Science teacher’s conception about importance of Geoscience learning: A case study of junior high schools in Surabaya Indonesia

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Abstract. The aim of this study is to identify the science teacher’s conception of the importance of geoscience learning. This study was possessed the conception profile of science teacher about geoscience learning through questionnaire instrument and curriculum analyses to 17 science teachers at three Junior High Schools in Surabaya as the participants. A descriptive quantitative approach is used to analyse the data. Based on the results obtained, almost all the participant stated that geoscience learning is important to teach but more than 50% of science teachers do not teach it because of insufficient time constraints. Based on the curriculum analyses, can be known that the learning method which is done using textbooks only without involving issues which are happening in the present. Therefore, it can be concluded that the developed geoscience learning curriculum for pre-service science teachers needs to be developed.

1. Introduction

For the past several years, geoscience learning has been of considerable interest to science education researchers. The quality of learning depends on the teacher's understanding of the geoscience subject matter, which reflects the quality of education. Education is one of the main vehicles for the intellectual and professional development of human resources and plays a very important role in supporting a stronger and globally competitive Indonesia. Therefore, it is the most powerful weapon that can be used to change the world [1]. To realize good quality education, science teachers, curriculum developers, and resource researchers must be organized and have easy access to overcome geoscience misconceptions [2].

A conception about geoscience is very important for humanity to successfully respond to these challenges and develop in the coming decades. Several supporting factors are (1) global finance depends on access to reliable and safe energy sources, most of which depend on geoscience knowledge; (2) air, soil, and mineral resources become very scarce in some areas due to the increase in human population and global industrialization; and (3) there are many questions in terms of sea-level rise, drought, forest fires, desertification and intensification of storms as a result of global climate change widely accepted [3]. Geoscience is important to enhance the disaster mitigation of Indonesian society. The science curriculum for junior high school in Indonesia has some content to prepare students to understand the layers of the earth, volcanoes, earthquakes, and risk reduction actions before, during, and post-disaster according to the threat of disasters in the area. Thus, this understanding can increase his/her knowledge and concepts of science that are useful in everyday life as well as to develop skills, to investigate the environment, and solve problems [4].
The science curriculum that has been formulated is very suitable with the conditions of the earth in Indonesia because the events of the disaster and the associated social and economic impacts are currently increasing. It is undeniable that Indonesia is a country closed by natural disasters [5]. In the last decade, it showed the highest number and impact of disasters, while 2015 was declared the hottest year ever. The Asia Pacific region has become the most frequent place for this disaster, while Indonesia is one of the most at risk of disasters and the effects of climate change [6].

In fact, there were 350 natural disasters occurred in 2016 worldwide, killing 10.273 people and affecting over 204 million people. The estimated amount of economic damage came close to US$147.4 billion [7]. The impacts of natural disasters in four indices, occurrence, number of deaths, number of affected people and economic damage based on the region that were covered in Figure 1.

![Figure 1. The natural disaster's impact by region, 2016 [7].](image1)

As shown in Figure 1, Asia ranks the first among all regions in the categories of disaster occurrence, the number of killed people, and economic damage, accounting for 45.1 per cent, 50.5 per cent, and 49.5 per cent, respectively. On the other hand, America is ranked the highest in the number of affected people, which is largely attributed to the storm in America.

While the impacts of natural disasters in Asia based on occurrence, number of deaths, number of affected people and economic damage that were covered in Figure 2 below.

![Figure 2. The natural disasters impact in Asia by disaster type, 2016 [7].](image2)
Based on Figure 2 above, we can be known that flood is the most dominant disaster in all categories. Flood tops at 43.7 per cent and 63.6 per cent while in the number of occurrences and killed people. In the number of affected people, the flood has the largest shares too, 78.3 per cent. Flood brings the heaviest economic damage by 48.3 per cent.

Based on EM-DAT (Emergency Event Database) data from the two figures above, it is known that more disasters that occur are from non-geophysical disasters (hydrology, meteorology, and climatology) than those originating from geophysical disasters. Therefore, the total damage and total losses resulting are more. However, the number of deaths is significantly caused by geophysics disasters, namely earthquakes and volcanic activity [6].

Volcanic phenomena become an inseparable part of the lives of Indonesian people [8]. Geographically, almost all Indonesia regions are prone to natural disasters, especially volcanic disasters. Indonesia has the most volcanoes in the world [9]. There are 147 volcanoes, and 76 of them are active volcanoes and spread along the islands of Sumatra, Java, Sulawesi and the Lesser Sunda [10]. This condition brings consequences or impacts both positive and negative for Indonesia society, especially those who live in the volcanic region. The positive impact is the potential of natural resources (fertile land, beautiful landscapes, many deposits of metals, non-metals, oil and gas) caused by the presence of volcanoes. Negative impacts are dangerous or vulnerable to geological disasters such as earthquakes, volcanic eruptions and landslides [9].

Another fact, many volcanic disasters show that the increasing number of deaths is caused by the weakness of the disaster preparedness system and the low understanding of disaster risk to the surrounding community. Indonesia is the fifth country with the largest population in the world where 60% of the population lives on stone slabs, but that number has not been balanced with a good level of understanding of disaster preparedness [11]. Beginning in 1815 and early 2014, Indonesia had 128 volcanic eruptions with deaths reaching 78647 people. The event was symbolized as a disaster with the second-largest eruption after the earthquake and tsunami. The National Disaster Management Agency (BNPB) also noted that from 2010 to 2014, there were 36 eruptions with a total of 432 people had died, and 2217 people had injured. These data illustrate the vulnerability of the society for the risk of disasters. If we cannot prevent and reduce significantly, the damage caused by extreme events is a major disaster for life [8].

One of the factors predicted as the cause of the number of disaster victims is the low knowledge and skills’ the society in minimizing disaster risk. The ability to reduce disaster risk greatly helps them to protect people and economic assets [12]. Certainly, it cannot be done spontaneously to manage the disaster, but it must be planned in good long-term management [13]. This disaster management should be integrated into geoscience learning in school. Therefore, knowledge related to disaster mitigation and response techniques needs to be shared by every Indonesian society, so as to minimize the risk of disasters that occur [11].

This paper is intended to identify the science teacher’s conception of the importance of geoscience learning. The function of this identified is to know how important this subject matter is taught, how the learning process is carried out at school, and what learning resources are used, so that the researchers can improve the appropriate learning strategy to create a generation that has excellent disaster mitigation.

2. Research Method

Participants of the study included 17 science teachers from three Junior High Schools in Surabaya, Indonesia, which five (5) teachers from Junior High School 21 Surabaya and six (6) teachers from each Junior High School 22 and 36 Surabaya. The research used a descriptive quantitative approach by using a questionnaire instrument created by the researchers. The data will be analysed using percentage descriptive analysis to determine the science teachers’ conception about the importance of geoscience learning and how the learning method used. Basic competence (KD) that supporting the geoscience curriculum is KD 3.10 and KD 3.11 on the Junior High School science curriculum, each of them is KD 3.10 state “explain the layers of the earth, volcanoes, earthquakes, and actions risk reduction before, during, and after a disaster according to the threat of disaster in the area” and KD
3.11 state “analyse the solar system, the rotation and revolution of the earth and the moon, and their impact on life on earth” [4].

3. Result and Discussion
The questionnaire has some question about geoscience learning. The first question is about the importance of geoscience learning based on science teachers’ opinion. The following Figure 3 is the science teachers’ response to the importance of geoscience learning.

![Figure 3](image-url)  
**Figure 3.** The importance of geoscience learning according to the science teachers from three Junior High Schools in Surabaya.

Based on Figure 3 above, it can be known that more than 50% of the participants think geoscience learning is important to teach. In school I, all of the science teacher implemented the geoscience subject matter in the Science lesson. On the other hand, several science teachers in another school aren’t teaching the subject matter. The following Figure 4 shows the implementation of geoscience learning in several junior high schools in Surabaya.

![Figure 4](image-url)  
**Figure 4.** The implementation of geoscience learning from the three junior high schools in Surabaya.
As shown in Figure 6 above, science teachers that did not teach geoscience subject matter were more than 50%. Based on the interviews, his/her reasons are (1) the geoscience subject matter is located in the most last chapter, so the time is often not available due to explain it; (2) the students are only given individual assignments, such as making clippings and papers; and (3) the science teachers only display videos of related phenomena about geoscience.

In addition to that, science teachers’ learning methods are adjusted to the characteristics of the students. For the students who have characteristics such as elementary school students, the suitable learning method is discourse. However, some classes were implementing another learning method, such as discussion.

Each school has different geoscience learning resources. The students of Junior High School 21 Surabaya just use their books in science learning. In Junior High School 22 Surabaya, the students use the internet as another learning resource. While in Junior High School 36 Surabaya, there are various kinds of learning resources, such as the science library and solar system model media. But based on the curriculum analyses, can be known that the learning method which is done using textbooks only without involving issues which are happening in the present.

Geoscience teachers have a very large contribution to make to universal education by offering place-based, locally relevant science education on topics of critical importance to society. These topics, such as water, natural hazards, and resource development, bring larger global concerns, such as energy and climate change, to a relevant, local level that can affect individual lives [14]. In this case, to achieving innovative learning, surely the teacher must be creative in applying geoscience learning by integrating various kinds of values that apply in society. For example, the developed geoscience learning showed that the implementation of the learning of Science, Environment, Technology and Society (SETS) was integrated with local wisdom that was able to reconstruct and increase the disaster management knowledge [15].

In addition, to improve the quality of Indonesian science education we suggested that science teachers should plan to teach strategic and systematic, implementation, evaluation systems, and continuous improvement of the education system in Indonesia [1]. So that, we need to do the reconstruction of the design of geoscience learning that prioritizes the issues of the earth through the subject of Earth and Space Sciences (IPBA) to the pre-service teachers, because the students’ understanding of geoscience is very important to answer the earth issues in future.

As Laurie et al. (2016) suggested education of sustainable development (ESD) skills contributes in many ways to quality education in primary and secondary schools. Teaching and learning change in all contexts when the curriculum included sustainable content and the ESD pedagogy promotes the learning of the skills, perspectives, and values needed to grow a sustainable society [16]. This could suggest that ESD skills could effectively improve students’ conceptual understanding and insightful problem-solving in geosciences phenomena through the subject of Earth and Space Sciences (IPBA).

4. Conclusion
Based on the results which are obtained of this research, it can be concluded that almost all of the science teachers stated that geoscience learning is important to teach. However, more than 50% of science teachers do not teach it due to several reasons, and the reasons are (1) there is no available time to explain the geoscience subject matter because it is located in the most last chapter; (2) the students are only given individual assignments, such as making clippings and papers; and (3) the science teachers only display videos of related phenomena about geoscience. While the learning method and learning resources also need to be developed to realize innovative learning. Therefore it can be concluded that the developed geoscience learning curriculum for pre-service science teachers needs to be developed.

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