Consideration Supplementary to Science Teaching in Worldview-Education-Oriented Science Education

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Abstract

This paper presents a supplementary consideration a science teacher gave in a primary school science in Japan. As a rule, science teachers should bring similar considerations into science lessons conducted in communities, where pupils' first language is incommensurate with some European languages. There, pupils are confronted with two worldviews different from each other in science lessons in the communities since a language entails a worldview inherent in the language. These two worldviews are the scientific worldview and the worldview pupils' first language entails traditionally. Because worldviews differently formulate sets of rules and beliefs respectively, pupils may follow the traditional worldview even in science lessons. This causes pupils' conceptual confusion about scientific concepts. In order to minimize pupils' confusion, science teachers have to realize pupils' language-culture milieu. Teachers should neither demonstrate just the superiority of the scientific worldview over pupils' traditional one nor encourage pupils to disregard it. A desirable outlook on these worldviews is to explain the differences in worldview occasionally. The explanations will be supplementary to teaching science. The present explanation is about distinguishing an individual name of a fish from its species name. Usually these two names are the same, but they are normally distinguishable according to the scientific worldview based on the dichotomy between the world of Idea and the phenomenal world, to use the Platonic terms. However, pupils do not distinguish between them in the Japanese worldview, because Japanese nouns do not change in their form whether singular or plural and because Japanese has never had an established method to form abstract nouns. From the viewpoint of the scientific worldview, the Japanese worldview appears to lack the world of Idea, which is essential for the scientific thought. The explanation is arranged in order to attract pupils' attention to the distinction between these two names.

Key words: *Worldview education, non-Western World, Scientific Thought*

1. Addressing the Problem

It was the mid-nineteenth century when Japan opened to the world. Since then Japan has arranged a system of teaching school science and participated in developing Western Modern science and technology. However, it seems doubtful that Japanese people correctly understand scientific concepts following the scientific worldview, because Japanese people have cultivated their own worldview for more than fifteen centuries.

Accepting that a language entails a worldview inherent in the language, Kawasaki (1996; 2002) revealed differences between the scientific and the Japanese traditional worldviews. For instance, the Japanese term "shizen" that is the Japanese counterpart of "nature" normally calls for something supernatural in pupils' mind; consequently, they

tend not to objectify their scientific objects but to have empathy with them even in science lessons. This throws pupils into confusion about scientific concepts.

2. Japanese worldview entailed in Japanese

The most possible reason for pupils' confusion is that very few science teachers realize that the Japanese worldview differs entirely from the scientific worldview that is based on the dichotomy between the world of Idea and the phenomenal world, to use the Platonic terms. From the viewpoint of the scientific worldview, the Japanese worldview seems to lack the world of Idea. This reflects a difference between English and Japanese. Japanese nouns do not change in form whether singular or plural. Consequently, Japanese-speaking people do not make a deliberate distinction between a name of an individual thing and its species name.

This means that Japanese pupils are poor at abstracting scientific concepts from various observations. Those teachers who realize this will arrange for pupils to distinguish an individual name from its species name. This will be the first step to form the dichotomy essential to scientific thought in pupils' mind. Teachers' arrangement will be a result from a consideration supplementary to teaching science in communities without the dichotomy between these two worlds.

3. Japanese Example of Supplementary Consideration

One of the present authors, Nakajo, arranged a science lesson so that pupils could experience an abstracting process. The lesson was for the fifth grade pupils, who were expected to learn that "There are males and females among fishes" (Japanese Research Team 2004, 119). The class consisted of nine groups, each of which included four or five pupils. Each group had a Japanese killifish (*Oryzias latipes*) in a beaker, and then he directed to judge whether the killifish was male or female. In order to judge, pupils were allowed to compare theirs with others distributed to other groups.

In order to clarify his intention, it is effective to compare the present arrangement with another arrangement he had made previously. Before he realized the differences in worldview, he had delivered a pair of male and female killifish in a beaker to each group. Pupils had been expected to judge according to the photo and the illustration in their textbook. The photo and the illustration had shown features distinctive between male and female killifish. Pupils had understood the distinctive features in an abstract manner, and then had made their judgement about the killifish sexes in the beaker by their observing. Pupils had assigned male or female to their killifish according to the photo or the illustration and had not experienced any abstracting process. This reflects the Japanese traditional worldview.

In Nakajo's new arrangement pupils were faced with several killifish. They were actual individuals. In order to judge whether the killifish was male or female, pupils had to classify all killifish in the class into two groups. In this process pupils had to judge whether differences between two individuals were accidental or not; if accidental, pupils had to ignore the differences. Gradually pupils established viewpoints to classify. In this process, pupils were led to form abstract concepts of different two groups. Then, according to the illustration and the photo, pupils judged which group was male or female.

4. Concluding Remarks

Because teaching science presupposes pupils' ability to abstract, science teachers unwittingly make the presupposition. However, it is almost impossible for pupils to abstract in the Japanese language milieu, where the dichotomy has never been established. There, the supplementary consideration is essential. This is the first step to

have pupils understand the differences in worldview. This understanding will lead pupils to another understanding that the scientific thought requires the dichotomy between the world of Idea and the phenomenal world. Then, pupils will liberate themselves from their conceptual confusion.

In the milieu of English, for example, Nakajo's previous arrangement will work well. By means of a combination of an article and a noun, pupils naturally judge whether the noun refers to the world of Idea or the phenomenal world. This is the reason why science teachers overlook the differences in worldview in Japan. The present discussion is an issue of the medium of instruction of school science, and then will be applicable to other communities, where pupils' first language does not entail the scientific worldview based on the dichotomy.

The present discussion is a direct consequence of worldview education (Kawasaki 2007) and the first step to accomplish it. Worldview education is a type of science education conducted by those science teachers who realize the differences between the scientific worldview and another worldview pupils' first language entails. In such communities, science teachers should take consideration of differences in worldview. In order to give the consideration, science teachers will have to accomplish another type of duty in addition to just teaching science: focusing explicitly on the traditional worldview shared in the community where pupils are growing.

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