

Raising Elementary Students' Awareness of Natural Disasters through Science Lesson

~To Live Together with Nature~

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1. Introductions

We, the *Matsumoto Arigasaki High School Natural Science Club*, conduct geological surveys in areas surrounding *Arigasaki High School*, and deepen our own knowledge about science through experiments on a daily basis. The club consists of 19 members. Although many people tend to assume us to be mostly science students, about half of us major in humanities. Therefore, we are distinctive in that we have both scientific viewpoints, and literary, historical, and/or social viewpoints.

2. What We Have Noticed and Understood Through Activities

We have been conducting geological surveys around *Arigasaki High School* since April 2019; both the scientific and historical viewpoints have played a large role in our surveys. For example, there is an unnatural step in the school grounds, and water is coming out of it. Moreover, there are more than ten wells around the school. Considering this fact and that *Arigasaki High School* is designated as a refuge during a disaster, we began to question whether the ground is firm enough, whether the step is a fault line, and whether the school functions as a refuge.

We put both our scientific and historical viewpoints to use, by examining the area using core samples and the surface wave method as the former, and by consulting documents and hazard maps as the latter (Fig. 1). Results of the scientific investigation have shown that the ground of the eastern side of the school, and it is recommended to take refuge in the gymnasium on the western side. We also have found from documents that there have been dozens of floods during the *Edo* period, and, according to the hazard maps, that the school will be flooded with 50cm of water. From this survey, we have succeeded in speculating which areas in the school are relatively safe and which are predicted to be dangerous.



Fig. 1 Using the Surface Wave Method

We have also found interest in “preventing disasters”, which is a topic that we haven’t found so interesting. Having interest in the topic has kept us motivated, and made us even more enthusiastic about

disaster prevention.

Having interest in science and observing things from a scientific point of view was so enjoyable to us that we wanted to share this feeling with others. However, we thought that observing things from a scientific point of view sounds difficult, and some may feel reluctant when told to do so.

To solve that problem, we turned to the Natural Science Class, which we have annually held at the *Yamabe* Children's Center for ten years. The Natural Science Class held for the purpose of spreading the enjoyment of science to local elementary school students at the children's center, which they are very familiar with. We present them with phenomena and substances that cannot be encountered in everyday life in concrete, such as tangible or visible, forms. We also never fail to provide time for crafts.

For this year's class, we performed a physics experiment on air and the atmosphere. We first confirmed its existence by putting air, which is both invisible and intangible, into a plastic bag and touching it. Next, we used bubbles to visualize the fact that air has mass. We performed a demonstration using desk pads and plastic bottles to let the children experience atmospheric pressure (Fig. 2).

The most exciting experiment was the air vortex cannon, which was very popular among the children. Although they may have seen an air vortex cannon before, none of the children know why it can put out a candle from a distance, and why it makes a vortex of air. However, we intentionally told them the theoretical mechanism. They might not understand how it works right now, we gave them some knowledge to recall when they are older.

The purpose of the crafts is to actively experience the class, not to passively participate in it. Taking the crafts home leads to talk in the family about them. Moreover, the children can fix the knowledge into their minds through output. Even the family can interact with science and find opportunities to be interested in the topic as a result of the children talking about the class. Even though a small number of children can attend the Natural Science Class, they will help spread the enjoyment of science to their family and friends.

For holding the class at the children's center, it is usually recommended to hold it somewhere where many children can participate, such as a science museum. However, holding the class at a museum limits the participants to those who love science, which makes those who don't feel very awkward, and would not like to participate. On the other hand, holding it at the children's center, where children frequently come to play, lessens the emotional burden, and enables more children to enjoy. We hope that they will experience the enjoyment of science, and will someday find interest in the topic, recalling what we taught them.

3. Problems and Plans for Improvement

Having an interest in science spontaneously creates the basis of "observing things from a scientific point of view". "Making observations from scientific viewpoints" leads to the ability of "observing things with solid reason". Having that ability will prevent you from believing in rumors or distorted information on



Fig. 2 Experiments at the Natural Science Workshop

the internet, acquire your own ground, and view disasters and their prevention from a scientific aspect.

Having participated the Natural Science Class, the children told us things like, “It was enjoyable. I couldn’t understand the hard explanations, but I am glad that I could listen.” Even we, who were teaching the children, had a good time at the class, and became more enthusiastic about science. From this experience, we came up with ideas such as, increasing the number of opportunities for holding classes, and cooking survival meals, for we have made presentations using sight, sound, and body feeling, but not taste. We also have made new plans for future activities, such as raising awareness of disaster prevention by creating hazard maps and maps showing dangerous areas with the children’s group meeting, and increasing the amount of knowledge we have about prevention.

Moreover, we have made new connections through the Natural Science Class. When we made a presentation at the school fair, in order to let people know what we are doing, a friend of ours found interest in the workshop, and decided to hold the Natural Science Class as an inquiry activity for school. Thanks to this friend, preparations are being made for the class, which is currently held in only one location, to be held in four locations in *Matsumoto* City from next year.

In addition, the *Matsumoto* City Board of Education, who learned about our activities, called out to us to attend a workshop for the New *Matsumoto* City Science Museum. When we proposed our feelings toward the Natural Science Class and the enjoyability of science at the museum workshop, we got an opportunity to hold the class at the museum when it has opened.

Although the Natural Science Class is currently an activity of small scale, we feel like the circle is gradually getting bigger. We would like to expand class activities even more into the future by holding the class with friends, and/or inviting people who would like to help.

Japan is a country that is bombarded by natural disasters. We cannot leave our country because of a disaster; we will have to live with it. Those who have been able to make observations from a scientific aspect through our activities should increase knowledge about prevention, send the knowledge into society, and enable our circle of activities to grow even more. We would like to continue learning about our home land, showing affection towards it, searching ways to coexist with its nature, and putting all into action.

4. Acknowledgements

We would like to take this opportunity to thank all who have supported our activities.

We also would like to thank Prof. *Kohki Yoshida* of the Faculty of Science, *Shinshu* University, who has given us the opportunity to present our activities at the *Science Agora*. We have held the Natural Science Class annually, and we have reconfirmed our purpose of holding the class, thanks to the presentation, along with finding problems that we have to solve. With feedback from students from other schools, we have found meaning and a sense of mission in our research. We have also noticed that the Natural Science Class can lead to education of preventing disasters, and that we too can contribute to society.

We are also grateful to those from *Nihonsougou Kensetsu Co. Inc.* for instructing us in performing the surface wave method, its mechanism, how it is performed, and how to characterize core samples. We thank you for hints in ways in thinking. It was very enlightening.

We also would like to show a special thanks to the *Yamabe* Children’s Center, for calling out to us every year for the past decade. The children’s smiles have always been motivating to us, and we always look forward to meeting them.

Finally, we would like to show our gratitude to Mr. *Naoki Kobayashi* of the *Matsumoto* City Board of Education, for inviting us to the New *Matsumoto* City Science Museum workshop, and letting us brainstorm there. In this way, we had had less resistance towards proposing our opinion, and reconfirmed the meaning of our activities. Please call out to us again when the new science museum has opened.