Analysis of student’s environmental attitude on the topic of buffer solution

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This paper is aimed to describe the environmental attitude for high school students on the topic of buffer solution. The environmental attitude is one of the attitudes in the 18 values of the Indonesia National Character Education which is still very less applied in schools even though it is urgently needed for the environment sustainability. Buffer solution is one of the topic in chemistry that rarely linked with the environment even though actually it has a very large influence in the environment. Therefore, this paper is to describe how the environmental attitude that students have on the topic of buffer solution. The participants of this study were 68 students. In this paper qualitative methods were used by giving questionnaires to students. From the results obtained, most of the students still lacked a good environmental attitude on the topic of buffer solution, even though the students actually wanted to explore ways to maintain the environment.

1. Introduction

In recent, the study on student environmental attitude still become a hot topic in educational research. It is happen because the lack of human awareness on environmental conservation. Another reason why this could happen because of their lack of understanding of the concept of science behind it. However understanding the concept of sciences are not enough to reduce the environmental damage. To reduce the impact of environmental damage that occurs it is necessary to instill an environmentally caring attitude in each community.

It has been said that effective environmental education for school-age students is crucial. That is why the best ways to instill the environmental attitude is through education [1]. The government through the Indonesian Ministry of National Education considered character formation through education since 2010 contained in the National Action Plan for Character Education. This character education includes 18 values, namely: religious, honesty, tolerance, discipline, hard work, creative, independent, democratic, curiosity, national spirit, love for the country, respect for achievement, friendly communication, peace of mind, love to read, environmental attitude, social care, and responsibility. But unfortunately, this character education seems to only be an educational slogan because in reality there are still many graduates from educational institutions that have no character, especially on the environmental attitude [2].

It has been reported that 11th grade students appear to be the most appropriate targets for fostering ethical and ecological appreciation of the natural world. That is why the topic this study use is buffer solution which learned at 11th grade [3]. Many students can understand about buffer solution, however they mostly never considered the connection between buffer solutions with environment sustainability. Even though buffer solutions have a very important role in the environment. For example, according to
[4] many living things can only live on a very small pH range, e.g. fish. Which mean if there is even a slight change in pH, fish can’t live.

Based on the explanation above, the author feels that to instill the character of environmental attitude in students is a top priority in order to maintain the environment. Also as it is stated that 11th grade students is the most appropriate targets for fostering ethical and ecological appreciation for the natural world so this paper aims to describe how the students environmental attitude on the topic of buffer solution.

2. Method
This paper was based on the qualitative descriptive research. The subject of this study was 68 students which consists of 23 male students and 45 female students from two High School around Cimahi and Bandung, Indonesia. To investigate the student environmental attitude, a questionnaire that consists of 10 statements which include both positive and negative statements was used. The questionnaires were distributed to students as they learn the topic of buffer solutions at school. The data were analyzed to discover the connection between the answer of students with their environmental attitude. The data from questionnaire converted to scale and categorized into three criteria based on the score as stated at Table [6].

Table 1. Questionnaire Categorization

| Score Interval | Category | Criteria |
|----------------|----------|----------|
| $D_{ai} - 1.8 < X \leq D_{ai - 0.6}$ | Bad | |
| $D_{ai} - 0.6 < X \leq D_{ai} + 0.6$ | Average | |
| $22 < X \leq 28$ | | |
| $D_{ai} + 0.6 < X \leq D_{ai} + 1.8$ | Good | |
| $28 < X \leq 34$ | | |

$D_{ai}$: Ideal average $= \frac{1}{2} (\text{max score} + \text{min score})$; $D_{si}$: Ideal Standard Deviation $= \frac{1}{6} (\text{max score} - \text{min score})$; $X$: Student score

3. Results and Discussion
From the questionnaire given there are three indicators, namely: (1) having curiosity in preventing environmental damage by applying the principle of buffer solution, (2) preventing environmental damage by applying the principle of buffer solution, and (3) wisely using materials that can disrupt the stability of soil / water pH. This numbering is in accordance with table 1.

Table 2. Mean Score for Questionnaire Statement

| Indicator | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------|---|---|---|---|---|---|---|---|---|----|
| Mean      | 2.22 | 2.97 | 1.82 | 1.88 | 2.94 | 2.18 | 2.18 | 2.68 | 1.81 | 2.00 |
| Mean Indicator Mean | 2.34 | 2.29 | | | | | | | |

aIndicators 1: Having curiosity in preventing environmental damage by applying the principle of buffer solution; 2: Preventing environmental damage by applying the principle of buffer solution; 3: Wisely using materials that can disrupt the stability of soil / water pH.

bStatement number: 1: I always look for information regarding environmental damage caused by pH change, 2: I always looking for information regarding the effect on pH changes on environment and how to prevent it from books, internet, or other sources, 3: I don't care about the destruction on the environment caused by pH changes because it doesn't happen around where I live, 4: I once have spread lime powder to maintain soil pH value, 5: I never contain soap water waste, 6: I have and happy to be included in an activity about soap water waste treatment, 7: I once have to treat soap waste water with dilution, 8: I never use soap water excessively when taking a bath
and/or washing, 9: I always throw acidic ceramic cleaner directly to the ground or waterways, 10: I always throw vinegar from food left over directly to the ground.

The given analysis follows the mean value obtained in Table 1. The first indicator relates to students' curiosity in preventing environmental damage which consists of three statements (statement 1-3). From statement 1, the average score obtained is 2.22 which states that students still rarely seek information on environmental damage due to changes in pH. Statement 2 has an average score of 2.97 which states that students want to find information related to environmental damage due to changes in pH and ways that can be done to prevent environmental damage due to changes in pH. Statement 3 has an average score of 1.82, which indicates students have sufficient sense of concern for the environment that exists and is not limited to the environment around them. These three statements illustrate that students actually have curiosity to explore the causes of environmental damage due to pH damage and how to prevent it but lack motivation or encouragement to explore further.

One of the causes of students' lack of motivation in seeking information regarding environmental damage due to changes in pH can be attributed to the teaching methods carried out at school. From author observations, the teaching methods in these two schools still used conventional methods in the form of lectures and problem training. The teaching given is more focused on students understanding of what buffer solutions, types of buffer solutions, and how to calculate the pH of the buffer solution. From the observations, the author did not see any teacher who linked the topic of buffer solutions to environmental damage both during teaching and when giving assignments. Therefore the author conclude that the thing that can motivate students in seeking information related to environmental damage due to changes in pH is on what method the teacher use in teaching and the assignments given to them.

The second indicator relates to the actions of students to prevent environmental damage due to changes in pH. This indicator consists of four statements (statement 4-7). Statement 4 has an average score of 1.88 which indicates most students still do not know the things that can be used to maintain pH. Statement 5 gives an average score of 2.94 which shows that in their personal lives students still do not care too much about the impact of what will happen to the environment if they don't treat soap wastewater. Statement 6 gives an average score of 2.18, indicating that most students have never participated in waste water treatment activities. Statement 7 also gives an average score of 2.18, which also shows that most students have never treated soap wastewater by dilution. If these fourth statements are linked to the statement on the first indicator it can be seen that students still have a low understanding about changes in pH and the effects that can be caused. However, students have a high enough curiosity to explore what effects can be caused by changes in pH and what ways can be done to prevent it.

The third indicator, which consists of three statements (statement 8-10) relates to the wisely use of materials which could disturb the pH of the soil and / or water. Statement 8 has an average score of 2.68 which indicates that there are still many students who use soap excessively when bathing and / or washing. If it is related to the statement on the second indicator, this further clarifies the students' low understanding of the impact of environmental damage from soap wastewater. Most of them still do not know the impact that can be caused from waste water so they use excessive amounts of soapy water. Statement 9 has an average score of 1.81 which indicates that most students never throw acid-based porcelain cleaners anywhere. Statement 10 has an average score of 2.00 which indicates that there are many students who realize that throwing left over vinegary-water from food is not a good thing. From statements 9 and 10 the author tries to connect with statement 8 which shows that most students already understand enough about the impact of environmental damage caused by acid but do not know about the impact of environmental damage caused by substances that are alkaline. It seems that most students assume that soapy water has a bacterial killing nature so if it enters the water channel it can kill the bacteria so that it is harmless. The previous statements also show that students do not understand the impact that can occur if there is a change in pH. From this third indicator, it is strongly observed that students still have a very low understanding about the impact of pH changes to the environment. Nevertheless, students already have the curiosity to explore the effects of changes in pH on environmental damage and how to prevent it.
It was revealed in this study that the percentage of students categorised as bad and average environmental attitude were 47% and 50%, respectively, while only 3% of the students were categorised as a good environmental attitude. In line with previous research [1,7] reported that environmental attitude have a strong relations with environmental knowledge, most of the students who have a low environmental attitude were also lack of the environmental knowledge. It was stated that students having favorable environmental knowledge before participating in the course tended to have more favorable environmental attitudes after participation and those students having less favorable environmental knowledge before participating tended to have more negatives attitudes after participation in the course. Another finding also stated that the relationship between environmental attitude and environmental knowledge may not be a direct relationship, but mediate by several factor such as religions, social interaction, parent’s knowledge, and personal belief [7,8,9,10].

4. Conclusion
From the data obtained it can be concluded that students still have a low caring attitude because of the low understanding of the environment itself. However, students have a curiosity about how to deal with environmental damage that has occurred. Hopefully, with the right teaching method their understanding can deepen and their environmental attitude will also become much better.

5. References
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