Effect of Using Chemsketch on Teaching Molecular Shape of Hydrocarbon to Increase Student's Achievement

Dewi Natalia Marpaung[1], Lamtiar Ferawaty Siregar[2], Jesi Jecson Pongkendek[3]

[1,2,3]Chemistry Education Department, Faculty of Teacher Training and Education Merauke, Indonesia

e-mail: [1]dewinataliamrp14@gmail.com, [2]lamtiar.siregar@gmail.com, [3]jejepongkendek@gmail.com

Abstract. This research was aim to know the effectiveness of using chemsketch in teaching molecular shape of hydrocarbon to increase student achievement. hydrocarbon is very interesting to be discussed. As we known hydrocarbon is one of difficult subject matter in senior high school. Many students considered that chemistry is a difficult subject and it makes them boring. To solve this problem especially for molecular shape of hydrocarbon chemsketch was effective to increase student's achievement, chemsketch implemented by powerpoint in the teaching and learning process of hydrocarbon topic. The research conducted in SMAN 5 Medan sample that used consists of two class, experiment class, and control class. The result showed that chemsketch with powerpoint effective to increase student's achievement in hydrocarbon. Increasing student's achievement showed the average of pretest score is 39.71 and posttest score is 81.71. Percentage of passed students in post-test is 86.49% (32 students). By using chemsketch student's was motivated to study hydrocarbon.

Keywords Chemsketch, Molecular Shape, Hydrocarbon, Student's Achievement.

1. Introduction

Chemistry as one of the science branches that really important, but students regarded it as a difficult subject. So the teacher as a facilitator must solve this problem by communicating the material to the student using strategy [1]. where to provide multiple communication between teacher and students not only meet each other but they also can use animation, sound effect, and other media to explain the data also can used graphic and chart. Multimedia can help teaching become efficient, teacher must be integrated by technology to make learning process more fun [2].

To improve the quality of teaching, the teacher required to be creative. As we known the world today's has been developed in Technology. In education ICT can be used as a learning media to deliver the topic to the student, this is one of the way of teacher to make the learning process more enjoyable and not bored and make the student motivated to learn Animation as a media used in the learning process can improve student's motivation and achievement, both in present and future because media able to help the student easy to memorize because it shows visualization [3]

Hydrocarbons characterized as an abstract concept, for example, the reaction that occurs in alkanes, alkenes. The reaction could not be observed directly. Hydrocarbon demand the students able to draw the molecular shape, many students have difficulty in relating molecular formula with molecular shape. Actually to showing molecular shape used molymod. But w it needs more time to arrange the ball to form the molecular shape. students difficult to understand the concept [4]. They were difficult to understand the microscopic representation of molecules symbol and equation of chemical formula.

Because ICT was developed computer animation is a better concept to use in the teaching of an abstract subject. Learning process in the classroom always conducted by the conventional method so it makes student bored and difficult to understand. Media is really important in the development of education for the learning process, especially in chemistry because some of the topics molecular shape of hydrocarbon must be explained by media to make student easy to understand and learning process will more enjoyable if we used as a learning media in education [5].

This research conducted by using learning media to delivery the topic. The effectiveness implementation of media in teaching and learning process. Blended between media and learning method are more effective and efficient to improve the quality of learning by the teacher if we compare with the conventional method [6]. Implementation of information and Communication Technology (ICT) to develop education in the future not only following the global trend but also improving quality service to the community as a strategic. [7].

ACD/ChemSketch Freeware is a drawing package that allows us to draw chemical structures in hydrocarbon. Chemsketch can draw chemical bonding in 2D and 3D. And the molecule that showed can move Student experience in learning by using tools to implement the courses in chemistry was chemsketch, where for increasing the understanding computation project of molecular shape via visualization tools. [9]. By using chemsketch media, students will be able to draw the hydrocarbon molecules, the 3D of molecules and name the molecule. Actually, learning will be more interesting if students can see the animation, in this case, the 3D of hydrocarbon molecules. The visualization that produced affords student to make the abstract concept that manipulating by chemical structure becomes visible.

Chemical structure drawing software is specialized in the chemical structure information with regard for processing, rendering, and editing. With the advance of bioinformatics for drawing chemical structure [11]. Not only using chemsketch but also using powerpoint to present Students achievement that used Chemsketch as a learning media higher than students achievement that thought by the conventional method, so by using media on hydrocarbon able to improve student achievement. [9]. Founded molecular models, simulations, and animation integrated by visualizing in teaching to promote student more understand in science about unobservable phenomena in chemistry topic [9].

According to the Hennessy [11] the significance of technology for teaching chemistry in schools is inevitable to ignore because the application of technology plays a contributory role in the teaching of science by accelerating and improving work of supporting technology in learning process able to increase student motivation in learning chemistry. Student will explore more information about experiment in chemistry and they can see all the process for making molecular shape in chemsketch more clear. Beside that student in. So students can see the shape in three-dimension rotation, it can make them easy to understand molecular shape.

The use of e-learning material on hydrocarbon able to improve students achievement [11]. By using interactive media, the cognitive test result student learning completeness from 51.35% become 76%. All the treatment was done by using media to conduct learning process on teaching hydrocarbon aim to increase the activity and learning achievement of the student. [12]. Teacher required to be creative and innovative to support and help student motivation to learn the topic in chemistry.

2. Research Methods

This research used quasi-experiment by grouping the sample. This experiment conducted in Senior High School, Grade X. The sample choose two classes, first-class as an experimental class treated by using chemsketch and the second class as a control treated by using the conventional method. The research design showed below

Table 1. Research Methods

Class	Initial Evaluation	Tracking Process	Final Evaluation
Experiment	I1	A	F1
Control	I2	B	F2

Description:

A : Teaching by using Chemsketch

B : Teaching without Chemsketch

I1: Score of initial Evaluation

F2: Score of final Evaluation

Research Variable There are two variables, that consist of:

- Independent Variable

  The independent variable in this research is the use of chemsketch, powerpoint and mind map in experiment class and conventional (explanation) in control class.

- Dependent Variable

  The dependent variable in this research is studying chemistry student achievement on the subject of hydrocarbon.

  There are several steps that will be done to obtain the data in this research. The research procedure that will be done showed in figure 1 below.
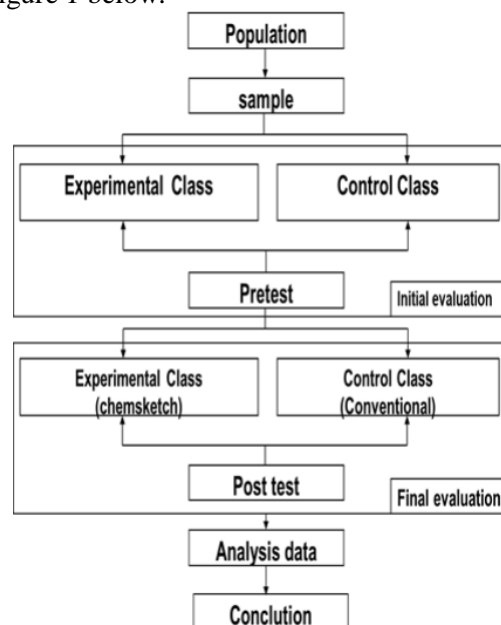

Figure 1. Research Procedure

Research procedure based on figure above consist of

2.1. Population

The populations of the study are all first grade of high school students. The samples are chosen purposively due to the limitation of the researcher. The sample is selected from randomly two classes each in SMAN 5 Medan. The first class is experiment class and the second class is control class.

2.2. Initial evaluation

An initial evaluation in this experiment is giving pretest to the student both in control and experiment class to know how far student understand about hydrocarbon before teaching treatment done in both of the class.

2.3. Implementation

Implementation of teaching process done in both of the class in control and experiment

Learning process in the control class used the conventional method. Control class conducted in one meeting, the activity is consists of initial, core and final activity. In the initial activity, the teacher evaluates initial knowledge of students by giving pretest for 15 minutes. Student's achievement in control class gets from the result of the test in post-test.

In core activity, student taught by using the conventional method, which is explained about hydrocarbon especially about alkane. Teacher giving question to the students to know the ability of the student to understand about hydrocarbon. The last activity is the teacher and student make a conclusion together. Then they're given the posttest to measure their achievement.

The learning process in the experiment class is same with control class, there is no different activity between control and experiment class in initial activity. In core activity, the researcher gave a mind map about the hydrocarbon generally. Then explained about hydrocarbon especially about alkane using powerpoint. Besides that, in the subject matter about molecular structure, after finish makes the molecular structure, the researcher showed students the molecular shape in 3D. to make students interest in learning. Although it is not too effective because students couldn't try it by themselves because of limited computer, but it made them more interesting to see the 3D shape of molecular structure. For learning process, students were active in answering every question that is given. In experiment class also, the researcher gave some candies to every student who wanted to try to answer the questions on the whiteboard.

Data obtained from students' achievement. The students' achievement is obtained based on their achievement in solving problems of evaluation test, pre and post-test. There are 10 questions in each test that cover the hydrocarbon topics. The data is obtained from students' achievement who answer rightly.

3. Result

This research conducted in SMAN 5 Medan by using two classes in Grade X, the first class as a control class and the second as experiment class. Based on table 2, in control class at SMAN 5 Medan, there are 33 students. The average pretest score is 33.33 and posttest score is 73.03%. Percentage of passed students post-test is 69.70% (23 students). In the experiment class, there are 35 students. The average pretest score is 32.12 and posttest score is 81.21. Percentage of passed students post-test is 85.71% (30 students). The gain percentage between the post-test score in the experiment and the control class is 16.01%. It shows that there are differences in student achievement between both classes.62.771.950

Table 2. Result of Student Achivement

	Initial Evaluation		Tracking Process	
	Pre-test	Post-test	Pre-test	Post-Test
Mean	33.33	73.03	32.12	81.21
Median	I2	80	30	80
Maximum	50	90	50	100
Minimum	20	50	20	60
Deviation Standard	9.57	10.15	8.57	11.39

Based on the explanation above, if we compare the mean of posttest in control and experiment class, there are significant differences score where the score in experiment class is higher than in the control class. It is shown in figure 2 below.
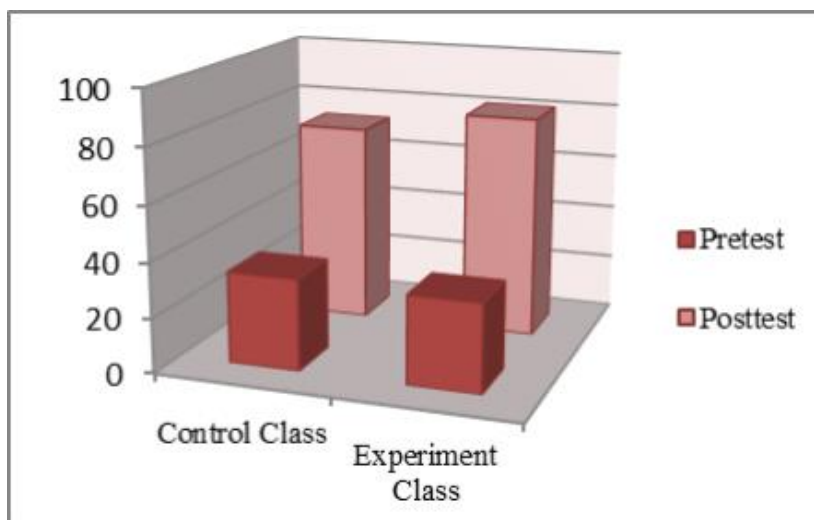
Figure 2. The difference between pretest and posttest score in control and experimental class

Based on calculation, tcalculation = 10.39, meanwhile ttable = 1.997. It means that tcalculation is bigger than ttable. We can conclude that Ha is accepted and Ho is ignored. So there is significant different between teaching uses the chemsketch, powerpoint and mind map with conventional teaching method, where teaching uses the chemsketch, is effective to be conducted in SMAN 5 Medan.

4. Conclusion

Chemsketch as one of the program is used to display two or three dimension structure of chemical bonding. The advantage of using chemsketch is student can see the rotation of the molecule and show the color to improve visualization. In the learning process, students become interested to learn hydrocarbon. Implementation of chemsketch in learning process able to increase student's achievement, besides that student easier to memorize the color of atom information of hydrocarbon.

Based on research in control class, the average pretest score is 33.33 and post-test score is 73.03%. Percentage of passed students post-test is 69.70% it means that from 33 students only 23 students able to pass the test.

While n the experiment class, there are 35 students. The average pretest score is 32.12 and post-test score is 81.21. Percentage of passed students post-test is 85.71% (30 students). The gain percentage between the post-test score in the experiment and the control class is 16.01%.

5. Suggestion

The use of chemsketch in hydrocarbon topic better if students also have a computer or laptop to support the learning process, so they can try to draw the molecular shape of hydrocarbon and make the molecule move and see the three dimension of the atom. Teacher as a facilitator in teaching process must find out more media or application to conduct hydrocarbon topic to motivate student interesting in learning hydrocarbon.

Acknowledgments

Reference

[1] W. Yu and L. Chen, "The Application of Computer Softwares in Chemistry Teaching," Int. J. Educ. Manag. Eng., vol. 2, no. 12, pp. 73–77, 2013.
[2] Y. Baek, J. Jung, and B. Kim, "What makes teachers use technology in the classroom? Exploring the factors affecting facilitation of technology with a Korean sample," Comput. Educ., vol. 50, pp. 224–234, 2008.

[3]   A. Kinoso, "Effect of the Use of Multimedia on Student Performance in Secondary Mathematic," Glob. Media.,vol. 16, no. 30, pp. 1-8, 2008.

[4]   E. Saripudin, I. J. Sari, and M. Mukhtar, "Using Macro Flash Animation Media on Motion Material to Improve Learning Achievement for Learning Science in Junior High School," J. Penelit. dan Pembelajaran IPA, vol. 4, no. 1, p. 68, 2018."

[5]   E. Saripudin, I. J. Sari, and M. Mukhtar, "Using Macro Flash Animation Media on Motion Material to Improve Learning Achievement for Learning Science in Junior High School," J. Penelit. dan Pembelajaran IPA, vol. 4, no. 1, p. 68, 2018.

[6]   S. Novita Yanda and Y. Safitri, "The effect of using e-learning material on hydrocarbon chapter to improve students' achievement motivation in learning chemistry," pp. 843–847, 2018.

[7]   Munir, "Kontribusi Teknologi informasi dan Komunikasi (TIK) dalam Pendidikan di Era Globalisasi Pendidikan Indonesia," J. Pendidik. Teknol. Inf. dan Komun., vol. 2, no. 2, pp. 1–4, 2009.

[8]   N. Evy, S.Susanto, R, Nur' aini. K. D, and Meirista, N., "the Utilization of Edmodo As Learning Strategy in," vol. 226, no. Icss, pp. 1427–1434, 2018.

[9]   R. E. Mayer, "Getting started with blended learning," Comput. Educ., vol. 15, no. 4, pp. 331–346, 2008.

[10]   Z. Li, H. Wan, Y. Shi, and P. Ouyyang, "Personal Experience With Four Kinds Of Chemical Structure Drawing Software : Review On Chemdraw, Chemwindow, Isisdraw And Chemsketch, ". J of chemical information and Computer Sciences. Vol. 44 no. 5, pp. 1886-1890, 2004.

[11]   H. P. S. Noviana, M. Mohammad, and Haryono, "Peningkatan Aktivitas Belajar Dan Hasil Belajar Materi Hidrokarbon Melalui Penerapan Model Pembelajaran Team Assisted Individualization (Tai) Dengan Media Interaktif," vol. 7, no. 1, 2018.

[12]   C. P. K. Sitepu, "Pengaruh Pemanfaatan Media Chemsketch Dalam Pembelajaran Yang Menggunakan Metode Resitasi Terhadap Motivasi Dan Hasil Belajar Kimia Di Smk Kelas Xi," J. Ilm. "INTEGRITAS," vol. 2, no. 1, 2016.