

The Educational Methods Immediately after the Sediment-Related Disasters on a Basis of Local Historical Experience - The Case Study of Environmental Educational Programs in Kumamoto Earthquake 2016 -

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This study suggested a mentally considerate approach for educational methods of disaster prevention immediately after the earthquake disasters, incorporating the learnings of local historical experience. The education programs, based on the disaster situation, were planned in cooperation with the locals and the elementary and junior high school teachers. The education programs were carried out in two Minami-Aso Elementary School, and a Minami-Aso Junior High School by scientist, locals and NPO, teachers. After the education programs, it carried out the free description to 36 the elementary students (9-12 years old), 7 junior high school students (15years old). This educational program was accepted by both local children and teachers even half a year after the earthquake, and demonstrated successful educational effects in Knowledge and understanding of social event and local identity.

Key words: Kumamoto Earthquake 2016, Aso, Education method, Local historical experience

1. INTRODUCTION

The Disaster Risk Education plays important roles to take over the memory of the disaster and to provide the preparation for future disasters. The education methods for sediment-related disaster utilizes the scientist simulation model, the hydraulic apparatus and field seminar [Yamada, 2006]. Besides, importance of the local wisdoms of elderly generations is re-realized through the experience of Great East Japan Earthquake in 2011.

As a response to the 2011 Great East Japan Earthquake, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) set up an expert committee for reviewing disaster prevention education and management. Additionally, at a 2012 Cabinet meeting, the Promote Plan for School Safety was approved, which also stated the country's need to secure educational time in schools for security.

MEXT published a revised material in 2013 titled Zest for Living, which includes not only the evacuation procedures during disasters, but also educational programs from the viewpoint of local life and customs.

However, in the disaster areas of the Great East Japan Earthquake, only 30 percent of schools practiced disaster risk education in consideration of local characteristics and disaster histories. On the other hand, the Education Psychology studies reported that the children who experienced a disaster have effect of serious psychology stress in the daily life [Fujimori, 2011]. There are several examples of disaster prevention educational programs that encourage children's participation in the recovery, while paying considerable attention to children's mental care immediately after the disaster [Matsuno 2013, Yamazaki 2016]. Mitsuhashi points out that the understanding of local culture serves as the basis of disaster risk education, in reference to the education theory of Katsue Misawa [Mitsuhashi, 2013].

Therefore, the disaster risk education programs need to provide not only the technique and knowledge of the disaster prevention, but also the correct understanding of local life style and environment for children who continue to live in the disaster area after the disasters. These disaster risk education programs are expected to help foster a sense of local patriotism. Moreover, these programs

are also expected to increase the children's motivation to participate in the recovery of the region.

The Kumamoto Earthquake struck the Aso Area of Kumamoto Prefecture on April, 14 and April 16 in 2016, killing at least 20 people. The vast grasslands of Aso Area, historically managed by local agricultural activities such as controlled burning, mowing and pasturage for centuries, has suffered from the sediment-related disasters caused by torrential rainfalls in Northern Kyushu in 2012. The local residents overcame shortly after the disaster by the cooperation in local community, which have evolved historical land use management.

However, there is only one elementary school providing disaster prevention education in the Aso area in 2017. Promotion of disaster prevention education is required based on traditional life style and knowledge that have helped local people to coexist with the volcano and overcome disasters such as eruptions and landslides. Especially at the immediate aftermath of the sediment-related disasters, the traditional lifestyle, knowledge and feelings of local patriotism are considered to have helped the children psychologically.

This study aims to propose the method of mentally considerate education immediately after the sediment-related disasters on a basis of local historical experience based on Kumamoto Earthquake 2016 cases. The study set the evaluation criteria based on "Zest for Living", the ministry's curriculum guideline. Then, based on students' oral comments and written, open-ended survey answers it evaluated the effectiveness of the educational programs.

The following articles from the Education Ministry guidelines are incorporated into the elementary school curriculum: "to help pupils become aware of the close relationship between the national land, people's lives and livelihoods" - from the objectives of Social Studies; "to help pupils develop interest in the relationships between themselves, the people around them, the various local places, public facilities; to enable them to appreciate their locality and to develop a feeling of attachment to it; at the same time, to enable them to think about their roles and actions as members of their groups or society and to act safely and appropriately" - from the objectives of Life Environment Studies.

For the programs conducted in junior high schools, the following article was included in the curriculum: "learning activities should be conducted according to the conditions of each school: for example, learning activities about interdisciplinary topics, including environment, welfare, health; learning activities about tasks based on students'

interests; learning activities about tasks depending on the characteristics of the local community and the school; and learning activities concerning employment and their own futures" from the objectives of Integrated Studies.

Existing literature on the development of educational programs for disaster prevention [Ishihara, 2014] served as a reference to the perspective of evaluation. Articles such as "interest, motivation and attitude in relation to social events", "consideration and judgement from a social viewpoint" and "knowledge and understanding of social events" were included in the evaluation criteria. Additionally, this program's concept of local identity "disaster area considered as an irreplaceable place" [Funami, 2016] was also included in the evaluation.

2. THE LOCAL HISTORICAL EXPERIENCE IN THE ASO

The topographic characteristic of Aso is that it is a huge caldera which was created by four volcanic eruptions with pyroclastic flows. The central cone of the caldera hosts Mt. Taka (1,592m), Mt. Naka (1,506m), Mt. Eboshi (1,337m), Mt. Kijima (1,270m), Mt. Oujyo (1,235m), and is therefore called "Aso Go Gaku" or the Aso Five Mountains. Mt. Naka is an active volcano. Inside the outer rim of the somma caldera is home to a vast grassland lying at 700 to 800 meters above sea level.

The annual rainfall reaches approximately 3,200 mm in Aso which makes it the second highest rainfall in Japan. The wind from the Ariake Sea southwest of Kumamoto at 1,000m altitude meets with the wind from the Pacific Ocean to cause heavy rainfall in the Aso area during the summer. Also, the influence of the hot and humid air flow from the East China Sea increases the possibility of torrential rains in the rainy season [Tanaka, 2010]. The volcanic soil and the weather conditions are not suitable for cultivation, so the Aso area was developed using drainage engineering techniques and the local people have been using the grassland for livestock for centuries. The grasslands in Aso have been managed by local agricultural activities such as controlled burning (**Fig. 1**), mowing and pasturage for centuries. The grasslands of Aso are managed as commons in the region. There is a local custom in Aso placing wild flowers on ancestor's graves (**Fig. 2** and **3**).



Fig. 1 Controlled burning



Fig. 2
Polemonium kiushianum



Fig. 3
Echinops setifer Iljin

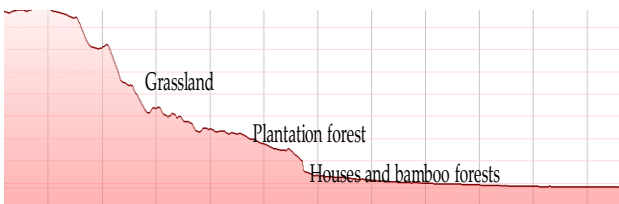


Fig. 4 The historical land use in Aso



Fig. 5 The grassland in top of the Caldera

This custom is called “bonbana”. People gather wild flowers from the grasslands to celebrate their ancestors’ spirits. It is a symbolic custom of Aso uniting local people and the grasslands. The historical

land use in Aso has been a balanced combination of rice fields, bamboo forests, orangeries, tea plantations, timber forests, fuel forests and pasture (Fig. 4 and 5). The local people traditionally avoided forestation at the higher slopes, because those areas were more difficult to access, more difficult to maintain and because such activities could also cause landslides.

From the 1950’s some neglected grasslands were converted into timber forests, but the historical land use area did not suffer landslides at the time of the Kumamoto Earthquake. The grasslands of Aso were certified as Globally Important Agricultural Heritage Systems (GIAHS) in 2013, and they were also certified as Geopark in 2014. The international reputation of the grasslands of Aso has increased. On the other hand, the decline of the livestock industry and the increasingly aging population, the landscape management of grasslands has become increasingly difficult. To address the shortage of manpower, the volunteer activity in Aso attracted a lot of motivated people outside of Aso since 1990’s.

3. METHODS

3.1 Investigation of the damage situation of sediment-related disaster in Kumamoto Earthquake

A wide variety of research materials were used, including academic journals of sediment-related disaster and the survey result of sediment-related disaster by Ministry of Land, Infrastructure, Transport and Tourism and the local newspapers (KUMANICHI). Also, directly after the earthquake, surveys using telephone and SNS were conducted with 11 local residents to check the conditions of disaster areas. Subsequently, on-site interview surveys were conducted with 11 local residents on an ongoing basis in June, September and October of 2016 and February and March of 2017.

3.2 The development of the method of mentally-considerate education immediately after the sediment-related disasters based on local historical experience

The education programs, based on the disaster situation, were planned in cooperation with the locals and the elementary and junior high school teachers. The education programs were carried out in two Minami-Aso Elementary School, and a Minami-Aso Junior High School by scientist, locals and NPO, teachers (Table 1). After the education programs, it carried out the free description to 36 the elementary students (9-12 years old), 7 junior high school students (15years old).

The study looked at the effects of the program based on the selected keywords from children's comments adopting the text-mining approach [Nakamura, 2016]. The questionnaire survey about this educational program was carried out by 3 class teachers. After the program, the comments from the children were collected and the effectiveness of the program was evaluated.

4. RESULTS

4.1 The damage situation for sediment-related disaster in Kumamoto Earthquake

As a result, the first research clarified the characteristics of the Sediment disaster caused by Kumamoto Earthquake. The particular multiplex sediment disaster occurred in Aso area such as the large-scale slope failures (e.g. Tateno area), the landslides and slope failures in the low-pitched slope (e.g. Ko-you area), and the debris flow occurrences (e.g. Cho-yo area). The earthquake (7.3 M) caused by the multiplex sediment disaster in the mountain slope. Together with the torrential rainfalls (19-25, June 2016) expanded the sediment disaster damages in Mt. Yomine, Tateno and Nagano area, Minami-Aso Village [Kurokawa, 2017]. The following figure is a GIS overlay map of the distribution of secondary grasslands and plantation forests, and the distribution of landslides and cracks in Aso's grasslands recorded by the Kyushu District Office of the Ministry of Environment (Fig. 6).

According to interviews with 11 local peoples in Minami Aso Village, when the disaster happened, local communities of grassland management worked together to support the evacuated locals. Three days after the earthquake, farmers also offered food to the evacuated people to help them recover and get back to their daily activities more quickly (19th April 2016). The traditional life style, utilizing the local fresh water supply also helped people during the recovery (16th April 2016 - 8th May 2016). In this way, the local residents recovered after the disaster

Table 1 The responsibility matrix chart of program

Process of the program	After Disaster	University	School	NPO
Start of discuss the program	2 weeks	○	○	○
Plan to the program	2 - 4 Months	◎	○	○
Implementation of the program	5 Months	◎	○	○
Feedback of the program	6 Months	○	◎	○

◎ The chief of practitioner

○ The coauthor of the program

thanks to the cooperation of local community, which has recovered quickly evolved historical land use management. On the other hand, the several natural disasters in the Aso area, it has suffered from landslides caused by torrential rainfalls in Northern Kyushu in 2012. In addition, Mt. Aso became the subject of volcanic activity from 2014.

4.2 The mentally considerate approach for educational program immediately after the sediment-related disasters based on local historical experience

4.2.1 The plan of educational program

The conclusion of the advance meeting with local teachers was that the educational program aimed at helping children deal with the damage and trauma of the earthquake was too early. Therefore, the educational program leveraged the local historical experiences, such as the grassland management techniques (controlled burning, fire belt or seven plants in season). The culture of "bonbana" was rejected as being premature in the program.

Meanwhile, the program also included the introduction of charitable fundraising conducted in Tokyo for the recovery from the Kumamoto Earthquake. Furthermore, the educational program used the National Park and GIHAS for the promotion of the local historical experience. Moreover, the educational program was a prime example of people becoming aware of the importance of the conservation of the grasslands and where voluntary

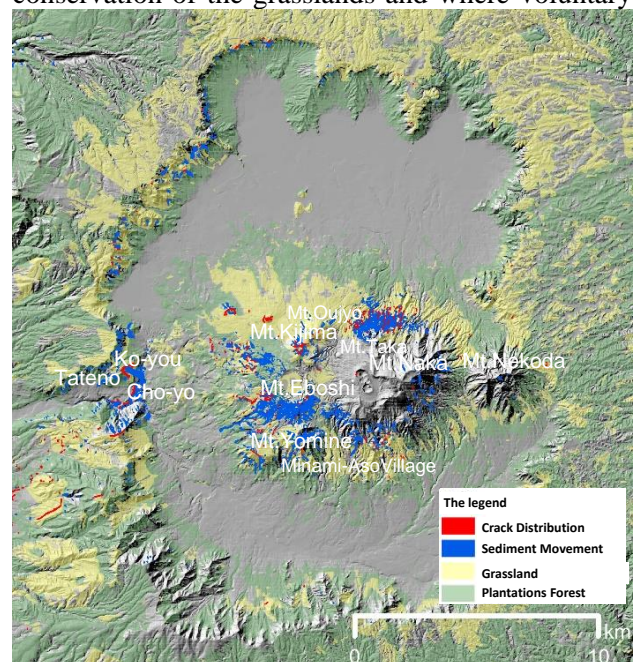


Fig. 6 The crack distribution and sediment movement by Kumamoto Earthquake

activities were organized bringing together various members of the local rural communities and the urban residents. The junior high school students planned self-directed programs in which agricultural and regional resources were included. This education program proposes the five learning objectives.

This study aims to propose the method of mentally considerate education immediately after the sediment-related disasters on a basis on local historical experience based on Kumamoto Earthquake 2016 cases.

- Instead of facing the reality of the recovery from the disaster of Kumamoto Earthquake, it aims to turn children's attention to the values of local community and local historical experience such as the grassland management.
- It used the National Park and GIHAS, Geo-Park for realization of the local historical experience.
- It introduced the voluntary activities of the local rural communities and the urban residents.
- It promotes the friendship of elementary students and junior high school students through the recreational program.
- It provides junior high school students with the problem to debate on the restoration of grasslands by locals and NPOs after the torrential rainfalls in Northern Kyushu in 2012, and the visions of local community in the future.

The Introduction of this program featured fun quizzes and games. In the latter half of the program, children discussed their impressions and their most memorable experiences (Fig. 7).

4.2.2 The educational program based on the local historical experience

The children enjoyed the program with very little sign of anxiety from the prior earthquake. During the discussion session the elementary school students made the following comments about the local historical experiences (Table 2). The elementary

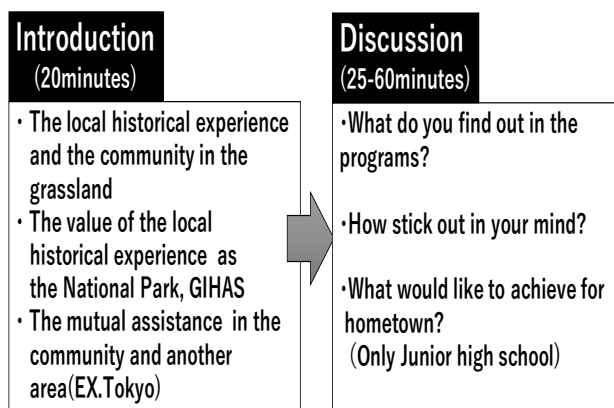


Fig. 7 The Education Program

school students commented about the local historical experience, saying “I did not know about controlled burning and fire belt mowing” or “I realized that so many hands are needed for grassland management” and so on. The rest of the comments included their first realization that Aso is a national park and their expression of emotional attachment to the community, saying “I am happy to be living in Minami-Aso”.

Judging from the free comments about their impressions, the words “national park” appear frequently and the role of controlled burning seemed to have been a particularly memorable part of the program teaching about local historical experiences (Table 3).

From the children's feedback we can say that the result of the educational program was that children were able to raise their knowledge and understanding of social events. Through the learnings of the local historical experience in the national park and geo-park, children came to realize the strength of local patriotism and the importance of the local community.

The junior high school students made various comments about the conservation of grasslands such as “We have no one but each other to conserve the plants and flowers in Aso”. The experience of seeing the elderly engaged in grassland management seemed to develop their interest in succeeding the local historical experience. Also, some students expressed their intention to share information online about grasslands and plants.

The expressions “scarce species of grasslands” appeared frequently in their comments. Also, they wrote that the educational program about the local historical experience gave them the opportunity to learn about grassland management for the first time. Additionally, some of them expressed their will to continue the agriculture and grassland management activities even after the Kumamoto Earthquake, in order to further contribute to the recovery from the disaster (Table 4). The results showed the presence of educational effects on “the understanding and knowledge of social events”. Therefore, the program about the local historical experience widened their attention from the conservation of the local environment to regional revitalization.

4.2.3 The questionnaire to class teachers about the educational program

The question items were as follows: children's behavior during the program, the timing of implementation, the educational effect of the program and requests regarding the content and venue of the next program. Concerning the results, all

the class teachers answered that the children enjoyed the program and timing of the program based on the local historical experience was not premature even though it was held shortly after the earthquake. Regarding the educational effect of the program, through the learning of local historical experiences the children were able to rediscover the value of the local community following the earthquake, which can be easily forgotten in daily life. Requests relating to the contents of the next program were to learn more about historical precedents where the people of Aso had to overcome natural disasters and to include further activities to strengthen the bond within local communities.

5. CONCLUSIONS

This study suggested a mentally considerate approach for educational methods of disaster prevention immediately after the earthquake disasters, incorporating the learnings of local historical experience. This educational program was accepted by both local children and teachers even half a year after the earthquake, and demonstrated successful educational effects in nurturing local patriotism and pride. Regarding to the effect of the program for the elementary school students, the learning of the program led to the realization of the state of Aso as National Park and the nurture of place attachment to the community. Regarding to the effect of the program for the junior high school students, their experience led to the understanding of the

Table 3 Extracted words by elementary school students
(multiple answers allowed, N = 36)

Extracted key words	Numbers
National park	11
Yellowstone national park	11
The numbers of national park in Japan	4
The designation of national park	9
The numbers of volunteers for the controlled burning	1
The season of the controlled burning	3
The reason of the controlled burning	1
Geo-park	1

Table 4 Extracted words by junior high school students
(multiple answers allowed, N = 7)

Extracted key words	Numbers
The conservation of scarce species of the grasslands	7
The conservation of the grasslands	4
The regional activation	2
Geo-park	1
The Yellowstone national park	1
The Kumamoto earthquake	1
The reconstruction	1
The agriculture in Aso	1
The tourism resources for reconstruction	1

importance of succeeding the local historical experience, with positive opinions on the recovery from Kumamoto Earthquake.

The program also achieved to encourage local teachers' inclinations to further develop the programs by incorporating the learning points of the disaster struck region and by learning more about the disaster specific characteristics of the region.

The future challenge is to establish educational methods of disaster prevention in order to promote the practical understanding of the type of disaster damages, through the learning of local history and culture to successfully coexist with disasters.

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Table 2 The Objective of educational program and the evaluation effect
(Educational goal: the understanding of local life style and environment on a basis of local historical experience for children who continue to live in the disaster area after the disasters)

School curriculum	The objective of education program		The evaluation criteria			
	The comments from elementary school students	The comments from junior high school students	Interest, motivation and attitude	Knowledge and understanding	Consideration and judgement	Local identity
Elementary school and junior high school curriculum [Social Studies] To help pupils become aware of the close relationship between the national land, people's lives and livelihoods	<p>a) Instead of facing the reality of the recovery from the disaster of Kumamoto Earthquake, it aims to turn children's attention to the values of local community and local historical experience such as the grassland management</p> <p>b) It used the National Park and GHAS, Geo-park for realization of the local historical experience</p>	<p>• I did not know about the controlled burning and fire belt mowing</p> <p>• I learned the necessity of manpower for grassland management</p> <p>• I learned the topography of caldera in Aso</p> <p>• I am happy to live in Minami-Aso</p> <p>• It was great that we are involved in the culture of Aso such as grassland management</p>	<p>• I have seen a lot of conservation for the grasslands from a young age</p> <p>• We have no one but each other to conserve the plants and flowers in Aso</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[Life environment studies] To help pupils developed interest in the relationships between themselves, the people around them, the various local places, public facilities To enable them to appreciate their locality and to develop a feeling of attachment to it To enable them to think about their roles and actions as members of their groups or society and to act safely and appropriately	<p>c) It introduced the voluntary activities of the local rural communities and the urban residents</p> <p>d) It promotes the friendship of elementary and junior high school students through the recreational program</p>	<p>• I did not know about the national park</p> <p>• I did not know that the Aso was designated a national park</p> <p>• I was surprised at the national park in foreign countries</p> <p>• I was surprised at the numbers of national park in foreign countries</p> <p>• I realized that so many hands are needed for grassland management</p>	<p>• It will expand opportunities to transmit the agriculture in Aso</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Junior high school curriculum [Integrated studies] Learning activities about interdisciplinary topics, including environment, welfare, health Learning activities about tasks based on students' interests Learning activities about tasks depending on the characteristics of the local community and the school Learning activities concerning employment and their own futures	<p>e) It provides junior high school students with the problem to debate on the restoration of grasslands by locals and NPOs after the torrential rainfalls in Northern Kyushu in 2013, and the visions of local community in the future</p>	<p>• I wish to provide the information about the grassland in Aso</p> <p>• I try to consider the direction for the conservation and the transmission of Aso</p> <p>• The adults don't know the appealing of flowers in Aso</p> <p>• It is necessary to confirm the values of plants in Aso</p> <p>• I hope to publish the digital books about the grasslands</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>