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The Use of Scientific Issues In PBL Learning On Virus Chapter to Develop Students' Cognitive Outcomes and Health Care Attitude In SMA

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Abstract

Education is now faced with the demands of the 21st century who expect students to have critical thinking, able to solve problems, creative, communicate and collaborate well. The study aims to determine the enforceability of the learning process, develop cognitive skills and attitudes of health care students. The study was conducted in SMA N 1 class X Muntilan academic year 2019 / 2020. Design research was Quasi-Experiment with Non-Equivalent Control Group. The population in the study were all students of class X SMA N 1 Muntilan as much as 7 classes. The samples were determined using purposive sampling technique to obtain class X 6 and X MIPA MIPA 3. The techniques used for data collection are observation, testing, and questionnaires while the data collection instruments namely observation sheets, about the test and questionnaire sheet. Learning to use scientific issues done well, can be seen on the average results of observations for the fourth meeting of the learning that is equal to 93.3% (excellent). Cognitive learning outcomes obtained based on the value of pretest and posttest 20 multiple choice questions and obtained N-gain experiment grade of 0.56> 0.32 grade control. In the analysis of indicators of the result is that the indicator C1, C3, C4 and C6 indicate a difference in the average yield posttest values between the experimental and control classes. Classical completeness experimental class> which controls 97.1%> 71.4%. Based on data from the student health care attitudes questionnaire obtained N-gain of 0.172 (low category) for the control and 0,361 class (medium category) for the experimental class.

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INTRODUCTION

Education today is very important because it serves to prepare students to be able to face the demands of the 21st century. 21st century is the century that is based in science and technology so that human resources should be prepared to afford skilled both in education and in the field of technology. The 21st century recommend their four specific competencies that students should have is critical thinking and problem solving, communication, creativity and innovation, and collaboration (Kemendikbud, 2017: 6).

The government is currently trying to continue to improve education in Indonesia one of them with their curriculum launched in 2013 as a national curriculum. Curriculum 2013 is a curriculum that emphasizes student centered learning by applying 4 models of learning that discovery, inquiry, problem based learning and project based learning which aims to enable students to learn independently. Law of the Republic of Indonesia Number 20 of 2003 states that education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that students are actively developing the potential for him to have the spiritual power of religion, self-control, personality, intelligence, noble character, and skills required. Education is expected to be able to develop the character and potential of students.

Along with the development of science and technology, more and more media that provides a variety of useful information. Media is meant to be a print and non-print (electronically). Print media such as newspapers or magazines of health and non-print media (electronic) such as the Internet or television can now be easily accessed. The media presents news from a wide range of areas of life such as sepertidalam fields of politics, education, sports and health. The development of print and non-print media (electronic) in the field of education can give students knowledge on related phenomena occurring in the environment, especially in school age children.

Minister of Health Regulation No. 25 of 2014 states, children aged 10-18 years are children belonging to the age of adolescence. Adolescence has distinctive properties that is a great curiosity, love a challenge and are likely to dare to risk without prior deliberation, especially in children dijenjang SMA. High school students aged 15-19 years require knowledge and concern over her health-related importance. Based on data from the Ministry of Health (2017) HIV continues to grow, since January until March 2017 infection in children aged 15-19 years is as much as 334 souls.

Learning Biology class X semester consists of a variety of materials one of which is the material Virus. Virus material includes material about the characteristics of the virus, the body structure of the virus, viral replication lytic and lysogenic, role of viruses in life, both positive and negative, the importance of vaccination and community participation in tackling the spread of the virus. Virus material other than it must be understood also should be students apply in life because this material relates to everyday life one of the HIV virus so that it can be useful learning materials for student life.

KD 4.4 still need to be a concern for teachers because all this is still not implemented optimally, basic competencies can provide communication skills in students for learning in the curriculum in 2013 not only emphasizes on cognitive aspects but also on the student's skills. Issues raised for learning with a model Problem Based Learning (PBL) using scientific issues such as health news from various media which is a real problem and it occurs in the student environment. Based on research Zeidler & Nichols (2009) who studied the importance of using sosiosains issues in education, the use of these issues can improve scientific literacy, improve critical thinking, contributing to the education of character, as well as provide interesting material for teaching science.

RESEARCH METHODS

The study was conducted in SMA N 1 class X Muntilan academic year 2019 / 2020. Research was Quasi-Experiment with Non-Equivalent Control Group Design. The population in the study were all students of class X SMA N 1 Muntilan as much as 7 classes the total number of all students is 251, The samples were determined using purposive sampling technique to obtain class X MIPA 6 as an experimental class and X MIPA 3 as a control class. The independent variable of this research is the use of scientific issues with PBL learning model of virus material. The dependent variable is the cognitive

abilities and attitudes of health care students while the control variables is teacher of biology, virus material, the number of lessons, the material for the pretest and posttest. The technique used for data collection are observation, testing, and questionnaires while the data collection instruments namely observation sheets, test questions, and the questionnaire sheet. Observation and questionnaire data were analyzed descriptively percentage, the test data were analyzed using SPSS.

RESULTS AND DISCUSSION

Description of the learning process and enforceability of learning by utilizing scientific issues

Data from the study of primary data that is data of the learning process and learning keterlaksanaan, the data value of students 'cognitive abilities and attitudes of data on students' health care. Other data were obtained are secondary data in response to learning of teachers and students utilize scientific issues. Data enforceability of the learning process and learning are taken at every meeting held in both the control and the experimental class class. The data presented in Table 1 and Table 2.

Table 1 The learning process in the class control

Syntax	Learning process
Observe	The teacher presents the related images during the learning material such as images Virus viral form, the replication cycle of the virus, a disease caused by a virus whether adverse or beneficial, and people with HIV. Students observe the image.
Ask	Students are assisted by teachers ask the things associated with the displayed image. Example questions is how the characteristics of the virus, how the virus can be transmitted, what is the cause of a disease, and how the transmission of a disease.
Collecting data	Students and teachers observe the character of the virus and its replication process, then discuss the causes of a disease, especially HIV and its impact on the body by reading a variety of literature such as books and the internet to be able to answer questions that arise from the students.
Associate	Students and teachers to discuss answers to questions that arise, and then connect it to everyday life, and also discusses the behavior that must be done to avoid contracting a disease.
Commu-nicate	Students explain verbally associated characters and the virus replication process. Students are also able to explain the positive and negative effects of the virus, the end of the learning of students to create a poster related to the HIV virus and to show to the class.

Table 2 The learning process in the experimental class (Arends, 2012: 411)

Syntax	Learning process
Student orientation to problem	The teacher presents a variety of problems that occur in the environment in the form of sheets of discussion. Those problems include the discovery of the virus, the news spread of bird flu in Indonesia, cases of HIV that affects children, tobacco farmers who failed harvests due to plant disease, polio immunization program of the government and the HIV virus in sub-chapter teacher to show pictures of people with HIV. Students read and watch the news which has been provided in the LDS.
Organize students to learn	Students record important information and the fact that they find on the news they read or what they witnessed. Teachers guide students find important facts of news.
Guiding the individual and group investigation	Students gather information from a variety of sources both book and the internet to resolve issues that are available in sheets of discussion. Teachers guide students to use a variety of book and internet literature, because students are less active and less leverage in utilizing the internet to get the information needed.
Develop and present work	Students write down the answers they have found from various literatures was in the form of a report on the discussions, then display it in front of the class. For HIV sub material students make posters in asturo paper with each student creations and displays them in front of the class. Teachers guide students to make a report on the discussions and posters that will be displayed. Teachers also providing the chance for a question and answer when one of the groups present the results of their discussion.
Analyze and evaluate the problem Solving process	Students and their teacher concludes the discussion that has been implemented. Teachers also review the entire matter to the meeting reaffirmed if there is a concept that is less understood for example students as students who still think that HIV can spread via cutlery but this understanding is wrong. Teachers give students the opportunity back in to ask if there are material that has not been understood.

Data were also taken during the study is data learning process that has been done to control class and experimental class. This data taken every meeting. Data in four meetings taken by observing the teacher during the learning takes place. In the control group there were 10 different indicators or aspects of the observed observer during the learning takes place. In the experimental group, there were 15 different indicators or aspects of the observed by observer during the learning takes place. The conclusion from data learning process that has been done are presented in Table 3.

Table 3 The conclusion of learning process that has been done in control class and experimental class

Data	Meeting				Average
	1	2	3	4	
control class	80% (Well)	80% (Well)	100% (Very good)	100% (Very good)	90% (Very good)
experimental class	80% (Well)	93.3% (Very good)	100% (Very good)	100% (Very good)	93.3% (Very good)

Based on the data that has been obtained and analyzed related keterlaksanaan PBL learning by utilizing scientific issues to develop cognitive abilities and attitudes of health care high school students, it is known that the enforceability of the study was included in the criteria very well for the second class. This can be seen in Table 4.5 on the observation that the percentage of 90% for the control group and 93.3% for the experimental class. In PBL learning by utilizing these scientific issues, teachers almost execute all indicators or aspects that must be observed by the observer.

The use of scientific issues to develop students' cognitive outcomes

Based on the pretest and posttest conducted in control and experimental classes. Both of these classes at the beginning of learning has the same capabilities as the t-test showed such results. Both classes beginning of learning also has a normal distribution of data and have the same variance. At the end of the t test of learning from the results that there are significant differences between the average student learning outcomes between the control and the experimental class.

In Table 6 shows the results of the N-gain the experimental class and control both show the result of an increase in the medium category. Values of N-gain control class and experimental class, respectively, are 0.32 and 0.56, although both are in the medium category, but the N-gain experimental class is higher than class N-gain control of this case because the average value posttest experimental group was also higher than the control class. N-gain value is the value obtained from the division between the pretest and posttest value so that it can be ascertained value of N-gain experimental class will be higher because the average value is also higher posttest.

Table 4 The test results of N-gain control and experimental classes

Data	control class		experimental class	
	pretest	*posttest*	*pretest*	*posttest*
Total students	35		35	
lowest Rated	25	35	20	55
The highest score	70	100	70	90
Average	46.14	63.42	42	75
N-gain	**0.32 (Medium)**		**0.56 (Medium)**	

The average value obtained in the posttest control class is 63.42 and posttest obtained experimental class of 75. This shows that the average yield higher posttest experimental class after learning. Based on this it was concluded that PBL learning by utilizing scientific issues can improve the cognitive abilities of students. However, because this pembelaran never been accustomed to the students, student learning outcomes is less than optimal. The average obtained experimental class is higher, but only slightly. In the control group were also found 1 students scored 100, while in the experimental class did not exist. It can be caused due to these students really like biology,

In Table 5 shows the average information regarding student learning outcomes of each indicator between the control and the experimental class class. In the data analysis has been done can be seen that on the overall indicator Bloom's Taxonomy of C 1 to C 6 (Krathwohl, 2002) showed that the experimental

class has an average value posttest higher value than the control class. T test then performed on the average value, the results showed that although the experimental class overall average is better than the control class, but only on indicators of C 1, C 3, C 4 and C 6 are indicated differences between classes the control and the experimental class.

Table 5 The t-test indicator of cognitive abilities and experiment control class

No.	Indicator	classroom Control	class Experiment	T test results
1	C 1 (Given)	40	61.4	0.011 (Different)
2	C 2 (Understanding)	60	64	0.483 (Not Different)
3	C 3 (apply)	66	79	0.002 (Different)
4	C 4 (Analyze)	66.4	80	0.026 (Different)
5	C 5 (Evaluate)	85.7	91.4	0.460 (Not Different)
6	C 6 (Creating)	68.6	94.3	0.005 (Different)

Mastery learning students classically based Table 6 it can be seen that, based on the sum of the value of the student's final of twice the value of the posttest, one score sheet discussions and one-time value assignment poster students obtained results that were completed in the classical style is experimental class alone while the control group did not complete classically. Experimental class classical completeness reaching a percentage of 97.1%, while the control group only 71.4% declared incomplete so classically, this is in line with the results Widyastuti (2016) which states that the classical completeness student is at least 85%. According to research from Nuangchalerm (2010) states that the issue of Socio-Scientific can improve cognitive ability and analytical skills of students.

Table 6 Classical learning completeness students

Data	control class	experimental class
Average value	74.5	80.6
Number of students completed KKM	25	34
The number of students do not complete KKM	10	1
Percentage of students completed KKM	71.4	97.1

The use of scientific issues to develop students' health care attitude

Data on students' health care attituude taken beginning and end of learning. N-gain data from the four indicators are then averaged and the result amounted to 0,361 in the medium category. Based on this average, it is known that the N-gain experimental class> class control so it can be concluded that the experimental class learning to use the scientific issues can improve students' health care attitude is higher than the control class. Thanks to habituation and insertion of values of health care students to care about their own health and the environment, can eventually grow and develop students' attitudes toward health care. Indicators used to measure students' attitudes of health care there are 4: 1) student's basic knowledge about health, 2) awareness of the students maintain a healthy body and environment, 3) the ability of students to investigate health problems in the neighborhood and 4) application in everyday life (Adapted from Dimopoulus et.al, 2009). N-gain test results are presented in Table 7.

Table 7 Test N-gain attitude indicator of health care and the control class experiment

No.	Indicator	Control Class		N-gain	ExperimentClass		N-gain
		Before	After		Before	After	
1	Basic knowledge about health	86.97	88.89	0.147	85.59	93.58	0.554
2	Awareness maintain health	74.03	76.39	0.091	72.64	77.08	0.162
3	The ability of students to investigate health problems	86.31	90.18	0.283	85.61	91.07	0.379
4	Application in the life	78.30	81.94	0.168	74.13	83.16	0.349
		Average		0.172	**Average**		0.361

Teacher responses to learning process

Data questionnaire responses teacher in PBL by utilizing scientific issues can be seen in Table 8. Based on these data it can be seen that the response of teachers also showed a positive response to learning. Based on the results of questionnaires were obtained, PBL learning utilizing scientific issue is in accordance with the curriculum of 2013 as one of the suggested learning model 2013 is a PBL curriculum.

From this learning can improve learning becomes more meaningful for students because it shows the real problems that occur in the environment are also students will find themselves learning concepts in the material, especially viruses, not by the material they are given by the teacher.

Table 8. The results of the questionnaire responses of teachers to learning

Indicator	Responses Teacher
The response of teachers to learning	Appropriate learning material used for virus because it can stimulate students to be active during learning in solving problems that are available in sheets of discussions and to make students more active in digging up information.
Attract student interest	Learning can be used to attract student interest for each student become actively involved in the learning process.
Easier for students to understand the material	Learning can be easier for students to understand the material because every student can search for information and propose in their group so that students not only become the object of study only.
Encourage active students	Learning to use a scientific issue capable of making every student involved in learning so as to make students more active.
Easy to implement	Learning can be carried out by teachers but requires more preparation for designing the learning process in the classroom.
Train students to solve problems	Learning to train students in problem solving because the discussions sheets provided questions that must be resolved within the student-related issues.
Train communication skills	According to the professor, this learning can train students in communication training for the group of students freedom of speech and respect the opinion of other friends to get the best answer to solve the problems are provided.
Criticism and suggestions	Internet use can be maximized to obtain information that is more diverse.

In learning to utilize scientific issues facing some obstacles such as depreciation and conditioning class hours students are still difficult for students not yet accustomed to the discussion. Based on research Tidemand & Nielsen (2017) stated that teachers have a low awareness of the potential problems of scientific issues to be used in learning is also the need for sufficient time to prepare lessons. Therefore, the readiness of both teachers and learning materials in the classroom conditioning is necessary so that learning can take place as planned especially students not accustomed to learning in the discussion.

Students responses to learning

Based on student feedback questionnaire data in Table 9, it can be concluded that PBL learning the scientific issues are able to provide variation in biology learning so that the learning can be centered on the student and in accordance with the demands of Curriculum 2013. Learning PBL utilizing scientific issues is based on data obtained is also capable make students more interested in exploring issues related to the virus in the environment. This means showing that students enthusiastic in participating in PBL learning by utilizing scientific issues. According to research Fatchurrohmah et al. (2017) PBL positive effect on students' active learning. The data also showed that PBL learning by utilizing scientific issues were able to raise awareness of students in maintaining personal hygiene and the environment.

Table 9 The results of the analysis of students' responses to learning each indicator

No.	Indicator	Percentage (%)	Criteria
1	Student interest in learning to follow	84.29	Very good
2	Student's motivation to study	79.29	Well
3	Classroom atmosphere for learning	74.29	Well
4	Understanding learning model	80.71	Well
5	Students explore environmental problems	83.57	Very good
6	The discovery of new ideas	72.86	Well
7	Courage students argue	77.14	Well
8	Student interest in her health	88.57	Very good
9	The interest of students on cleanliness in the environment	87.86	Very good
10	Student interest in environmental problems	81.43	Very good
	Average	**81**	**Very good**

PBL learning by utilizing scientific issues by students were also able to increase students' motivation to display a variety of images and videos related to the subject matter. According to Arief et al. (2016) significantly increased student motivation through learning PBL. According to Marks et al. (2014) Another benefit of sosiosaintifik issues in science learning that sosiosaintifik issue presents a framework that can motivate students. Students' ability to solve a problem of expression can also be sharpened with PBL learning done by utilizing these scientific issues. Conclusion PBL learning to utilize this scientific issue that is able to increase the interest of students in participating subjects, able to increase students' motivation and enthusiasm of students in the following study.

CONCLUSION

Based on the results of research and data analysis has been done, the conclusion that the use of scientific issues during the learning material in SMA N 1 virus Muntilan the control and experimental classes have been performing well. Utilization of scientific issues in learning Viruses also can enhance cognitive abilities of students in all the indicators of Bloom's Taxonomy. On the value of the pretest and posttest control group and experiment also shows the test results of N-gain in the category for both classes: 0.32 (control group) and 0.56 (experimental group). The use of scientific issues in learning viruses can also improve students' cognitive abilities in all indicators of Bloom's Taxonomy. The pretest and posttest results for the control and experimental classes showed that the N-gain test results in the medium category for both classes were 0.32 (control class) and 0.56 (experimental class). The use of scientific issues in learning viruses can develop a health care attitude which can be seen from the increase in N-gain before and after learning, which is 0.172 in the moderate category for the control class while in the experimental class the increase in N-gain is 0.361 with the moderate category.

SUGGESTION

This research needs to be studied in other schools that have different characteristics. This learning is also expected to be used as an alternative in the learning model of Virus material in schools.

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