

The Existence of Animation in Learning Video. Does it Affect Students' Academic Achievement?

Findi Citra Kusumasari
Chemistry Education
State University of Malang
Malang, Indonesia
findicitrakusumasari@gmail.com

Agus Rimus Liandi
Chemistry Department
Universitas Indonesia
Depok, Indonesia
agus.rimus@ui.ac.id

Abstract— The purpose of this study is to find out the effect of the existence of animation in learning video on students' academic achievement in SMA Trensains Tebuireng Jombang. ICT has been something that can not be separated from our activity. With the development of technology, it affects education field too in using technology in learning environment. Now days there are many videos relating about topic that is learned in school, and it can be got easily from internet. In chemistry, there are two kinds of video, video about experiment and video about explanation. In explanation video there are two types video, explanation using picture (static graphic) and explanation using picture animation (dynamic graphic). This study used quasi-experimental post test only design. Both control and experimental group consists of 28 students that have equivalence academic achievement. The control group is given video consists picture still and explanation, while experimental group is given video that consists picture animation and explanation. From the result, it shows that there is significant difference between control and experimental group at significant level 0.05. Experimental group has higher score in the post test compare to control group with significant differences 0.002. So, the learning video that uses audio and visual mediator contains picture animation inside it can increase students' understanding.

Keywords : ICT, Animation, Video, Academic Achivement

I. INTRODUCTION

The development of technology has increased rapidly and it affects education aspect as well. Some innovations, especially in technology will influence learning and teaching atmosphere. Information and Communication Technology (ICT) becomes one of component that can not be separated in our life. Computer, internet, television are some of example of ICT that are used in education environment. Using ICT learning can be done anywhere and anytime. [1]. Students can discuss, share and work together although they are not in the same place. And also they can discuss with other students around the world without limitation.

Now days, students more frequently use computer [2]. Using computer though accessing, selecting and organizing they can get more information quickly to increase their knowledge and build their understanding about a topic by themselves. ICT also creates students to have higher level understanding [3]. ICT give unlimited distance to explore something new to increase information. People can build new

knowledge from their background knowledge before and it can make them more confident to take risk and learn from their mistakes before [4].

Internet is one of facilities that grow faster in this era. From internet we can get information easily, including learning video. Learning video is a media that offer information through audio and visual language to support understanding of learning material [5]. Video has two mediators to send information. From audio part, the information is got from hearing aspect and visual part will complete this catching information from its visible elements which is shown simultaneously. Video can contain multimedia elements such as text, images, sounds and also animation [6]. The component in video will support the explanation of material that makes its understanding easier. Using video, the students can control the information that they want by stop or repeat the video. It makes the information that they get becomes deeper in learning with video. The pedagogical impact using learning video are [7] :

- (1) Interactively with content : in the learning video, the information is delivered in audio-visual that makes the learners get understanding easier
- (2) Engagement : the learners can involve in the video because of the audio and visual offering
- (3) Knowledge transfer and memory : using learning video, information can be transferred easily and it can stay still in memory much better than other learning media

Utilization of learning video in the classroom is not something new in learning environment. Learning video can be got easily from internet. There are many videos with various content can be got from internet with just typing the topic of video which is needed. In chemistry, there are two kinds of videos that present in the internet. It is about experiment and explanation. Video about laboratory experiment shows the real experiment in the laboratory or using animation or picture to show how the experiment works. In explanation video, there are some types of videos. There are explanation from expert, explanation from lecture in the classroom, explanation using picture (static graphic) and explanation using animation (dynamic graphic) accordingly. Therefore, choosing best video to make deeper understanding becomes important. It is caused

the main function of the existence of video is making easier insight of learner.

From the information above, there are two visualization forms in learning material especially in explanation video. The visualization can be presented in picture still or in animated picture. The purpose of picture in learning is students can capture the information that needs visualization completely. Using informative picture in picture still form, the information can be provided in graph, charts or illustration. In animated pictures, the picture is presented in material that needs movements. Movement or motion is the crucial part to increase understanding about that material [8]. So, animated picture will accent in motion to visualize the concept.

The increasing of development of multimedia especially animation equal to the increasing of utilization visualization media as one of learning materials because it believes that it can facilitate learning environment [9]. Animation becomes one of well-known media in education [10]. There are many studies that show positive effect from utilization of animation learning environment. Animation is a technique to visualize abstract thing to make it easily to understand. Painting and cartoons will not be animations if they don't show any movement. This is because animations should not be continuously moving, nor stay in motion forever [11]

Animation can develop both affective and cognitive aspect of the students. In affective aspect, students can give more attention because there are some attraction sides in animation to make them more interested and motivated in learning. While in cognitive aspect, students can increase their understanding about the material because animation gives clear visualization in the abstract part that makes the concept can be easier to be understood [12]. Animation gives more realistic representation that is similar with the reality.

Chemistry is one of subject in senior high school that contains abstract material and difficult to understand. It is caused by many topics in chemistry must be visualized by the students to understand the chemical phenomena. Beside that, most of topics in chemistry contain material that is unseen because chemistry tells in molecular scale and intangible [13]. Therefore, ICT is very helpful in this case to make the learners become easier to understand about the material. Njoku and Eze-Odurukwe [14] showed that the students that got material using animation media got improvement in their academic achievement. Ikwuka and Samuel [15] indicated that students who were taught Chemistry concept using CACI (Computer Animation Chemistry Instructional) had higher academic achievement than students that taught using CM (Conventional Method). In making chemistry subject become more enjoyable and easy to be understood, learning media such as learning video is needed. Beside it can make the material become easier to understand because it is visualized, the students can give more attention when the learning video is played.

Reaction rate is one of material in grade XI in Senior High School. One of topic in that material is about factors that affect reaction rate. In that topic, students have to understand why that factor can affect reaction rate. Beside that, students also have to know more about how the mechanism from that factor

until it can cause the changing of reaction rate. Reaction rate's topic is one of abstract topic because it happens in molecular scale. While understanding this topic, students have to imagine and visualize by themselves how the molecular works and make differences in the reaction rate. That's why animation is needed to make it clear using the visualization. Visualization will show the movement of any molecule and make the concept can be easier to understand.

This study investigated the effect of the presence animation in learning video of factors that affect reaction rate. The research will conduct using video only that use explanation and picture still compare to video that use animation picture and explanation inside the video. One video (in control class) used only static (still) image while in other video (experimental class) used moving images.

II. EXPERIMENTAL

A. Methodology of the study

This study used quasi-experimental post test only control group design to get information about the effect of animation's existence in video (independent variable) on the cognitive aspect (dependent variable) in "Factors that Affecting Reaction Rate" topic. A comparison study was made between control group who studied this topic using video that only contain explanation while experimental group would study using video that contained explanation and also animation. Other variable that were controlled, both classes had equivalent in their competence that was known from the examination before in "Thermochemistry" examination. Beside that teacher and post academic test were equivalence too.

B. Population and sample

The population of this research was the students at SMA Trensains Tebuireng Jombang grade XI academic year 2015-2016 and they were 94 students.

The sample was two classes of grade XI SMA Trensains Tebuireng Jombang. One class acted as control group, it is XI Sains 3 and other acted as experimental group, it is XI Sains 4. The selection of the sample is based on purposive random sampling because both classes have equivalence academic achievement. In this study researcher did post test only experimental method. To know the equivalence of their academic achievement, it is got from their score in material before about "Thermochemistry".

C. The study tools

The researcher conducted explanation of "Factors that Affecting Reaction Rate" using video both in experimental and control group, while the video in experimental group contained animation while explained the topic and in control group the video just contain picture and explanation. The audio commentary, background music, and on screen text were identical in both video

The researcher designed post test only experiment using 20 questions that had been analyzed and validated before. The test consists of 20 items of multiple choice questions. To make sure the reliability of the instrument, there is trial testing group consist of 18 students who not part of the research.

Reliability co-efficient is 0.819 and it means the test consists of question with high reliability and all items are reliable.

D. The process of the research

- The topic “Factors that Affecting Reaction Rate” was selected based on national curriculum at grade XI
- Using the same teacher in experimental and control class to control the effect of location of study.
- Teacher did not give any explanation about the topic in both classes so the students just got the knowledge and understanding from the video
- A post test was held in control and experimental group right after the video over and the duration is 45 minutes.
- The equivalence of two groups and the result from post test was analyzed using SPSS to know the mean, standard deviation and also the (*T*) value.

E. Statistical Analysis

The result of post test and also equivalence is analyzing using Statistical Package for the Social Science (SPSS). Standard deviation is used to obtain information about how close the individual data to mean. T-test is used to know the difference between cognitive score of experimental and control group.

III. RESULT AND DISCUSSION

SMA Trensains Tebuireng is one of school in Jombang city that has used Information and Communication Technology (ICT) in learning. Video is one of example of ICT that give explanation to improve the knowledge of students and animation that give visualization to increase understanding of them.

One of topic that needs more intensive comprehension in chemistry at XI grade is “Factors that Affecting Reaction Rate”. In this topic, students will need more explanation to answer the question “Why” and “How” it can be affected by that factor. That’s why other sources such as video and animation are needed to increase their understanding.

Class that is used in this research is XI Sains 3 as control group and XI Sains 4 as experimental group. Both classes are analyzed its normality and it is given in Table I.

TABLE I. NORMALITY RESULT OF STUDENTS’ ACADEMIC ACHIVEMENT BEFORE TREATMENT

Group	Normality Test using <i>Kolmogrov-Smirnov</i>		
	K-S value	df	Significant value
Control	0.115	28	0.200
Experiment	0.157	28	0.077

From Table I, based on *Kolmogrov-Smirnov* it is known that significant degree on control class is 0.200 and in experiment class is 0.077. Both significant degree is greater than 0.05, so the data is normally distributed..

Equivalence of academic achievement in two groups is done using *Independent-Sample t Test*. The result is presented in Table II.

TABLE II. T-TEST RESULT OF STUDENTS’ ACADEMIC ACHIVEMENT BEFORE TREATMENT

T-test value	T-table value	df	Significant difference
1.222	1.674	54	0.227

Based on Table II, the significant value is 0.227. Significant value is greater than 0.05, therefore it can be concluded that there is no significant difference in academic achievement in both group before treatment.

After giving treatment in both classes, the result from post test that is given as quiz is analyzed to get information about the effect of the performance that has been given shown in table below. Table III shows the normality of academic achievement after treatment.

TABLE III. NORMALITY RESULT OF STUDENTS’ ACADEMIC ACHIVEMENT AFTER TREATMENT

Group	Normality Test using <i>Kolmogrov-Smirnov</i>		
	K-S value	df	Significant value
Control	0.107	28	0.200
Experiment	0.129	28	0.200

From Table III based on *Kolmogrov-Smirnov*, significant value for control and experimental group is 0.200. Significant value in both groups is greater than 0.05, It means that academic achievement in both classes is normally distributed.

Hypothesis test is done using *Independent-Sample t Test*. The result is shown in Table IV.

TABLE IV. T-TEST RESULT OF STUDENTS’ ACADEMIC ACHIVEMENT AFTER TREATMENT

T-test value	T-table value	df	Significant difference
3.214	1.674	54	0.002

From Table IV, it shows that significant difference is 0.002. Significant value is lower than 0.05, therefore it shows that there is significant differences between control group where the students are given a video contain explanation and picture still while in experimental group the video contains picture animation and also explanation. The animation gives visualization to answer “Why” and “How” the factors can affect reaction rate using the movement of molecule that show motion with the different action caused by the action of the factor.

The video that contain explanation and picture only without motion in control group will push the students to imagine by themselves what happen when the action is applied. For the students that have good imagination, they will not find any difficulties to visualize it in their brain, but for students that

have lower imagination aspect, they will just remember without understanding what the videos explain about.

Animation will give more realistic in transformation, movement, and also it can demonstrate action to visualize the changing, procedure and resulting in declined of cognitive understanding compared to the static image in which students have to be reconstructed from a sequence of pictures. Moreover, in static pictures often just give arrows or highlighting and it is still abstract condition for some topics because it still pushes the learners integrated and interpreted by the students alone [16]. The existence of animation in video will provide audio and visual representation in molecular scale about the topic because getting visualization in molecular scale make the understanding of the concept become clear and it present in motion.

This result is suitable with the result of Trevisan, Oki and Senger [17]. They studied comparison between two groups of students. One group used a video of traditional lecture while other group using animation as learning material. The topic was about follicular dynamics. The sample was students in undergraduate reproductive physiology course from six universities in USA. Students who used animation as learning material got significantly higher score.

In the static pictures, it only display *visuospatial* information, while in animations, it displays *temporal* information. It means that animation can act more informative, natural and more similar with the actual condition than static pictures. Therefore, learning video that contains animation inside it become more effective than learning video contains only static pictures [18].

IV. CONCLUSION

From this research can be conclude that there is significant difference between students that get video with explanation and picture (static graphic) and video that contain picture animation (dynamic graphic) and explanation with significant level 0.05 at SMA Trensains Tebuireng Jombang. The existence of animation in learning video can increase the students' understanding because it can visualize the abstract concept using movement or motion and make it easier to be understood.

REFERENCES

[1] J. Shan Fu, ICT in Education: A Critical Literature Review and its implications, 2013, International Journal of Education and Development using Information and Communication Technology (IJEDICT), Vol 9 Issue 1, pp 112-125.

[2] J.J Castro Sanchez, and Aleman, E.C, " Teachers' opinion survey on the use of ICT tools to support attendance-based teaching, Journal of Computers and Education, 2011, Vol 56, pp. 911-915

[3] T. Levin, and R. Wadway, Teachers' beliefs and practises in technology-based classrooms: A development view, 2006, Journal of Research on Technology in Education, Vol 39, pp 417-441

[4] D.L Lowther, F.A Inan, J.D Strahl, and S. M, Rosa, Does Technology Integration Work when Key Barriers are removed?, 2008, Educational Media International, Vol 45, pp. 195-213

[5] C.Riyana. Pedoman Pengembangan Media Video. 2007. Jakarta: P3AI UPI

[6] S.K. Fahrurrozi, The Development of Video Learning to Deliver a Basic Algorithm Learning. 2017, Indonesian Journal of Informatics Education (IJIE), Vol 1 Issue 2 pp 49-56

[7] A. D. Greenberg and J. Zanetis, The Impact of Broadcast and Streaming Video in Education, 2012, Cisco Systems Inc. to Wainhouse Research, LLC, AINHOUSE Research

[8] B. Furstenau, M. Kultz, B. Simon-Hatala and L. Kneppers, Learning from Static versus Animated Pictures of Embodied Knowledge, 2016, CCIS 635, pp. 144-158

[9] S. Kim, M. Yoon, S. M Whang, B. Tversky, J. B. Morrison, The effect of animation on comprehension and interest, Journal of Computer Assisted Learning. 2007, No. 23, 260-270

[10] L. Xiao, Animation Trends in Education, 2013, International Journal of Information and Education Technology, Vol 3, No. 3, pp. 286-289

[11] B. Baglama, Y. Yucesoy, A. Yikmis, Using Animation as Means of Enhancing Learning of Individuals with Special Needs, 2018, TEM Journal, Vol 7, No. 3, pp. 670-677

[12] R.K. Lowe, 'Animation and learning: Value for money?', 2013, in Atkinson, R., McBeath, C., Jonas-Dwyer, D. and Philips, R. (ed), Beyond the Comfort Zone: Proceedings of the 21st ASCILITE Conference, Perth, Australia, December, pp 558-561

[13] B. Pekdag, Alternative methods in learning Chemistry: Learning with animation, simulation, video and multimedia, 2010, Journal of Turkish Science Education, Vol. 7, No. 2, pp 111-118

[14] Z.C. Njoku and P.I Eze-Odurukwe, Resolving Nigerian secondary school students learning difficulties in nuclear Chemistry using animation solutions, 2015, Procedia-Social and Behavioral Sciences, 176, pp 1034-1040

[15] O.I. Ikwuka and N.N.C. Samuel, Effect of Computer Animation on Chemistry Academic Achievement of Secondary School Students in Anambra State Nigeria, 2017, Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS), Vol 8, No. 2, pp 98-102

[16] T.N. Hoffler, D. Leutner, Instructional animation versus static pictures: A meta-analysis, 2007, Learning and Instruction, 17, pp 722-738

[17] M.S. Trevisan, A.C. Oki, and P.L. Senger, An Exploratory Study of the Effects of Time Compressed Animation Delivery Multimedia Technology on Student, 2009, Journal of Science Education and Technology, Vol 19, No. 3, pp 293-302

[18] W. Schnotz, A Unified View of Learning from Animated and Static Graphics, Chapter 14, 2008