

Competency-based curriculum reform and current issues in teaching of school subjects

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Since the 2000s, in elementary and secondary education, Japan has become conscious of PISA literacy, and has begun to emphasize the abilities of thinking, judgment, and expression regarding applying knowledge and skills to problem solving. In higher education, the importance of generic skills is emphasized by catch phrases such as 'bachelor's degree ability' and 'basic skills to become a fully-fledged member of society.' The next National Course of Study tries to clarify not only subject matter content but also 'qualities and competencies' including cross-curricular generic skills, and is endeavouring to drive a shift towards 'quality and competencies' (competency) based curriculum, through systematized instruction and assessment of competencies and the reform on entrance exam or articulation system between upper secondary education and higher education that assess students' ability to continue learning in university, workplace and society (college and career readiness).

In this lecture, I first outline the development of competency-based curriculum reform in Japan and summarize both its perceived problems as well as its potential. Next, I raise some key points aimed at encouraging a positive direction in competency-based curriculum reform. Finally, I propose a framework for categorising and structuring qualities and competencies that should be developed at school. And I propose the following direction of reform in curriculum and instruction of school subjects: It is necessary to emphasize the process of 'doing a subject' toward authentic learning.

Keywords: Qualities and competencies, Competency-based curriculum, Active learning, Authentic learning, Do a subject, Performance assessment

Orienteering and Map Learning

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I propose to do the orienteering for map learning. Orienteering fits in geography education. In particular, orienteering is fit to map learning. However, orienteering is not popular in Japan. Many Japanese do not know less about orienteering. Orienteering is popular in Europe. European people are familiar with orienteering. Already, curriculum in school in the Nordic countries education have orienteering. And orienteering has also been actively carried out in the school education in Switzerland and the United Kingdom.

Orienteering is outdoor sport compete the time to finish through in the order specified number of points shown on the map from the start using a map and a compass. At that time, orienteering competitor, compete with each other to reach the point of the purpose to understand the current position while constantly matching the map with the field. "Matching the map with the field" is a main skill in orienteering. This is consistent with the purpose of the map learning. So, I explain "matching the map with the field" as an important concept that fit on the map learning. "Matching the map with the field" is a basic skill in the map learning and field work learning, and have a lot of applicability.

In Japan, there are a number of natural disasters such as earthquake, volcanic eruption, typhoons with heavy rain and storm. So, the Japanese need firmly recognition in space. The basic skill is the "matching the map with the field". This skill is intended to utilize the information indicated by the map more practical. It is not only for avoid from natural disasters, but also for distress avoidance in mountain climbing and hiking, and for the behavior of in a strange land in every scene in modern society. It is the same kind of life skills like swimming. Many Japanese are lacking about the skills of the "matching the map with the field". However Japanese geography education do not have a method for learning the skill of the " matching the map with the field ".

Orienteering have rules and map symbols to determine the champion at the competition. Classes at school, are constrained in people, places, time. So, classes at school, it is necessary to organized system for effective education. Orienteering is suited to learning practical map of " matching the map with the field ". In Japan, it has been recommended active learning. Orienteering is an active learning itself. I was to try the orienteering exercise a geography lesson of high school, with 40 students at the schoolyard. I made the orienteering map at the schoolyard. This orienteering exercise is very effective. Skills obtained by this orienteering exercise is not only a schoolyard, is also effective in other places. The students were very excited, also could improve the skills of map learning.

Keywords: Map Learning, Field Work, Matching the Map with the Field, Orienteering, Active Learning

Class of Active Learning and Its effects on Students' Learning

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In traditional teacher-centered classes, where a teacher talks and students just listen, students are generally 'passive' and have only to write down what their teacher says. Their learning is completely dependent on how much students themselves are motivated to learn.

On the other hand, at the instruction of *Active Learning*, which I present you today, teachers not only set steps that let students voluntarily learn deeply but also teach them how to learn and to think critically.

Today's presentation introduces how my teaching, conducted in the instruction of *Active Learning*, affects how students learn and how they commit themselves with their learning. It also shows you how students have changed throughout the series of the instruction.

Keywords: Class, Active Learning, How my teaching

Can you consider my past classroom practice as so-called active learning?

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At the beginning the past activities in my classes, for example experiment training, looking back on the class by student oneself and the method of evaluation to the student by me are introduced. Then we argue whether we can consider my past classroom practice as active learning type class demanded in the future.

Keywords: classroom practice, active learning

New Talents Necessary for Geotechnical Consultation Industry and Expectations to Science Education

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Great East Japan Earthquake happened in March, 2011 led to legislation of "Basic Act for National Resilience Contributing to Preventing and Mitigating Disasters for Developing Resilience in the Lives of the Citizenry" in 2013, and recent frequent occurrence of major natural disasters, such as 2014 Hiroshima Landslides and 2014 Mount Ontake Eruption, is now attracting unexampled rise of people's attention to our land.

Geotechnical consultants have been regarded as their main business to provide basic information of the ground for construction of social infrastructures that supported rapid growth of Japanese economy. However, due to the change in people's attitudes toward the ground, geotechnical consultants are now expected to provide solutions for balancing natural environments and human societies, such as, prevention and mitigation of natural disasters and elucidations of the ground environments. As exemplified in a project that examines effects of forests in disaster prevention from a viewpoint of the distribution of geology and vegetation (Ikegami, et al., 2015) and another project that proposes a timed countermeasures against sediment disasters triggered by a heavy rainfall (Ohmura, et al., 2015), our services are expanding from traditional engineering services based on geology to provision of solutions through combination with other engineering techniques and integration with information technologies, and there is an emerging tendency in which new business opportunities take place.

On the other hand, due to increased interest in the ground at a national level and a development of information technologies, geotechnical consultation, which has been providing information to business operators, are now turning into a position where we directly respond to people's needs, for example, supply of easy-understanding ground information using three dimensional modeling (Nishiyama, 2015).

These changes in industry, of course, lead to a change of expected talents in the industry. Such talents include ability to logically derive solutions from broader natural scientific perspectives beyond his/her specialty, and have to have a capability of hypothesis testing too.

Fieldwork-oriented-education like geological reconnaissance is recommended to grow such talents, and expanded application of fieldworks into geoscientific university educations is being awaited. From a different perspective, as an industry with a mission to build safe & secure societies and to contribute to national resilience, we regard it important to further improve people's levels of knowledge regarding natural sciences. Therefore, we have been working as the whole industry on school education activities that principally involve fieldworks. However, activities driven by an industry have a natural limit. We should look to science education at school to play this role. As a level to be achieved in the education, it is important to target the knowledge formation that enables people to participate preventing and mitigating activities for natural disasters.

Keywords: disasters, hypothesis testing, fieldwork-oriented-education

New Geography Education as a Compulsory Subject in High School~Comprehensive Geography for Sustainable Society~

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In August 2015, the proposal was submitted that geography and history education will be revised as geography will be compulsory subject by next national curriculum standard.

A subcommittee in Science council of Japan about geography and history education in high schools and a subcommittee in the association of Japanese geographers about geography education have been acting to make geography a compulsory subject in high school for about 30 years. Three experimental schools also have been developing new geography and history subjects supported by ministry of education, culture, science and technology in Japan.

A new compulsory subject "Integrated Geography" is required that to develop geographical skills, geographical perspective and way of thinking. To practice project-based learning for solving local and global issues. fostering qualities and abilities for creating sustainable society.

But there are many challenges to work to do. Many of high school doesn't have geography classes, because lack of geography teacher and geography disappeared as an university entrance exam.

In this report, I would like to talk about practicing "Integrated Geography" from my major in ESD

Keywords: Education in high school, National Curriculum Standard, New Compulsory Subject, Comprehensive Geography, Education for Sustainable Development(ESD)

Suggestion about Basic Earth Science in the next Course of Study for high school –What and How to be improved

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Four years have passed since “Basic Earth Science” was introduced and carried in the present Course of Study. The ratio of students who study Earth science in high school has increased and there have been some improvements in education of Earth science.

In *Japan Geoscience Union Meeting* held two years ago, *the Educational Curricula Subcommittee of JpGU* suggested three tentative subject plans, subject A, subject B and subject C, considering how Geoscience should be taught in high school in the next Course of Study, in order to improve the nation’s geoscience literacy. Last year we conducted a questionnaire survey to teachers in charge. We issued a report of the results on how the teachers were teaching Basic Earth Science, what problems they were facing, and what they could improve.

It is often said that education policy in Japan is changing rapidly; entrance examination reform, aiming for cultivation of human resources to keep pace with the world affairs, and the revision of the next Course of Study as well.

Based on these situations, assuming that Basic Earth Science will be kept in the next Course of Study too, we have talked many times about how it should be taught, and came to have a definite direction in common.

We have four major points.

1. To be based on the present “Basic Earth Science” (“subject A” mentioned above)
2. To select key words and concepts that should be incorporated
3. To incorporate principles and mechanisms of Earth science phenomena.
4. To be composed of contents with a story line.

We suggest these and want to make arguments for expanding Earth science education.

Keywords: the next Course of Study, Basic Earth Science, questionnaire survey, education policy, principles and mechanisms of Earth science phenomena, story line