Assessing students 21st century attitude and environmental awareness: promoting education for sustainable development through science education

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Abstract. The study aims to measure students 21st century attitudes and environmental awareness. This study is a survey study which is part of development research of character learning model based on education for sustainable development. The data were collected by using 21st century attitude questionnaire and environmental awareness self-assessment that given to senior high school students in West Nusa Tenggara (NTB). The instrument was adapted from Assessment and Teaching of 21st Century Skills (ATC21S) that consists of four aspects are critical thinking, collaboration, communication and creative thinking. The result shows that generally students 21st century attitude can be categorized on low category and mostly students environmental awareness can be concluded on enough category. The study will be used as the reference and need assessment of developing character learning model based on education for sustainable development.

1. Introduction
The education concepts that United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the Organisation for Economic Co-operation and Development (OECD) recommend to teach science in 21st century is education for sustainable development (ESD). UNESCO promotes some learning strategies and models to implement education for sustainable development namely: experiential learning, project based learning, story-telling, values education, inquiry learning, appropriate assessment, future problem-solving, learning outside the classroom, & community problem solving [1-8].

Education for sustainable development includes 21st century skills and environmental awareness which is one of the components that assessed in the Programme for International Student Assessment (PISA) [9,10]. In this study, 21st century attitude in way of working aspect including critical thinking, collaboration, communication, and creativity, also called “the 4Cs” by the Partnership for 21st Century Learning (P21) is assessed to promote education for sustainable development through science education [11]. The indicators of 21st century attitude is adapted from Assessment and Teaching of 21st Century Skills (ATC21S) on way of working aspect [12]. There are four aspect of 21st century attitude that
assessed in this research are critical thinking, collaboration, communication and creativity which the ability explained below.

Table 1. 21st Century Attitude.

| 21st Century Attitude Aspects | The Ability |
|-------------------------------|-------------|
| Critical thinking | analyzing arguments, claims, or evidence making inferences using inductive or deductive reasoning judging or evaluating making decisions or solving problems |
| Collaboration | coordination, conflict resolution, decision making, problem solving, Negotiation |
| Communication | demonstrates effective written and oral communication skills actively listens, provides constructive feedback, and demonstrates respect for differing views shares information with others actively seeks others’ perspectives to ensure inclusiveness and understanding tailors communications to diverse audiences |
| Creative Thinking | identify problems generate ideas, often by thinking divergently using fluency, flexibility, originality, and elaboration solve problems |

Environmental awareness is one of the component that includes in environmental literacy. It is defined as a combination of motivation, knowledge and skills. Environmental literacy consists of five aspects are knowledge, awareness, behaviour, involvement and attitude [13,14]. The indicators of environmental awareness defined by OECD are described by: (1) Awareness of environmental issues: A measure of how informed students are about current environmental issues; (2) Perception of environmental issues: A measure of how concerned students are about environmental issues; (3) Environmental optimism: A measure of students’ belief that their or human actions can contribute to sustaining and improving the environment.

It is important to assess and enhance this both competencies (21st century attitude and environmental awareness) to the students who live and socialize in 21st century. As we know that environmental awareness grew in the second half of the twentieth century. Environmental awareness is an integral part of the movement’s success. By teaching our friends and family that the physical environment is fragile and indispensable we can begin fixing the problems that threaten it [13].

2. Method

2.1 Research Design

This research was a survey study that focused to describe students 21st century attitude and environmental awareness. The method used in this research is a qualitative method and the data were collected by using 21st century attitude questionnaire and environmental awareness self-assessment that given to senior high school students in West Nusa Tenggara (NTB).

2.2 Research Subject and Location

This research was conducted at six senior high school in six district located in West Nusa Tenggara (NTB) province namely school A, B, C, D, E and F.
3. Result and Discussion

3.1 The Result of 21st Century Attitude

The indicators of 21st century attitude is adapted from Assessment and Teaching of 21st Century Skills (ATC21S) on way of working aspect [12]. There are four aspect of 21st century attitude that assessed in this research are critical thinking, collaboration, communication and creative thinking which the result described below.

| Sample Each School (Σ) | Critical Thinking | 21st Century Attitude | Communication | Creative Thinking |
|-------------------------|-------------------|-----------------------|---------------|-------------------|
|                         | High   | Enough | Low   | High   | Enough | Low   | High   | Enough | Low   | High   | Enough | Low   | High   | Enough | Low   |
| A (35 students)         | -      | 8      | 27    | -      | 11     | 24    | 1      | 13     | 21    | -      | 8      | 27    |
| B (27 students)         | -      | 6      | 21    | -      | 2      | 25    | -      | 17     | 10    | -      | 11     | 16    |
| C (32 students)         | -      | 4      | 28    | 2      | 7      | 26    | 1      | 11     | 23    | -      | 3      | 29    |
| D (30 students)         | -      | 7      | 23    | -      | 14     | 16    | -      | 15     | 15    | -      | 5      | 25    |
| E (32 students)         | -      | 8      | 24    | 5      | 15     | 12    | 2      | 13     | 17    | -      | 5      | 27    |
| F (28 students)         | -      | 6      | 22    | -      | 10     | 18    | 1      | 7      | 20    | -      | 4      | 24    |
| Total                   | 0      | 39     | 145   | 7      | 59     | 121   | 5      | 76     | 106   | 0      | 36     | 148   |

Based on table 2 above, students' critical thinking ability is still very low. This is indicated by the 184 students there are 78,80% students who have low critical thinking and 21,20% students have critical thinking ability in enough category, whereas there is no one student who has the ability to think critical in the high category. This is because by the time of the learning process students very rarely train students' critical thinking skills. Teachers only teach the concept and summative evaluate. Whereas in learning science teachers are required in addition to teach the concept of science but very need to exercises students critical thinking skills [15,16]. The same thing is seen in the students' creative thinking ability.

Based on table 2 above, there are 80,43% students who have low creative thinking ability and 19,56% students who have creative thinking ability in enough category, but there are no students who have creative thinking ability in high category. This shows that students' creative thinking ability is very low. This is also because teachers rarely practice the creative thinking skills of students during the learning process either in the classroom or in the laboratory where it can be seen from the learning tools that do not include the 21st century skills aspect. This is in line with the results of research that the low ability of creative thinking in students is caused by teachers who do not trained students' creative thinking ability [17,18]. High and low critical and creative thinking skills will certainly affect student learning outcomes. Based on several studies that students who have critical thinking skills and high creative thinking generally have high learning outcomes while students who have critical thinking skills and low creative thinking generally have low learning outcomes as well [19].

Another thing that can be seen from table 2 above is the ability of communicative and collaborative students who are generally still categorized as low. The collaborative ability of the students shown in table 2 shows that there are 65,76% students in the low category and only 3,8% students in the high category. As for the students' communication skills, there are 57,61% students in the low category and only 2,72% students in the high category. This is because the model and method of learning that teachers use in teaching does not encourage students to develop communication and collaboration skills. The students who have collaborative and communicative abilities in the high category are caused by the
students involved in organizations at schools [20,21]. Teachers should be able to design a lesson that is capable of developing 21st century skills so that students are equipped with four important aspects of critical thinking skills, creative thinking skills, collaborative and communicative skills.

3.2 The Result of Environmental Awareness

The indicators of environmental awareness is adapted from OECD in PISA framework which the result described below.

| Sample Each School (Σ) | Environmental Awareness |
|------------------------|-------------------------|
|                        | High | Enough | Low |
| A (35 students)        | 1    | 22     | 12  |
| B (27 students)        | -    | 17     | 10  |
| C (32 students)        | 5    | 18     | 9   |
| D (30 students)        | -    | 25     | 5   |
| E (32 students)        | 3    | 17     | 12  |
| F (28 students)        | 2    | 19     | 7   |
| **Total**              | **11** | **118** | **55** |

Based on table 3 that there are 29.89% students who have low environmental awareness and 64.13% students have environmental awareness in the category enough and there are 5.98% students have environmental awareness in the high category. This shows that students are well aware of the importance of knowledge about environmental awareness even though not all students are able to apply the knowledge they have. Based on the observation that the existence of environmental awareness owned by the students actually not only because it is taught through learning in the class but more influenced by the culture and habits that exist in the school environment [5,22]. In addition, knowledge of environmental awareness is needed by ensuring sustainability.

4. Conclusion

Based on the analysis data and result, it can be inferred that generally students 21st century attitude can be categorized on low category and mostly students environmental awareness can be concluded on enough category.

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