

Data science education practice that fosters “zest for living”  
- Disaster prevention data analysis exercise -

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The purpose of this study is to practice DS education that fosters the ability to live in high school. In the new course of study for high schools of the Ministry of Education, Culture, Sports, Science and Technology, the enhancement of inquiry activities is a major pillar. We propose a design for PBL exercises with affiliated high schools. Then, we practice lessons that utilize disaster prevention data. As a result, students deepened their knowledge of statistical inquiry methods, acquired skills, and recognized risks in society. In the future, we will increase the versatility of the proposed method.

## 1. Introduction

Shiga University opened Japan's first Faculty of Data Science (DS) in April 2017. Prior to that, in 2016, it was selected as one of the six base schools for DS education, including the University of Tokyo [1]. The human resources that Shiga University wants to develop are data scientists who have not only science skills but also a liberal arts mindset [2]. The purpose of this study is to propose a design of PBL exercises that utilize disaster prevention data and to practice DS education that fosters the ability to live. In this paper, we will report the research contents for the three years from 2017 to 2019.

## 2. DS education in high school

The Ministry of Education, Culture, Sports, Science and Technology's new course of study for high schools was announced in 2018 and is scheduled to be implemented in 2022. Enrichment of inquiry activities will be set as a major pillar, and classes to foster "zest for living" will be started. The following are some of the efforts at high schools under a partnership agreement with Shiga University.

### 2.1 Shiga Prefectural Torahime High School

Shiga Prefectural Torahime High School (hereinafter referred to as Torahime High School) signed a partnership agreement with Shiga University in 2016. They are conducting summer collaboration courses (DS field) and "Study II" (DS course) with Shiga University [3].

#### 2.1.1 Summer collaboration course

In the collaborative course (DS field), an intensive lecture "Creation of a river topography model for a safety map of the land" was held for students majoring science in the second grade [4,5]. Lecturers are Hatayama (Kyoto University Disaster Prevention Research Institute, Shiga University Faculty of DS) and Izumi (Shiga University Faculty of DS, Kyoto University Disaster Prevention Research Institute), and Matsumiya (Torahime High School SSH chief) was in charge. The students first learned how hazard maps work in classroom lectures. Next, the students took an aerial photograph of the area along Ane River (Fig. 1). In the PC training, an ortho image was created from the aerial photograph and superimposed on the existing map (for example, the Geographical Survey Institute map) (Fig. 2). Based on the results,

they investigated disaster risk. At a later date, the results obtained in this course were used for disaster prevention measures as part of the "land safety map" in Shiga Prefecture.



Figure 1. Data collection starting point and surrounding area

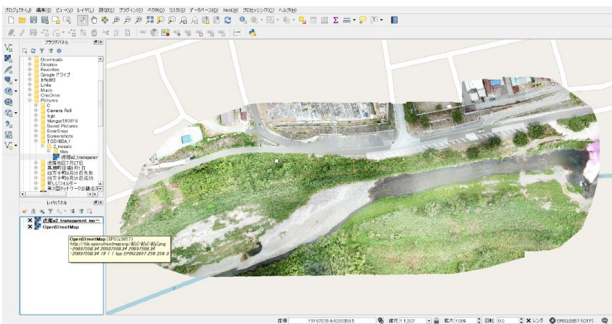


Figure 2. Overlapping example of ortho image and OpenStreetMap

### 2.1.2 Data-driven inquiry activity

"Study II (DS course)" is a one-year course for students majoring science in the second grade. Matsumiya focused on data-driven inquiry activities and designed the curriculum in collaboration with Izumi. It started in 2018 with 3 classes (about 80 students) and is continuing in 2020. In the "inquiry activity" of the third semester, the lesson design and teaching materials offered in the freshman of the DS Faculty of Shiga University were diverted [6-9]. The mission of this inquiry activity is "Explore the characteristics of the regional disaster prevention plan!". Students run a Problem -Plan -Data -Analysis -Conclusion: PPDAC cycle to solve problems.

## 2.2 Kagawa Prefectural Kanonji Daiichi High School

Kagawa Prefectural Kanonji Daiichi High School (hereinafter referred to as Kanonji Daiichi High School) signed a partnership agreement with Shiga University in 2019. Utilizing ICT, the National Statistical Research Presentation: FESTAT's annual convention is being held with Shiga University [10,11]. It was planned mainly by Ishii (Kanonji Daiichi High School SSH chief) and Izumi. FESTAT is a place where junior high school, high school and university students can learn from each other. It is not a completion. The fields of statistical data analysis are diverse, including biology, society, traffic accidents, and sports, and risk analysis. As a result, Kanonji Daiichi High School students won a prize at the Super Science High School student research presentation [12].

### 2.3 Online courses for high school students

Shiga University has released an online course "Introduction to Data Science for High School Students" for free from 2017 [13]. High school students across the country have learned the basics of statistical data analysis in every summer break. Continuation is an online course "Introduction to Data Science for University Students (I)" for free from 2018 [14]. Some contents are used by high school students to help their statistical inquiry activities.

## 3. Results

As a result of this study, students deepened their knowledge of statistical inquiry methods, acquired skills, and recognized risks in society. In the future, we will increase the versatility of the proposed method.

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