My Earth science educator story – Seungho Maeng
What I did, why I did it and what happened

My experiences as an Earth science educator began as a high school science teacher in 1996. I had taught high school students (year 16 – 19) Earth science and general science for 11 years before I started my doctoral studies. As a novice school teacher I had emphasized the content of Earth science, so that the main focus of my teaching was to transmit Earth science to students accurately and effectively. In the fifth year of my teaching experience, I joined two Earth science teachers' professional development teams, which pushed me a little further towards becoming an advanced Earth science teacher. One team was the "Young Earth Science Teachers" where the members read current published Earth science textbooks and designed new lesson plans for improving their Earth science teaching. We published a book, "*Seven-coloured Earth science*" (written in Korean), which targeted students who wanted to have deeper understanding of school Earth science. While this professional development team focused on classroom teaching, the other team, "Nature explorers" tried to encourage Earth science teachers to teach at outdoor sites and improve their capacities for field trip teaching. As a member of Nature explorers, I investigated several famous geoscientific field sites around Korea, and designed exemplary worksheets for Earth science teachers to use during geoscience during field trips. The experience of Nature explorers gave me an opportunity to apply for a university master's degree program. During the master's program, I majored in petrology and geoscience education. The title of my master's thesis was "*Qualitative analysis on a geological field excursion teaching model on Tando coast and Hanyom area at Shiwha lake*". Geologically, the site is on part of the Shiwha formation where students observe sedimentary rocks and structures, and Cretaceous fossils such as dinosaurs' eggs.

Dinosaur egg fossils in the Shiwha formation in Korea.

Burrows (in the center) filled with sand, Shiwha formation in Korea.

The focus of my master's thesis was to develop and implement an alternative field excursion teaching model, which enhanced the students' own experience of practical observation, giving specific on-site information for effective learning

during field excursions. Through practical observation the students should look for evidential data to help them to make sense of the rocks and features at each outcrop. The on-site method of giving information, is not intended to transmit or deliver content knowledge about the outcrop at a field excursion site, but to give specific information at the outcrop on how to observe rocks, minerals and any structures present. Field trip instructors give clues to students to help them to understand how to observe geological features and how to use tools to help them in the observation. This information is not usually taught in the school curriculum in Korea.

My five year experience as a field trip instructor in the Nature explorers made me one of expert teachers who were able to teach geoscience in outdoor programs. Based on this experience, I started a doctoral program at Seoul National University in 2005. The main focus of my doctoral study was to understand the specific features of language and discourses used in geoscience classrooms. The theoretical framework for the study was a linguistic approach, so called discourse register and language code analyses. The title of my doctoral dissertation was "*Variations in the modality of science teaching about minerals and rocks based on classroom discourse genres: An application of discourse register and language code theory*". The study investigated how a middle school science teacher organised whole class dialogue with students in learning about rocks and minerals. The teacher used a typical Korean type of school discourse, in other words, a traditional teacher-directed discourse. However, through the study of textual relationships between teacher talk and student talk, several kinds of pedagogic learning could be identified, such as successful learners, simple participants, or unsuccessful learners. The study showed that, in order to improve understanding of rocks and minerals, a teacher should relate student use of language to targeted geoscientific language use.

I have now moved to become an assistant professor at Seoul National University of Education, focussed on elementary teachers. I have been studying how elementary children think and act when they encounter geoscientific phenomena and when they learn geoscientific topics and content. This is an analogy to "how geoscientists think and learn" (Kastens et al., 2009), and I call it geocognition. Geocognition includes the cognitive factors which children employ in understanding geoscientific phenomena, and can be a bridge between field trip studies and classroom studies.

The roads that I have followed so far shed light on how to become a good Earth science educator. As an Earth science teacher, I read a lot of books and documents on Earth science content and teaching. I also taught students field trip learning, with emphasis on practical observation. More recently, I have studied geocognition, focussed on how geoscientists and children think and act in response to geoscientific phenomena. Thus, I would argue, that the title of this article should be, '*To be a good Earth science educator: read more, observe wider, and think deeper'.*

Seungho Maeng, aged 46, Seoul, November 2016,
smaeng@cloud.snue.ac.kr

Reference

Kastens, K. A., Manduca, C. A., Cervato, C., Frodeman, R., Goodwin, C., Liben, L. S., Mogk, D. W., Spangler, T. C., Stillings, N. A., & Titus, S. (2009). How geoscientists think and learn. EOS, 90 (31), 265-272.