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How much do Japanese university students know about soil? A survey of university students who received science education in Japanese schools

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In the science curriculum in Japan, as Mori et al. (2019) examined the content of course of study for elementary schools, there are opportunities to plant and grow plants in soil, and to learn about the erosion, movement, and deposition of sediment. However, the science curriculum does not include specific learning content about the characteristics and functions of soil. Furthermore, in the new course of study to be implemented in 2020 (Ministry of Education, Culture, Sports, Science and Technology, 2017), an emphasis is placed on science education aimed at the prevention of natural disasters (sediment-related disasters caused by localized rainfall, etc.), which have caused substantial damage in Japan recently. Thus, in the current reality of science education in Japan, there are no occasions for teaching about how ordinary soil supports our lives and affluent living. The purpose of this study is to obtain suggestions on what should be taught at schools about soil by conducting a survey of university students who received such school education in Japan, to investigate their level of comprehension regarding the characteristics and functions of soil.

The survey was conducted in October 2019 in Tochigi Prefecture. Participants comprised 253 first-year university students who had just graduated from a high school (78 students majoring in humanities and social sciences, 175 students majoring in agricultural studies). The survey was in the form of a questionnaire. Soil's "water retention" function received particular attention in this study. To survey the students' understanding, they were asked the following two open-ended questions. Question 1: Why do plants require watering to grow? Question 2: How can weeds that grow on the roadside do so without watering? The first question was intended to examine the students' understanding of why plants require watering to grow, while the second question was intended to assess their understanding of the water retention function of soil.

The most common answer to the first question was "Water is necessary for the growth of plants." Sixty-five students majoring in humanities and social sciences and 165 students majoring in agricultural studies provided this answer. Approximately 25% of these students mentioned the mechanism of photosynthesis. Nearly half of the students answered, "because weeds are strong," to the second question, which was the common answer. Twenty-six students majoring in humanities and social sciences and 77 students majoring in agricultural studies answered,

“because it rains,” which was the second most common answer to the second question. Only four students majoring in agricultural studies, all of whom had attended university lectures on dendrology, were able to answer with reference to the water retention function of soil. The responses provided in this survey indicate that while the students were taught that plants require water for growth, they were not educated about soil and its functions that are necessary for this process, which arguably shows the results of the science curriculum in Japan. Thus, it is necessary to develop teaching materials and lessons that will educate students about the characteristics and functions of ordinary soil.