

[J] Oral | O (Public) : Public

📅 Sun. Jun 6, 2021 10:45 AM - 12:15 PM JST | Sun. Jun 6, 2021 1:45 AM - 3:15 AM UTC | 🏠 Ch.01 Zoom Room 01

### [O-04] Suggestion to teaching Earth science under GIGA school from online lesson

convener:lida Kazuya(Komaba-Toho Junior and Senior High School), Iwata Makoto(Hiroshima Prefectural Ogaki High School), Satoshi Miyajima(Saitama Prefectural Kumagaya High School), Hiroaki Akimoto(Faculty of Economics,Dokkyo University), Chairperson:Hiroaki Akimoto(Faculty of Economics,Dokkyo University), syo uranaka(Osaka Institute of Technology Graduate School), Satoshi Miyajima(Saitama Prefectural Kumagaya High School), lida Kazuya(Komaba-Toho Junior and Senior High School)

In this session, we will discuss teaching Earth science under GIGA school. GIGA school means Global and Innovation Gateway for All, which aims to provide computer and internet environment for all students in the school. In the online lessons due to the epidemic of the COVID-19, many practices using computer and internet were conducted. Based on suggestions from both online and face-to-face classes using computers, we will discuss teaching Earth science under GIGA school.

10:45 AM - 11:00 AM JST | 1:45 AM - 2:00 AM UTC

[O04-07] Report on the Online Teaching Experience with WebGIS in the High School Geography Classes under the COVID-19 Pandemic

★Invited Papers

\*Yoshihiko Shibata<sup>1</sup> (1.Tokyo Metropolitan KOKUBUNJI Highschool)

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11:00 AM - 11:15 AM JST | 2:00 AM - 2:15 AM UTC

[O04-08] Development of Educational Materials for the Kanagawa version of "Geological Fieldworks conducted in a Classroom" applying for High School Subject "Basic Earth Science" — Using Strata from Ikuta Ryokuchi Park—

★Invited Papers

\*Yasushi Fujiwara<sup>1</sup>, Shungo Kawagata<sup>2</sup> (1.Graduate School of Education, Yokohama National University, 2.College of Education, Yokohama National University)

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11:15 AM - 11:30 AM JST | 2:15 AM - 2:30 AM UTC

[O04-09] Supporting school teachers with GSI's Toolbox for geography education in the era of Society 5.0

★Invited Papers

\*Yuki Kurisu<sup>1</sup> (1.Geospatial Information Authority of Japan)

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11:30 AM - 11:45 AM JST | 2:30 AM - 2:45 AM UTC

[O04-10] The trial and error of on-line bidirectional lecture

★Invited Papers

\*Yukari Kido<sup>1</sup> (1.Japan Agency for Marine-Earth Science and Technology)

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11:45 AM - 12:15 PM JST | 2:45 AM - 3:15 AM UTC

[O04-11] General Discussion

★Invited Papers

\*lida Kazuya<sup>1</sup>, Hiroaki Akimoto<sup>2</sup>, Iwata Makoto<sup>3</sup>, Satoshi Miyajima<sup>4</sup> (1.Komaba-Toho Junior and Senior High School, 2.Faculty of Economics, Dokkyo University, 3.Hiroshima Prefectural Ogaki High School, 4.Saitama Prefectural Kumagaya High School)

# Report on the Online Teaching Experience with WebGIS in the High School Geography Classes under the COVID-19 Pandemic

\*Yoshihiko Shibata<sup>1</sup>

1. Tokyo Metropolitan KOKUBUNJI Highschool

In April 2020, schools across the country were suddenly required to offer online lessons due to the state of emergency associated with the Corona disaster.

However, the ICT environment of public schools at that time was extremely low quality and the security was excessively strict, and schools could hardly do anything.

However, in the spare time of the work-at-home system, many geography teachers were able to actually operate WebGIS such as Geographical Survey Institute maps, Google Earth, and GSMap, and realize their effectiveness.

For this reason, some teachers have used them to conduct online geography lessons from home, and their effects, issues, and know-how have been showed to islands where they cannot usually participate in workshops through online conferences that were explosively spread at the time, and shared with teachers who were on maternity leave.

In addition, we realized that digital teaching materials are easy to copy and spread, and launched a geography teaching materials sharing project to deliver useful geographic information to non-specialized teachers when geography becomes compulsory in 2022.

At this time, we will report on the merits and demerits of online lessons and the project to share geography teaching materials, and talk about geography education during the GIGA school era.

Keywords: Geography, WebGIS, Online lesson

# Development of Educational Materials for the Kanagawa version of "Geological Fieldworks conducted in a Classroom" applying for High School Subject "Basic Earth Science" —Using Strata from Ikuta Ryokuchi Park—

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## Purpose

The next Japanese High School Curriculum Guideline emphasizes the importance of Experiential learning for the Subject Area "Science" including "Basic Earth Science". However, this is not easy for not well-trained teachers in geoscience to teach the local geology for real by field observation. Thus, we develop a package of educational materials containing digital learning and hands-on training materials for geology which those teachers allow students to easily experience outdoor geological observations in classrooms and facilitate hands-on activities with sediment samples.

## Target of research: Mt.Masugata in Ikuta Ryokuchi Park

In Kanagawa Pref., the Quaternary terrestrial sediments of the Kanto Loam cover the underlying marine deposits (Kazusa and Sagami Groups). These strata are well exposed along the 1 km circuit course in the Mt. Masugata in the Ikuta Ryokuchi Park, Kawasaki City, where we can observe the limuro Formation of Kazusa Group unconformably overlain by the Oshinuma Sand and Gravel Formation of Sagami Group, and conformably overlying terrestrial Kanto Loam, in ascending order. The limuro Fm. yields fossil molluscs and fossil foraminifera, and the Kanto Loam interbeds wide-spread tephra. Therefore, these strata are suitable for students to learn a part of the Quaternary formation history in Kanagawa Pref. even at 1 location.

## Developed Educational Materials

We have developed three digital materials, as follows; (1) "Ikuta Ryokuchi Park Fieldwork" for students to experience outdoor geological observations in classrooms, (2) "Fossil Foraminifera from the limuro Fm." and (3) "Rock-Minerals in Key Tephra". Each material involves worksheet and taxonomic search list for classification of foraminifera and rock-minerals for students, digital learning materials for students by operating with electronic devices of tablet terminals and smartphones, digital teaching materials for teachers and real sediment samples". These materials are expected to be used in the classes as shown below.

### (1) Ikuta Ryokuchi Park Fieldwork (Estimated time: 1 to 2 class hours)

Students observe the overview of strata by moving the images of the 6 outcrops obtained by a 360 degrees camera around in any direction by themselves, and the details of sediment characters by enlarging the high-resolution spot images. They can compare their observations to images of boring sediment-core samples exhibited in Kawasaki Municipal Science Museum and summarize the name of stratum in each outcrop and its characteristics, then draw geological columnar section.

### (2) Fossil Foraminifera from the limuro Fm. (Estimated time: 2 class hours)

Students can wash sediments from the limuro Fm. within minutes using tea filter bags and obtain fossil

foraminifera from the residues (ca.  $>250\ \mu\text{m}$  in size). They identify foraminifera by using the digital taxonomic search catalog named "Foraminifera search card". Based on the species lists compiled all results of classmates, they try to reconstruct the past environment and depositional age of the sediments.

### **(3) Rock-Minerals in Key Tephra (Estimated time: 1 class hour)**

Students can wash tephra sediments from the Kanto Loam in a short time using tea filter bags and can extract rock-minerals from the "Hakone Tokyo Tephra (Hk-TP)" and "Ontake Daiichi Tephra (On-Pm1)". They identify rock-minerals by using taxonomic search catalog named "Mineral Search Card". Based on the observations, they estimate the type of magma for each tephra.

### **Summary**

We have developed educational materials that help geologically not well-trained high school science teachers to teach the local geology for real by field observation in the Subject.

By three materials using the Parks with samples from the same strata in the other areas, students can deepen the understanding of formation history of the common land of Kanagawa Pref. with spatial relationships among strata.

Every student can operate the digital materials. So, they can do fieldwork in a regular classroom, which enables them to understand the scale of the entire outcrop and the geological formation using regional materials. They can extract the desired material from the sediment sample low cost and short time processes, and then identify fossils and minerals. Hence, those teachers can allow students to spend much time in observing and considering. Classes with these developed materials could shorten the necessary class times about an hour compared with traditional classes. "Fossil Foraminifera from the limuro Fm." is also a new material, which can lead to the understanding of depositional age.

We plan to distribute our newly developed materials and give a lecture on this package to teachers.

Keywords: Digital Educational Material, Non Geoscience-Based Teacher, Experiential Learning, Local Geology, Geological Fieldwork, Real Sediment Sample




図1. 教室で行う野外実習デジタル教材「生田緑地フィールドワーク」の操作例  
生徒たちは、各露頭の360°カメラ(RICOH THETA V)による全地球画像とデジタル一眼レフカメラ等による詳細な画像を、自らの操作によって、模擬野外観察を行う。

Fig1. Operation example of the digital educational material named "Ikuta Ryokuchi Park Fieldwork" for students to experience outdoor geological observations in classrooms  
Students observe the overview of strata by moving the images of outcrops obtained by a 360 degrees camera around in any direction by themselves, and the details of sediment characters by enlarging the high-resolution spot images.

### ii. 約250 μm以上の粒子を抽出

②洗面器の中でお茶パックの中から、泥(汚れ)が出なくなるまで、泥岩をもみ洗いをする。最後にお茶パックをきれいな水(洗淨瓶や水道など)でゆすぎ、軽くしぼる。



もみ洗いによって、250μm未満の粒子がお茶パックの外に出ていく。お茶パックの中に5%程度の粒子が残る。

③お茶パックをキッチンタオルにはさみ、水分をしっかりととる。



原生有孔虫

### ハンザワイア・ニッポニカ

#### *Hanzawaia nipponica*

側面
口孔側
らせん側面



**Hanzawaia属**  
 トロコイド状旋回。外面縁は角ばりキールをもつ。らせん側面は平たく、部分的に隆起部で、各室の縁が重なり合って形成の凹凸をおおひ。通常それらは重なり合う。側面縁は凸面で、包成回。頂部には中央円隆が発達する。縦合縁は強く高曲し。肥厚する。口孔は外縁部で気状、やや側面にも伸びるが、らせん表面の最終室の開口の下につづく。補口孔群は開口下に開口する。生存期間：中新世～現世。



日本周辺海域での生息環境  
 内海環境 深奥:非常に少なく存在  
 浅口:少なく存在  
 太平洋水成 大陸棚上～大陸棚斜面  
 水深0～200m

図2. デジタル教材も併用した実物実習教材「有孔虫化石の観察」で、プロジェクター等で表示する授業進行用(教員用)資料の画面例(左)と、生徒が分類・同定に用いるデジタル教材「有孔虫検索カード」の画面例(右)

Fig2. Screen example of materials for class progress (for teachers) displayed on a projector (left) and screen example of the digital taxonomic search catalog named "Foraminifera search card" (right), in the educational material named "Fossil Foraminifera from the Imuro Fm." using real sediment samples

# Supporting school teachers with GSI' s Toolbox for geography education in the era of Society 5.0

\*Yuki Kurisu<sup>1</sup>

## 1. Geospatial Information Authority of Japan

It is important for children to develop ICT skills in daily life as well as learning opportunities in the era of Society5.0: a new society which incorporates advanced technologies into every industry and social life, seeking for balanced solution between social agenda and economic development. GIGA school, which realizes a classroom provided with high-speed internet connection and individual ICT device such as tablet, and STEAM education, which enriches cross-curricular learning by integrating each subject such as Science, Technology, Engineering, liberal Arts, and Mathematics for solving the problems in the real world, have been well recognized for developing children' s ICT skills. Realizing GIGA school is further hoped as online teaching has imperatively prevailed in response to COVID-19 pandemic.

On the other hand, increased burden on teachers for preparation is concerned, if online education contents are not sufficient, resulting in insufficient learning experience of children. In this regard, Geospatial Information Authority of Japan (GSI) launched the Toolbox for geographic education (<https://www.gsi.go.jp/CHIRIKYOUIKU/>) (here in after "the Toolbox" ) in support of school teachers in June 2016. In this article, we report the advantage of educational contents in the Toolbox, with a view to fully utilizing them in GIGA school and STEAM education.

First; data and cross-media accessibility. We posted all the contents on the Toolbox website so that anyone can easily download them through a web browser: an anticipated environment in GIGA school classrooms. We provided the contents as images and PDF files so that teachers can easily prepare their teaching materials for an online class. With easy links to "GSI maps" included in the contents, we also help teachers develop adequate story-telling for their teaching subject. Further, embedding attractive SNS postings in the contents is intended to make students feel closer to geography subjects.

Second; contents classification according to national school curricula. We first classified the contents into grade levels (3-4G(grade), 5G, 7-9G and 10-12G). Further we classified those according to themes such as neighborhood, Japanese landform and natural disasters in Japan. This classification help teachers find appropriate contents easily and quickly.

Third; contents for cross-curricular learning for STEAM education. Geography should not only be regarded us a subject, but can also be used as a connector to promote cross-curricular learning. For example, we developed a content which relates a section of a three-dimensional object (mathematics) to topographic sectional profile (geography). Another one relates three primary colors of light (visual art) to topographic/cartographic representation (geography).

Fourth; contents with story-telling aspects. These contents are intended to attract students for animating class teachings. For example, a character in a content poses a question toward students about the important points in understanding a hazard map. Another example is a cartoon style content where student can learn relationship between disaster and landform.

We asked 28 teachers about the possibility of utilizing contents in the Toolbox. Most teachers answered that the contents can be useful. Some respondents suggested the possibility of saving time for class preparation by using the contents in the Toolbox.

GSI will continuously support promotion of geography education through the Toolbox and introduce features and effectiveness of the contents in the Toolbox in various opportunities to help school teachers.

Keywords: Toolbox for geography education, cross-curricular learning, GIGA school, STEAM education

## The trial and error of on-line bidirectional lecture

\*Yukari Kido<sup>1</sup>

1. Japan Agency for Marine-Earth Science and Technology

The UN decade of Ocean Science for Sustainable Development (2021–2030, hereafter the UN Decade) by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) began in January, 2021. We are involved in the marine research and technology field and would like to provide access to “Ocean, Marine, and Sea” to the general public. “Ocean, Marine, and Sea” contains information on the latest oceanographic investigations, future global environmental problems and their impacts on human lives, and the continuation of development objectives worldwide. Sustainable development goals are directed at men and women of all ages. Thus, we perform education and outreach activities at schools and conduct ongoing research expeditions. In this session, under the GIGA school framework, we conducted trial and error activities with student and teachers from the Saitama Prefectural Kumagaya High School during COVID-19 circumstances. We focused on outreach activities and provided online information that participants accessed using their tablets. Our online education and outreach activities are associated with three SSH schools of Shizuoka in collaboration with the Drilling Vessel "Chikyu" which are currently conducting operations in an accretionary prism in the Nankai Trough. We addressed the state of operations aboard the ship, which hosts international participants, in January, 2019. During a voyage on the American scientific drilling vessel "Joides Resolution" on Exp. 378 in the South Pacific Ocean in January 2020. Using a narrow internet network connection, students and teachers at Meijyo University Senior High School received online instruction and vivid real-time access to a drilling field. We would like to thank all the participants, supporting schools, and onboard researchers.

Keywords: GIGA network connection, Online lecture, bidirectional

## General Discussion

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Based on the presentations in this session, we will exchange opinions on future issues and how to use them in class.