Universitas Muhammadiyah Malang, East Java, Indonesia

JPBI (Jurnal Pendidikan Biologi Indonesia)

p-ISSN 2442-3750, e-ISSN 2537-6204 // Vol. 8 No. 1 March 2022, pp. 10-21

Research Article

Virtual laboratory based online learning: Improving environmental literacy in high school students

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ARTICLE INFO

Article history
Received: 18 September 2021
Revised: 09 March 2022
Accepted: 12 March 2022
Published: 15 March 2022

Keywords
Environmental change materials
Environmental literacy
Virtual laboratory

ABSTRACT

Oftentimes the increase in industrial development is the cause of environmental problems. Environmental problems can be overcome by the presence of humans who care about the environment or have environmental literacy skills. Environmental literacy skills can be instilled from an early age, for example through practicum learning in schools. However, considering that the Covid-19 pandemic is one of the obstacles in carrying out the practice, virtual laboratory-based online learning is carried out. This study was aimed to improve students' environmental literacy through virtual laboratory-based online learning that has been developed. This research is quasi experiment with pre-test and post-test research design Control Group Design. The total sample of the study was 70 students of class X of state senior high school. The research instrument used was in the form of test questions about environmental changes material and environmental literacy questionnaires. The results showed that the N-gain value of environmental literacy in the experimental class was 29% high, 60% moderate, 11.42% low with the percentage of attitudes 66.62% and 63.43% behavior. Meanwhile, for the control class, the N-gain value was 9% high, 48.57% moderate, 42.85% low and 68% attitude and 67% behavior. This shows that virtual laboratory-based online learning contributes to increasing environmental literacy skills.

How to cite: Angreani, A., Saefudin, S., & Solihat, R. (2022). Virtual laboratory based online learning: Improving environmental literacy in high school students. *JPBI (Jurnal Pendidikan Biologi Indonesia), 8*(1), 10-21 https://doi.org/10.22219/jpbi.v8i1.18120

INTRODUCTION

The 21st century, the world has been facing with various kinds of industrial developments followed by science and technology to support development in a better direction. However, often the increase in industrial development does not only have positive impacts but can trigger negative impacts and become the cause of environmental problems (Schot & Steinmueller, 2018; Song et al., 2021). Environmental problems have had many negative impacts on humans for example accumulation of waste, climate change, destruction of ecosystems etc. Environmental problems that arise at this time, do not fully stem from the development of the industrial sector and technology, but rather the weak level of human literacy (Abdel-Shafy & Mansour, 2018;

Chu & Karr, 2017; Ferronato & Torretta, 2019). Including attitudes and behavior towards the environment, so that there is no dynamic relationship between humans and the environment (Utama, 2018). Environmental problems can be solved effectively by guiding individuals to know the environment and changing behavior through knowledge (Zheng et al., 2018). So that people realize that problems can build intelligent human awareness and new understanding of the environment and foster environmental behavior and skills (Steg et al., 2015). In this case, environmental problems can be resolved by the presence of humans who care about the environment or have environmental literacy skills.

There are various ways to overcome environmental problems, including through an attitude of caring for the environment, which can be obtained through the development of environmental literacy (McBride et al., 2013; Meilinda et al., 2017). People who have environmental literacy are defined as people who have affective environmental insight, and can act consistently in adjusting the balance between quality of life and quality of the environment (Kaya & Elster, 2019; White et al., 2019). Based on the opinions that have been put forward, we can see that environmental literacy possessed by a person is very important. Environmental literacy can support efforts to overcome environmental problems. For example, if the community understands the concept of environment and ecology, cares about the environment and has the skills to analyze complex environmental problems (Burchett, 2015). So that in overcoming environmental problems it can be done, one of which is by creating a community that can understand ecology, care for the environment and have the skills to analyze complex environmental problems, meaning that the community must have environmental literacy skills. Environmental literacy is currently still in the stage of raising awareness and concern, while responsibility has not become real behavior / participation and has not been based on strong knowledge (Safitri et al., 2020).

According to the results of the study, it shows that the average affective aspect gets the highest score and the behavior gets the lowest score of the three aspects of environmental literacy. Affective includes individual attitudes and perceptions of the environment while behavior is defined as behavior towards the environment. Referring to research results by Levy et al therefore individuals today must be based on strong environmental knowledge. It was further stated that a person should be given a basic knowledge of the environment in order to be literate on environmental issues (Levy et al., 2018). Individuals who are aware of environmental issues can support efforts to achieve the Sustainable Development Goals (SDGs) initiated by the United Nations through UNESCO (Bergman et al., 2018; Ferrer-Estévez & Chalmeta, 2021; Shulla et al., 2021). In the SDGs, environmentally friendly behavior and awareness of the importance of development does not only build intelligent people, but also builds people who have social behavior in protecting the environment or can be said to be environmentally literate (Alisjahbana & Murniningtyas, 2018).

Environmental literacy can be developed through environmental education (Kidman & Casinader, 2019; Ulfah et al., 2020). Environmental education or other education that integrates environmental literacy should be instilled from an early age, especially in the formal education environment (Mardiani et al., 2021; Nada et al., 2021; Nurwidodo et al., 2020). This integration will be related to the curriculum applied in the formal education environment or school. Environmental literacy can be integrated into environmental education. According to Goldman et al (2017), environmental education is able to effectively build environmental literacy. Meanwhile, according to Williams (2017) environmental education aims to improve students' environmental literacy by increasing their knowledge, cognitive skills, attitudes and behavior. Meanwhile, environmental education is defined as awareness and sensitivity, knowledge and understanding, attitudes, skills, and participation. Environmental education includes sensitivity and individual awareness of the environment; knowledge, understanding and challenges about the environment; environmental care attitude and motivation in improving or maintaining environmental quality; skilled in identifying and helping to solve environmental challenges; participate in activities related to solving environmental challenges (EPA, 2018). Based on the explanation above, environmental education can be defined as a forum to facilitate individuals in gaining knowledge, understanding, skills and attitudes towards the environment. Meanwhile, literacy itself is one of the achievements in realizing the transformation of education management in Indonesia.

Current environmental education can be developed through learning materials. As for one of the materials in biology subjects that can help in bringing up environmental literacy skills includes Basic Competency 3.11 (analyzing data on environmental changes, their causes and impacts on life) and 4.11 which supports practicum activities. The use of Basic Competency 3.11 as a support for environmental literacy skills because in these basic competencies there is learning that analyzes environmental changes, so that students learn to understand current environmental conditions and how to solve them. In addition, in different basic competencies, namely basic competence 4.11 learning material for environmental change is also supported by practicum activities. Practical activities are at the core of a good scientific program and provide students with

experiences that are in line with the goals of teaching science (Alneyadi, 2019). Practical activities can be a way to develop environmental literacy. However, given the Covid-19 pandemic, it is one of the obstacles in carrying out practicum. So, it must have another strategy so that practicum activities can still be carried out. One of the learning media that can be used as a means of learning today, especially practicum, is a virtual laboratory.

The advantages of using virtual laboratories in learning are students can carry out dangerous experiments or experiments without worrying about endangering themselves and others; students can create more varied experimental works because the time and cost required are more effective and efficient; provide independent or collaborative work that does not have to be only related to school time, school laboratories or available chemicals and laboratory facilities; allows students to get an overview at the macroscopic, submicroscopic and symbolic levels; as a powerful motivational tool (Herga et al., 2014). Meanwhile, learning using virtual laboratories has advantages such as being able to increase students' understanding of concepts; improve scientific problem solving and creative thinking skills (Hermansyah et al., 2015; Nurwidodo et al., 2021; Subali et al., 2017). Broadly speaking, the advantages of virtual laboratories are that they can be done anywhere and anytime so that learning time can be streamlined. With these advantages, students are expected to be able to conduct experiments well. While the weaknesses in the use of virtual laboratories (Somantri, 2021) are: (1) In running a practicum simulation through a virtual laboratory, students must always be online or connected to the internet network; limited knowledge of the procedures for conducting online practicums, if the language of instruction applied in the virtual laboratory uses a foreign language; (2) Real experience in a real laboratory is still lacking, so there are difficulties in operating it; and (3) Virtual laboratories do not provide hands-on or real experiences.

Although there are weaknesses, virtual laboratories have benefits that can be used in this research, because they are one way to facilitate practical learning, especially during the pandemic (Dhawan, 2020; Lamo et al., 2022; Mishra et al., 2020; Muthuprasad et al., 2021; Radhamani et al., 2021; Zalat et al., 2021). In general, the goal of virtual laboratories is to develop and carry out synchronous and interactive experiments (Almaatouq et al., 2021). Virtual laboratory is one of the tools that is presented online. Virtual laboratories can improve the learning experience of students in the laboratory, as well as support the exploratory involvement of students in virtual experiments (Heradio et al., 2016).

In an effort attempt to improve students 'environmental literacy, the implementation of virtual laboratory-based online learning is expected to help improve students' environmental literacy. This study was aimed to improve students' environmental literacy through virtual laboratory-based online learning that has been developed. Based on the explanation above, the use of virtual laboratories in online learning is the focus of research. The virtual laboratory developed by researchers can be used by students via computers/laptops. The developed virtual laboratory is designed or designed to improve the environmental literacy of high school students on environmental change material.

METHOD

This research is quasi-experiment with pre-test and post-test research design Control Group Design. This design included an experimental group (A) and a control group (B) which were selected without a random placement procedure (Table 1). In both groups, pre-test and post-test were carried out, but only the experimental group was given treatment (Creswell, 2010).

Table 1. Research design

Class	Pre-test	Treatment	Post-test
Experiment	O1	X	O2
Control	O1	-	O2

where X: Classes with the implementation of online learning, virtual laboratories, -: Class with the implementation of problem-based learning, O1: Pre-test to measure students' environmental literacy skills, and O2: Post-test to measure students' environmental literacy skills.

The population was carried out on all environmental literacy abilities of students at one of the X grade high school levels in Cianjur-West Java, who were studying environmental pollution material. Meanwhile, the sample in of this study was the environmental literacy skills of class X high school students in Cianjur through the implementation of online virtual laboratory learning in the experimental class and problem-based learning

in the control class. The time used in the use of the virtual laboratory is about 30x45 minutes. The number of students in each class is 35 people, a total of 70 people. The sample selection technique used is cluster sampling technique. The instruments used were test questions referring to the North American Association for Environmental Education (NAAEE) and environmental literacy questionnaires. The instrument for environmental literacy consists of 20 multiple choice items to measure aspects of knowledge and cognitive skills, and 20 items in a questionnaire statement to measure aspects of environmentally responsible attitudes and behavior.

RESULTS AND DISCUSSION

Environmental literacy skills are measured using multiple choice questions and an attitude scale that refers to four aspects of environmental literacy, namely knowledge, cognitive skills, attitudes and responsible behavior. The pre-test and post-test data that have been tested are then analyzed using simple calculations using Microsoft Excel 2007, then discussed based on each of the aspects contained in environmental literacy. The virtual laboratory that is implemented in learning can be accessed on the page https://vlab.agsdigital.id/index.php?page=kdid.

Achievement of students' environmental literacy ability

In this sub-chapter, the findings and general discussion on environmental literacy skills are presented, followed by exposure to each component of environmental literacy skills. Figure 1 will present an initial profile of environmental literacy abilities in the experimental class and control class.

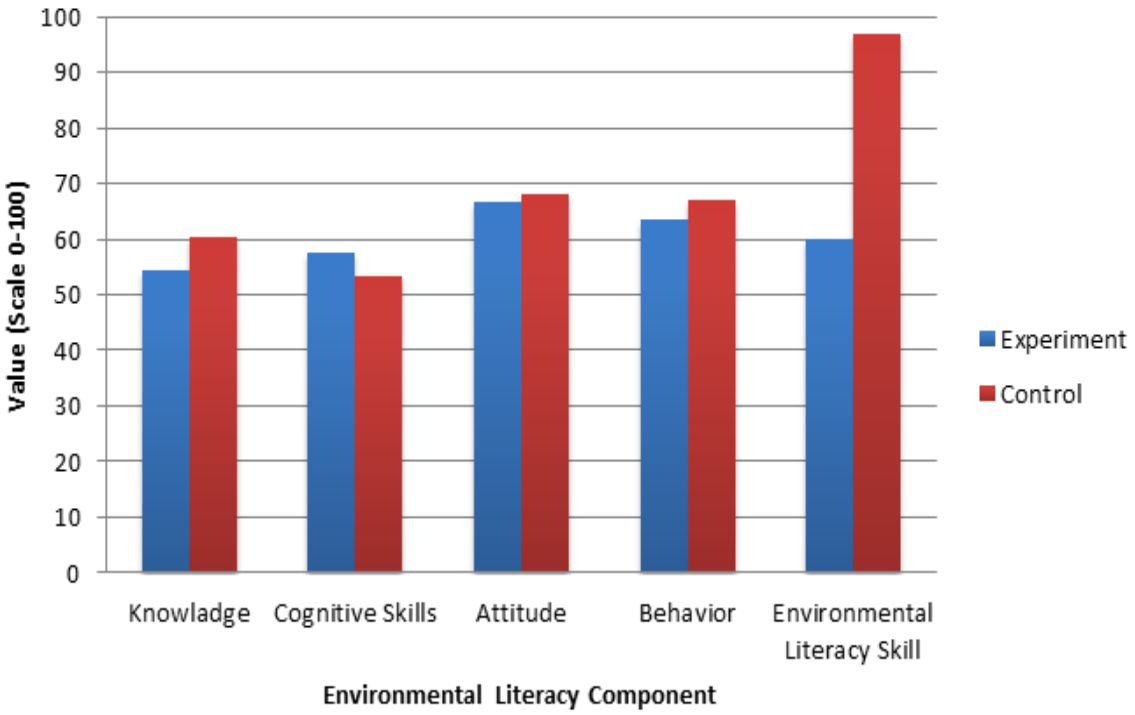

Figure 1. Average pretest score of students' environmental literacy ability in experiment class and control class

Based on Figure 1, there is a difference in the average pretest score or initial ability in the control class and the experimental class. After the learning was carried out, there was an increase from the average pretest score. The following will present the final profile or post-test of environmental literacy abilities in the experimental class and control class in Figure 2.

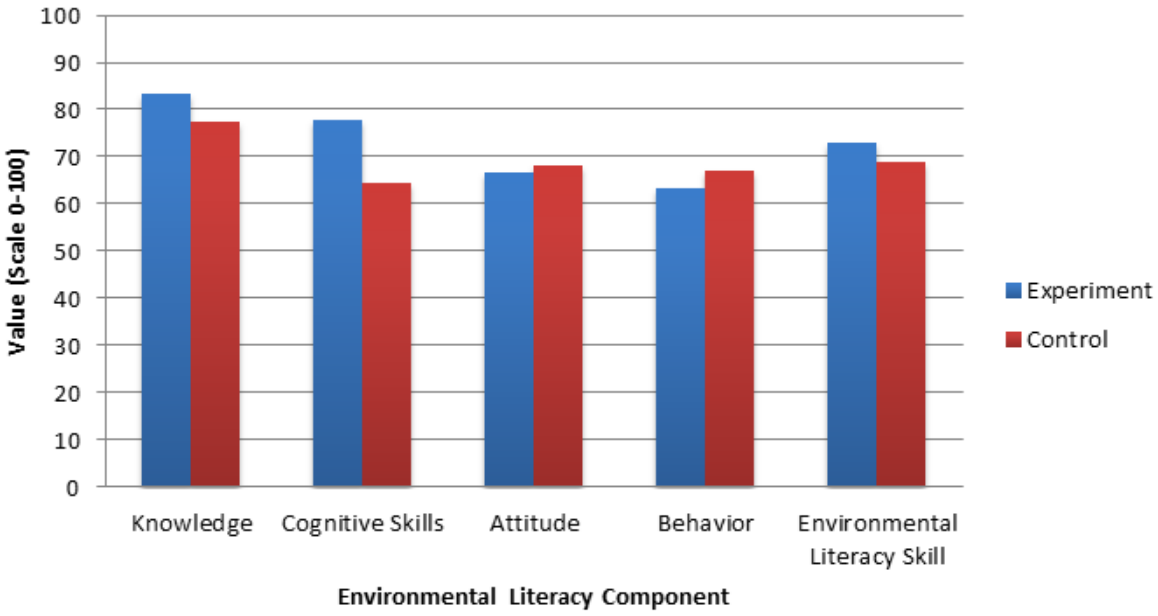

Figure 2. Average post-test score of students' environmental literacy ability in experiment class and control class

Based on the initial profile and final profile of environmental literacy data, it can be seen that the increase is based on the Gain calculation. Table 1 and Table 2 each present a recapitulation of the data from the pretest and posttest results and a recapitulation of the increase in environmental literacy skills.

Table 1. Data recapitulation of pretest and posttest results of environmental literacy

Component	Experiment		Control	
	Pretest	Posttest	Pretest	Posttest
The number of students	35		35	
Average Score	55	81	58	73
Maximum Value	100		100	
Minimum Value	0		0	
Standard deviation	9.72	8.09	12	12

Table 2. Recapitulation of increase in environmental literacy ability in general

Component	Class	
	Experiment	Control
Gain Max	40	30
Gain Min	10	5
Average Gain	26	15
	Distribution of Ngain Categories	
High	28.57% (10 person)	8.57% (3 person)
Middle	60.00% (21 person)	48.57% (17 person)
Low	11.42 (4 person)	42.85% (15 person)

Figure 1 shows the initial profile of each component of students' environmental literacy skills. The experimental class has an average value of knowledge and cognitive skills of 54.29 and 57.55. While in the control class the average score on knowledge and cognitive skills was 60.21 and 53.46. After the learning is carried out, then a reassessment is carried out. Based on the final profile of each component of environmental literacy ability, it can be seen in Figure 2.

Figure 2 shows the scores on each aspect of the students' environmental literacy skills. In the experimental class the aspects of knowledge and cognitive skills of students scored 83.30 and 77.96, while the aspects of attitude and behavior were 66.62 and 63.43. So that it can be seen, the average value of the environmental literacy ability of students is 72.83 which is classified as good. It can be said that the achievement of environmental literacy is facilitated by the virtual laboratory. This is presumably because in VL there are materials that can increase knowledge, as well as learning videos and virtual practicums that can improve

cognitive skills, attitudes and behavior. Meanwhile, in the control class, the students' knowledge and cognitive skills were scored 77.36 and 64.49, and the attitude and behavior aspects were 68.00 and 67.00. So it can be seen that the average value of the environmental literacy ability of students is 69.00 which is classified as good.

The average post-test score for students' environmental literacy skills based on Figure 2 is found in the knowledge aspect of 83.30 for the experimental class and 77.36 for the control class. Meanwhile, the lowest value of environmental literacy skills in the aspect of cognitive skills is 57.55 for the experimental class and 64.49 for the control class. Based on these data, we can see that the literacy value of problem-based learning environment in the control class does not contribute to improving cognitive skills, due to several obstacles such as the lack of identifying environmental problems.

The increase in environmental literacy skills in the experimental class and control class can be seen in Table 4.8 with an average gain of 26 and 15, respectively. The increase between the experimental class and the control class is quite different. The distribution that has the level of environmental literacy ability in the experimental class with the high category is 10 people, 21 people are medium, and 4 people are low. In the control class, the level of environmental literacy ability in the high category is 3 people, 17 people are medium and 15 people are low.

Biology learning is not only understanding theories, concepts and facts, but carrying out a process of discovery. Activities in finding concepts can generally be done through practical activities (Setiyaningsih et al., 2021). Practical activities are one way to change biology learning in the form of minds on learning into hands-on learning (Erwinsyah et al., 2016). In biology learning, it is also required to learn with direct and contextual experience so that students are able to express the phenomena that are around them (Aisya et al., 2016). In addition, practicum activities in this study aim to support improving environmental literacy and problem solving abilities of students. The achievement of the environmental literacy level of students in the experimental class and control class has different results. This is because, the treatment in each class is different. Learning in the experimental class is carried out through online learning in the form of a virtual laboratory, while in the control class using problem based learning.

UNESCO-UNEP, Environmental literacy is a functional education that provides basic knowledge, skills and motives to address environmental needs and contribute to sustainable development. Environmental literacy is an individual who has environmental knowledge and how to act in protecting the environment based on the knowledge he has. Meanwhile, environmental education aims to improve students' environmental literacy through increasing knowledge, cognitive skills, attitudes and behavior. When linked to the context of environmental education, NAEE states that environmental education is a comprehensive process to help people understand their environment and related issues (Siddiq et al., 2020). Meanwhile, environmental education is able to build environmental literacy effectively (Williams, 2017). So in this case the education system can be used as a forum to develop aspects of knowledge related to the environment. Knowledge can guide individuals to get to know the environment and change individual behavior (Zheng et al., 2018). Environmental knowledge affects attitudes which in turn will increase behavioral intentions (Fang et al., 2018).

Achievement of students' environmental literacy ability in knowledge aspects

the average pretest and posttest scores in the experimental class were 54.29 and 83.30, respectively. In the control class, the average pretest and posttest scores were 60.21 and 77.36, respectively. The two classes have different starting and ending abilities. The experimental class has a lower average pretest score than the control class, but the experimental class has a higher average score.

In the experimental class, which is included in the high category by 42%, the medium and low categories are 45.71% and 11.42%, respectively. While in the control class, which included in the high category were 8.57% of students, the medium and low categories were 65.71% and 25.71%, respectively. The highest score on the knowledge component is if students are able to answer 13 questions, while the lowest score is if students are unable to answer any of the questions. Based on the results of the study, the knowledge aspect in the experimental class and control class was dominated by the medium category with 16 and 23 students, respectively. It can be interpreted that learning through virtual laboratories (experimental class) and problem based learning (control class) both have the potential to improve aspects of knowledge. Even so, the experimental class facilitated by the virtual laboratory is superior to the control class because the number of students who are classified as high is more, namely there are 15 students (experimental) and 3 (control). The low category was dominated by the control class with 9 students while the experimental class consisted of 4 students.

In the knowledge component, the questions presented are related to environmental change material. There are indicators used in this component, namely explaining the notion of environment and environmental change, describing the impact of environmental pollution, identifying environmental changes, describing efforts to preserve the environment. In this component, students who are able to answer correctly are all contained in the indicators explaining the meaning of the environment and environmental change. If it is associated with learning through virtual laboratories, students can find out the meaning of the environment/environmental changes, namely from the learning materials that have been displayed. Meanwhile, the majority of students' answers that were not quite right on the indicators described efforts to preserve the environment. This is because the material presented in the virtual laboratory is less focused on environmental preservation.

The knowledge about environmental literacy obtained is expected to provide understanding and awareness to better understand the environment, as well as to save the environment properly (Maulaa et al., 2020). In a sense, knowledge must be able to influence cognitive skills, attitudes and behavior. The richer the environmental knowledge, the higher the environmental attitude (Zheng et al., 2018). This is because increasing environmental awareness will naturally pay more attention to environmental changes to refer to concerns about a deteriorating environment.

Achievement of students' environmental literacy abilities in the aspect of cognitive skills

mean pretest and posttest scores on different components of cognitive skills. The experimental class had a higher average pretest and posttest score than the control class, with an average score of 57.55 and 77.96, respectively. While the control class has an average pretest value of 53.46 and a posttest value of 64.49. The difference in the average value in each class, when viewed based on the average pretest to the average posttest has an increase.

In the experimental class, which is included in the high category by 25.71% with 9 students, the medium and low categories are 51.42% (18 people) and 22.85% (8 people). While in the control class, which is included in the high category by 17.14% (6 students), the medium and low categories are 22.85% (8 people) and 60% (21 people).

The questions on the cognitive skills component consist of seven questions with several indicators, namely identification of environmental problems, analyzing environmental problems, and planning an investigation of environmental problems. The indicator that most students answered correctly was the indicator of planning an investigation of environmental problems. In this question, a literature review is presented on “Forests in Papua are Threatened by Expansion of Oil Palm Plantations” (Source: https://www.ussfeed.com/hutan-di-papua-terancam-hasil-percepatan-kebun-kelapa-sawit-how -fate-local-citizen/) are then provided with options about various actions and students are instructed to choose the most appropriate action regarding the above literacy.

Cognitive skills are the ability to choose, make appropriate action strategies, evaluate, and implement action plans. These cognitive skills aim to carry out scientific investigations and basic risk analysis, think within a systems framework, and make plans. In contrast to the knowledge aspect, which is an understanding of various problems and issues, it does not reach the stage of making an action strategy. Szczytko et al (2018) defines cognitive skills as how well students can understand and analyze environmental problems.

Based on the results of the study, the experimental class was dominated by students who were in the medium category (18 students), while the control class was dominated by students who were in the low category (21 students). It can be said that the implementation of virtual laboratories has a contribution in improving students' cognitive skills compared to problem based learning. The increase in the ability of students' skills is due to the fact that in the virtual laboratory there are learning videos about soil/water pollution and its impact on living things, and there is an interactive practicum that supports understanding of cognitive skills. Virtual laboratories can implement biology-related experiments that may not be available and can improve students' skills and develop their cognitive abilities by participating in the experiment step by step and repeating it several times according to their needs (Almuqbil, 2020).

Achievement of students' environmental literacy ability in attitude aspects

The achievement of environmental literacy skills in the attitude component can be seen based on the average percentage of students who respond to positive or negative statements. The Table 3 is a recapitulation of the attitude components of students who respond to positive or negative statements.

Table 3. Recapitulation of attitude components based on positive responses and negative responses in the experimental class and control class

	Percentage of number of students (%)							
	Experiment				Control			
	SA	A	D	SD	SA	A	D	SD
Positive statement								
Response	17.92	67.14	12.65	0.82	26.53	61.22	14.64	0.00
Average Positive Response (SA and A)	42.53				43.88			
Average Negative Response (D and SD)	19.64				7.32			
Negative statement								
Response	15.00	25.19	41.43	19.29	16.43	19.64	33.57	21.79
Average Negative Response (SA dan A)	6.73				18.04			
Average Positive Response (D dan SD)	30.36				27.68			

Notes: SA = Strongly Agree; A= Agree, D= Disagreed, SD= Strongly Disagreed

The questionnaire in this study has positive and negative statements. Positive statements have the highest score when students answer "strongly agree or agree". While negative statements have the highest score when students answer "disagree or strongly disagree". Based on Table 3 for the overall positive statement in the experimental class, those who responded strongly agreed at 17.92%, agreed 67.14%, disagreed 12.65% and strongly disagreed 0.82%. The control class has a response of strongly agree with 26.53%, agree 61.22%, disagree 14.64% and strongly disagree 0.00%. The average positive response in the experimental class and control class were 42.53% and 43.88%, respectively. While the average negative response was 19.64% in the experimental class and 7.32% in the control class.

Overall negative statements in the experimental class were those who responded strongly agree by 15.00%, agree 25.19%, disagree 41.43% and strongly disagree 19.29%. The control class has a response of strongly agree by 16.43%, agree 19.64%, disagree 33.57% and strongly disagree 21.79%. The average negative response in the experimental class and control class were 6.73% and 18.04%, respectively. While the average negative response was 30.36% in the experimental class and 27.68% in the control class. In detail, the percentage of students' attitude components on each indicator can be seen in Table 4.

Table 4. Percentage of responses to the number of students in the experiment class and control class

Indicator	Percentage of number of students (%)							
	Experiment				Control			
	SA	A	D	SD	SA	A	D	SD
Environmental thought	23.37	50.86	7.20	4.57	25.14	44.00	14.68	4.57
Environmental precautions	14.85	43.43	10.80	10.86	20.00	36.47	34.29	9.14
Having a solution for the environment	10.9	40.00	11.40	16.57	18.29	36.57	21.71	21.14

Notes: SA = Strongly Agree; A= Agree, D= Disagreed, SD= Strongly Disagreed

Based on Table 4, it can be seen the percentage of attitude questionnaire scores on each indicator. The experimental class has an average percentage score of attitudes on the environmental thinking indicator of 23.37% with a strongly agree response, 50.86% agree response, 7.20% disagree response and 4.57% strongly disagree response. The percentage of environmental awareness who responded strongly agreed was 14.85%, agreed 43.43% and disagreed and strongly disagreed, respectively 10.80% and 10.86%. The last indicator that is the solution to the environment has a response of strongly agree 10.9%, agree 40.00%, disagree 11.40% and strongly disagree 16.57%. In the control class, the indicators for thinking on the environment were 25.14% with a response strongly agreeing, 44,00% agreeing, 14.68% disagreeing and 4.57% strongly disagreeing. The percentage of environmental awareness who responded strongly agreed was 20.00%, agreed 36.47% and disagreed and strongly disagreed respectively 34.29% and 9.14%. The last indicator that is the solution to the environment has a response of strongly agree 18.29%, agree 36.57%, disagree 21.71% and strongly disagree 21.14%.

Based on the results of the study, the attitude indicators that showed the most positive responses were indicators of thinking about the environment for the experimental class and the control class. One of these indicators contains the availability to sort waste between organic and inorganic. While the indicator that has the

lowest percentage is the indicator that has a solution to the environment for the experimental class and control class.

In these two classes, the highest percentage is owned by the experimental class who uses virtual laboratories in online learning even though the results are not much different from the control class. This is presumably because the formation of attitudes takes a relatively long time (Siddiq et al., 2020). In addition, attitudes also have a relationship with knowledge possessed. The experimental class has a high average value of knowledge so that it will grow attitudes towards the environment. Individuals who have high knowledge will have an optimistic attitude towards the environment (Zheng et al., 2018). Other studies argue that there is a significant impact on environmental education in schools on students' knowledge but not on students' environmental attitudes and awareness (Haryono et al., 2014). However, a more positive environmental attitu de will relatively increase environmental behavior so that environmental awareness will be increased (Zheng et al., 2018). Attitudes derived from life experience and education can significantly affect human behavior. there is a relationship with the knowledge possessed by students and there is a relationship between the level of interest in learning about environmental topics and the attitudes possessed by students (Nasution, 2017).

Achievement of students' environmental literacy ability in behavioral aspects

Behavioral aspects in this study were netted through a questionnaire combined with attitude aspects, but with different indicators. Data collection was carried out through a questionnaire on the behavioral aspect, due to the Covid-19 pandemic, which did not allow direct observation. The data recapitulation of behavioral analysis results in the experimental class and control class can be seen in Table 5.

Table 5. recapitulation of responsible behavior components based on positive responses and negative responses in the experiment class and control class

	Percentage of Number of Students (%)							
	Experiment				Control			
	SA	A	D	SD	SA	A	D	SD
Response	8.00	53.71	22.29	16.00	18.86	46.29	17.14	17.71
	Positive statement							
Average positive response (SA and A)	34.3				37.62			
Average negative response (D and SD)	15.71				24.76			
	Negative statement							
Average negative response (SA and A)	25.7				25.00			
Average positive response (D dan SD)	24.29				25.00			

Notes: SA = Strongly Agree; A= Agree, D= Disagreed, SD= Strongly Disagreed

Table 5 shows a recapitulation of all components of student behavior. The experimental class had a response percentage of 8.00% strongly agree, agree 53.71%, disagree 22.29% and strongly disagree 16.00%. The control class has a response percentage of strongly agree at 18.86%, agree 46.29%, disagree 17.14% and strongly disagree 17.71%. Meanwhile, the percentage based on positive statements of the experimental class had a positive response of 34.3% and a negative response of 15.71%. The control class has a positive response percentage of 37.62% and a negative response of 24.76%. In the negative statement, the percentage of negative responses that the experimental class has is 25.7% and 25% is the control class. Meanwhile, the percentage of positive responses in the experimental and control classes was 24.29% and 25.00%, respectively.

The behavior of students has something to do with the knowledge they have. as according to research by Fang et al (2018) shows that knowledge about the environment influences behavior. Meanwhile, according to Zheng et al (2018) individuals who have more knowledge show more positive environmental behavior and vice versa, if individuals have less knowledge they can show less positive environmental behavior. Meanwhile, according to Meilinda et al (2017) environmentally friendly behavior is influenced by attitudes, norms, behavior and control of a moral obligation that will affect interest in behavior and shape behavior. Zheng et al (2018) also stated that people with higher environmental cognition will display positive environmental behavior. This is because people with higher knowledge cognition will pay attention to the importance of environmental protection and immediately participate in environmental protection with concrete actions. According to Meilinda

et al (2017) the solution to overcome environmental problems is to develop community environmental literacy, in ways that are more environmentally responsible.

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