A Practice Report of Science Classes to Increase the Interest in Regional Geology in Elementary School

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We report two educational practices using the regional geological material in the science class of the sixth grader.
For the first we focused on the learning activity before the observation. We planned students increase their interest themselves with knowledge that already learned and they observe an outcrop near their school. In the prior learning, we distributed the worksheet printing the picture of outcrop. They described their notice on a worksheet. Based their description, they decided observation target at outcrop. Teacher did only help student they can use their knowledge and they can observe with their purpose. As a result, the student observed at outcrop on their own initiative.
Next, we practiced the learning program that student made Rock specimen and they observed geological material around school using it. Probably the learning program to use the rock specimen which student made themselves is rare. In this program, they showed high interest about regional geology.

Keywords: Elementary school science, Regional geology, Active learning

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The scientific book and the demonstoration experiment in the island library in"Oki " Letts science book! the one which was made with water is enough

*Kunihiro Abe[1]

1. NPO corporation nature reproduction center toward

The try to have appeal children put on a scientific book in the island library in Oki and a natural phenomenon with it by the experiment and to have a scientific outfit worn is accomplished every year.

It becomes the 4th last year.

Last year, water on the island in Oki reproduced the natural environment to bring about by the scientific book and the Enji experiment by the theme of "the one which was made with water is enough "with Mr. Doi at the Galileo atelier and deepened the understanding of the natural phenomenon which is related to water in Oki to the children with the protector.

The handled scientific book and the experiment are last year and "Rika doku" theme in Oki which becomes the 4th is Let's Rika doku!

The one which was made with water is so-called adequacy.

・The reading " It doesn't receive Shizuku".

・The dissolving of water, and the difference, the experiment of oil, " various ones dissolve in water "

The case of the tanker accident and the oil leak on the sea

・The evaporation of water and the extraction of the melting one

The experiment, the evaporation and the extraction of seawater in Oki

・The experiment (on) " water in Oki is delicious " (fresh water lens)

・Evaporating water where.

It catches water in the experiment, air.

・The water which becomes rainy

The experiment, the rainfall experiment

The reading " There, it is rain, rain, rain."

・Water density difference (1)

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Heavy water - light water (The difference with density by the dissolving)

・Difference (2) with the density of water of 1 of the experiment on the Tsushima Current (the big flow in the sea)

Experiment 2 on heavy water - light water (the difference with density by the temperature difference of water)

It sees an ocean current.

・The aquatic resource with 1 piece of show - the ocean current of the sending it of the sea, too, and rich Oki

・2 of the sending it of the sea, too

The ocean current and the air mass of show - Oki Geopark

・3 of the sending it of the sea, too

The alternating current of the show - Oki obsidian - the ironware - the chinaware and so on and the people in the Korea

・The sending it one with thankfulness

The show - drifting-ashore garbage

It did being.

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Introduction of “Ocean Education Pioneer Schools” Subsidy Program

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In 2016 we launched the “Ocean Education Pioneer Schools” program to provide financial support to elementary, junior high, and high schools. The aim is enhancing ocean education in Japan as part of school education. 64 schools from 28 prefectures in Japan are participating in this program. They study various ocean themes, from general to regional problems; natural disaster damage prevention, ocean driftage and pollution, marine biology and coastal environment, traditional salt manufacture, coral reef fisheries, and so on. These ocean programs will be brought together into practical ocean education curriculum in the future. We provide information about this Pioneer Schools program to stimulate discussion about ocean education in the natural science and earth planetary science fields.

Keywords: Ocean Education, Ocean Education Pioneer Schools program, Subsidy System

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An Exploration of Measures of Citizens' Ocean Literacy in Taiwan

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One important objective of ocean education is the enhancement of learners' ocean literacy, including, but not exclusive to ocean conceptual understanding, problem-solving ability, attitude toward ocean, and care about the ocean public issues. Ocean literacy may be a key to (1) link public with the understanding of ocean and ocean's influence, (2) applying ocean knowledge to solve problems and issues regarding the ocean and its resources, and (3) to inform and taking actions to public issues. However, previous studies have rarely surveyed citizens' ocean literacy, and to confirm the impact of ocean literacy on citizens' willingness to take action. This study attempted to fill this gap by conducting such an inquiry. This study explored public ocean literacy in Taiwan. To measure ocean literacy in terms of ocean concept understanding, attitudes toward the ocean, and interesting in studying ocean issues, Ocean Conception Test (OCT, multiple-choice question), Attitudes toward Ocean Inventory (AOI, 5 point Liker scale), and the Interesting in Studying Ocean Issues Instrument (ISOI) were constructed. Totally 324 subjects participated in this study.

The OCT is a 75questions questionnaire to measure ocean concept understanding. The mean score was 45.02 (SD =11.03). Three major misconceptions were: (1) what is the major mechanism causing sea level rise; (2) what is the major mechanism causing storm surge; (3) The reason why Kuroshio is called 'black current'. The mean score of AOI is 3.48 (SD =0.52), shows subjects have a positive attitude toward marine science. With respect to ISOI, the analysis revealed that the top 3 most interesting topics of marine issues subjects would like to study were: 'coral reef ecosystem', 'dead zones', and 'ocean resource conservation'. Besides, attitudes toward ocean explained significantly more variance in willingness to take ocean action than of ocean concept understanding.

To conclude, this study may be of importance in providing researchers with a better understanding of citizens' ocean literacy. It is our hoped that this analysis and discussion will encourage the inclusion and replication of the public understanding of ocean.

Keywords: Ocean Literacy, Ocean Conception, Attitudes toward Ocean, Interesting issue of Ocean

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The making of animations of geological phenomena in JAPAN using global geological data.

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After the 2011.3.11 earthquake in Tohoku, crustal deformation by earthquakes and volcanic activity is being observed every day at Japan. Japanese people realize that they do not know much about how crustal deformation in Japan is continuously occurring, as well as how to prepare for huge earthquakes. One of the reasons for this problem is the fact that crustal deformations in Japan are not taught properly in Junior High Schools. If these things were properly taught, the preparation for huge earthquakes would be much easier to do in the near future.

In this study, we created 3D animations for Japanese crustal deformation using GNSS data obtained by the Geographical Survey Institute of Japan (GSI), and from animations that show the distribution of earthquakes around the world using earthquake catalog data obtained by the United States Geological Survey (USGS). Overall, this would make it easier for school children to understand the Japanese crustal motions and how earthquake work in global distribution. The GSI had already created a 3D animation of Japan, but only for a limited time and area. The utility of that animation was suggested, under KATO (2011), to be applied again to current studies. The newly created animations will help to understand the detailed crustal deformation in Japan and the regularity of earthquakes in the world.

Using these animations in Junior High School education, we hope to change people’ s attitude toward nature, especially in relation to big earthquakes and the loss of lives, like in the 2011.3.11 Tohoku earthquake and Kumamoto earthquake, etc.

Keywords: GNSS, JAPAN, crustal deformation, GEONET, epicenter

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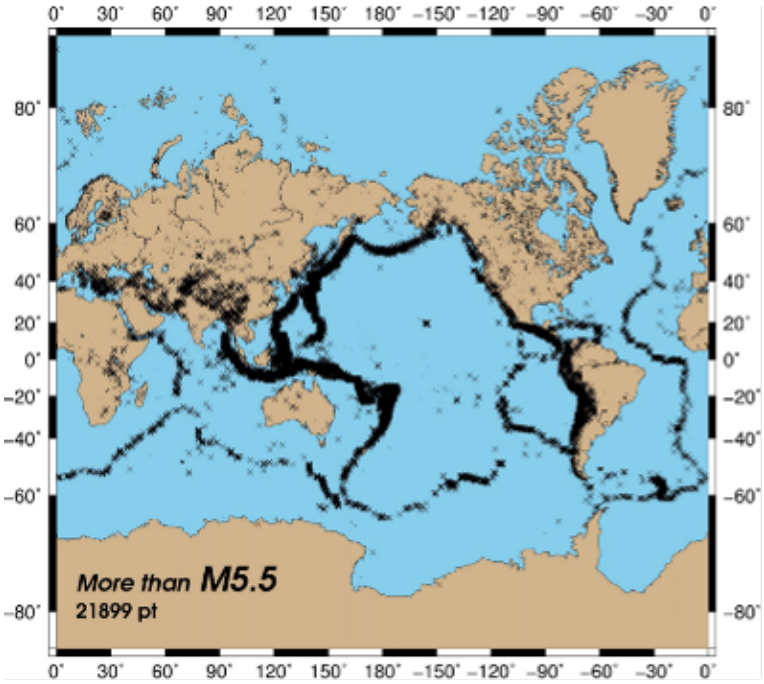
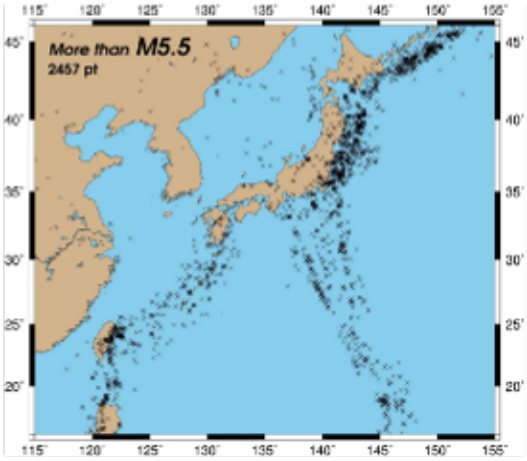


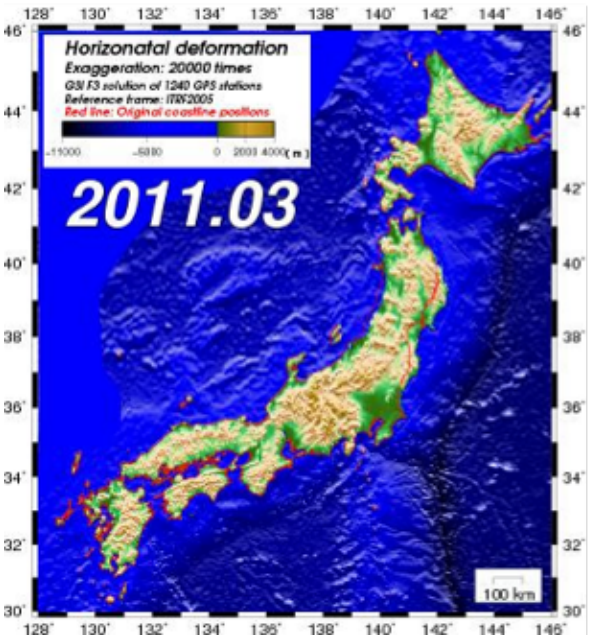
Epicenter map

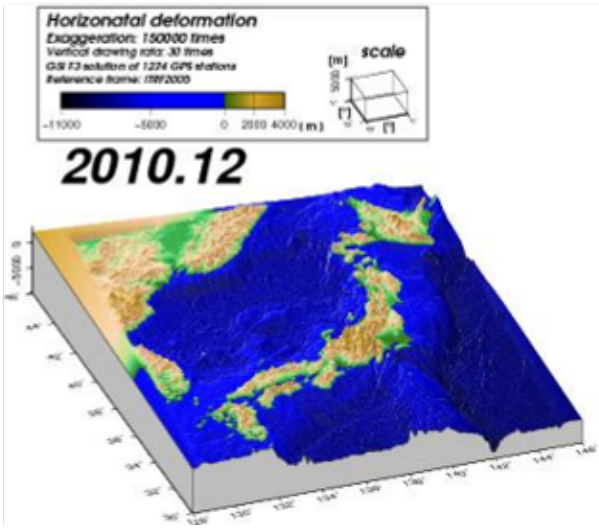
Earthquake catalog by USGS



Crustal deformation map

GNSS data by GSI





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Web service for active learning in Geoscience

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It gets more important to educate about the Earth’ s environment as the global warming and following unusual meteorological phenomena become serious problems every year. On the other hand, the recent education gives weight ” active learning” : not only provide new knowledge, but also make students find problems and come up with the conclusion. So, we have been building the new web service, C3 (Cross-Cutting Comparisons/; http://www.darts.isas.jaxa.jp/C3/). The feature of the C3 is interactive interface. Even for a beginning student can check various geoscience data because of the leading input form. It also provides free scale adjustment, group working by using URL query and pseud 3D display, which help in understanding various phenomena on Earth. In this presentation, we introduce the practice of the active learning by using C3.

Keywords: Active learning, Web service, Cross-Cutting Comparisons

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Preliminary survey about understanding of the volcanic rock texture in students of faculty of education and related discussion in the earth science instruction

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1. Fukuoka Kyoiku Daigaku

In Japan, every students entered into faculty of education had learned the common curriculum through elementary and middle schools. Preliminary inspection using closed questionnaire was executed to measure the degree of understanding about earth science. 48 students from 4 of 26 student grouping in some lecture were surveyed through 8 questions. About 13 % in those students could correctly designate the groundmass in the porphyritic texture drawing. It is slightly decreased in comparison with the result of Tojo (2006) reported about 20%. This questionnaire shows the drawing of thin section image with the caption of “This is a image of andesite section. Paint all the area of groundmass in this image”. The groundmass looks like hyalopilitic texture, and about 21.7% painted only the fine mineral grains (groundmass minerals), and it seems more analyses must be needed. “Porphyritic texture” is described as “relatively large crystals (phenocrysts) set in a finer-grained or glassy matrix” in Tomkeieff (1983), which refers Rosenbusch (1887), and almost same description was given in every science textbooks of middle school in Japan. At decline of the 19th century, petrologists already utilized polarized microscope and noticed fine grains in the groundmass texture. No data may available that how many middle schools in the present day equip the polarized microscope, or how many science teachers are good at using those microscopes. As a result, we should support increasingly the middle schools for the better practical education in petrological teaching unit.

Keywords: porphyritic texture, groundmass, questionnaire, groundmass texture

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An attempt to relate magma's crystal differentiation with formation of basaltic and rhyolitic volcanic island arcs of the Izu Islands as the learning material

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1. UT Ocean Alliance

1. Background and purpose

Since the Izu Islands are oceanic volcanic islands, they should originally be all basaltic volcanic island rows. Although it tends to be thought, surprisingly, Niijima, Shikinejima, and Kozushima Islands form rhyolitic volcanic island rows. And, on the east side, basaltic volcanic island rows such as Oshima, Toshima, Miyakejima, Mikurajima, Hachijojima Islands are lying, it is a seemingly strange array of two rows. Why is volcanic island row formed from rhyolite rock magma which can be at the final stage of crystal differentiation exist parallel to basaltic volcanic islands offshore. Consideration about its origin and also about the birth, growth and expansion of the typical basaltic volcanic island such as New Nishinoshima, I think , those are good educational materials to deepen understanding about magmatic "crystal differentiation" and arc formation. Based on the Izu Islands belonging to the Tokyo metropolitan's familiar area as the material, I introduce examples of practical topics on the geological educational theme like this taken up in classes. I will report a part of it.

2. Method ·Description

On the Izu Islands, it seems that it is one of the rare examples in the world as a bimodal event that both basaltic volcanic islands and rhyolitic volcanic islands exist side by side in Pacific Ocean. However, this fact is considered to be an advantageous and valuable teaching material for learning the nature of magma, the eruption style of volcano and the form of volcano.

Regarding the development mechanism of rhyolitic magma, textbooks include a shematic explanation diagram as a model. Based on the model, next two ideas could be arisen. < Draft 1> By subsiding and sinking of the Pacific plate under the Philippine Sea Plate, magma is supposed to occur. This suggests that as the ascending path becomes longer, the elapsed time since the magma evolves becomes longer, so the crystallization differentiation progresses to the extent that the magmatic nature changes to quality following as the Basaltic material →Andesitic one →Daisitic or Rhyolitic one, as a result. < Draft 2> By extensional force field (crack etc.) caused by collision, submergence and sinking of the Philippine Sea plate which is carrying the Izu Peninsula and the Izu Islands below the Honshu side plate, "partial melting" in the crust to occur. This another one suggests that in a part of the continental crust (partial deformation) due to some cause (pressure phenomena or temperature rise), partial melting occurs, and staying at that position but with the passage of time, granitic rich in SiO_2 % (or rhyolite quality) magma is formed and eventually appears on the sea bed surface (or on the sea level). Whether it is one of the above two theories, it seems that the elucidation has not been fully understood academically now. However, in any case, it can be said that the core part of the scenario where the magma generated by the partial melting of the plate and the crust eventually reaches the rhyolitic magma due to the crystal differentiation effect, and both can be almost the same conclusion. Therefore, I have taken up to the topic in the class, because these learning materials could make the description items like textbooks more familiar and also could utilize it. Even in the case of geological excursion to the site, it is convenient for traveling to learn by watching while easily compare the relationship between lava nature and volcanic island shape at the same time, because those islands are tied through a same route. So I often solicited applicant students and often carried out excursion in the summer season by myself.

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3. Results and discussion

In the lesson based on this materials, I introduce, the main questions and issues issued from the students are as follows.The one for < Draft 1> is that "why is not the formation of andesitic magmas visible?", next one for< Draft 2> is that "Niijima, Shikinejima, Kozushima Islands are all on the ocean and why they can be said to be a continental crust? It is strange". The total time required for a series of learning processes is scheduled to be around 30 minutes, including group review and presentation activities. Though I insist repeatedly , correct answers are not provided. However, we learned that by relating the learning matters of "crystal differentiation" which is textual description items to our familiar area's learning-matters of Izu Islands in Tokyo, I felt that the merit of using them is great.

Keywords: magma's crystal differentiation, rhyolitic volcano, plate sinking, Izu Islandes, Niijima/Shikinejima /Kouzujima

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Problems concerning the classification of igneous rocks dealt with in earth science education -A practical educational program using cumulate rocks-

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Education of earth sciences deals with the classification of the igneous rocks based on modal and chemical compositions. Plutonic rocks, however, do not necessarily represent magma composition. We propose a practical educational program for verification of classification of the igneous rocks by using ultramafic rocks of drill cores from NE Japan.

Keywords: Igneous rocks, Ultramafic rocks, Cumulate

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Digital Classroom, light microscopy, mineralogy

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1. Carl Zeiss Microscopy

Digital Microscopy in a Digital World

The world we are living in is changing rapidly, as digital technology is more and more integrated into our everyday lives. Smart phones are common possessions for most, big data is shared, analysed and interpreted around the world using “Cloud” technology and people are continuously connected via the world wide web. It is therefore safe to say, that in the last 10 years, we have truly undergone a third industrial revolution; the digital revolution.

Digital technology is now revolutionising the way we educate and communicate. These digital capabilities are now being applied to Geoscience education and specifically, in this paper, for the microscopy and mineralogy education.

Optical Mineralogy Education with the ZEISS Digital Classroom

The digital classroom allows the supervisors to connect to all Primotech microscopes in the classroom. Using the Zeiss Matscope iPad application, the supervisor is able to view all the images from the microscopes at any time, giving him a comprehensive overview of the students microscopes. The supervisor has the capability to select and share anyone of the student’s microscope images by projecting the image onto the screen.

A simple example of the application of this technology, may be the following scenario. A supervisor is showing his class the features characteristic of an olivine on his light microscope. Now the students will aim to recreate the steps in search for the same features that are used to distinguish an olivine. Whilst overseeing the students microscopes, using the Zeiss Matscope iPad application, the supervisor notes one of the students has an olivine which has been cut perpendicular to the c axis and is showing maximum birefringence. This student’s microscopic image can be easily selected and projected on the front screen, to show the rest of the students this example. Another student may have, in plane polarised light, what appears to be an olivine with high relief, fractured texture and colourless pleochroism; the birefringence is black-grey in colour.

Both examples can be projected live from the students’ microscopes and be used to provide examples of the difference in birefringence based on the orientation of the crystal relative to the crystallographic axis. This is not just a better way of sharing information but also, by involving the students in such exchanges the supervisor can invoke an element of peer-on-peer teaching and greater student engagement with what is being taught.

In addition, students have the benefits of having iPads, which can wirelessly be connected to the microscope. Typically, students within the lecture make observations with the microscope, taking notes and making sketches based on their observations. This is a time intensive process and can result in students spending more time drawing and making notes than interacting with the microscope and the samples. The Zeiss Matscope iPad application therefore allows students and supervisors to acquire and save images, so they are able to build their own library of images. With the Zeiss Matscope iPad application students have the ability to perform measurements, annotate the images or record short

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videos based on their observations. Therefore, supervisors can create practical exercises, where measurements can be taken to ensure students note the relevant features and observe specific details within the sample. The Matscope iPad application thus allows the students to spend more time focused on the sample and its features and acquiring data from the samples.

Summary Remarks

The digital world we now live in provides us with a great opportunity to revolutionise our education provisions. The ZEISS Digital Classroom is one such evolution taking advantage of the digital technology available today. The capabilities of the ZEISS Digital Classroom lead the future of how optical mineralogy and microscopy education are evolving.

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Experiments to "feel" Coriolis Force

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See Japanese abstract.

Keywords: Coriolis force, rotating frame of reference, geodynamics, geophysical fluid dynamics

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Space Science outreach of National Space Organization Taiwan

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1. National Space Organization

Space science is one of the most popular subjects for the young students and general publics. However, the material of space science is much less than the other subjects in the elementary/junior high school textbook. Students learn the space knowledge from museum, book, movie and educational TV program. National Space Organization (NSPO, Taiwan) hold the space science camp, competition, exhibition and TV program for the young students to further realize the knowledge about space science and satellite technology. More than 3 years of space science outreach experience and results will be seen in this paper.

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Experiments about rocks weathering and rocks change, these utilizations in school.

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1. Ota Ward Kamata Junior High School

I have developed several experiments about rocks weathering and rocks change for 25years in junior high school in Tokyo. Here is the summary of my report and effects of practice.

Keywords: rocks weathering, rocks change, science club

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A Practical Example of Composite Field Study Program in Mt. Fuji: Geosciences and Arts

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1. Ibaraki University, 2. Toyo University

In FY2004 and FY2008 the classes of the Faculty of Education at Ibaraki University "Field works on geology" were carried out at/around Mt. Fuji. In addition to the viewpoints of Earth Sciences, it also has contents of abundant artistic standpoints, and a measurement of the bidirectional educational effects between Earth Sciences and Art was aimed at. In these classes, from the planning stage, science teachers and art teacher are working closely together in addition to pedagogy teacher.
Specifically, we focused on how the experiences of sketches of the landscape affects the field observation in abundance of viewpoint and their deep understanding. Also, at before and after these classes, 1) to express the image of Mt. Fuji at that time, 2) to appreciate the paintings of Mt. Fuji and write out the information that can be read from there, were carried out. They were a clue to know how the student's understanding changed. In addition, reports and impressions submitted by the participating students were used as materials for achieving the classes.
In recent years, some studies are raising doubts on the effect of sketches in class. However, as results of the classes, at the university students' level, large number of positive effects corresponding to the time and energy spent sketching seems to be obtained. In addition, it was suggested that the experience of observation at the site provides various new and concrete viewpoints for appreciation of paintings.

Keywords: Earth Science, Arts, Field observation, Mt. Fuji, cross-sectoral study

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Observation and education in geoscience by using low-priced instruments

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In this presentation, we will introduce four experiments and hands-on activities for geoscience observing and measuring by using low-priced and small-sized commercial instruments. The Black Box for Environmental Measuring (BBEM) system is based on Arduino platform, low-power consumption sensors are employed to measure meteorological and environmental parameters. Built-in accelerometer on BBEM or smartphone could be used to observe shake and vibrations by earthquake and strong wind. Webcam is used to detect and record sprites, thunders, and the development of cumulonimbus, as well as automatically visibility observation. A simple VLF receiver is built by using the audio interface on computer, and the observed signals show the variations of the ionospheric D-region. These experiments are practical which have been applied in classroom and science outreach in Taiwan.

Keywords: geoscience education

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Educational view of the simple seismometer recordable by an optical mouse

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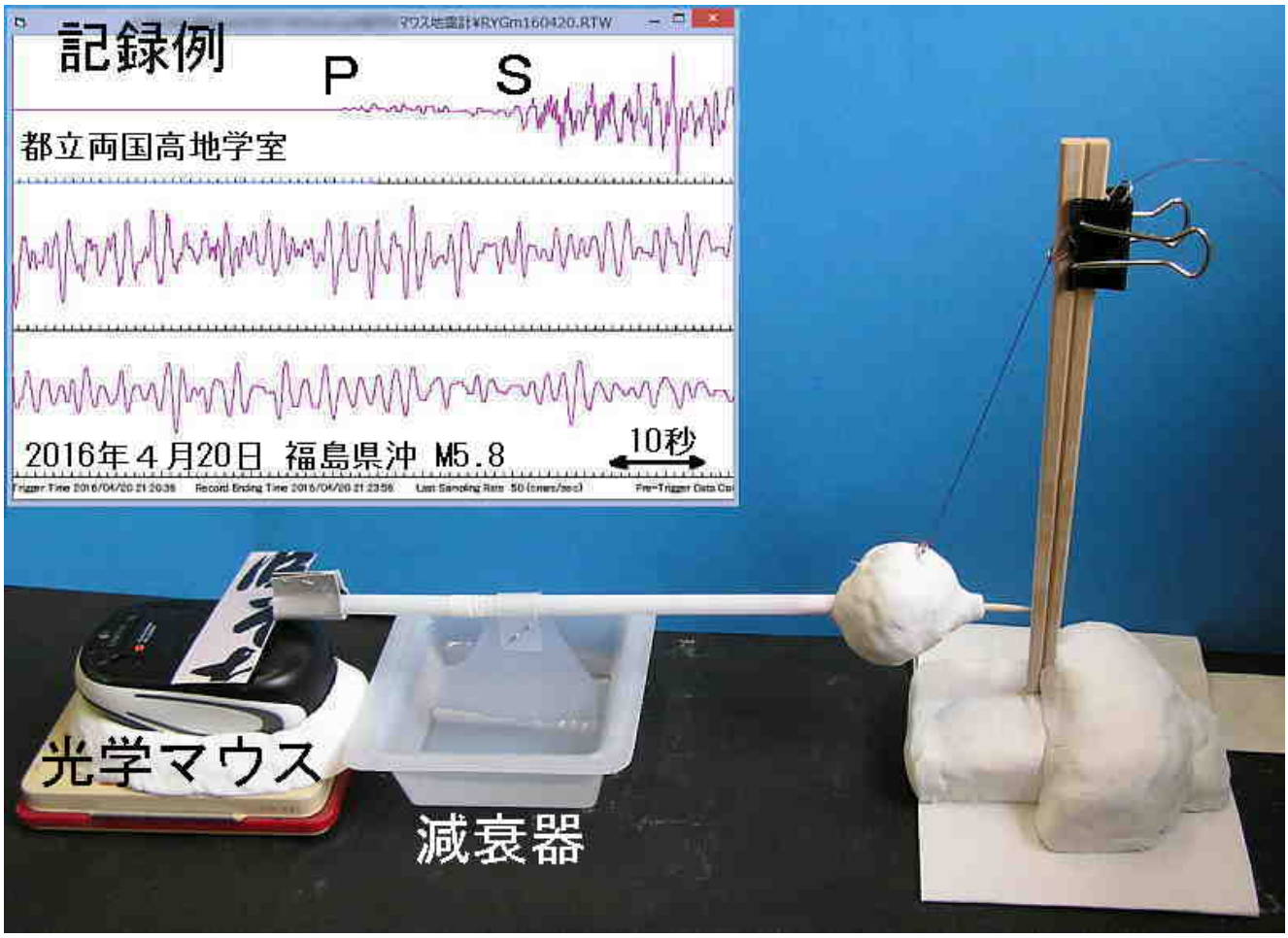
Using an optical PC-mouse, the simple seismograph is developed for secondary education.
Within 1 hour, the mechanical one modeled on Omori-type seismograph can be made from a piece of paper clay, a polypropylene straw and a pair of disposable chopsticks. Using an optical mouse as sensor, the displacement of its pendulum is recorded without friction.
The classical seismograph shows a principle of a seismometer system, and its output can also be utilized as digital data. Students can learn a mechanism of seismometer through their handmade of this, and observe the real seismic wave by themselves. Therefore, this remarkable seismograph brings with actual feelings to the scientific understanding of earthquake.
Examples of educational practice and future's educational view using this seismometer will be reported.

Keywords: optical mouse, seismometer, secondary education



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An Example Geoscience Class of Model Experiment of River Process Utilizing EMRiver Color-coded Media

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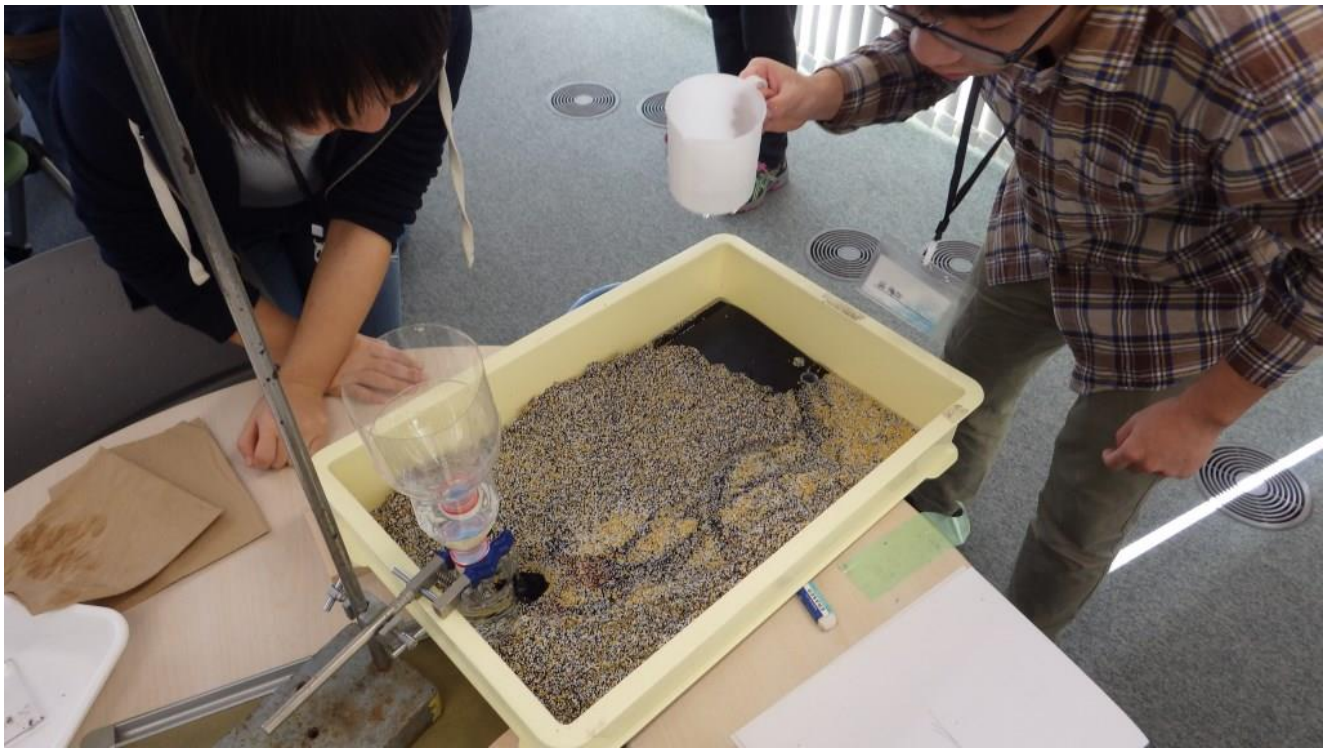
The author conducted a geoscience class for lower and upper middle school students. The modele experimantal apparatus for river process could develop utilizing EMRiver Color-coded Media supplied by Little River Research & Desing, US. This device can form meandering river in small box such as 50cm X 30cm. Responces by the students in a geoscience class are as follows,
"Good because I could observe geomorphology such as meandering river and ox-bow lake. " and
"My prediction for results on model experiment was wrong. It was interesting".
This apparaus may intense understanding on morphology of river.

Keywords: EMRiver, Lower middle school, Upper middle school, Meandering river



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Development of GNSS Radio Telescope with Rawdata Output using Smartphones

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The android smartphones are useful for high-school students to observe multi-GNSS satellites such as GPS and learn the space technologies actively. It is important to foster young people inthe field of space technologies. We can observe GPS, Glonass, BDSS and QZSS more than thirty GNSS satellites over the sky of eastern Asia. On JpGU 2016 we showed that smartphones of high-school students can receive the GNSS satellites and display the skyplots or levelplots on the screen of their smartphones very easily, just as radio telescopes . On JpGU 2017 we will show the big step of GNSS raw data output from the Android7 smartphones. They can offer the pseudo-ranges, the carrier phases and even the doppler data of GNSS satellites precisely. We will show that the students can learn the higher experiments and data reductions regarding satellite-orbits determination, navigation and positioning using the raw data from their radio telescopes now.

Keywords: GPS, GNSS, smartphone, raw data, radio telescope, fostering

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Development of portable Jovian radio wave receiver system for application in high school science education

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We propose portable receiver system for Jovian radio waves in high school science education.
Radio waves are used ordinarily in our daily life as a result of the development and spread of cell-phone and other wireless equipment. The radio is emitted not only by artificial system, but also by natural phenomena. Planets and the Sun that have magnetic fields and atmosphere would be the natural radio sources such as Sun, Earth, and Jupiter. Solar and Jovian radio waves whose frequency range is higher than 10 MHz can be observed from ground stations because they can penetrate the terrestrial ionosphere. So, the ground-based radio wave receiver can be a useful tool for exploration of the planets and the Sun. Furthermore, among several types of the Jovian radio waves, decametric S-bursts shows unique occurrence such as quasi-periodicity with the repetition frequency of ~20Hz, and the negative drift rate (~-20MHz/s). Ergun et al. [2006] and Su et al. [2006] proposed Jovian ionosphere Alfven resonator model. According to these previous studies, eigenfrequencies of Jovian IAR are expected to determine the repetition rate of S-bursts of Jovian decametric radiation.
Observing Jovian radio waves would interest to high school students and be attractive scientific experiment-teaching material. In this study, we propose Jovian S-bursts receiver system that is easy to use in high school education. However, if we install antenna and receiver in the high school site in or near the urban area, artificial noises would make it difficult to detect Jovian radio waves. Therefore, the receiver system must be transportable. For getting the data to provide contributions for studies on mechanism of Jovian S-bursts in the future, the time resolution of the receiver must be better than 1 milliseconds. Hence we will develop it in considerations of the following points: (a) the portability, (c) the cost, (d) sensitivity, (e) the frequency range, and (f) the time resolution.
We have two receiver system plans: One is based on Radio JOVE receiver provided by NASA Radio JOVE project (http://radiojove.gsfc.nasa.gov) and the other is based on 1seg TV tuner USB device controlled by Software Defined Radio. We are going to choose one based on comparisons of the expected performances on (a)-(f).
In this presentation, we will report the scheme and the state of progress.

Keywords: Jovian radio waves, ground-based receiver

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High-level science education and research activity program for high school student using video conference system with PC chat

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So far, university has been one of the most effective field to educate analytical skills of science, and to discuss scientific-topics logically, because teachers and students can gather easily and discuss the results obtained using up-to-date apparatus and advanced research resources. A difficulty arises, however, when we try to educate in a laboratory of university for high school students having a potential in the field of science. It takes much time to gather together in the laboratory, since they inhabit separately in local areas of Japan; especially, in the case of high school students living in except for the area called Pacific coastal belt in Japan. Moreover, when we educate them using only what we call as e-learning, because of the living away from the university, their decreasing motivation in the research activities can frequently occur. To overcome those difficulties, we have developed an original program about science education and research activity for high-school students using video conference system from 2014: Super Scientist Program. This program is clearly different from e-learning. The main feather is below: 1) Lectures and interactive discussions using video conference system with PC chat, which is held once a week. 2) Self-determination of research subjects to promote an active learning and investigations. 3) Adoption of the educational program with several short camps, including fieldwork studies. 4) Group works and scientific discussions for the research subjects in English with foreign students and graduated school students in University. In our presentation, we will show our approach for science education and research activity program in geophysical field. We will also report about the educational effect of PC chat in our program.

Keywords: Science education for high school student, Video conference system, Effect of chat

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Process of development of natural science research experienced by high school students

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I have been assigned to this school in April 2014 and immediately founded the Earth Science Club. Initially when it launched the club it consisted of 31 members. After that, the number of members gradually increased, and now the Earth Science Club is the largest departmental activity of the cultural club that works with 50 people. The basic policy of Earth Science Club are the following three points. 1. Study without using special equipment, with the theme of familiar natural phenomena as a theme, and obtain professional outcomes. 2. Provide the obtained results to the administration and local residents. 3. Open the movement experiment classroom and tell local elementary school students the results obtained. Regardless of the name of the Earth Science Club, if it is a theme of the natural science system, study regardless of the field. There are five research groups currently - physics 1, biology 2, geology 1, social engineering 1. The leader is the author only. Since the beginning of organizing this club, we have nationwide high ranking of evaluations and grades at the Ministry of Education, Culture, Sports, Science and Technology Ministry certified conferences and specialized academic societies etc.

Students in the field of geology continuously conduct research on the same theme for three years from the beginning of the founding. The magma team has been awarded the Japan College of Science Awards' Central Convention, awarded the Kanagawa University High School Science Paper Awards Excellence Award, and the Japan Geological Society of the Year Award for the third consecutive year. This research team leading the Earth Science Club. Continuing research with the same theme allowed the students to have the opportunity to experience the process of development of natural science research unexpectedly.

1. Research results in 2014

Students who suffered floods of the first grade river Kakogawa flooded every year thought to elucidate the cause. Students examined a wide range of 20 kilometers east - west x 18 kilometers north - south, and 94 samples were sampled, and all of which observed with a polarizing microscope. They also measured the modal compositions and magnetic susceptibilities and analyzed the total rock chemical compositions. They drew a geological map of the southern part of Hyogo Prefecture and created a schematic sectional view to clarify the cause of the flood of Kakogawa.

2. Research results in 2015

After the 2014 research fulfilled the nationwide top prize, students discovered evidence in the hiking shortly overturning the idea that was the basis of the research in 2014. The fluctuations of the students were large, and they were confused as I can’ t say that they were wrong at the moment. The students were inspired by the words only you can fix it by the author, and they began to observe their research outcomes denying. They examined Hyogo prefecture from the Seto Inland Sea to the Sea of Japan, 20 km east - west x 160 km north –south, and 146 samples were collected and analyzed. They created schematic diagrams of modified geological maps and formation process by rock mineralogical research method, and showed the formation process of Hyogo prefecture.

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3. Research results in 2016

For our research paper in 2015, several papers on controversies from specialized researchers was published. The students realized that they finally entered the stage of discussing with experts beyond the level of research of high school students. To respond to these objections, they intensively investigated 60 km east-west x 90 kilometers north-south from a new structural geological point of view. They also analyzed 103 samples by rock and mineralogical methods and published papers showing that their research results were correct in 2015. Through these series of studies, students experienced that natural science develops while correcting errors by discussion.

Keywords: Earth Science Club, correction, argument

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Problems as seen from the transition of geoscientific terminology described in high school textbooks

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It is predicted that "Basic Earth Science" and "Earth Science" will be set continuously in the next learning guidelines of high school.
However, there is no doubt that many teachers who have not studied Earth and planetary science while in college will be in charge of these subjects.
Under such circumstances, the following things should be avoided as much as possible.
・To use geoscientific concepts and terminology which can only be understood with a certain geoscientific background,
・Different expression by textbooks on certain concepts and phenomena,
・Array of learning contents and configration of logic are different from textbook to textbook,
It is considered, as a result, that these probrems negatively act on the student's formation of geoscientific literacy and on their course selection.
However, it is pointed out that such problems are found in current textbooks of "Basic Earth Science" and "Earth Science", and that similar problems are occurring with "Geography", and studies for problem solving have been made in JpGU.
In fact, such problems have been continued without improvement, in over 150 kinds of geoscience textbooks published in the past 70 years.
The depth of the problems mentioned above is thought to be here. As long as they are not solved, it is considered that there is no advance in the task.
Some examples of probrems are shown below.
·earthquake ground motion
·S-P time
·magnetic poles
·classification of igneous rock
·cross lamina

Keywords: high school textbooks, geoscientific terminology, transition and problems of contents

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