SCIENCE TEACHERS' PERCEPTION OF THE ROLE OF CULTURE IN SCIENCE TEACHING

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The United Nations has earmarked the period 2005 to 2014 as the Decade of Education for Sustainable Development (DESD). Society, environment and economy have been identified as the key areas of sustainable development. The DESD International Implementation Scheme drafted by the UNESCO, stresses the fact that these three areas, namely, society, environment and economy are interconnected through the dimension of culture. In order to attain the goals of education for sustainable development, this document lays emphasis on the following aspects to ensure culture fair teaching/learning practices: (UNESCO, 2005):

- Recognising diversity
- Growing in respect and tolerance of difference
- Using local indigenous knowledge
- Recognizing and working with culturally specific views of nature, society and the world, rather than ignoring them

(Only those aspects that have a relevance to the present paper have been listed.)

This study was undertaken to identify how science teachers (both preservice and inservice) perceive culture's role in classroom teaching and ascertain their choice of teaching approaches that either ignore or encompass the aspects of culture as enumerated in UNESCO's draft.

IMPLEMENTATION SCHEME

Objectives

The study was conceived to ascertain how student teachers and working teachers of science perceive the role of culture in science teaching, by identifying their:

- View of culture vis-à-vis science teaching
- Preference for culture fair or culture free teaching
- Choice of teaching approaches.

Theoretical Framework:

The role of culture in education had been recognized long before DESD. Educators in countries with diverse immigrant and ethnic populations such as the United States, the United Kingdom, Canada and Australia initiated 'multiethnic' and 'multiracial'

education, to help improve the academic achievement of ethnic and immigrant populations (Jenkins, 1985). These terms later acquired a wider connotation and 'multicultural' education became popular (Sleeter and McLaren, 2000). Multi ethnic/racial education can be historically traced to the civil rights movement in the U.S.A. It was used to bridge racial and ethnic groups. Multicultural education broadened the umbrella to include gender, economic, language and other forms of cultural diversity. Moreover, the primary aim of multiethnic/racial education in their initial stages was to help the immigrant and coloured populations to conform to the dominant culture of their adopted country. The advocates of multicultural education replaced this assimilationist approach with a post-modernist approach which calls for accepting and promoting cultural diversity.

In spite of the existence of multicultural education programmes for nearly three decades, multicultural science education is still a relatively new area of research within multicultural education. However, concerns about science for all in the past decade have led to a spate of research in multicultural science education.

These researches have shown that the students navigate among a number of subcultures namely, that of the family, the peer group, religion etc and the culture of science, (Costa, 1995; Jegede & Aikehenhead, 1999; Aikenhead, 1996). There are predominantly two theories which researchers use to understand these cross-cultural navigations:

- The worldview theory, which posits that culture conflict in worldviews, affects science teaching and learning (Okebukola et al, 1995; Cobern, 1996; Lee, 1996).
- The concept of border-crossing between cultures. When border-crossing has to be done, the researchers strive to identify ways and means of helping students traverse the border (where they exist) between science and their everyday life-world (Aikenhead, 1996; Jegede & Aikenhead, 1999).

One conclusion that emerges from these researches is that academic achievement in science depends on the degree of cultural difference that pupils perceive between their life-worlds and their classroom; how effectively pupils move between their life-world culture and the culture of science; and the assistance that pupils receive in making these transitions easier.

Of course, efforts for multicultural science teaching have not been without criticisms. Some critics (Nanda, 1996; Gross, 2001) have pointed out that multicultural science education has been used as a platform to politicize science education. A few others (de Boer, 1991; Yerrick & Nugent, 1996) have criticized the excessive stress on societal issues and culturally relevant science teaching at the expense of the content of science. The present research does not attempt to go into the relative merits and demerits of multicultural science teaching but only ascertains the opinion of the teachers towards multicultural science teaching.

A dearth of research in this area led the present researcher to develop an opinionnaire based on interviewing leading scientists, technologists and science educationists. Ogawa's (1995) categories of researchers in multicultural science education were used as the framework for conducting the open-ended interviews. Based on a review of the decade–old research in multicultural science education, Ogawa had classified the researchers into the following four categories:

Those who see students' culture as a barrier to science teaching and learning. They are normally the ones who opt for culture free science teaching.

Those who are interested in alternative knowledge systems that explain our world. These science educators respect such alternative knowledge systems and not only make a reference to but also try to incorporate elements from these knowledge systems in their science classes wherever possible.

Those who address the contribution of various cultures to Western science.

Those whose interest lies in the "culturality" of science itself. This group considers science also as a part of a larger cultural milieu.

Methodology

The primary objective of the research is to identify teachers' perception of culture vis-à-vis science teaching. This is best answered by a survey type of research as surveys allow a researcher to simultaneously measure attitudes or opinions, determine the status quo of some primary phenomenon, and assess relationships among variables. Although surveys only help in providing descriptive information, they can provide a firm empirical basis for policy formulations (Best, 1961).

This survey was conceptualized as a cross-sectional survey. The population comprised of:

Science student teachers i.e., science graduates who had enrolled for the one-year B.Ed training programme in Colleges of Education at Chennai and its neighbourhood; and

Practicing high school teachers of science i.e. those handling science subjects for classes VI to X in recognized schools of Chennai and its vicinity.

This survey utilized questionnaire as the tool for data collection.

Tool

The respondents' view of culture vis-à-vis science teaching was identified through their choice from among the following options: culture as always a barrier to the teaching/learning of science; culture as a barrier sometimes; culture as never a barrier. The respondents, who had no opinion on this aspect or those who were yet to form one, had a fourth option, namely, "Cannot definitely say".

The respondents' preference for multicultural science teaching was ascertained by their choice of culture free or culture fair science teaching. By culture free science teaching is meant that culture should not be brought into the classroom. By culture fair science teaching is meant that science teaching should not be divorced from the culture of the students.

The third objective, namely, identifying the teachers' choice of teaching approaches, were classified into four broad categories: approaches that ignore culture; approaches which utilize indigenous knowledge systems; approaches which address the contributions of various cultures to Western science, through the history of science; teaching approaches which identify science itself as being a subculture in the larger cultural milieu. These categories are not mutually exclusive. However, as they signify dominant positions derived from a review of over two decades of literature in multicultural science teaching (Ogawa, 1995), and are fairly comprehensive these categories have been adopted for the present research. To the best of the researcher's knowledge there is no alternative schema of classification pertaining to multicultural science teaching.

This sequence was adopted on the assumption that a teacher's perception of culture vis-à-vis science teaching would have a bearing on his/her preference for multicultural science teaching, which would in turn influence his/her choice of teaching approaches.

There are two other studies, both focusing on pre-service science teacher trainees' (i.e., student teachers') opinion on multicultural science teaching. One has been conducted in Papua New Guinea and the other in the United Kingdom (Vlaardingerbroek, 1990, Reiss, 1994). Both these studies showed that student teachers had a positive opinion towards multicultural science teaching. This kind of study could not be duplicated in India because of a lack of awareness about multicultural science education in India. Hence, there can be no possible comparisons of the results of this study with any previous research.

Findings

	Number	Percentage
Always	58	8.6
Sometimes	230	34.0
Never	253	37.4
Can't say	136	20.0
Total	677	100

Table 1: View of Culture vis-à-vis science teaching

Thus, a majority of the respondents feel that culture is either sometimes a barrier or never a barrier whereas less than one-tenth of them consider culture as always a barrier to the teaching/learning of science.

Table 2 gives the percentage of respondents who have preferred culture free science teaching as against those who preferred culture fair science teaching.

	Number	Percentage
Culture free	237	35
Culture fair	440	65

Table 2: Preference for Multicultural Science Teaching

Of the 677 respondents, 237 (i.e., 35%) have preferred culture free science teaching and the remaining culture fair science teaching.

As with Vlaardingerbroek's (1990) and Reiss' (1994) studies on the opinion of pre-service science teachers in Papua New Guinea and England respectively, the present research also shows that a majority of the respondents prefer multicultural science teaching.

Those who had opted for culture free science teaching were also required to state the reasons for doing so.

S.No.	Reasons	Numbers	Percentage
1	Science has nothing to do with the culture	28	11.8%
2	Even if it has, the classroom is not the place to explore or establish the relation between science and culture	49	20.7%
3	Culture has no role to play in science teaching	160	67.5%

Table 3: Reasons for not Preferring Culture Fair Science Teaching

Among the respondents who preferred Culture free science teaching 67.5% of them feel that culture has no role to play in the teaching of science. Pre-service and in-service teacher training programmes can include research findings that bring home the fact that culture does influence the teaching/learning of science.

In addition to the aforementioned three choices, the respondents who had preferred culture free science teaching were also given the option of suggesting any other reason that they might find pertinent. About 32% of the respondents had filled in this column.

The following were among some of the recurring ideas, particularly among the student teachers that emerged from their free responses:

--Western countries have progressed only because they do not harp on culture.

--If you attempt to bring culture in the science classroom, culture will tarnish science also with its superstitions. (While conducting the survey the researcher had repeatedly stressed the meaning of culture as used in the present context. Despite this, a few of them seem to have equated culture to superstitions or is it that they feel that our everyday culture is steeped in superstitions? Only future research can clarify this.)

--Include cultural values into the subject only by means of extra-curricular activities.

Choice of Teaching Approaches

A total of twelve teaching approaches were given in the second part of the questionnaire. These were classified into four categories namely, teaching approaches that ignore culture, teaching approaches that utilize a historical approach, teaching approaches that make use of indigenous knowledge/resources and teaching approaches that consider science as a part of the everyday culture i.e., those that take into account the "culturality" of science itself (Ogawa, 1995). Therefore there were three teaching approaches under each category. The respondents had to rate these twelve teaching approaches on a five-point scale. The "Most Preferred" choice was allotted 4 points "Preferred" 3 points, "Somewhat Preferred" 2 points, "Least Preferred" 1 point, and "Not at all Preferred" 0 points.

The respondent was considered to prefer a particular teaching approach, if he/she had a combined rating of 9 and above for all the three teaching approaches under each of the four categories. This is an arbitrary decision. However, the reasoning behind this is that a respondent who prefers all three teaching approaches under a particular category, would get a maximum rating of 3 x 3 = 9.

Teaching Approaches	Percentage of Respondents	
	Prefer	Do not prefer
Ignore	39.4	60.6
Historical	72.4	27.6
Indigenous	73.4	26.6
Science as Subculture	90.0	10.0

Table 4: Choice of Teaching Approaches

Teaching approaches that view science as part of the everyday culture got the highest rating. This was followed by approaches that use indigenous knowledge/resources and historical approaches. Approaches that ignore the students' culture in science teaching got the least rating.

Conclusions

Among the 677 respondents 34% perceived culture as sometimes and 37.4% as never a barrier to the teaching/learning of science compared to 8.6% who perceive culture as always a barrier.

Nearly two-thirds of the respondents preferred culture fair science teaching.

Teaching approaches that consider science itself as a part of the larger cultural milieu, got the highest rating from all the respondents.

These findings imply that teachers are amenable to multicultural science teaching. A positive opinion towards multicultural science teaching exists among both the future and present teachers of science. Therefore these teachers would not resist the introduction of culture fair science teaching practices in their classrooms. From their choice of teaching approaches, it appears that the student teachers and the practising teachers of science who took part in this survey are favourably disposed towards bridging the students' life worlds and the world of science, which is ultimately what multicultural science teaching is about. But they require guidance in doing so. We therefore need to develop a curricular framework that would incorporate multicultural science teaching in programmes for teacher education.