Climate Change Literacy of Elementary School Students in Buleleng District, Bali Province, Indonesia

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Abstract. This study aimed to identify the level of knowledge, attitudes, and behavior of elementary school students in Buleleng District on climate change. Data were collected with a Guttman-scale questionnaire (true-false) for the knowledge domain and Likert scale for attitude and behavior. The area of knowledge consists of four aspects: the fundamental concept aspect (20 statements), the cause (13 comments), the impact (8 comments) as well as mitigation and adaptation (10 statements) while the attitude domain with 12 statements and the behavior of 11 statements. The survey was conducted on 153 students of fourth, fifth, and sixth grade from three different public schools. The results of this study revealed that the majority of participants show moderate levels for understanding basic concepts, impacts, mitigation, and adaptation, but unfortunate for the causes of climate change. Overall, the majority of respondents indicated moderate levels of knowledge of climate change, whereas in attitude but behavior were good. The results concluded that students' literacy on climate change needs to be improved primarily through teaching strategies on relevant materials to foster awareness of action on climate change mitigation and adaptation from an early age.

1. Introduction
Climate change became a topic that has gained much attention in the last few decades as it induced problems for the survival of life on Earth [1]. That is, for humanity the impact caused by climate change is not only faced by the present generation but also by future generations and perhaps in a more worrisome form. This of course directly affects the lives of humanity [2]. Various efforts both at
the national or international level through international agreements have been made to mitigate and anticipate the impacts of climate change. Among these efforts, it is equally important to cultivate a pattern of action and low-carbon emission patterns among young people, especially students from the basic to the upper level. This is important because they will face problems in the future.

In line with these efforts, climate change education (CCE) became the focus of the international world [3, 4]. In term of this, the United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the ‘UNESCO Climate Change Initiative’ at Copenhagen at the 15th Conference of Parties of the United Nations Framework Convention on Climate Change (UNFCCC) in 2009 [5]. Climate change education is one of four core programs in the Climate Change Initiative and other components of the initiative include: (1) climate change science and knowledge; (2) a culture of climate change and biodiversity and cultural heritage; and (3) ethical, social and humanitarian dimensions of climate change [5]. According to [5], climate change education is expected to help the community, especially the young generation to: (1) understand and deal with climate change issues; (2) promoting lifestyle changes; and (3) adapt to changing local conditions. Also, climate change education should be carried out at all levels using formal and non-formal methods, and it is best to start at a young age [5]. Learning about climate change since the early stage is the most fundamental among global best practices to prevent or reduce the effects of climate change on humans [5-7]. Meanwhile, primary education is a relevant means to create environmentally conscious character including climate change.

This study aimed to explore the perceptions, attitudes, and behavior of elementary school students on climate change to reveal ways of thinking and understanding, emotions, and student behavior on climate change related issues. Assessing how children understand climate change will help to know how educational efforts have addressed this issue and also evaluating the gaps to be filled through future climate change education programs.

2. Method

2.1. Research design
This research used a descriptive, analytical research design. The data used in this study was quantitative data and supported by qualitative data. Quantitative data were obtained from close questionnaires, while data qualitative obtained from the extensive questionnaires. Intimate surveys were used to collect student perception data on climate change issues, basic knowledge related to climate change, and the students daily behaviors related to carbon emissions, while close and open questionnaires were used to collect teachers’ views and comments on climate change learning.

2.2. Respondents
Total of the respondents involved were 153 students, but one of the students did not complete the questionnaire so that the respondents considered responses were 152 students. In these, 63 of them were students of fifth grade SD Lab Unidksha which consists of 30 male students and 33 female students as representatives of students in urban areas. For SD in the rural area, SDN 1 Bungkulan and SDN 3 Sawan were chosen by involving the students in fourth, fifth, and sixth. The total of fourth-grade students in this area were 24 students consisting of 12 male students and 12 female students. Total students of fifth grade in this area were 26 students comprised of 12 male students and 14 female students. The total number of sixth-grade students in this area were 40 students consisting of 23 male students and 17 female students. Total respondent, 77 were male (50.66%), and 75 were female (49.34%). The interview was conducted by involving ten teachers. Four teachers from SDN 3 Sawan,
four teachers from SDN 1 Bungkulan, and three teachers from SD Lab Undiksha. Four of them are men. These teachers were generally classroom teachers.

2.3. Instrument
Data were collected using close and open questionnaire. Close questionnaires were used to collect data about student literacy on climate change, and semi-structured interviews were used to collect responses from teachers. Both instruments were developed by adopting and modifying instruments used by [8-12]. True/false questions were used to find out the students' knowledge of climate change. These statements included perceptions of respondents (students) about the weather, climate, greenhouse gases, and climate change (20 statements); causes of climate change (13 statements); impacts of climate change (8 statements); and mitigation and adaptation to climate change (10 statements). The correct answers were rated one whereas the incorrect answers were rated 0. A Likert scale questionnaire with a scale of 4 with 12 statements was used to determine responses of students' attitudes to climate change. Score for positive statements: 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree otherwise for negative statements. A 5-Likert scale questionnaire with 11 statements was used to determine students' behavioral responses to climate change. Scores for positive statements: 5 = always, 4 = often, 3 = sometimes, 2 = rarely, and 1 = never with reverse for negative statements. Questionnaires have been validated through content and item validity and reliability. Content validation was conducted by two experts (expert judgment) in the preparation of instrument and environment field while the item validation was conducted with Pearson product moment correlation and the test reliability using Cronbach Alpha formula that gives coefficient 0.85.

2.4. Interviews
The interview questions were raised in an effort to collect the views of first-hand education practitioners at the grassroots level involve the following aspects: (1) school curricula relating to current climate change and global warming materials; (2) difficulty in learning about climate change issues and finding relevant resources in learning; (3) the introduction of formal environmental education / climate change; (4) climate change teaching strategies; (5) availability of ecological activities and facilities; (6) the most significant difficulties or problems encountered when implementing environmental activities or providing environmental facilities in schools; and (7) training programs on learning climate change or green living.

2.5. Data analysis
A participant's total score was obtained by tallying his or her marks for each section of the statement as a percentage. A scoring matrix was used to record the participants' scores on each aspect of the questionnaire perception. With a five-point multiple-choice summated scale of very poor (0-20), poor (21-40), fair (41-60), good (61 – 80), and very good (81-100), each participant's score on each variable was categorized to determine where the participant should be located. The category with the highest frequency indicated the level where the majority of the clustered.

3. Results and Discussions
3.1. Student Responses
Table 1 shows the number of students with scored per category on the dimensions of knowledge for all aspects.
Table 1. Scores of students' knowledge of climate change.

| Range of score | Basic Knowledge | Cause | Impact | Mitigation and adaptation | Average score | Category |
|----------------|-----------------|-------|--------|----------------------------|---------------|----------|
| 0 – 20         | 20              | 8     | 3      | -                          | 62.20         | Very poor |
| 21 – 40        | -               | 57    | 36     | 25                         | 41.75         | Poor     |
| 41 – 60        | 84              | 38    | 10     | 55                         | 64.97         | Fair     |
| 61 – 80        | 48              | 33    | 44     | 69                         | 62.50         | Good     |
| 81 – 100       | 20              | 4     | 54     | 3                          | 57.86         | Very good |
| Average        | 62.20           | 41.75 | 64.97  | 62.50                      | 57.86         |          |

Deviation

Standard 14.89 20.60 27.33 21.99 14.66

Table 1 indicates that in the knowledge aspect, no students in the junior category, 25% show in poor class, 55% in right type, 69 in the excellent group, and 3% in the outstanding group. Therefore, with an average score of 57.86 from these four aspects explain that students' knowledge of climate change is in the open class. The results of this study are in line with [10] founded.

Instrument results also indicate misconception of students on the fundamental knowledge aspects of climate change. Table 2 shows the number and percentage of students that answered correctly for each item of statement on the essential knowledge aspect. In the 20 questions posed, many students responded incorrectly. For example, the report "climate is the same as the weather," only 52% of students answer correctly. Similarly for points 11 (Gases in the atmosphere that are not included in the greenhouse gas group are carbon dioxide (CO₂) and methane (CH₄)), 12 (Gases in the atmosphere classified as greenhouse gases are oxygen (O₂) and nitrogen (N)), 13 (The process of trapping solar energy (heat) on the earth's surface by greenhouse gases is called the rainbow effect), 14 (The greenhouse gas effect is the process of warming the planet by human activity), 19 (The depletion of the ozone layer and the impact of greenhouse gases are the same events), and 20 (Dumps of organic waste can release greenhouse gas emissions in the form of methane gas (CH₄)), fewer than 60% of students answer correctly.

Table 2. Number of students who correctly answer the statement items on the basic knowledge aspect

| No. | Statements (S) | Frequency | Percentage (%) |
|-----|----------------|-----------|----------------|
| 1   | The weather often changes from hour to hour, day to day, or month to month | 141 | 92.8 |
| 2   | Weather only varies from year to year | 129 | 84.9 |
| 3   | The climate often changes from hour to hour, day to day, or month to month | 95 | 62.5 |
| 4   | Climate is the same as the weather | 79 | 52 |
Climate is a weather change that occurs in a month

Climate is the average state of the weather for long periods of time and in large areas

The climate has not changed for millions of years

This daytime the sun shone sunny. Suddenly in the afternoon, the sky was cloudy and rainy. It was the weather

The energy source that keeps the earth's surface temperature is the moon

The gas that causes the trapping of solar energy (heat) on the earth's surface is a greenhouse gas

Gases in the atmosphere that are not included in the greenhouse gas group are carbon dioxide (CO$_2$) and methane (CH$_4$)

Gases in the atmosphere classified as greenhouse gases are oxygen (O$_2$) and nitrogen (N)

The process of trapping solar energy (heat) on the earth's surface by greenhouse gases is called the rainbow effect

The greenhouse gas effect is the process of warming the planet by human activity

Global warming (global warming) is the increase in the average temperature on the surface of the earth as a result of the greenhouse effect.

Climate change is the change of climate elements (temperature, rainfall) as a result of global warming

Burning fossil fuels is one of the primary sources of increasing carbon dioxide gas in the atmosphere

Deforestation reduces the absorption of carbon dioxide gas from the atmosphere

The depletion of the ozone layer and the effects of greenhouse gases are the same events

Dumps of organic waste can release greenhouse gas emissions in the form of methane gas (CH$_4$)

The lowest student understanding is on the causal aspect of knowledge about the causes of climate change. This is in line with [13] founded. It is possible because these subjects do not form part of the issue on the related themes and the teacher's lack of understanding of this aspect. The low knowledge of students on the causes of climate change will undoubtedly be challenging to expect for its early involvement in combating climate change, or it will be difficult to make responsible decisions and efficient solutions to mitigate climate change impacts in the future [14]. Whereas, the issue of climate change that will be faced later can be much more complicated than the current generation met. The statements put forward in this aspect and the student responses are shown in Table 3. Table 3 shows that most students incorrectly answer most of the statement items (1, 2, 7, 8, 9, 11, 12, 13). It also indicates students have misconceptions on this aspect and low teacher's efforts in facilitating learning on this aspect. For example, the statement on point 1 of this aspect, "Increasing greenhouse gases in..."
the atmosphere is the cause of climate change" is only correctly answered by 45.4% of students. The statement of item 2 "Burning of fossil fuels is the cause of climate change" is only correctly answered by 33.6% of the students. The least correctly answered statement is that only 20.4% of students who correctly answered the statement "Climate change is something that mostly happens naturally."

Table 3. Number of students who correctly answered the statement items on the impact aspect

| No. | Statements (S)                                                   | Student answered correctly | Frequency | Percentage (%) |
|-----|-----------------------------------------------------------------|-----------------------------|-----------|----------------|
| 1   | Increasing greenhouse gases in the atmosphere are the cause of  |                | 69        | 45.4          |
|     | climate change                                                 |                |           |                |
| 2   | Burning fossil fuels causes climate change                     |                | 51        | 33.6          |
| 3   | Deforestation increases the carbon dioxide gas in the atmosphere|                | 77        | 50.7          |
| 4   | Deforestation leads to climate change                          |                | 79        | 52            |
| 5   | Damage to the ozone layer causes climate change                |                | 83        | 54.6          |
| 6   | Volcanic eruptions produce climate change                      |                | 81        | 53.3          |
| 7   | Acid rain causes climate change                                |                | 65        | 42.8          |
| 8   | Disposed of waste will contribute to climate change            |                | 47        | 30.9          |
| 9   | Climate change is something that mostly happens naturally      |                | 31        | 20.4          |
| 10  | Humans have a significant influence on climate change          |                | 101       | 66.4          |
| 11  | Using public transport can contribute to reducing greenhouse   |                | 56        | 36.8          |
|     | gas emissions                                                  |                |           |                |
| 12  | Waste of energy use causes climate change                      |                | 59        | 38.8          |
| 13  | Consumptive lifestyle causes climate change                    |                | 52        | 34.2          |

On the other hand, students are familiar enough with knowledge of the impacts of climate change. Table 4 shows that students are familiar enough with awareness of the effects of climate change. In this aspect, there were no students in very poor or needy category, 10.53% were in the right understanding type, 75.66 were in a good class, and 13.82% were in the very good quality. Only two statements are answered correctly by less than 65% of students. Firstly, only 57.2% of the students answered correctly for the comment "Climate change can lead to an increase in the availability of foodstuffs" and secondly, for the statement "Climate change can cause ice melt at the poles" only it was correctly answered by 52.6% of students. However, overall students' understanding of this aspect in the excellent category with an average score of 65. This indicates that the average students have a good understanding of the impacts of climate change.

The responses of students' understanding of climate change mitigation and adaptation are 3 students (1.97%) got score abysmal, 39 students (25.66%) got to score with poor category, 33 students (21.71%) got to score with fair category, 48 student (31.58%) got to score with good category, and 29 students (19.08%) got to score with category very good. Based on the students' responses to each of the statements it is found that only 48.7% of students who correctly answered for the statement "Using more land to produce food can reduce the occurrence of climate change" and for the statement "Buying more local products can reduce the occurrence of climate change "even only answered correctly by 21.7% of students. However, the overall understanding of students on this aspect into the
excellent category with an average score of 62.5. This indicates that the average student has a good understanding of climate change mitigation and adaptation. In more details, the responses of students' knowledge of climate change mitigation and adaptation are shown in Table 5.

### Table 4. Students' knowledge of the impacts of climate change

| No. | Statements (S)                                                                 | Student answered correctly | Frequency | Percentage |
|-----|-------------------------------------------------------------------------------|----------------------------|-----------|------------|
| 1   | Climate change can lead to an increase in the availability of foodstuffs       |                            | 87        | 57.2       |
| 2   | Climate change can cause changes in weather                                   |                            | 128       | 84.2       |
| 3   | Climate change can cause sea level rise                                       |                            | 102       | 67.1       |
| 4   | Climate change can lead to more animal and plant species                      |                            | 99        | 65.1       |
| 5   | Climate change can cause flood-affected areas and more droughts               |                            | 104       | 68.4       |
| 6   | Climate change can help stop microbe/bacteria/virus-causing diseases          |                            | 96        | 63.2       |
| 7   | Climate change can cause ice melt at the poles                                |                            | 80        | 52.6       |
| 8   | Climate change may lead the dessert to be smaller                             |                            | 99        | 65.1       |

### Table. 5 Students' knowledge of the methods of mitigation and adaptation to climate change

| No. | Statements (S)                                                                 | Student answered correctly | Frequency | Percentage |
|-----|-------------------------------------------------------------------------------|----------------------------|-----------|------------|
| 1   | Using more land to produce food can reduce the occurrence of climate change.   |                            | 74        | 48.7       |
| 2   | Using as many private vehicles as possible than public transport can reduce the appearance of climate change |                            | 109       | 71.7       |
| 3   | Using more energy resources can reduce the appearance of climate change       |                            | 103       | 67.8       |
| 4   | Transforming organic waste into fertilizer can reduce the occurrence of climate change |                            | 98        | 64.5       |
| 5   | Planting more trees can reduce the appearance of climate change               |                            | 110       | 72.4       |
| 6   | Using more electricity can help reduce the appearance of climate change       |                            | 122       | 80.3       |
| 7   | Buying more local products can reduce the occurrence of climate change.       |                            | 33        | 21.7       |
| 8   | Building a catchment well is an example of adaptation action to climate change|                            | 110       | 72.4       |
| 9   | Planting mangrove trees is an example of adaptation action to climate change  |                            | 120       | 78.9       |
| 10  | Farming practices that conserve water in the dry season are examples of adaptation action to climate change |                            | 103       | 67.8       |
As shown in Table 6, significant respondents are worried about climate change, enjoy planting and harvesting crops, wanting to learn more about climate change, doing things eco-friendly, and eager to do more to save the environment, and happy to talk about environmental issues with friends, parents or teachers. On the other hand, there are exciting things that are contrary to the attitude that few respondents strongly disagree over the statement: "I am not happy with the schoolyard overgrown with plants and trees" and the statement "it is useless to do something to preserve the environment if people others do not do the same ". The overall weighted average score is 2.70 which is equivalent to right. This shows that respondents generally have a high awareness attitude towards environmental issues primarily related to climate change. These environmental awareness programs have the potential to be improved by increasing students' knowledge of climate change from primary education, causes, impacts, and mitigation and adaptation aspects.

Table 7 shows the results of a student's behavior survey on climate change. Most of the respondents indicate appropriate behavior with small efforts that contributed to efforts to reduce greenhouse gas emissions or adapt to climate change. Such attempts include: turning off lights in unused rooms, deciding not to buy anything because of too much packaging, buying recyclable paper products, using public transport rather than private vehicles when get around or going, Walking or riding bicycles while going at close range (less than 3 km), eating and drinking with reusable containers, reducing waste generated, turning off taps while brushing teeth, and taking a shorter bath. As for the behavior that is contrary to the effort to overcome the problem of climate change, most respondents stated never do that. However, one statement: to let the television on standby when it is not watched again, most respondents, respond to it, often. Overall the students showed the right attitude towards the environment. In this domain obtained a weighted average of 3.09 or in the high category.

### Table 6 Students’ attitudes and beliefs about climate change

| No | Statements                                              | Choice of Response | Weight | Description         |
|----|---------------------------------------------------------|--------------------|--------|---------------------|
| 1  | I like to plant and keep plants.                       | SA: 98, A: 37, D: 13, SD: 4 | 3.51   | Strongly agree      |
| 2  | I am not happy with the schoolyard overgrown with plants and trees | SA: 64, A: 70, D: 10, SD: 8 | 1.75   | Strongly disagree   |
| 3  | It is useless to me doing anything to preserve the environment if others do not do the same | SA: 60, A: 53, D: 21, SD: 18 | 1.98   | Strongly disagree   |
| 4  | I do not believe my everyday behavior and lifestyle contribute to climate change | SA: 20, A: 75, D: 36, SD: 21 | 2.38   | Strongly disagree   |
| 5  | I want to learn more about climate change in school    | SA: 105, A: 36, D: 6, SD: 5  | 3.59   | Strongly agree      |
| 6  | I am worried about climate change                      | SA: 38, A: 77, D: 29, SD: 8  | 2.95   | Strongly agree      |
| 7  | I am happy to talk about environmental issues with friends, relatives, parents or teachers | SA: 68, A: 57, D: 18, SD: 9 | 3.21   | Strongly agree      |
| 8  | I am pleased with what I am doing                      | SA: 53, A: 51, D: 27, SD: 21 | 2.11   | Strongly agree      |
right now and do not want to do to save the environment.

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 9 | I want to do little to keep the environment | 8 | 38 | 59 | 47 | 2.95 |
| 10 | I want to do more to save the environment | 91 | 32 | 11 | 18 | 3.29 |
| 11 | I do not want to do something in an environmentally friendly way | 60 | 55 | 20 | 17 | 1.96 |
| 12 | I do everything in an environmentally friendly way | 78 | 56 | 6 | 12 | 3.32 |

Average: 2.75

Note: SA = strongly agree, A = agree, SD = Strongly disagree, D = disagree

3.2. Teachers’ responses

In this study, the teacher's response to climate change learning was also explored. There were ten teachers involved in the study. Teacher's responses on the questions: 'Do you think climate change is an important issue? Do you think climate change has any influence in the future? And is climate change a worrying thing? Why?' All teachers consider climate change to be an important issue. Teachers also worry about climate change. All of them also agree that climate change will have a major impact in the future. Among the teachers revealed that: climate change can affect human behavior; resulting in seasonal change irregularities that result in changes in the life cycle; the vulnerability of society especially students to various types of diseases that arise; affect the life of the living creatures on earth; climate change has spread in various materials but lacks appropriately addressed; and affect human activities, health, and livelihoods. The responses indicate that teachers understand the impact of climate change. When asked further questions "Who do you think is responsible for combating climate change? With the choice of answers: Government, School, and Individual. One teacher answered the government, one teacher answered the government and each, three teachers answered all of them, and the remaining five teachers answered each. This indicates that only half of the teachers have a view that every individual has a responsibility to combat climate change. The next question is: "As an educator, what are the important things you can do about climate change?" Teacher responses: motivating/teaching students to preserve nature, pulling climate change materials out of science, instilling respect and protecting the environment, presents climate change subjects to be more interesting for students, reminding students to adapt to climate change impacts especially health-related, inserting and linking climate change materials in lessons other than science.

Table 7. Behavior is related to greenhouse gas emissions.

| No. | Statements | Choice of Response | Weight | Description |
|-----|------------|--------------------|--------|-------------|
| 1   | Let the television in standby when watched again turn off the lights in the room when not in use | A O S R N | 1.91 Never |
| 2   | 49 84 4 13 2 | Always |
| 3   | Turn on the fan or air conditioner | 10 30 18 31 63 3.7 Never |
|   |   |   |   |   |   |
|---|---|---|---|---|---|
|   |   |   |   |   |   |
| 4 | 12 | 8 | 23 | 64 | 45 | 2.2 | Always |
| 5 | 18 | 12 | 34 | 51 | 37 | 2.49 | Always |
| 6 | 15 | 9 | 35 | 48 | 45 | 2.35 | Always |
| 7 | 31 | 16 | 32 | 51 | 22 | 2.89 | Always |
| 8 | 59 | 29 | 30 | 15 | 19 | 3.62 | Always |
| 9 | 59 | 34 | 27 | 21 | 11 | 3.72 | Always |
| 10 | 79 | 20 | 15 | 21 | 17 | 3.81 | Always |
| 11 | 33 | 11 | 40 | 61 | 7 | 3.01 | Always |

**Average: 3.09**

*Note: A = always, O = often, S = sometimes, R = rarely, N = never*

Furthermore, teachers are asked their views related to, whether the current primary school curriculum has adopted climate change education? Most teachers answered already, and only one teacher did not respond. The materials are scattered in various learning themes such as water cycle, natural phenomena, and their impacts, human impacts on the earth's surface, natural resources, natural disasters, nature conservation, natural and human resources, environment, maintaining natural balance, and almost on any theme for applying K-13. For the question "Do you also link climate change issues in teaching relevant themes to your students? If so, in your teaching strategy, do you guide students to think about the relevance of climate change to other issues (e.g., social, economic, cultural, ethical and moral, etc.)? If not, give a brief explanation why? Nine teachers answered yes, while the other one did not respond. Most of the explanation is done through real practice such as inviting students to do the cleaning in the school environment, giving guidance so that students are more understanding and responsive to climate change. The teacher's response indicates that in general teachers have not been able to link climate change issues in various aspects of human life as well as habits undertaken among students both at school and at home that can contribute to the issue of climate change. This is consistent with the lack of student knowledge on the causes of climate change. The question "Do you think climate change education should be implemented in schools to improve your students' literacy skills? Why or why not? From your point of view, what pedagogical strategy would be most appropriate for students to understand this problem? ". Lecture, inquiry, problem-based learning, project-based learning, etc.? Eight teachers declared must be implemented, the rest did not respond. In the eight teachers were only three people who showed the right pedagogical strategy. According to them, the relevant strategy is an inquiry and problem-based learning. This indicates that not all teachers have adequate knowledge of climate change and their relevant learning strategies. The question "In your opinion, what components should be addressed in teaching climate change/global warming issues? For example basic knowledge and causes of climate change, impacts, and solutions,
mitigation and adaptation, etc. "The various answers put forward by teachers in response to these questions include: Understanding of weather and climate; The consequences of climate change for life on earth; How to combat climate change; The causes of climate change and its impact; How to preserve the environment; Climate change causes, impacts, and solutions; Impacts of climate change/global warming; Climate change prevention solutions; Basic knowledge and causes of climate change; Environmental changes caused by human activities. The question "Are there any school activities/programs that have been launched to raise student awareness about climate change and encourage their involvement in low-carbon emissions behaviors? For example, a green school, 3R, energy saving action, green generation move, etc. If there are, what are the difficulties faced when carrying out these activities? "Eight teachers answered there already and the rest, two people, did not answer. The eight teachers revealed the activities that have been done are: Preserving and maintaining the school park; Setting up the garbage bin; Conduct afforestation in the school area; Save energy (turn off the light in or outside the classroom); Creating school gardens; and Sorting garbage. According to the respondents, generally, the main difficulty in the implementation is to maintain consistency. The question "Do you think, as a teacher who responsible for the implementation of environmental education in schools, you need the teacher training program on climate change? Why or why not? "Eight teachers answered, they need it. The reason: know how to cope with climate change so that it can adopt in learning, so that teachers have insights on climate change to be transmitted to students, teachers who should know before it is sent to students, to make teachers more professional, and add ideas about climate change which is currently being the attention of the world community [15,16].

4. Conclusion
The results of this study indicate that the majority of participants show moderate levels for understanding basic concepts, impacts, mitigation, and adaptation, but unfortunate for the causes of climate change. Overall, the majority of respondents indicate moderate levels of knowledge of climate change, whereas attitudes and behaviors are okay. The results of this study conclude that student literacy on climate change needs to be improved again and recommend that the subject of climate change need to be considered as a separate theme in the current curriculum. Teachers as implementers of climate change education must be equipped with adequate knowledge, both related to culture and pedagogy in climate change teaching and learning.

References
[1] IPCC 2013 Summary for policymakers. Climate Change 2013: The Physical Science Basis ed Stocker T F et al., (Cambridge University Press).
[2] Kolawole O D et al. BAMS 8 131-145
[3] Ayanlade A and Jegede M O 2016 BAMS 8 465-473.
[4] Cordero E et al. 2008 BAMS 8 865-872.
[5] UNESCO and UNEP 2010 Climate change starter’s guidebook (France: UNESCO/UNEP)
[6] Clement A et al. 2011 BAMS May 633–635
[7] Donner SD 2011 BAMS October 1297-1302
[8] Olatumile A 2013 International Education Research 1 3 38-50
[9] Walker S L dan McNeal K S 2013 Journal of Environmental Education 3 1 57-73
[10] The KA 2013 Students' perceptions of climate change and engagement in low-carbon
behaviors: implications for climate change education in Hong Kong (Thesis) (Hong Kong: University of Hong Kong) Retrieved from http://dx.doi.org/10.5353/th_b5099154

[11] Christensen R and Knezek G 2015 *International Journal of Environmental & Science Education* 773-788.

[12] Njoku C 2016 *International Journal of Curriculum and Instruction* 8 2 29–40

[13] Liarakou G et al. 2011 *International Journal of Environmental and Science Education* 6 1 79-98.

[14] Mochizuki Y and Bryan A 2015 *Journal of Education for Sustainable Development* 9 1 4-26

[15] Hayhoe D et al. 2011 *BAMS* 3 254–260.

[16] Ambusaidi A et al 2012 *International Journal of Environmental & Science Education* 7(2) 233-251