Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

G04-P01 Room:Convention Hall Time:May 24 18:15-19:30

A class room tool for demonstrating the striped magnetic anomaly across the mid-oceanic ridges

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The striped magnetic anomalies over the mid-ocean ridges play an important role at the emergence of the plate tectonics from the classical continental drift theory. The so-called ”The Tape-Recorder Model” developed by Vine and Mathews(1963) is essential to study this process in a high-school class room. However only text-based resources are used to study for this theme. The students do not learn the theory and development process with firm reality or motivation. In this regard, we developed an analog model showing this striped magnetic anomalies in our class room. The model consists of a thick foamed styrol plate and iron nails which have been magnetized using a permanent magnet. The plate is a mimic of ocean floor and covered partly with colored tapes symmetrically showing stripes. The normal magnetized nails and reversed nails are stuck on the grids of the plate symmetrically across the center respectively. The measurement is carried out on a acrylic transparent plate above the foamed styrol plate which symbolize sea surface and sea floor. A magnetic sensor (Gauss-mater) is transversed over the model slowly and the total magnetic strength are measured at real time showing a periodic change. So, the students can be experienced the measurment on the ship and can comprehend easily the meanings of this measurment and the relation with the mechanism of ”The Tape-Recorder Model”. The cost of Gauss-meter is high expensive, so we tried to use a smart-phone as an alternative and found that thier magnetic sensor and the free application are sufficient enough and quite useful for this type of measurement. At the conference, we will present an analysis of this model and make a demonstration of magnetic survey using our model.

Keywords: magnetic anomaly, stripe, ocean floor spreading, education, high school

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G04-P02 Room:Convention Hall Time:May 24 18:15-19:30

Volcanology class in Dinosaur Valley Fukui Katsuyama Geopark: Molten lava flow experiments in elementary schools

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We report the results and educational effectiveness of our volcanology classes in the elemental schools in Katsuyama, Fukui. The volcanology class is a part of the outreach activity in Dinosaur Valley Fukui Katsuyama Geopark, and is designed for the purpose of disseminating knowledge of volcanoes and volcanic products in Katsuyama region. Although there is no active volcano in Fukui prefecture, several Quaternary volcanoes (1 to 0.7 Ma) are existed in Katsuyama region. These volcanic products formed a large part of the basement in this region. The largest ski site in Fukui (SKIJAM Katsuyama) harnesses the slope of lava flow morphology of the youngest volcano (Hoonjisan) in this region. These facts indicate that people in Katsuyama region lives on the benefits of volcanoes, however, the relationship between volcanoes and the land formation in Katsuyama region is not well understood by local residents. Thus we aim to give elementary school students a deeper understanding of volcano and the land formation in Katsuyama region through our volcanology class. In the class, we demonstrated an experiment of lava formation by using portable clay cooking stove (Shitaoka et al., 2011). The students observed lava forming process, and measured the temperature of the produced fluid lava by using an infrared radiation thermometer during the experiment. In addition, the students observed flowing lava on the slope of sandpile, and studied the formation of lava flow morphology. The results of questionnaires after the volcanology class indicate that the students understood the formation of lava flow morphology and the basement volcanic products of SKIJAM Katsuyama, and also show the improvement of their interest to the relationship between volcanoes and the land formation in Katsuyama region.

Keywords: volcanology class, molten lava flow, elementary school, geopark, Katsuyama, Fukui, Japan

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G04-P03 Room:Convention Hall Time:May 24 18:15-19:30

A multidisciplinary approach to learning from geological and geographical perspective.

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The intention of this study is to consider the efficiency of a multidisciplinary approach of learning from the perspective of geology and geography. The common word ”GEO” implies its commonness and many geology and geography teachers are aware of it, but just vaguely. It is time to reconsider the relation between both learning concretely, since the global environmental change has increased its complexity and needs a practical interdisciplinary approach for the real solution. In particular in Japan, the earthquake in 2011 also stimulated us to reconsider our perspective on earth. Such actual problems should be addressed by whole earth perspective and through an interdisciplinary approach. These points are intensively discussed in context of future earth. As a school subject concerned with earth and global problems, geology and geography can contribute to it.

We planned and implemented a one-hour class with multidisciplinary approach of geology and geography for 52 11th-grade students in a private high school in Tokyo. The issue is Fossa Magna, geological feature located in central Japan, treated at first from geological aspects such as development of Japan islands, active fault line and thickness of sediment rock. Successively into geographical aspect such as geo-tourism in Geopark, mining limestone and developing cement industry. The questionnaire of students review shows 96% of students ”understand the difference of the 2 subjective perspectives” and ”recognize the significance of the multidisciplinary approach.” Almost half of them agree that ”multidisciplinary learning is efficient for better understanding.”

Earth-scientific explanation from the perspective of geology is to geographies advantage to learn scientific physical condition for human activity. As for geology, the relation between geological features and human activity treated by geography gives feedback to geology to remind the significance of learning geology.

For further advance of multidisciplinary approach, besides revising learning material, the potential of the cooperation of 2 geo-subjects should be discussed at curricula level.

Keywords: Geology, Geography, Future Earth, School Education, Geopark, Fossa Magna

Japan Geoscience Union Meeting 2015
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G04-P04 Room:Convention Hall Time:May 24 18:15-19:30

The role of the teacher in ordinary high school who worked in SSH high school

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1.Introduction

I worked in Hyogo Prefectural Kakogawa Higashi High School that is SSH designated school, during 10 years until 2013 fiscal year. I focused on geoscience education and offered the earth science course regardless of the humanities and science. The Earth Science Club I was teaching got first prize in the Geological Society of Japan and the Physical Society of Japan. In addition, the Earth Science Club got many high reputations, including the Minister of Education, Culture, Sports Award. The guidance of me was also evaluated, and I was awarded the like of Education, Culture, Sports, Science Minister excellent faculty awards, Noyori science Award, Physical Society Lifetime Achievement Award, and Kanagawa University Excellence Leadership Award.

I transferred to this year Prefectural Nishiwaki Senior High School, became the adviser of Earth Science Club and Biological Club. I was entrusted with the activation of the entire science education including the students of the science education course.

I think every day, what is the role being sought in myself, and if there is any way to fulfill it in annual budget of about one twentieth of SSH schools. What is required for teachers who experienced the SSH high school? Between I has been working in SSH high school, I had teachers consciousness noticed that easy to change imperceptibly from ”implementation of the research and development of high-level science and mathematics education” that is philosophy of installation of SSH high schools, to ”studies that cannot be only in SSH schools”. Activities of SSH that are carried out with a lot of taxes, have tried the competence of its budget enforce teacher. The study theme of me while working in SSH high school was how to can be study originality and priority researches, and how to grow the imaginations without using a special analysis device. The experience, knowledge and personal connections obtained in SSH high school, has been utilized in the current working school.

2.Current specific educational activities of

Nishiwaki Senior High School located in the mountainous region of the south area of Hyogo Prefecture. The school consists of infantry 7 classes and an information science 1 class per grade, and about 70 students go onto the National University. Students are laid-back and very serious. Students are timid for a challenge to new things for inexperienced.

I was appointed to this school, and I established the Earth Science Club at the same time. About 30 students participated in the studies. They study actively on the theme full of originality. I am realizing that the students had been craving a stimulus. They think by hypothesis deductive method and announce the results in the research papers and posters.

I am teaching students by take advantage of experiences and knowledges and personal connections of SSH high school. And I take advantage of the research methods that do not use special analysis equipment. The students join many tournaments that the cost is not take because school budget is small. The Earth Science Club has already played nationwide top finishers, in just half a year for the first time research. The Students are studying in two themes now. (1) clarify the formation process of southern Hyogo Prefecture, (2) the estimate of movement of the ground based on the cracks around the manholes, and the recommendations of the maintenance standards of ground. I am involved in the agency cooperation project that connect the citizens and scientists with a focus on Kobe University as a core member.

Keywords: SSH high school, geoscience education, Earth Science Club, hypothesis deductive method, special analysis equipment

Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

G04-P05 Room:Convention Hall Time:May 24 18:15-19:30

Study of lightning-induced transient luminous events with university and high-school sprite observation network

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A various investigation of sprites, one of frequent observable transient luminous events (TLEs) in the region from mesosphere to lower ionosphere, has been reported. Sprites are induced by a strong electric field attributed to the neutralization of a large amount of positive charges at the upper part of thunderstorm when positive cloud-to-ground (CG) lightning occurs. Many papers have suggested that the complex physics of sprite-induced CG lightning, termed parent CG lightning, causes various morphologies and lifetime of sprites and the time delay of sprite occurrence, which have been some of unsolved issues in the TLEs studies. In addition, the major issue might be the largely different locations in horizontal between sprites and parent CG lightning, which often reaches about 50 km. On the other hand, sprites occur just above the luminous center of parent CG lightning according to satellite observations. It is expected that the luminous center of parent CG lightning over the thunderstorm is equivalent to the positive charges at the upper part of thunderstorm where the positive CG lightning starts. Few study, however, discusses the horizontal differences among the sprites, the luminous center of parent CG lightning over the thunderstorm, and the strike point of the parent CG lightning. Thus, we investigate the differences among them through an optical measurement, assuming that the position of positive charges at the upper part of thunderstorm is the luminous center of parent CG lightning over the thunderstorm in cooperation with high-school sprite observation network.

Keywords: TLEs, Sprite, Lightning