Multi-Science Perspectives and Implications for Science Education

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Cultural (or culture) studies have been visible as one of the research areas within science education from around 1990s: A specific strand for cultural issues has been developed at international conferences on science education, and even international conferences for cultural studies of science education are not rare; Number of PhD as well as Masters' studies focusing on cultural issues have been increasing all over the world; Major science education research journals (*Science Education*, *JRST*, and *IJSE*) had occasionally published special issues on cultural studies; Also published have been monographs and edited books directly relevant to cultural studies of science education (Aikenhead, 2006; Cajete, 1999; Cobern, 1998; Hines, 2003); And, even a unique academic journal, *Cultural Studies of Science Education* established in 2006 and kept publishing many papers and fora. These are good evidence that the cultural studies of science education is now regarded as an established research area in science education.

This 'culture sensitiveness' within science education, where the idea, 'western science as one of sub-cultures in western tradition' is shared, can be traced back to the Maddock's (1981) memorable review article, '*Science education: An anthropological viewpoint.*' Before that, most science educators had identified cultural and linguistic 'hazards' and 'problems' prohibiting 'effective science teaching' in non-western societies (see Wilson, 1981a; 1981b), but been unaware of *culturality* or *value-laden-ness* of 'science' and/or 'education.' Few had tackled the issues from the very viewpoint of learners who are vividly living in such non-western cultural and linguistic environments. But from around early 1990s, learners' culture-sensitive voices had been expressed even in several major academic journals, where several relevant ideas presented: Among them are 'world-view theory' (Cobern, 1991); 'collateral learning' (Jegede, 1995); 'science education in a multiscience perspective' (Ogawa, 1995); 'cultural border-crossing' (Aikenhead, 1996); 'science education as foreign language education' (Kawasaki, 1996) etc.

Then, what are common features among research agendas of cultural studies in science education? Pomeroy (1994) tried to categorize research on cultural contexts in science education and identified nine research agendas as follows:

(1) Support systems for under-represented groups;
(2) Localized context of the science curriculum;
(3) Appropriate teaching strategies for diverse learners;
(4) Inclusion of the contributions of those generally omitted;
(5) Study of the real stories of Western scientific discovery;
(6) Science for language minority students;
(7) Study of the science in "folk knowledge" or "native technologies;"
(8) Bridge the world view of students and that of Western science; and
(9) Explore the beliefs, methods, criteria for validity, and systems of rationality upon which other cultures' knowledge of the natural world is built.

But Jegede and Aikenhead (1999) argued that only the agendas 7 to 9 can be regarded as cultural studies, because while the agendas 1 to 6 tended to assimilate pupils into western science, they challenge us to conceive of alternatives to assimilation. Thus, cultural studies in its narrowest sense share a stance that researchers should stand by the learners' side, not by the western science side, at least at the very starting point of their respective research programs. From the viewpoint of target learners, cultural studies can be categorized into four groups: (1) non-western people living in developing countries; (2) non-western people living in developed countries; (3) aboriginal (or First Nation's) people living in western or non-western countries; and (4) under- represented minority and/or immigrant groups living mainly in metropolitan urban areas. One of the shared ideas among them is to start from learners' 'empirically based way of knowing nature' (Aikenhead & Ogawa, 2007), not from western scientific way of knowing nature, when considering science education.

Since early 1980s, I have been consistently struggling with the question, 'What is *an ideal science education enterprise for non-western learners living in our contemporary societies*?' through deciphering the very nature and unique

characteristics of Japanese elementary science program (called Rika), where two mutually different cultural/epistemological ways of knowing natural world around us ('western modern science' and 'Japanese indigenous ways of knowing nature') have been 'unconsciously' tried to be amalgamated (Ogawa, 2002) and harmonized (Ogawa, 1986). Despite of this rather curious nature of Rika (a *Japanized* elementary science program), Japanese science education has celebrated a great success for these several decades in terms of R & D arenas as well as students' higher performance in international surveys on science achievements.

In this sense, I have had confidence that Japanese Rika can serve as one of the interesting and successful models of science education programs for learners (despite of their age) who are in their very initial phases of encountering western science, at least, in non-western society. Ideas like 'science as a foreign culture' (Ogawa, 1986), 'four-eyed fish' (Ogawa, 1996), 'science education in a multiscience perspective' (Ogawa, 1995), and 'a stratified and amalgamated model of knowledge and cosmology' (Ogawa, 2002) are derived from such deliberation.

Thus, the present review talk, after a very brief overview of research trends in cultural studies of science education, will make focus on my personal reflection on the ideas mentioned above, and explains its essential features in detail, especially, how it was deeply affected by the decipherment of the nature of Japanese Rika, which has been an amalgam of western science and Japanese ways of perceiving Shizen (Nature). Then, it proceeds to an extensive description of several aspects of Japanese Rika: (1) amalgamated nature of Rika objectives (Ogawa, 1986); (2) origin of the idea, Rika (Ogawa, 1998); (3) Japanese people's unaware confusion between western science and Rika (Ogawa, 1986); (4) Japanese view of nature (Shizen) and its relation to their ways of life (Aikenhead & Ogawa, 2007; Ogawa, 2002); and (5) symbolic episodes from Rika classes (Ogawa, in press). The talk will end up with certain sets of issues of, and implications to the contemporary science education, not only in Indian contexts, but also in contemporary technologicalized societies with an emphasis on need for developing a comprehensive grand-design of science education enterprise in respective societies with collaboration and work sharing among various kinds of institutions including schools, families, communities, and religious institutions etc. (Ogawa, 2008a, 2008b).

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