dependent Variable. Dependent variables are variables that affect or cause. In this study, the application of media study based on 3D visualization and animation for distance learning chemicals Bonds. c) Control Variable. Control variables are variables that must be controlled in a study. The control variable in this study is the teacher who teaches, the material taught, the student handbook, the time used and the same questions about the instruments (pre-test and post-test). This control variable is used to homogenize the sample so that the sample has the same effect on the symptoms studied.

### **Research Instruments**

In this study the research instruments consisted of test instruments and non-test instruments. The test instrument is an objective test (multiple choice questions) and the non-test instrument is an observation sheet for student activeness assessments.

Test Instrumen. The test instrument used in this study was a test of student chemistry learning outcomes, namely the pretest and posttest. Pretest is given to the sample before treatment (treatment) with the aim of knowing the homogeneity and normality or similarity of the characteristics of the students' initial abilities. Posttest is given after completion of the treatment process with the aim of knowing student learning

outcomes. In this study, the researchers analyzed the test instruments qualitatively and quantitatively. For qualitative analysis, namely the content validity of the learning outcomes test instrument, while the quantitative analysis was testing the questions to students

**Content Validity.** After the instrument was tested and searched for the validity of the test *SPSS 19 for Windows*, from the 50 items tested, 40 items were valid and 10 items were invalid. With  $r_{count} = 0.334$  and  $r_{table} = 0.320$ .

**Reliability Test.** The test results of the test *SPSS 19 for Windows*, that have been tested, obtained the reliability of the test of 0.912 so that  $r_{count} > r_{table}$  ( $0.912 > 0.320$ ). It can be concluded that the overall test learning outcomes are classified as reliable and can be used as a research instrument with a very high category.

**Level of Difficulty.** The trial results can be seen from the 50 questions tested, it is known that 20 questions are classified as easy category, 19 questions are classified as medium category, and 11 questions are classified as difficult category.

**Discriminatory Power of Problems.** Based on the instrument trials that have been carried out, there are only 40 items that can be used as a research instrument as seen from the requirements for validity, reliability, difficulty level, and differentiation of the test (attachment 16), but only 25 questions were selected to be used as instruments. research based on indicators from the Learning Implementation Plan (RPP) and the form of questions in the cognitive domain

## Research Design

Based on the problems studied and the research objectives, this type of research is an experimental research. The research was conducted in two classes, one class used as the experimental class and one class as the control class. The research design used T1 and T2 designs, respectively, was the initial test and the final test, while X and Y were the treatment, namely the learning model used, as in table 2.2.

**Table 1.** Research Design

Group	Initial Test	Treatment	Final Test
Experiment	T <sub>1</sub>	X	T <sub>2</sub>
Control	T <sub>1</sub>	Y	T <sub>2</sub>

Information :

X = The treatment that will be given to the experimental class is learning using media Visualization 3D and animation

Y = The treatment that will be given to the control class is learning using conventional learning models.

T1 = Initial test (Pretest)

T2 = final test (posttest)

## Data Collection Technique

### a. Research Preparation Stage

Conducting observations at school to find out problems that occur in the learning process, especially in class X regarding chemistry lessons and learning models. Preparation of research proposals. Approval of research proposals. Perform content validity on multiple choice test instruments with expert validators. Analyzing the validity and reliability of the non-test instruments. Testing the test instrument on the questions that will be given to students as the research sample. Manage research permits.

Consultation with the principal of the school where the research was carried out by bringing a research permit. Consultation with a chemistry teacher for class X MIA SMA Panca Budi Medan. Compiling learning materials by applying media visualization 3D and animation and conventional learning models in the control class. Arrange student learning evaluations.

b. Research Implementation Stage

Determine two classes randomly from several parallel classes that exist as a sample class. The first class was used as the experimental class and the second class was used as the control class. Before learning begins, first collect data on students in each experimental class and control class. Carry out a pretest (T1) in the experimental class and control class to measure the initial ability, normality and homogeneity of the sample before being given treatment. Determining a sample of students, namely students whose status is relatively homogeneous. Providing X treatment (applying media visualization 3D and animation distance learning in the experimental class and Y (using the conventional distance learning model) in the control class for a certain period of time. used, the length of teaching time, etc. During the research process, each experimental class and control class observed student activity through an observation sheet assessment of activities observed by the observer while the learning was in progress, namely from the beginning to the end of the learning. Providing treatment in the experimental class and in the control class is complete, the next stage is giving a posttest (T2) to measure learning outcomes and student activities in the experimental class and in the control class.

c. Final Stage of Research

The data on the pretest and posttest scores for each student were tabulated, then calculated the difference in the value of the learning outcomes obtained in the experimental class and the control class before and after treatment (posttest - pretest). Performing the statistical analysis requirements test, especially the normality test and the homogeneity test of the data. Calculating the average (mean) value of learning outcomes obtained in each class. Applying a suitable statistical test to test whether there is an effect of learning outcomes and assessment of student activity attitudes in the experimental class compared to learning outcomes and student assessments in the control class. Draw research conclusions.

▪ **RESULT AND DISCUSSION**

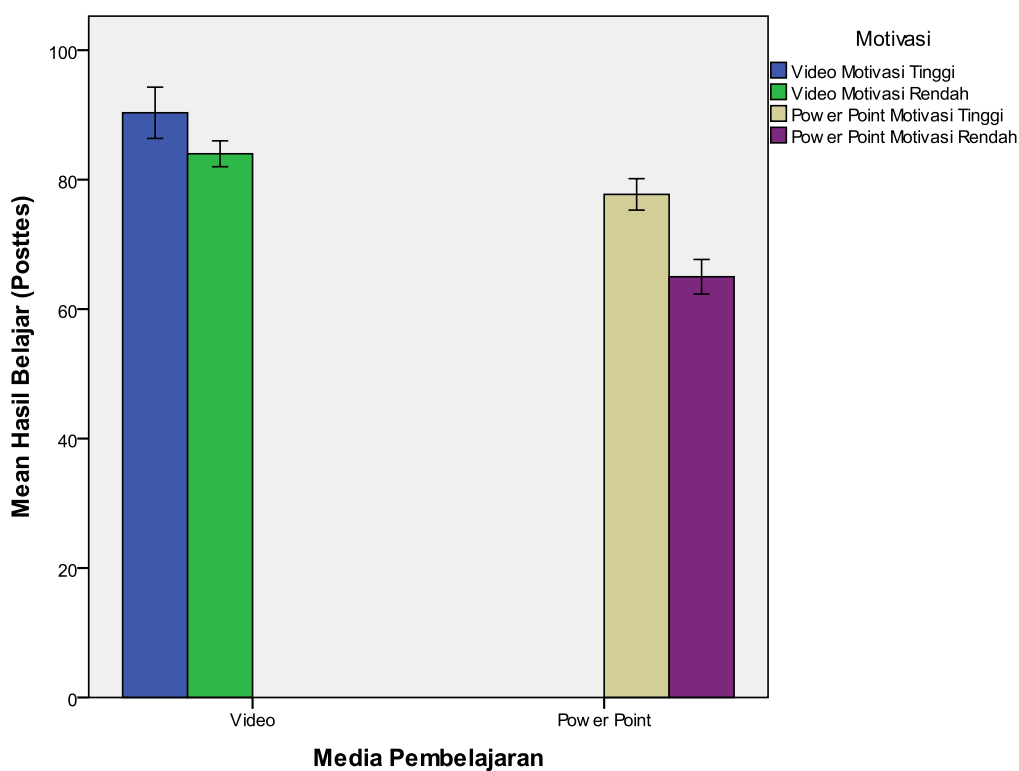
From the results of the research that has been carried out, student learning outcomes indicate that the average pretest score of students in classes taught with Learning Media using 3D visualization and animation is 45.25 with a standard deviation of 9.931 and the average pretest score of students in classes taught with Learning media using conventional media is 46.22 with a standard deviation of 9.472.

While the average posttest value of students in classes taught using Learning Media using 3D video and learning animation was 88.75 with a standard deviation of 7.232 and the average posttest value of students in classes taught using conventional learning media was 75.24 with a standard deviation of 7.232. standard deviation of 8,212. Student learning outcomes are presented in table.

**Table 2.** Score of Students

Media Study	Pretes		Posttes	
	Average	SD	Average	SD
<b>Visualization 3D and Animation</b>	45,25	9,931	88,75	<b>7,232</b>
<b>Konvensional</b>	<b>46,22</b>	<b>9,472</b>	<b>75,24</b>	<b>8,212</b>

To more clearly see the effect of student learning outcomes (posttest), it can be seen in the following graph.



Error bars: +/- 2 SE

**Figure 1.** Result Study

## ▪ CONCLUSION

Student learning outcomes with media visualization 3D and animation in the experimental class were higher with an average score of 88.75, while in the control class, they were 75.24. The average value of learning outcomes in the experimental class has reached the minimum completeness criteria (KKM) at SMA Panca Budi Medan, namely 75, but in the control class there are students who have not reached the minimum completeness criteria (KKM). There is a difference in the increase in student learning outcomes in the experimental class and the control class. In the experimental class there is an increase in student learning outcomes by 86%, while the increase in student learning outcomes in the control class is 80%.

The media study visualization 3D and Animation has an effect on student activity with an average value of activity in the experimental class is 78.22 and in the control class 70.07.

Based on the results and conclusions of the study, the researchers have several suggestions, namely for teachers and prospective teachers who want to apply the The media study visualization 3D and Animation to be able to master the class and manage the time well so that the syntax of the The media study visualization 3D and Animation as well as the application of Science Literacy can work well and efficient. More observers are needed in order to provide a more mature assessment of observing student activity. For the management of guided classes with experiments, it takes a longer duration of time so that the teacher can control student activities while conducting experiments in class. It is necessary to do more in-depth research on the factors that affect student learning.

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