Profile of elementary school science teacher instruction in disaster risk reduction: case study of volcano disaster

Pujianto\textsuperscript{1a}, Prabowo\textsuperscript{2} and Wasis\textsuperscript{2}

\textsuperscript{1}Department of Physics Education, Universitas Negeri Yogyakarta, Indonesia
\textsuperscript{2}Department of Physics Education, Universitas Negeri Surabaya, Indonesia
\textsuperscript{a}E-mail: pujianto@uny.ac.id

Abstract. This study examined the profile of science teacher instruction in Disaster Risk Reduction (DRR), as a feature of instructional quality, on students’ learning experiences. A qualitative study was done to observe teacher activities in teaching of disaster preparedness. Science teacher and 14 students at grade 4 of SDN (elementary school) Kiyaran 2 are involved as the subject of this study. Teacher’ instruction was coded with regard to preparation, action, and evaluation using observation sheets and documentation. Data analysis results showed a positive significant effect of the readiness during preparation on learning process of disaster risk reduction and an indirect effect of teacher’ action on students’ learning experiences. There is a lack of teaching materials about volcano disaster in the elementary school. Teacher found difficulties on evaluation of student achievement in disaster preparedness. These findings highlight the importance of DRR in uphold science teachers’ education. Items of teachers’ skill in preparing of DRR may be used to offer model of concrete instruction situation during university workshop for maintain teacher education.

1. Introduction

Geographically, almost all regions in Indonesia are prone to natural disasters especially volcano disaster. Indonesia is one of the richest countries in the world in the number of volcanoes it owns. This condition brings consequences or impacts both positive and negative for the people of Indonesia, especially those living in the district of the volcano. The positive impact is the potential of natural resources (fertile soil, beautiful scenery, many mineral deposits of metals, non-metals, oil and gas) caused by the presence of volcanoes. Negative impacts are dangerous or prone to geological disasters such as earthquakes, volcanic eruptions, and landslides.

Many volcanic disaster events indicate that the increasing number of fatalities is due to the weakness of the disaster preparedness system and the low understanding of disaster risks to the surrounding communities. Indonesia is the fifth country with the largest population in the world where 60% of the population lives in the rock plates but that number has not been matched by a good level of understanding of disaster preparedness [1]. This situation is exacerbated by the existence of a local culture or myth that is more trusted by society than the scientific knowledge disseminated by related experts. This situation is clearly less flattering for disaster mitigation systems. This triggers the need for integration between scientific knowledge and local cultural in reducing the risk of natural disasters [2].

The fatalities from Mt. Merapi eruption in 2010 amounted to 354 people. Most victims were in Sleman district, 252 inhabitants, followed by Magelang district 75 people, Klaten 36 people, and
Boyolali 10 people, while the refugees reached 47,486 people. Government expenses budget in developing countries is mostly spent on evacuation funding for natural disaster victims [3]. The budget can be employed for other important purposes such as health, education and community tenure if disaster management can be well developed. Volcanic eruptions also indirectly cause learners to get limited learning services.

**Table 1. Recapitulation of number of victims and refugees.**

| Areas         | Decease | Total | Inpatient | Refugees | Evacuation Point |
|---------------|---------|-------|-----------|----------|------------------|
|               | Burn    | Non Burn |          |          |                  |
| Sleman        | 190     | 62     | 252       | 98       | 27,127           | 151               |
| Kulonprogo    | -       | -      | -         | -        | 1,574            | 11                |
| Kota Yogya    | -       | -      | -         | -        | 1,142            | 39                |
| Bantul        | -       | -      | -         | -        | 1,961            | 15                |
| GunungKidul   | -       | -      | -         | -        | 2,309            | 17                |
| Klaten        | 7       | 29     | 36        | 30       | 3,909            | 6                 |
| Boyolali      | -       | 10     | 10        | 37       | 34               | 4                 |
| Kab. Magelang | -       | 56     | 56        | 75       | 8,971            | 46                |
| Kota Magelang | -       | -      | -         | -        | 28               | 3                 |
| Temanggung    | -       | -      | -         | -        | 359              | 4                 |
| Semarang      | -       | -      | -         | -        | 72               | 3                 |
| TOTAL         | 197     | 157    | 354       | 240      | 47,486           | 299               |

Source: BNPB Report, 5th December 2010[4]

The observation of Elementary School (ES) students in the area affected by eruption of Mt. Merapi found one of the students who had difficulty speaking (do not want to talk). Learners experience a deep sense of trauma because all family members and their homes are lost due to Mt. Merapi hot cloud attack. The student's daily activities only use their writing or gesture of limb movement to communicate with the surroundings. This condition will bring a greater impact on the development of human resources in the area.

The role of education in improving students’ understanding of disaster risks and how they should be addressed is crucial. The importance of this educational responsibility can be seen from the efforts of schools to provide a good level of understanding of disaster preparedness to the students so that it can help explain to parents and communities around his residence (especially the area around the volcano) about the risk of disaster due to living in a prone environment disaster. It is intended that the community is ready early on in case of disaster so that the number of victims can be reduced. In general, parents gain knowledge and listen to information about natural disasters that their children get in school.

Therefore, it is deemed necessary to have a disaster alert school capable of teaching science materials related to the understanding of natural phenomena closely related to the volcano and as a means of education which can still take place despite the disaster due to the existence of active volcanic activity. This is due to the need to provide scientific research enrichment in developing a mitigation education framework [2]. In addition, this research is also to introduce students around the volcano about the knowledge about disaster, as emphasized by United Nations International Strategy for Disaster Reduction (UN ISDR) in the form of Institutionalizing Integrated Disaster Risk Management at School.
2. Research method

This study reveals science instruction in ES impacted by eruption of Mt. Merapi aimed to impress upon understanding of volcanic concept and its risk. This study is a qualitative research conducted on the natural setting based on the context of a fact in the field. Natural ontology calls for realities as incomplete wholeness apart from its context [5]. The qualitative research approach of case studies is designed through the determination of research questions, defining research focus, defining theoretical foundations that support case analysis, determining the conceptual framework and theoretical framework of case studies, determining criteria of findings during case studies [6] [7].

The subjects of this study are science teacher and 4th grade students of SDN Kiyaran 2. The subjects are chosen by purposive sampling. Science teacher and 14 students at grade 4 are involved in this study. The entire subject of the study was selected based on consideration of findings during the pre-observation activities that supported the research attention. Data were gathered through documentation, observation and in-depth interview. All of data were justified of the validity through three angulation methods, described, and descriptive analysis to construct the finding and concluded refers to the focus of the study.

3. Result and discussion

3.1. Planning of Local Curriculum Development on Science Instruction by Mitigating Volcano Disaster at SDN Kiyaran 2

The preliminary observation started at the end of June 2014 when the SDN Kiyaran 2 teachers participated in the preparation work of Disaster Preparedness School organized by the Regional Disaster Management Agency (BPBD) of Sleman district. In the event, there is an opportunity to discuss with the principal and some teachers of SDN Kiyaran 2 related to the implementation of science teaching done by the teacher to give understanding of the concept of volcano and the risks caused when living in the vicinity to the students of SDN Kiyaran 2.

Teachers of 4th grade stated that science instruction can be a bridge to introduce the concept of volcano to ES students from an early age. However, teachers do not have sufficient knowledge in teaching disaster mitigation, especially volcanic eruption disasters and difficulty linking them to the curriculum content of primary schools. Furthermore, the headmaster revealed that the school does not have a standardized curriculum reference in adding volunteer disaster mitigation content to the ES curriculum. Based on this condition, it can be concluded that the school is experiencing difficulties for the development of local content curriculum in volcano mitigation disaster instruction especially in the area of Mt. Merapi.

This study try to reveal further availability of learning resources owned by SDN Kiyaran 2 in teaching-learning the concept of volcano in science instruction. Teachers and principals revealed that all this time the effort is to follow disaster mitigation workshop held by BPBD Sleman. The existence of USAID Priority Program in collaboration with SDN Kiyaran 2 as partner school enables teachers to make a science instruction complementary book containing the concept of volcano and evacuation measures to rescue in case of eruption that endanger the people around Mt. Merapi. Based on these conditions it can be concluded that teachers are still experiencing difficulties in the process of science learning conducted in schools to improve students’ understanding of the concept of volcanoes and disaster risks caused in volcanic disaster mitigation learning.

The principal gives an illustration that every eruption of Mt. Merapi is still found by parents and students who are experiencing confusion and difficulty identifying the signs and symptoms of Mt. Merapi eruption so it has not been able to decide when the best time to follow the evacuation. Such conditions cause them to feel anxious to let their children go to school because of the fear of danger of Mt. Merapi eruption even though the status of Mt. Merapi is still in the safe category. Socialization and information that has been given by the government and related faction has not been fully up to the people living around the area affected by Mt. Merapi eruption. As a result of this condition, schools often experience a void of students who attend because many students are not allowed to go to school by their
parents. Such circumstances show that parents and students do not have enough knowledge and skill in eruption disaster mitigation of Mt. Merapi. Teachers and principals have doubts about their success in learning the mitigation of volcano disaster through the process of learning in the classroom especially through science learning from 4th grade ES. Based on the condition, it can be concluded that the school has constraints in the evaluation process to measure the success of volcano disaster mitigation learning, especially around the Mt. Merapi area conducted in schools.

In the preliminary research, it has been analysed the distribution of materials in the curriculum of elementary, junior and senior high schools that have the opportunity to in filled disaster mitigation content, especially volcanic eruption disaster. Students’ understanding of voluntary materials is presented in Earth and Aerospace Science teaching materials that are integrated into science subjects at KTSP for ES. The material of volcano and Earth Science is included in the cluster of Natural Sciences. The learning process emphasizes the provision of direct experience to develop the competence to explore and understand the natural surroundings scientifically. Science Education is directed to inquiry and doing some activities so it can help learners to gain a deeper understanding of the environment. The overall skills that must be mastered by the students are contained in Competency Standards and Basic Competency of Science. Substance of Earth and Aerospace Science for ES is integrated in science subjects with 23.53% share of total Science material given, for Junior High School given in Science subjects and Social Science with Science portion 6.94% and IPS 5.26%, for Senior High School given at physics and geography subjects with physics portion 2.70% and geography 55.56% of the total material class X or 19.23% for IPS program [8]. The material substance of Earth and Aerospace Science at elementary level is given in Science and Social science lesson.

SDN Kiyaran 2 is implementing KTSP during observation and is preparing to implement the Curriculum 2013. This school gets mandate from local government of Sleman regency to become one of the schools prepared as School of Disaster Preparedness (SSB) in Elementary level in Sleman district. The appointment as SSB is based on the consideration that this school has always been a reference school for other schools around Mt. Merapi during Merapi eruption and is a school that enters the safe zone from the danger of hot clouds of Mt. Merapi (namely wedhus gembel). The existence of school involvement as SSB becomes a pride as well as a responsibility that is not easy.

SDN Kiyaran 2 as one SSB in Sleman district does not have a special curriculum related to disaster mitigation content. The curriculum used is the same as other schools in ES. However, this school is authorized to develop local content as part of disaster mitigation education, especially Mt. Merapi eruption disaster. Principals and teachers received special training (workshops) on general disaster mitigation and disaster characteristics caused by Mt. Merapi from BPBD and the Cultural Education Department of the Sleman district. SSB is given the opportunity to develop a local content-oriented curriculum on disaster mitigation education in teaching materials for appropriate subjects. Such conditions are as expressed by the Principal and the classroom teacher when the researcher tries to unearth disaster mitigation-related curriculum information.

“We are still implementing KTSP curriculum for all classes. In recent months many teachers have been trained in the implementation of the Curriculum 2013 from the Provincial Education and Culture Department. More over ..... we were given the opportunity to add local content material about disaster mitigation because our school is SSB. Me and the teachers discussing this local content material should be entrusted into any subject. The result of the joint agreement that all subjects can be brought to introduce the education of Merapi disaster mitigation disaster and adapted to the characteristics of the subjects. (the Principal)”

The same opinion was also conveyed by grade 4 teacher as the classroom teacher to provide knowledge and educational content of Merapi disaster mitigation disaster as much as possible. Classroom teachers acknowledge that there are still many things he does not know about disaster mitigation education in general or in particular the disaster of Mt. Merapi.

“I try to provide disaster mitigation material as much as I can, sir, nuwunsewu .... during this time1 only get information and insight into disaster mitigation through
workshops, training and personal experience because I experience the eruption of Merapi several times. I am very lucky because there is assistance from USAID Priority Program and lecturers of PGSD UNY in developing learning tools that support disaster mitigation. (the teacher)"

Based on the results of interviews with principals and teachers of the class, it can be revealed that SDN Kiyaran 2 does not have standard reference in developing the local content of disaster mitigation education on the curriculum it uses. The scope of disaster mitigation education materials that teachers provide to students is highly dependent on the knowledge of teachers and their creativity in integrating disaster mitigation into the subject.

Teacher activity before implementing learning is to plan learning activities. Learning planning consists of planning the syllabus, and planning the Lesson Plans (called RPP). The syllabus has been formulated by the government and socialized through Teachers Working Group (called KKG) forum whose members are ES teachers in Sleman district. This is in accordance with the answer of the fourth grade teacher about how they compile syllabus and RPP especially those that have mitigation disaster of volcano.

“Syllabus has been made from the Department, RPP I made my own by referring to BSE book while the material volcano I add with the complementary book we have compiled with USAID Priority Assistance Team. (the teacher)”

The classroom teachers have compiled additional books as a supplement to the volunteer disaster mitigation education support materials. Companion teams from USAID Priority assist teachers in preparing complementary books. This is in accordance with the classroom teacher’s answer when the study tried to dig up more information how the teacher got the teaching materials about the volcano.

“I am lucky sir, there is a USAID Priority program that goes to our school. One form of program is the preparation of books or modules. And …. Because our school became the pioneer school of SSB then I was guided to arrange volcanic material supporting books. Alhamdulillah. (the teacher)”

| Competency Standards | Basic Competencies | Class and Semester |
|----------------------|--------------------|--------------------|
| Earth and Aerospace  | 10.1. Describe the causes of changes in the physical environment (wind, rain, sunshine, and sea waves) 10.2. Explain the effect of physical environment changes on land (erosion, abrasion, flood, and landslide) 10.3. Describe how to prevent environmental damage (erosion, abrasion, flood, and landslides) | Class IV semester 2 |

Table 2. The content of IPBA materials in Science Class 4 subjects.

Based on the results of mapping to the Competency Standards and Basic Competencies in the KTSP, teachers formulate the learning objectives to be achieved through the process of science learning in the classroom.

The Ministry of Education and Culture does not specifically set up a special curriculum on disaster. The curriculum developed to introduce the concept of disaster mitigation should not stand alone [9]. Areas affected by natural disasters are advised to develop local content that supports the socialization of the importance of mitigating natural disasters through education. Nunn and Braud states that the development of teaching materials can be initiated through activities of working with relevant parties or authorized institutions. PVMBG, BPBD and universities are institutions in Indonesia that can be partners in developing disaster teaching materials in disaster mitigation education [10].
Science teachers in New York teach geography to develop local curriculum based on National Science Education Standard (NSES), New York State Learning Standards for Mathematics, Science and Technology (NYS Standards) and Physical Setting / Earth Science Core Curriculum [11]. The acronyms used in developing the local content curriculum teach daily experiences related to earth activities or natural phenomena associated with the space Earth. Different conditions are found in schools affected by natural disasters including areas affected by Merapi eruption. These schools do not yet have the same set of standards and do not yet have certain standard measures in developing local content curricula. This is also experienced by SDN Kiyaran 2 as one of the schools mandated by the local government to become the Disaster Preparedness School (SSB). Field facts show that there are different standards in developing local content of disaster-laden curricula.

3.2. Implementation of Science Learning Process of Volcano Mitigation Disaster at SDN Kiyaran 2
Volcanic disaster mitigation material for SDN Kiyaran 2 began to be presented together with science teaching materials in 4th grade. The curriculum used by SDN Kiyaran 2 is KTSP and begins to introduce scientific approach in Curriculum 2013 as a transition towards the implementation of Curriculum 2013. Learning at the initial meeting used teachers to introduce the concept of volcanoes. The students are directed to the mind-set why volcanoes are not found in every region and know active volcanoes as well as inactive volcanoes. Here are excerpts of the 4th grade teacher dialogue and students as teachers begin the learning process:

- **Teacher**: Who are the children who have watched television? Or hear the news ...?
- **Students**: I am!!!! (raising one hand)
- **Teacher**: Have you ever seen television news about Mount Merapi? Ever .... How is the story, we see what it used to be? Hayo ... Firstly ... we must ... first we see the Merapi volcano that issued the incandescent fire, it is heat or not?
  Because of our location close to Merapi then we often see and experience a disaster that is .... volcano erupted.
  Does anyone know what a volcano is? Come on ... now we are together to read briefly about Knowing the Volcano on the passages that you have shared with you.
  While reading .... you look at the picture in the reading. Try to read first about 3 minutes.
  Already ....? If so, let's now representatives of group 1 come forward and read to your friends, others pay attention.
- **Students**: (reading in front of class)"

Based on the excerpts the opening dialogue indicates that teachers try to direct the attention and memories of the students around Mt. Merapi which is located close to the school. Nevertheless, the teacher has not attracted the attention of the students why Merapi is busy talking about people in the television news, the teacher directs to what objects should be seen such as the incandescent fire, smoke, and disasters and claim that the incandescent fire is very hot. The student’s response to answer becomes passive because the teacher gives less opportunity for the students to respond to their questions.
Figure 1. Sample of question form in the class discussion activities.

The teacher continued the activity with class discussion after each representative of the group read out Knowing the Volcano. The discussion begins with the teacher's questions and proceeds to ask questions and answers between teachers and students. The result of the observation indicates that there is a dependence of students on very high reading information. The answers that students give to teacher questions such as moving sentences in the reading and not sentences are compiled students. This illustrates that the introduction of volcanic concepts requires the help of books, coloured pictures and information that students can easily understand.

The teacher then proceeds to answer questions in writing on the activity sheets that have been distributed to the students. Questions about the name of the volcano around the student's residence (if any), identify the names of volcanoes known to students along with the name of the volcano's location, and mention the advantages of living in areas close to the volcano. The students answered individually even though they were still sitting in their own group. The teacher then points to one of the students randomly to read the answer in front of the class and the other students listen to the answers and respond if the answers are different.

All students answer the first question (Figure 1) with the right answer and the name of the volcano mentioned is Mt. Merapi. The students' overall answers are correct and in accordance with the actual conditions. The teacher always guides the students by reminding whether there are volcanoes around the student's residence. This indicates that the teacher tries to bring the students to always be aware around his residence there is an active volcano that is Mt. Merapi.

Documentation of student answers to question 2 (Figure 2) indicates the existence of diverse student knowledge about the names of volcanoes in Indonesia along with the name of the area where the volcano location. Students have known some of the names of volcanoes in Indonesia. Information on the names
of volcanoes obtained through news in the television media and print media as well as information from teachers in learning in the classroom. However, most students still find it difficult to name the volcano and its location correctly as one example of student answers as seen in Figure 2.

![Figure 2. Documentation of student answer.](image)

Based on the results of the analysis of answers to questions written by students, they indicate that students' knowledge about the names of volcanoes in Indonesia is deficient. The names of volcanoes are well written but the name of the area where the volcano exists is written with no real conditions. Students mention Mt. Sinabung in South Jakarta, and Mt. Slamet in Kalimantan/Borneo. However, knowing the student's answers does not help guide the correct answers and tends to silence them so that teachers may not be aware of the student's mistake.

The instruction at the next meeting is about volcano eruption. Students are introduced to volcanic activity during the eruption. This knowledge is given as an advanced understanding of the status of volcanoes that have been studied through the permissions of series images. Volcanic eruption simulations are taught using volcanic mock models created by teachers from used materials around the school. Materials in volcano erupted simulation use baking soda, detergent, food colouring and vinegar. Soda and vinegar are selected as ingredients that can cause explosive effects to illustrate that in the stomach of the volcano there is a rumbling of material that will be spewed through the eruption. Addition of detergent and food colouring materials is the material chosen as a red hot cloud model to signify very high temperatures.

The teacher guides each group to perform a simple simulation using some materials around the student's residence to model the volcano eruption. The students were introduced two ways to add vinegar liquid to the stomach of the model of the volcano that is through a used injection that is connected with a plastic hose to the abdominal model of a volcano and direct way by pouring it through the peak of the model of a volcano. The effects generated through both ways of pouring the vinegar are different. Vinegar acids poured through the aid of used syringes will cause the fluid spewed from the peak of a volcanic imitation model to flow slowly with clumps of soap bubbles that show hot clouds. The pouring of vinegar directly to the peak of the model of artificial volcanoes gives a melt effect that flows from the peak is very fast and exit bursts of red liquid mixed with soap bubble foam that describes hot clouds (wedhus gembel).

The observations during the simple demonstration conducted by the students showed that the students' curiosity was very high. Each group tried to repeat the demonstration that the teacher had modelled. There are some students who try to add more baking soda and observe the effects resulting from the addition of the ingredients. The teacher illustrates the flow that comes out through the peak of the model of a volcano as a very hot liquid from inside the earth so that students are expected to have a picture of how the flow of hot lava flows to reach the slopes of the mountains. The learning process developed by the teacher has trained the students to try to know the relationship of a factor with other factors that influence the eruption rate of the volcano.
Science studies natural phenomena and phenomena around the student's residence. Such a characteristic of Science is strategically used as one of the means to introduce that volcanic eruption is a normal natural event and will not be a disaster if it does not cause casualties. The introduction of the concept of volcanoes, volcanic characteristics, impacts (positive and negative) live near volcanoes and predict signs of volcanic activity can be introduced early on through science learning. Almost all volcanic eruption events in Indonesia can be identified by their symptoms [12]. A good understanding of volcanic characteristics will help each student provide true insights about volcano to peers, siblings, parents and the people around her residence. This will reduce the myth that many developed in the community around the volcano. Indonesia has active volcanoes that have different characteristics and cause disaster-prone impacts. Continuous understanding of the character and monitoring of a volcano's activities can help businesses reduce the risk of loss of life and property due to volcanic eruptions [13].

The introduction of disaster mitigation in science lessons is directed towards response to disaster preparedness [14]. Correct responses to early symptoms of natural disasters, especially volcanic eruptions will help to reduce the risk of natural events as part of the natural phenomena studied in science. The proportion of teaching materials that support the implementation of disaster mitigation education in the national education curriculum is very helpful in shaping community awareness and disaster response community. The weak substance of the material that has the potential of natural disaster mitigation education in the science curriculum becomes a challenge as well as obstacles for science teachers in Indonesia, especially in elementary and secondary education. Strategies that can be selected by the teacher one of them use games in introducing the names of volcanoes in Indonesia along with its location. The science learning that is packaged in the form of games is adapted to the level of development of elementary school students [15].

3.3. Implementation Evaluation process to measure the success of volcano disaster mitigation learning, especially the area of Mt. Merapi in SDN Kiyaran 2

The principal revealed that the success of science lesson and other subjects in teaching volcanic disaster mitigation material (Merapi) can at least help dissemination of disaster mitigation education. Students who have understood the concept of volcano can provide the knowledge they have received to their peers, family at home and the people around the student's residence. Based on these considerations, SDN Kiyaran 2 always conducts an evaluation to measure the success of volcano eruption mitigation learning.

Teachers are given the additional task of inserting the material content of volcano eruption disaster mitigation to the appropriate subject. This is also done in the Science lesson. Evaluation by teacher to measure educational attainment of volcano eruption mitigation disaster (Merapi) in SDN Kiyaran 2 is done in several ways. Student comprehension is measured using a series of cognitive tests and ‘gladhi lapang’ or simulation skills performed with direct observation.

“Students work on questions to answer some questions about the concept of volcano, knowledge of emergency response and other volcano-related matters. The whole question is made by me, Pak. Problems that compiled in reference to the additional modules that have been used by children in science instruction, especially about volcanoes. I also asked the children to do ‘gladhi lapang’ simulations and in the school yard. The atmosphere and the classroom situation is designed as if there was a volcano eruption. The students play roles by acting as police officers, BPBD officers, SAR, elderly people, children, health workers, village officials and young youth cadets. In the beginning it is difficult to carry out this field rehearsal but after repeated the students become happy and understand their respective roles. The obstacles encountered are the number of students who are few so that the simulation is less so smile.”
Based on the results of interviews with school principals and teachers of the class can be seen that SDN Kiyaran 2 has received a formal mandate from the Regional Government of Sleman District as Disaster Preparedness School, especially volcano eruption disaster. The principal fully supports the volcanic eruption disaster mitigation education program that is inserted into each appropriate subject. The classroom teacher always held an evaluation to explore the information and knowledge of the students about the concept of disaster mitigation of volcano eruption disaster. Evaluation is done in the form of theory (cognitive granting) and field practice of simulating evacuation of emergency response of volcano eruption at school (inside and outside class).

Based on the results of the analysis of the evaluation process that has been done by teachers in SDN Kiyaran 2, it is found that the success rate of volcanic disaster mitigation learning has not been used by the teachers as the basis of reference of the next lesson planning. Teachers in planning further learning activities have not considered the achievement of learning achievement that has been obtained by students in the previous stage. The learning outcomes that students have learned should be a consideration of the strategies the teacher chooses to improve the students' weak skills [16]. Students who have achievement of learning outcomes are still low should get more attention by the teacher when the learning takes place. Weak knowledge of disaster risks posed by natural disaster sources will affect the weakness of disaster preparedness measures [17]. Furthermore, knowledge of preparedness will determine the success of the natural disaster mitigation program developed by the government.

4. Conclusion

The availability of local content curriculum as one of the supporting components of disaster mitigation education, especially mitigation of volcanic eruption disaster is one of the key readiness of Disaster Preparedness School (SSB). The first step in the preparation of local content in the curriculum that supports science learning oriented to Merapi eruption disaster mitigation is the mapping of Competency Standards and Basic Competencies which are then used as the basis for determining the indicators and learning objectives. The 4th grade teacher in SDN Kiyaran 2 uses one of SK and KD that is how to understand the changing of physical environment and its influence to the land.

The implementation of science learning oriented to Merapi eruption disaster mitigation in SDN Kiyaran 2 shows the teacher has not attracted the attention of the students why Merapi is hot issues talking about people in television news, the teacher directs to what objects should be seen such as incandescent fire, smoke, and disaster and stated that the flame is very hot. The student's response to answer becomes passive because the teacher gives less opportunity for the students to respond to their questions. Implementation of science-oriented learning evaluation of volcanic disaster mitigation was found to result that knowledge evaluation, students' insight and understanding about volcano, mitigation and evacuation action were given in the form of cognitive test in short form. Psychomotor tests are given in the form of standby skills evaluated using role playing methods. Teachers have not done affective tests. Teachers have not performed a weighting system of scores for any aspects of learning outcomes. Learning outcomes are only measured by the cognitive and psychomotor domains.

Acknowledgment

References
[1] Hidayati D 2012 Striving to Reduce Disaster Risk: Vulnerable Communities with Low Levels of Preparedness in Indonesia J. Disaster Res. 7 75
[2] Cadag J and Gaillard J C 2012 Integrating Knowledge and Actions in Disaster Risk Reduction: The Contribution of Participatory Mapping AREA R. Geogr. Soc. 44 100
[3] Kenny C 2012 Disaster Risk Reduction in Developing Countries: Cost, Benefits and Institutions J. Compil. Disasters 36 559
[4] Zamroni M I Islam dan Kearifan Lokal Dalam Penganggulangan Bencana di Jawa J. Penanggul. Bencana 2 1
[5] Lincoln Y S and Guba E G 1985 *Naturalistic Inquiry* (London: Sage Publication)
[6] Yin R K 2003 *Case Study Research: Design and Methods Third Edition* (California: Sage Publications Inc)
[7] Gay L T, Mills G E and Airasian P W 2012 *Educational Research: Competencies for Analysis and Applications* (USA: Pearson Education Inc)
[8] Pujianto 2011 Pros. Sem. Nas. MIPA UNY F 219
[9] Goldsmith D W 2011 A Cased Based Curriculum for Introductory Geology *J. Geosci. Educ.* **59** 119
[10] Nunn J A and Braud J 2013 A Service-Learning Project on Volcanoes to Promote Critical Thinking and the Earth Science Literacy Initiative *J. Geosci. Educ.* **61** 28
[11] Contino J and Anderson O R 2013 From Prescribed Curriculum to Classroom Practice: An Examination of the Implementation of the New York State Earth Science Standards *J. Geosci. Educ.* **61** 129
[12] Iguchi M et al 2012 Methods for Eruption Prediction and Hazard valuation at Indonesian Volcanoes *J. Disaster Res.* **7** 26
[13] Indyo P 2006 Klasifikasi Gunungapi Aktif Indonesia, Studi Kasus dari Beberapa Letusan Gunung Api Dalam Sejarah *J. Geol. Indones.* **1** 209
[14] Petal M 2008 *Disaster Prevention for Schools Guidance for Education Sector Decision-Makers Consultation Version* (Geneva: UNISDR)
[15] Tsai M, Wen M, Chang Y and Kang S 2015 Game-based Education for Disaster Prevention *J. AI & Soc.* **30** 463
[16] Macpherson G L, Lee Y and Steeple D 2011 Group-Examination Improves Learning for Low-Achieving Students *J. Geosci. Educ.* **59** 41
[17] Seneviratne K, Baldry D and Pathirage C 2010 Disaster Knowledge Factors In Managing Disasters Successfully *Inter. J. Strateg. Prop. Manag.* **14** 376