



Cultural Incongruence in Science Class: Implication for Science Education

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ABSTRACT

Science is a systematic and controlled extension of common sense where common sense is a series of concepts and conceptual schemas culturally sanctioned and considered as satisfactory for practical purposes. The belief in ordered nature that can be objectively observed with a rational outlook and emphasis on verificationism are significant characteristic of the culture of science. Although science has been an inseparable part of all cultures, the modern science that emerged as a dominant culture in the past two and an half century is by and large considered by many and even projected by several nations as western in origin. Such delimiting of science obviously leads to sort of cultural wars specifically in the classrooms of young children. There are numerous instances where the ideas and beliefs in science are presented in the classroom colored by the western background of the proponent of the scientific claim and without any attempt to develop congruence between the universally accepted scientific view and the local views on the scientific phenomenon. Thus cultural war arises in the mind of the young learners. The mind war is even more prominent in the eastern countries where spiritualism and religious beliefs plays a major role in the life of young students and many often they find the scientific knowledge incompatible with their own cultural beliefs. The chasm therefore necessitates innovating and developing such strategies that are useful in the classroom in bridging the scientific claims and the cultural beliefs so that the students are able to better understand the universal nature of science rather than viewing it as a prerogative of certain part of the world. A multicultural perspective must be followed in a science classroom and help them in bringing cultural incongruency.

Keywords: Science, cultural war, in-congruency, nature of science

Culture is defined as the complex whole which includes knowledge, beliefs, arts, morals, law, customs, and any other capabilities and habits acquired by a human as a member of society (Tylor,1871). Science is often seen as a culture and the primary goal of Science Education, it has been advocated, is to enable and ennoble individuals into the culture of science characterized by the belief in ordered nature that can be objectively observed, an outlook in which rationality and verificationism are important values to be accepted and practiced. It is also acknowledged, if not by all, at least by a majority that the culture of science is universal and transcends the boundaries of the nations.

The ground level realities are, however, quite complex. For most of the developing nations,

science when translated into everyday classroom processes often leads to projection of science as something alien to the indigenous culture of the society and community at large. The general perception that develops among the students is that science is *western* in origin. Further, many often science is often construed as too technical and over mechanical quite divorced from the actual social situations and issues fraught with political, economic and religious concerns that the child perceives in actual life context.

Thus there arises, sort of, cultural war in the mind of the young learners. The attempt to initiate the students into the culture of science in Indian school is often seen by the students as something being told to them in terms that are alien to them. At

odds with their socio-cultural beliefs and values that are largely based on folklores, mythological stories and beliefs that have stood the test of time and being. The conflict is of greater magnitude in case of certain ethnic group in comparison to some other ethnic group depending upon the degree to which their own culture is flexible and tolerant to the beliefs and norms of other culture. In either case the learners inculcated with their indigenous culture confronts situations where the perception of a natural phenomenon within a science culture is at odds with the traditional beliefs in the community. Such confrontations either lead to acceptance by the learner of both the views without any conflict at the cognitive level or it may result in difficulty in grasping the scientific explanation.

The situation is more puzzling when one transcends the cognitive gamut and attempt is made to make the culture of science dominate or to make individual change their outlook, attitudes and beliefs. Even though the students accept the scientific view at the cognitive level, they find it difficult to replace their outlook with a scientific outlook. Many often they find the two cultures as incongruent. One of the reasons for such in-congruency is that they are not made aware about the nature of scientific enterprise and they fail to appreciate that science has its own limitations and is but a refined commonsense way to interpret the world and its phenomena as is the case with culturally accepted interpretation of the natural phenomenon. The classroom experience seldom provide opportunity for the students to develop the accurate idea of science and rather the focus is more on the different content knowledge in science. The imbalance or the cultural in-congruency is seldom addressed to by the school curriculum and instructions and the result is that there exists a general apathy towards the values and norms if science. It is in the background of the foregoing discussion that the present paper discusses the cultural in-congruency that creeps into our science classrooms and the need to overcome the same through highlighting nature of science as an instructional tool to address the issue.

Science Education and Cultural Wars

The cultural wars referred to in the introduction section, is a reality and that the school curriculum fails to settle the war is yet another reality. The long

history of over half a century of science education has yet to realize the ideal of developing a citizenry with “scientific temperament” as proclaimed by our first Prime Minister at the time of independence. Since then scientific temperament has been the most vocally acknowledged goals of science education (IEC, 1964; IEC 1988; POA, 1992; NCF 2005) but least attained among the students in the real sense.

The gap between the idealized and the attained outcomes can perhaps be attributed to this cultural war, as described in introduction section. The cultural wars are evident in the classrooms where epistemic differences and differences in the world-views between culture of science and that of student is evident (Jegede and Aikenhead, 1999). In a country like India where almost all the natural phenomena and events have a culturally embedded explanation that is a mix of rationality, spirituality and basic understanding of human nature, the children quite often find themselves at cultural wars in science classrooms. The result is that students are involved in collateral learning where science even if learned are not incorporated as cultural tools and at other times the two views co-exist.

The gap further poses a great challenge for science education specifically with respect to the young learners in our society. It is perhaps inefficacy of the school experiences, through its instructional strategies and learning activities, in presenting science as a universal human activity and the inability to highlight the fact that science is there and has always been a part of every culture since ancient times.

School science more aptly promotes a too westernized picture of science and this unilateral representation of science has led to the origin of cultural wars transcending the cognitive domain and penetrating affective dimensions of behavior. Science education has to some extent failed to establish the idea that science is inherent in every culture and that cultures across the globe has contributed to the development of science.

Science Education and Multiculturalism

The issue of cultural wars in science classroom is a global phenomenon identified across nations. On the one hand the dispersion of modern science across the traditional societies and on the other

hand the inter nation migration of people from east to the west has attracted the issue of multicultural representation of science to the surface. One of the primary sources for the emergence of this globally acknowledged problem specifically in the developing countries like India is because science teaching has overlooked the contributions of indigenous knowledge in interpreting and explaining the nature and its phenomena. The situation is made even more miserable when the curriculum developers yield to the 'epistemological hegemony' and 'cultural imperialism' that has negated the very existence of the validity of knowledge that has helped cultures to guide their life and dealing with nature for centuries (Cobern and Loving).

Multicultural science is an idea that addresses this challenge arising out of cultural wars in the science classroom and it advocates a science teaching in everyday classroom wherein science is projected to be a part and parcel of every culture, that science was there in every culture although the same might not have been formulated in terms familiarly used by modern science. Alloze (1998) for example claimed, with reference to the Yupiaqs a native culture in Alaska, that the Yupiaq's have their own "body of scientific knowledge and epistemology that differs from Western Science" (p.133). Similar findings were observed across cultures from Australia through Africa (Warren, 1991). Thus it is advocated to redefine school science, if we will to reap the benefits of science as well as at the same time get rid of "the culturally corrosive effect of western science has had on non-western cultures" (Colburn and Loving).

School science: From in-congruency to congruency

It is advocated that a two pronged approach should be used to initiate students to the world of science. First of all the significant contribution of the indigenous culture that are rational interpretations, need to be documented and retrieved for pedagogical purposes. These retrieved knowledge from the cultural legacy of the student is assumed to serve as the initial experience for the student to appreciate the richness of their own culture on the one hand and to construct further knowledge by rectifying the culturally embedded knowledge. At least it

prevents them from developing apathy towards science when it is introduced without any linkage to the knowledge developed in their own culture.

The second aspect is that the students need to be made aware of the character of science itself. They should be made consciously aware of nature of science as a mode of inquiry and hence of the knowledge generated thereupon. Nature of Science is defined as the values, assumptions and limitations of science (Lederman, 1992) operationalized in terms of certain tenets that characterize science and that differentiates science from other ways of knowing or other sources of knowledge. An understanding of NOS is considered as a valuable tool for science education within a multicultural perspective. An informed understanding of the NOS helps the learner to identify the elements of science in their own cultural knowledge. Instead of finding themselves in a quagmire when faced with conflicting views they are able to explore through border crossing between the different cultures. Such venture in an informed way is all too beneficial for the learner to develop pluralistic view and achieve congruency in their outlook.

Lee (2003) emphasizes that the attempts from a multicultural perspective should be directed at helping the students negotiate between the two cultural views and enabling them in border crossing between the two cultures. An understanding of nature of science then helps the students in not only such border crossing but also appreciating the elements of science involved in their own cultural knowledge base. William Cobern (1993) even proclaimed that the extent to which science education is successful in establishing science as a culture is determined by the extent to which it can be established in the classroom as something very close and embedded in the cultural framework of the students. Thus, from a multicultural perspective, NOS as an instructional tool addresses this cultural war and helps them to align the epistemic and world-view in the two cultures.

The position reiterated in this article is that science curriculum should yield some space for the Indian contributions to science specifically those derived from different ancient texts and centers of knowledge and on the other hand it should include a sophisticated understanding of nature of science as an instructional tool to help the

students align the knowledge from two sources. Such an approach is essential from a cultural vantage point as well if we expect our students to be historically aware and appreciative of our own cultural richness. The students, it is assumed, will be able to see developments in science as a continuous process rather than as something alien and western in character. They are also able to appreciate the common cultural elements of science in the knowledge that is their cultural and historical legacy.

For example the students could be introduced to Kanad's formulations of atoms and then moved towards the more modern version of atomic world and understanding of nature of science on the other hand helps them appreciate the presence of science as a universal phenomena as well as comprehend the developmental nature of the enterprise irrespective of any cultural hegemony. There are several similar contexts in which the students need to be made appreciative of the Indian contributions to science and thus overcome the general apathy towards science as something alien to their own culture.

CONCLUDING REMARKS

Science is one way of arriving at valid knowledge. However the too western view of science and the cultural imperialism in science education has led to emergence of new problems in science education in context of non-western cultures. This phenomenon and overlooking the elements of science in all indigenous culture has led to the advocacy for a more egalitarian view and embedding science education in a multicultural perspective. Multiculturalism in science is therefore a widely discussed and acknowledge phenomenon on the global scenario as a criticism to projecting science as western and as alien to indigenous culture. NOS, as a framework of values, assumptions and limitations of science, are considered as an instructional tool in a multicultural science class. It helps the learner to understand the assumptions on which science rests and at the same time they are able to comprehend the limitations of

science as a way of knowing. Such an understanding is beneficial since it helps the learners to explore the world of different cultures and thus they are able to understand as a universally prevalent phenomenon irrespective of cultures. It also helps them to overcome the general predicament of assimilation of science as superior over their own culturally originated explanation of nature and its phenomena. They are expected to develop insight into the different perspective from which knowledge can be arrived at and the practical utility of knowledge derived from different perspectives.

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