

Analysis of Senior High School Students' Understanding on Citizen Science Project in Indonesia

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Abstract: The Citizen Science Project (CSP) is currently a popular research study in the world. This is because it is in line with the demands of the Independent Curriculum. Many researchers use it to collect large amounts of data that is integrated into learning. Various evidence about the success of CSP has been known by world scientists. Developed countries have also practiced it and found results. The hope is that this can be an alternative solution that can be used by teachers to help the learning process in schools by encouraging active students. This research aims to provide an overview of how high school students in Indonesia understand citizen science projects. This research becomes the basis for carrying out subsequent research. The type of research used is descriptive qualitative with interview data collection techniques, distributing questionnaires, and analyzing relevant literature. The sample used was 109 students in Indonesia spread across the islands of Sumatra and Java using a random sampling technique. The research results showed that the majority of students did not know and understand the term citizen science project in the school or outside school environment. 85.32% did not understand the term CSP, 11.10% did not know much, and 3.66% knew the basics of CSP. This is proof of the need for CSP socialization and workshops in learning before it is implemented in learning. These results are supported by interviews conducted with teachers and students who stated that they had never heard of the term CSP in learning. Some schools have involved citizen science in learning but do not realize the important role citizen science plays in supporting learning now and in the future. The presence of citizen science projects in learning has great potential to improve learning outcomes in the form of knowledge, attitudes and skills.

Keywords: Citizen Science Project, Indonesia, Senior High School, Understanding.

Introduction

Citizen science (CS) has become popular research among the world community. The demonstrated success motivates researchers to involve CS in research and in the world of education. Many people use CS as a collector of large amounts of data. This is because having CS in a project will help ordinary people to contribute to the world of research. The results of several studies regarding the involvement of CS in learning have been proven to improve student learning outcomes. Among the increased learning outcomes are motivation, science process skills, collaboration, communication, and reducing negative attitudes towards animals (Aristeidou & Herodotou, 2020; Haklay et al, 2021). This provides new

opportunities in the world of education. This means that CS has great potential in the world of research and education in Indonesia. Support for this can be found in research results showing that public participation in science makes a significant contribution to understanding and knowledge of scientific topics, questions and problems faced by them (Miller-Rushing et al., 2012). The majority of adherents to the concept of citizen science explain that active participation in citizen science can increase understanding, scientific literacy, understanding of the scientific process, and change actions that were initially negative into actions that have a positive impact on the environment (Bonney et al. 2016; Fernandez-Gimenez et al. 2008; Jordan et al. 2011; Krasny and Bonney 2005;

Trautmann et al. 2012; Trumbull et al. 2000; Cornwell and Campbell 2012; Cooper et al. 2007; Lewandowski and Oberhauser 2017; McKinley et al. 2016). Meanwhile, some projects have demonstrated the achievement of positive learning outcomes, but most projects have not robustly documented outcomes such as increased interest in science or the environment, knowledge of science processes, science inquiry skills, or changes in behavior (Bela et al. 2016; Bonney et al. 2016; Jordan et al. 2012; Phillips et al. 2012).

Citizen Science is the involvement of the scientific community in research and learning. CS has a high concern for knowledge even though he did not gain formal knowledge at school. Collaborating with the surrounding community, students can learn how to interact and obtain information with the world outside school. As this field develops, it becomes increasingly important to consider its potential to foster innovative and creative education and learning opportunities (Roche et al., 2020). Indonesia, with its potential, has a high population, providing opportunities for the development of CS well in learning. These conditions really help scientists in conducting research. CS involvement in the world of education can help increase awareness of science. Several studies have revealed that CS can help solve environmental problems (Gusti, 2022). Besides that, research has also explained that CS is able to encourage the collection of a world biodiversity database. Not only that, CS is able to improve students' skills such as critical thinking skills and creative thinking. This is very beneficial for students' future in the career world. It was also surprising that CS was able to train communication and collaboration skills. So, CS has the potential to encourage 21st century skills for students in Indonesia.

CS integration in learning is usually used in the form of projects or known as citizen science projects (CSP). Through the projects given, students are asked to collaborate with community scientists or those known as citizen science. Apart from that, many worlds educational institutions have used this to help collect data and increase student activity. Therefore, it is necessary to analyze how students understand CSP, so that

teachers can design appropriate strategies in learning. There has still been very little research conducted regarding the analysis of students' understanding of CS. This research is the initial part before implementing CS research in the world of education. In Indonesia, citizen science has become applied among students who want to learn more about nature and science. With increasing community participation in research activities, it is necessary to understand how students in Indonesia understand and use citizen science in learning. Thus, this research is important to carry out as a foundation for CS research in Indonesia.

Methods

The research uses qualitative descriptive methods. The qualitative descriptive research method is a research approach used to investigate research objects in natural contexts or situations that do not involve special treatment or intervention. Data sampling technique with random sampling. The research population was high school students in Indonesia with a sample of 109 students in Indonesia who were chosen randomly. Data collection techniques using questionnaires, interviews, observation and analysis of relevant literature. Validation of research instruments was carried out by expert lecturers. This aims to ensure the validity of the instruments used in the research. The data analysis technique is by adding and calculating the percentage of indicators on the instruments used and observer reliability events.

Table 1. Research Sample Data.

School Name	Location	Amount
SMAN 1 Padang	Sumatra Island	61 People
SMAN 1 Koto Balingka	Sumatra Island	31 People
SMA Al Kenzie	Java Island	14 People
SMA BPPI Baleendah	Java Island	3 People
	Amoun	109

Results and Discussion

Citizen Science Project has 8 main components, namely context awareness, community involvement, utilizing infrastructure, technological innovation, educational innovation, reach and scale, building networks, and complex thinking (Sanabria-Z et al., 2022). These components must be present when integrating school learning with CSP. Therefore, it is necessary to know students' understanding of CSP before it is implemented in school. Students can carry out various activities with integrated CSP, from natural observations and measurements to data collection and analysis. Examples of citizen science projects that have been carried out in Indonesia include bird surveys, marine debris surveys, and climate and weather surveys (Aripin et al, 2022; Aripin et al, 2021).

Indonesian students generally have concern and positive attitudes towards citizen science and the surrounding environment (Gusti et al, 2022; Gusti et al, 2022; Chandrawati, 2021; Nurhaliza et al, 2023). Apart from that, the public is also aware that by involving citizen science in research projects they can obtain accurate and useful results. CS involvement can increase knowledge and awareness of important issues and create creative and innovative solutions. However, the conditions that occurred when interviewed about what citizen science was, students did not recognize it. The majority of students only understand that the community is involved in teaching and learning activities. However, they do not know in detail the application and concept of CS. This means that students do not yet understand CS in general or in learning. Based on the results of the research conducted, it was proven that participants did not know the terms citizen science or citizen science project in learning. So many people answered that they didn't know when the research questionnaire was distributed. The percentage of students' knowledge of the term citizen science project can be seen in Figure 1.

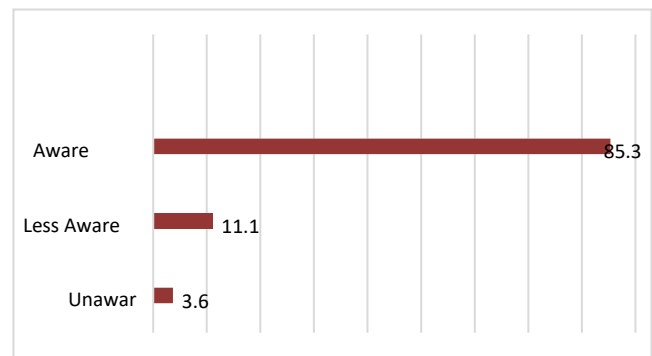


Figure 1. Percentage of CSP Knowledge.

The calculation results showed that 85.32% of students who did not know citizen science never even heard of the term CSP. In line with research which reveals that one of the difficulties in learning is remembering foreign terms (Nisak, 2021). This factor also reinforces the lack of students' understanding of CSP because it is a foreign term for them. Human cognitive theory provides an explanation that someone will easily convey something because they are used to it and often use it. This is because it has a low cognitive load. If someone does not know or has difficulty conveying it because the cognitive load is higher in conveying it (Wantika, 2017). Someone cannot possibly mention something if they have never heard or seen it (Widodo, 2023).

Besides that, 3.66% of students already know this term. When interviewed further, it was discovered that students got information from reading material such as YouTube, social media and newspaper print media. Students who knew this also admitted that they had only recently heard this term. Apart from that, 11.10% did not know this term. Most of those who don't know only know that the term refers to community involvement only. They do not know that there are other components that are indicators of CSP. So, it can be concluded that students are not yet familiar with the term CS in life and learning at school.

Factors that influence how students in Indonesia understand and use the term citizen science are through education and field activities. The majority of students in Indonesia learn about science through formal education at school. Others also find out about science through programs organized by non-formal institutions, such as

citizen science activities. Formal and non-formal education will play an important role in shaping students' understanding of citizen science in Indonesia. Another factor that influences how students in Indonesia understand and use citizen science is access to technology. Easy access to technology allows students to access various sources of information about citizen science. Technology also allows students to participate in citizen science projects easily, such as by using smartphone apps or websites. This increases community participation in citizen science activities. Based on the data obtained, a conclusion can be drawn that the majority of students do not know the term CSP in learning. So, it is necessary to socialize the introduction of CSP in learning before implementing CSP in learning. This is a consideration for Indonesian teachers and researchers who will apply CS in the world of research and education. This aims to obtain quality research results.

Conclusions

The qualitative descriptive research method is a research approach used to investigate research objects in natural contexts or situations that do not involve special treatment or intervention. The public realizes that by involving citizen science in research projects they can obtain accurate and useful results. The majority of students only understand that the community is involved in teaching and learning activities. This means that students do not yet understand CS in general or in learning. Based on the results of the research conducted, it was proven that participants did not know the terms citizen science or citizen science project in learning. The majority of students do not know CSP in learning. So, socialization needs to be carried out to help understanding. Formal and non-formal education, as well as access to technology, play an important role in shaping students' understanding of citizen science. Thus, it is important to improve formal and non-formal education, as well as access to technology to help students in Indonesia improve their understanding of citizen science.

In line with research which reveals that one of the difficulties in learning is remembering foreign terms. If someone doesn't know or has difficulty conveying it because their cognitive load is higher in conveying it. So, it can be concluded that students are not yet familiar with the term CS in life and learning at school. Technology also allows students to participate in citizen science projects easily, such as by using smartphone apps or websites. This increases community participation in citizen science activities. The research results showed that the majority of students did not know and understand the term citizen science project in the school or outside school environment. 85.32% did not understand the term CSP, 11.10% did not know much, and 3.66% knew the basics of CSP. This data proves the need to apply CSP in learning so that research results and the introduction of CSP can be seen more clearly through practice. Based on the data obtained, a conclusion can be drawn that the majority of students do not know the term CSP in learning.

It is necessary to conduct socialization or introductory workshops as well as training on CSP in learning before implementing CSP in learning. This introduction and training is carried out not only for students, including teachers, the community and parties involved during the implementation of CSP. This is a consideration for Indonesian teachers and researchers who will apply CS in the world of research and education. Thus, maximum results are obtained that are in accordance with the reality of what is happening. This research is the foundation for conducting subsequent CSP research, both used for data collection and in learning. In addition, the data can be used as a basis for subsequent research actions. Therefore, it opens up further relevant research opportunities.

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