Utilizing three-dimensional solid models of landscapes for fostering geographical imagination

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In the context of geoscience, geographical imagination is one of the crucial aspects that facilitate people's understanding and feeling of the Earth, from everyday life to extraordinary events such as disasters. Developing people's ability of geographical imagination to a certain level is highly recommended for a better community and society, but the current curriculums of school education supposed to be not fully enough to bring stimulation to the geographical imagination in a sustainable way. Other than school education, some other approaches to fostering geographical imagination are desired, particularly through everyday life. Having opportunities of browsing three-dimensional (3D) landscape data, which have recently become more popular and available with the development of geoscientific field measurements, is recommended or necessary to enhance the geographical imagination of people. Here we present several case studies of the use of landscape 3D physical models for art exhibitions. One is for the "UNIVERSAL MUSEUM: Exploring the New Field of Tactile Sensation", a special exhibition held at the National Museum of Ethnology (Minpaku) in Osaka. As a part of the exhibition, we presented art materials mainly regarding the archaeological contexts, including a sedimentary profile of shell mounds of the neolithic Jomon Period, artifacts found in the site, and landscape 3D models. The landscape models are made of wood, on which acrylic material was pasted to represent the sea area during the post-glacial Jomon transgression. The special exhibition was designed for visitors to be able to touch all the materials, and in our case, textures of soil, shells, and groundwater was given for the sedimentary profile, and that of ground, ground-based objects including trees, and the sea surface was expressed for the 3D landscape model. Touchable 3D models are more interactive and effective in fostering geographical imagination not only for adult people but also for kids and disabled persons. Another case of a small exhibition relating to Project Jomon by Hokkaido University of Education (the exhibition was held in Sapporo), for which colored landscape 3D models of the archaeological sites and waterfalls of the World Heirage were shown. Two types of landscape models based on the digital surface model (including trees and buildings) and the digital terrain model (bare ground) were presented, where the latter one is invisible in the real world but measurable with a laser sensor on small aircraft (uncrewed aerial system). As a part of the Jomon Project, these models appeared as an effective way of disseminating landscape conditions of the sites and will contribute to the development of geoscientific understandings together with archaeological contexts. The applications of these approaches may also help mitigate possible future disasters in developing countries such as in the Middle East and Central Asia.

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