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Familiar topography, geologic formations, rock samples and cross-sections as education materials

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The learning ratio of the subject earth science at senior high school is less than 10% at present. There are very few chances for most people to learn earth science after compulsory education. Therefore, it is very important for elementary and junior high school children to learn earth science in order to acquire earth scientific literacy as future adults. About 20 elementary schools visit the Geological Museum annually as experimental study of geological formations outside of school. The author visits these schools before their visiting the Geological Museum in order to investigate what kinds of topography, geologic out crops and rock samples are usually seen by schoolchildren. The school children should realize what kind of topographies their school building stands on, and what kind of topographic features of the roads they commute. Consequently, the topographic features around school are observed regionally using aerial photographs and Kashmir 3D images. It is very difficult to find out the outcrops of geological formations because outcrops are quickly covered by thick vegetation and/or concrete. Geological formations are sometime discovered at construction sites, but it is difficult to access there by safety reason. For these reasons, the author show the pictures taken at big quarry for sand gravel near east coast of Lake Kasumigaura where geological sequences are identified from top to bottom: soil, ash fall, clay, sand, gravel. This sequence is continuous horizontally at Tsukuba terrace and its surroundings. Ash falls and shell beds are good key beds to trace the time plane. In schoolyards, some rock samples are found usually as gates and stone monuments. In the case of Tsukuba and its surroundings, gabbro composed of upper part of Mt. Tsukuba; so-called Tsukuba-Ishi is commonly adopted as stone monuments in schoolyards. Some boring cores are preserved at some schools. These should be utilized for learning of earth science. The education support system for subject of science recently adopted at some schools is good chance for teachers to arrange educational material in the room of scientific learning. While the construction of Tsukuba Science city, subsurface geological surveys have been carried out, and a lot of core data have been summarized as a geological map and cross-sections. These references are very useful for children to learn geological formation below schoolyard. It is easy to extract the geological cross-section around the concerned school with reference to the geological map mentioned above. However, the depths of cross-sections are around 50 m. The author draws the deeper geological cross-section until 1 km from Mt. Tsukuba to 20 km south with reference to deeper drilling data. The author tells children that the geological formation of Mt. Tsukuba (gabbro and granitic rocks) is continuous from Mt. Tsukuba to the depth below schoolyard, and the depth of granitic rocks is gradually deeper according to the distance from Mt. Tsukuba. At the portion of the Geological Museum, drill data identified the depth of the granitic rock is around 500 m in depth. In order to make elementary and junior high school children become easy to like subsurface materials and phenomena, it is important to realize how the geological formations spread out and overlie each other under the ground, and also how deep earth quakes and magma generation occur in relation to plate motion. Observation of topography and geological formations by field excursion is essential for children to realize subsurface earth science. It is important to learn the relationship between knowledge and daily experience. For examples, the plate motion is closely related with

earthquake, and rock and fossil names are derived from geological diversity in the earth. To learn real scientific literacy, schoolchildren have to realize the relationships between the scientific theories and daily experiences.

Keywords: earth science, educational materials, topography, rock samples, geologic formation, geologic cross-section