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The Effectiveness of Multimedia-Based Blended Learning Method to Analyst Conceptual Understanding and Characters Development of Students in Hydrocarbon Compound Subject Matter

Nurul Inayah✉, Kasmadi Imam Supardi, Sri Mursiti

Universitas Negeri Semarang, Indonesia

Article Info	Abstract
	The development of communication and information technology has become an opportunity in the development of learning. Conventional learning is no longer effective in improving student learning outcomes. That is important to apply technology integration as a medium and resources in a blended learning system. This research aims to measure how effective the application of blended learning improving learning outcomes in hydrocarbon compound. This quantitative research applied experimental method. The research sample was divided into control and experimental class. The data mining was carried out using test and questionnaire. N-Gain Score and One-sample T-Test applied as analysis technique assisted by IBM SPSS 22. The results showed that the application of blended learning quite effective to increase students' conceptual understanding, the percentage of concept understanding scores in the experimental class 57.80% was far higher than the increase in the control class 15.51%. The students character development through blended learning is in high criteria, the lowest value is 3.6095 while the highest value is 3.6858 and the average value is 3.64 also can be categorized as high criteria. It can be concluded that multimedia-based blended learning method affective to analyst conceptual understanding and characters development of students in hydrocarbon compound subject matter.

✉ correspondence :
Postgraduate Universitas Negeri Semarang
Jalan Kelud Utara III No.37, Kota Semarang, Indonesia 50237
E-mail: nayaqutfi08@gmail.com

INTRODUCTION

Information and communication technology that is increasingly advanced makes the perspective and lifestyle of people in carrying out all their activities change. The role of technology is currently influencing the progress of education, one of which was developed in education based on the Republic of Indonesia Minister of Education Regulation No. 65 of 2013, namely the use of information technology used in learning is used to improve efficiency and effectiveness. Learning in accordance with this now is learning using the blended learning method. Because in the blended learning method learning cannot be separated from the use of technology, this learning can be done offline and online.

Kusairi (2011) said blended learning is a learning method that combines two or more methods and approaches in learning to achieve the objectives of the learning process. Whereas Poon (2013) states that blended learning is used to describe a learning situation that combines several delivery methods that aim to provide the most effective and efficient experiences. Blended learning method is a form of learning that utilizes technology, namely the internet to improve the quality of learning of students in using the functions of technology and information for interaction between students and teachers, in providing material enrichment and developing methods to be used in learning (Su'ud, 2009). Blended learning is a good method of supporting science learning especially in Chemistry subjects.

Students often have difficulty understanding chemical concepts, so students experience misunderstanding. The cause of misunderstanding of the concept of chemistry in terms of matter is caused by the characteristics of chemistry itself. According to Kean & Middlecamp (1985) the characteristics of chemistry, namely most of the concepts of chemistry are abstract, concepts in chemistry are simplifications from the truth, and the chemical concepts are sequential. Understanding is defined as the ability to understand the material (Yulaelawati, 2014). Chemistry requires students to master two types of understanding, namely conceptual understanding and algorithmic understanding (Yilmaz et al., 2007). Chemistry is often regarded as the most difficult science, especially at the recognition level (Chang, 2010).

Hydrocarbon Compound subject matter was chosen because the material is abstract enough so that it cannot be imagined in a real way so that high mastery of concepts is needed and it requires a long time to understand, besides that in hydrocarbon compound subject matter there are concepts very close to its application in daily life. One of the learning that is close to daily life can have a positive impact on students, especially in developing well-owned characters with meaningful learning (Arisetyawan et al., 2014). Hydrocarbon Compound material has characteristics that are generally not liked by students and are considered very difficult. The characteristics of the Hydrocarbon Compound material are; 1) Hydrocarbon Compound Material has many varied terms that students must understand and memorize; 2) The term Hydrocarbon Compounds is usually in the form of names of compounds that are foreign to students because they are rarely found in daily life so they do not know their use and the impact of their use on the environment; 3) Hydrocarbon Compound Material is one of the solid material, so it requires understanding and effective time to study it, and supported by productive activities outside the classroom (Hidayah et al., 2016).

Learning also does not stop at understanding concepts. The real learning goal is to change the behavior of students to become more mature and mature. Therefore the main reinforcement of learning is in character development, including the character of students.

Character is a way of thinking and behavior that is unique to each individual to live and work together, both in the family, community, nation, and country. Individuals who have good character are individuals who can make decisions and are able to account for what they have done, primarily are characters in relation to God Almighty. Chemistry itself as part of the branch of Natural Sciences, is related to efforts to understand various natural phenomena systematically so as to shape the character of students (Samani, 2017).

Alignment between understanding concepts and practicing aspects of character is an ideal form of achieving chemistry learning. Both can include

cognitive (conceptual understanding), affective and psychomotor (character). Therefore, we need an appropriate educational instrument to educate students in order to achieve the above aspects.

The application of learning in the Hydrocarbon Compound subject matter, researchers took the option of applying the Blended Learning method. In line with the development of science and technology, the educational paradigm then shifted from merely using paper to paperless, from face to face traditional classroom to face to face blended learning. Specifically, the application of blended learning has several benefits, one of which is enabling students and teachers to build communication in learning through the global world (Husamah, 2014). The availability of advanced digital technology has changed the way of thinking about chemistry, the diversity of old multimedia as a learning resource that is available free on the internet can be used to present and visualize teaching material whose purpose is to increase understanding of concepts, reasoning, problem solving abilities, even increasing curiosity and creativity learners.

Based on the above thought, the researcher took the title Effectiveness of Multimedia-Based Blended Learning Methods for Analysis of Understanding Concepts and Character Development of Students on Hydrocarbon Compound subject matter. The research was conducted for the purpose of increasing the understanding of the concepts and characters of students in the Hydrocarbon Compound material.

METHODS

This research was conducted at Madrasah Aliyah Darul Ulum, located at Kromodiwiryo Street, RT. 05 RW. 01 Kelurahan Purwogondo, Kalinyamatan District, Jepara Regency. Madrasa equivalent to this high school level stands under the auspices of the Darul Ulum Kalinyamatan Foundation.

This research uses quantitative research methods. Sugiyono (2007: 14) defines it as a research method based on the positivism thinking ground. Quantitative research is used to examine populations or specific samples, with sampling techniques generally carried out by random

means, data collection using research instruments, data analysis is quantitative / statistical in order to test the research hypothesis.

This type of research is a quantitative study with a True Experimental Design approach, which focuses on the analysis of character values contained in the chemistry learning process that includes learning planning, learning implementation, evaluation and supervision, as well as understanding students' concepts in the chemical learning of Hydrocarbon Compound material.

In this study the population in this study were all students of class XI MA Darul Ulum with 147 students. Of the four classes, two classes were taken for the control class and two classes as an experimental class. The research sample of XI IPA 3 and XI IPA 4 is used as the control class, and the experimental class is XI IPA 1, XI IPA 2. The data collected in this study are quantitative data in the form of pre-test and post-test score scores. The data was collected using a questionnaire and written test.

Analysis of the effectiveness of understanding concepts in learning using the Somatic Auditory Visual Intellectual (SAVI) approach can be used. Normalized gain test (N-Gain) was conducted to determine the increase in cognitive learning outcomes of students after being given treatment. This increase is taken from the pre-test and post-test scores obtained by students. Normalized gain or abbreviated as N-Gain is a comparison of the actual gain score with the maximum gain score (Hake, 1998: 65). Calculation of the normalized gain score (N-Gain) can be stated in the following formula:

$$N - gain = \frac{\text{Posttest Score (\%)} - \text{Pretest Score (\%)}}{\text{Maximum Score} - \text{Pretest Score (\%)}}$$

The Criteria for increasing understanding of concepts according to Meltzer in Monariska (2017: 22), can be seen in Table 1.

Table 1. Criteria for Improving Understanding of Concepts

Score (%)	Criteria
< 40	Ineffective
40-55	Less effective
56-75	Quite Efektif
>76	Effective

Analysis of student character data using the formula one sample t-test which is a way to test the difference in sample mean with certain values / constants. One sample t test / one sample t test is used for ratio or interval type data and normally distributed data. One sample t test calculation can use the help of IBM SPSS Statistics 22, namely Anallyse - Compare Means - One sample t test.

RESULTS AND DISCUSSION

Test of Concepts Understanding

Hypothesis testing is done in two stages. The first stage is to analyze the results of the answer questions with the N-Gain technique using IBM SPSS Statistics 22. The results of calculations using the IBM SPSS Statistics 22 application produce scores as summarized in Table 2.

Tabel 2. Output of SPSS Calculation for N-Gain Effectiveness

Class			Statistic	Std. Error
Experiment	Mean		57.80	1.599
	95% Confidence Interval for Mean	Lower Bound	54.60	
		Upper Bound	60.99	
	Std. Deviation		12.792	
	Minimum		33	
	Maximum		90	
Control	Mean		15.51	2.718
	95% Confidence Interval for Mean	Lower Bound	10.07	
		Upper Bound	20.95	
	Std. Deviation		20.881	
	Minimum		-71	
	Maximum		44	
	Range		115	

Based on the above measurements, it can be seen that the average percentage of the N-Gain score of the experimental class was 57.80% while the control class was 15.51%. The conclusion that can be drawn is that the application of blender leraning in the experimental class is in the category of "Effective Enough" to improve students' understanding of the hydrocarbon compound material. Whereas in the control class, conventional learning is categorized as "Not Effective" in improving students' understanding of concepts in hydrocarbon compound material.

Test of Character Development

The total respondents in the experimental class were 64 people who each filled out independent assessments. The results of filling out the questionnaire were then calculated using the IBM SPSS Statistics version 22 to produce a descriptive summary of the data collected. The results of statistical calculations can be summarized in Table 3.

Tabel 3. Data Description Questionnaire Improved Character

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Statement_1	64	3	4	255	3.98	0.125
Statement_2	64	3	4	238	3.72	0.453
Statement_3	64	2	4	213	3.33	0.837
Statement_4	64	2	4	246	3.84	0.407
Statement_5	64	2	4	211	3.30	0.810
Statement_6	64	2	4	224	3.50	0.591
Statement_7	64	2	4	214	3.34	0.781
Statement_8	64	3	4	252	3.94	0.244
Statement_9	64	2	4	248	3.88	0.378

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Statement_10	64	2	4	239	3.73	0.512
Statement_11	64	2	4	235	3.67	0.644
Statement_12	64	3	4	250	3.91	0.294
Statement_13	64	2	4	230	3.59	0.660
Statement_14	64	1	4	227	3.55	0.872
Statement_15	64	1	4	207	3.23	1.020
Statement_16	64	2	4	244	3.81	0.467
Valid N (listwise)	64					

The table above shows a complete description of the existence of data from the results of the questionnaire respondents. Column N is the number of data / number of respondents. Minimum and maximum are the lowest and highest scores from the questionnaire scores. Column Sum is the total score of each statement item. The mean is the average score, while the Std Deviation (Standard Deviation) is the value of the data distribution in the sample that determines how close the individual data points are to the average value of the sample. The greater of standard deviation mean the higher of average value.

Continuing the description of the data above, the next step is to measure the students' character improvement using the one sample t-test technique. In principle, one sample t-test is used to compare the average sample under study with the average population that already exists. This technique is used to test whether certain values differ significantly or not from the average of a sample. The calculation is done with the IBM SPSS Statistics 22 tool. The test results show a summary of the data in Table 4.

Table 4. SPSS Calculation Output Test One Sample T-Test

	Test Value = 0				95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Result	191.287	63	0.000	3.64766	3.6095	3.6858

To interpret these results, we first need to know that the value of t table of df = 63 is 1.67. If you see the above t value of 191.287, it can be concluded that the average value obtained is significant. The lowest value (lower) of the tested score was 3.6095 while the highest value (upper) was 3.6858. If you look at the design of the questionnaire where the highest answer score is 4, then the average value of 3.6 can be said to be of high category.

Discussion

Blended Learning in principle is a learning method developed by enriching sources and teaching materials from various platforms. In this study, researchers enriched blended learning with multimedia content, both video, slide shows, software, to internet content. With so many sources of learning content, students become more able to get used to applying a concept and see it from various points of view. At that point it can be said that students have reached the category of conceptual understanding. Understanding according to Hamalik is the ability to see the relationship between various factors or elements in a problematic situation (Hamalik, 2010: 48).

This learning emphasizes the combination of conventional face-to-face learning with learning with the use of information and communication technology. The advantage of applying this method is that it combines innovation and creativity in technological development with participatory learning activities offered by face-to-face methods. Participation of students in this case is not limited to class activities alone, but broader in the aspect of enrichment of resources and learning materials.

Hydrocarbon Compound Material itself requires complex comprehension abilities, at least to understand the peculiarities of carbon atoms, the classification of its compounds, chain networks intertwined with hydrogen, so that if one

day faced with examples of problems in real life that need to be resolved. Students are said to understand if they can construct the meaning of learning messages, whether oral, written, or graphically delivered through teaching, books, or computer screens (Airasian et al., 2010: 100).

Environmental problems are an aspect often encountered in the study of hydrocarbon compounds. Technological developments are always related to hydrocarbon compound material. Oil fuels, candles, asphalt, plastics, to textile and pharmaceutical basic materials are the main concerns in this material.

Given the complexity and importance of applying this material to everyday life, students need to get a comprehensive understanding of this material. So blended learning is important to provide understanding to students regarding conceptual material and its relationship with everyday life.

As has been tested with the NN-Gain Score above, it has been concluded that the application of multimedia-based blended learning to improve students' understanding of the concept of hydrocarbon compounds included in the category of "quite effective".

In the recapitulation of the character questionnaire, it can be seen that the highest average score is in statement number 1, namely the awareness of returning the items borrowed, with a score of 3.98 closest to the perfect number 4. In this attitude there are at least several indicators of characters at once, namely religious, responsible , honest, friendly, and social care. The lowest score is in statement number 15, which is about awareness of disposing of trash in its place with an average score of 3.23. In the statement there are also several indicators, namely responsibility, care for the environment, discipline and religious.

Here there is a contradiction between the indicators of social responsibility (social relations between people) with indicators of environmental responsibility (the relationship between humans and nature). Returning loans is in relation to fellow human beings, while the behavior of disposing of waste is a human attitude towards the environment. Both indicators get conflicting scores with each other.

The true hydrocarbon compound material includes all the above character indicators to be taught. In addition to developing students' social insights, this material is also very closely related to environmental insights. But there are still misconceptions in character formation through the material of hydrocarbon compounds here. Learners better capture social aspects, compared to aspects of environmental insight.

CONCLUSION

This research generates the conclusion that the application of blended learning to improve concepts understanding of students' in the hydrocarbon compound subject matter is quite effective. This level of effectiveness applies to all indicators of concept comprehension with an evenly proven increase in concept comprehension scores. The increase in the percentage of concept understanding scores in the experimental class by 57.80% was far higher than the increase in the control class by 15.51%. Then it can be concluded that blended learning is more effective when compared to conventional learning. A more significant improvement can be achieved by perfecting the application of blended learning that is tailored to the character of students in the future.

Increasing the character formation of students through blended learning is quite high. The lowest value (lower) is 3.6095 while the highest value (upper) is 3.6858 with an average value of 3.64 can be categorized as high. The highest score on item 1 with a score of 3.98 with the main indicators of social responsibility and care, while the lowest score on item number 15 with a score of 3.23 with the main indicators of responsibility and care for the environment.

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