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Report on science classes and a workshop for teen students to learn geography and geology using Minecraft

Junko Iwahashi¹, Yoshiharu Nishioka², Daisaku Kawabata², Akinobu Ando³, Shinsuke Okada⁴, and Takahisa Shiraishi¹

¹Geospatial Information Authority of Japan, Tsukuba, Japan

²Geological Survey of Japan, AIST, Tsukuba, Japan

³Miyagi University of Education

⁴Tohoku University

In this presentation, we report science classes in which the purpose was to learn the history of local geology, and a workshop to learn the relationship between landforms and natural hazards using Minecraft. Minecraft (Mojang/Microsoft) is a sandbox computer game for exploration and crafting in 3-D virtual worlds. It is very popular among the young generation (100 million users in the world), and by using the game it is easy to construct virtual worlds and exploration mechanisms. The science classes were conducted twice for students aged 12 to 13 in a junior high school in Miyagi Prefecture, Japan. Using Minecraft, we have constructed a virtual world tailored to their school, including the school buildings and paleoenvironments. In the game, students travel around the school buildings to learn and to solve basic knowledge questions based on references from their school science textbooks, then they go to the underground strata and into past worlds to learn and to solve advanced questions which refer to papers on regional geology. A questionnaire which was given to over 150 students after the first class showed that the students enjoyed the class and obtained a general understanding of geological knowledge. The second class was based on a revised game after referring to the results of the questionnaire. In the workshop, we used a 3-D topographic model of Japanese flood plains and surrounding terraces and mountains. This example was conducted for 15 to 18-year-old students as a workshop with a small number of students, less than 10. At first, we explained to the students how landforms are associated with natural hazards such as flooding and earthquake shaking, and explained how to find and view thematic maps like hazard maps that could be observed as interactive web maps published by Japanese public agencies and institutes. Next, the students were asked where they wanted to build a house on the virtual terrain. Through their constructions, we considered the balance between playing and learning. This study was supported by JSPS KAKENHI Grant Number JP18K18548.