Pakistan Journal of Social Sciences 5 (3): 253-257, 2008
ISSN: 1683-8831

Cultural Beliefs and Conceptual Understanding of Science:A Resolution of Cognitive Dissonance in Science Classroom

[1]Tunde Owolabi and [2]F.A. Olatunde
[1]Department of Curriculum Studies, Lagos State University, Ojo, Lagos, Nigeria
[2]School of Education, Federal College of Education (Technical), Akoka-Yaba, Lagos, Nigeria

Abstract: The study recognized the existence of cognitive conflict between students' worldview and the school view. It employed an interpretative-ethnographic technique with the use of Focus Group Discussions (FGD) to unveil and resolve the disconnectedness in the students' worldview and the school view. Twenty science teachers and 58 SS. III science students from rural environment of Lagos State participated in the study, which was carried out in 3 stages. The first stage enabled the researcher determined the extent to which values and cultural beliefs conflict with their conception of science. The second stage provided opportunity to bring side by side the conflicting schemata. The third stage inquired into the resolution along 2 domains. The discussions were recorded and transcribed. Findings revealed a compartmentalization of thought by students into 2 domains: School view and the worldview as contributing to one science.

Key words: Cultural beliefs, cognitive, FGD, science, Africa

INTRODUCTION

African countries have richly endowed culture and are therefore multicultural. Culture encompasses the knowledge, belief, art, morals, laws, customs and habit acquired by the people of the society (Jegede and Okebukola, 1991). Culture in Africa is knowledge-based and includes what we teach or pass onto our children about ourselves, our history and our values in all spheres of our environment. An African child develops with the mind full of knowledge acquired in the cultural milieu in which he found himself. Lessons from culture therefore often inculcate discipline and fear in learners and prepare them to survive and live well.

Evidence abounds (Aikenhead, 1991; Jegede, 1995; Ogawa, 1993) that indigenous groups have their own knowledge (African Knowledge). Jegede (1995) opined that "African knowledge" is an accumulation of information and practices from which learners can draw to aid further learning. African knowledge draws from the traditional and cultural beliefs, taboos, superstitions, customs and tradition of the society. It therefore constitutes the "worldview" of the learner.

The advent of western education presents to the learner an alternative environment (school view) through the teaching of science, hence a different worldview. Science is an endless human activity and needs which drive people to seek rational answers to many puzzling natural phenomena through observation and experimentation. Scientific rationality is analytical and seeks causal explanations of relationship between sets of isolated variables in idealize models they purport to represent (Waldrip and Taylor, 1999). The progress of science is usually marked by accumulation of knowledge about natural phenomena.

Transition from the micro-culture of the African environment (worldview) to the micro-culture of the western civilization (school view) requires a cultural border crossing. This cultural border crossing presupposes that a disparity exists between students' worldview and the students' school view. This disparity often impinges directly on the learning of science. The cultural background of the learner has been identified to have a greater effect on learning than does the subject content (Okebukola, 1995). The traditional cultural practices for instance are generally authoritarian in nature and children are taught to respect the wisdom and authority of their elders and are not encouraged to probe or seek clarification. This no doubt contradicts science which seeks to encourage students to be open and critical minded, curious and not to be passive recipients of developed knowledge.

As noted by Waldrip and Taylor (1999), western explanations of natural phenomena can be very different

Corresponding Author: Tunde Owolabi, Department of Curriculum Studies, Lagos State University, Ojo, Lagos, Nigeria

from traditional explanations. Waldrip and Taylor (1999) stated their experience of science teaching in developing countries where teachers try to enforce the school view while failing to recognize the existence of students' worldview. The difference in emphasis often results in students developing two different sets of values and attitudes (Kay, 1995) leading to a conflict concerning which set of values and attitudes to be adopted. A consequence of this conflict is compartmentalization, that is, students adopt two sometimes-conflicting explanations of a particular phenomenon. One of these explanations is based on traditional village experiences and the other is based on what is taught in school as science.

The cultural clashes between students' worldview and the school view of western education were identified as the major cause of poor performance in science (Wasagu, 1999; Ivowi, 1992). A possible explanation can be deduced from Kay (1995) statement that:

The transition (movement between the micro-culture of the family and the micro-culture of the science classroom) are smooth when the culture of family and science are congruent, that transitions become difficult whenever the culture are somewhat slightly different, that transitions tend to be hazardous when the cultures are diverse and that transitions are virtually impossible when the culture are highly discordant.

Success in science courses according to Kay (1995) therefore depends on:

- The degree of cultural difference that students perceive between the worldview and the school view.
- How effective students move between the worldview culture and the school view culture.
- The assistance students receive in making those transitions easier.

To enhance effective learning of science among African learners, it is therefore necessary to integrate Western and African knowledge. It can be argued that lots of indigenous knowledge has scientific explanations that can enhance learning in science. This study therefore examined and resolved the cognitive conflict between the students' worldview and their school view.

Theoretical framework: This study was premised on Schutz and Lucksmann's (1973) foundation theory that learners tend to typify experiences to create structures. The study recognized the existence of Western and African worldviews as contributing to one science. This was achieved using Jegede (1995) theory of collateral learning to resolve the conflict.

MATERIALS AND METHODS

This is an interpretative-ethnographic study designed to unveil and resolve the disconnectedness between the students' worldview and their school view. Twenty science teachers (8 females and 12 males) and 58 SS III science students (24 females and 34 males) selected by stratified sampling technique from a rural area of Badagry Local Education District (L.E.D.) participated in the study. The choice of the rural area was to ensure that the students involved in the study were rich in cultural beliefs. This is in view of the fact that students in urban environment were likely to possess an adulterated culture as a result of interference with western civilization.

This study employed Focus Group Discussion (FCD) strategies, which involved planned discussions in three interactive sessions. Delphi-technique was first used to generate a plausible account of student's knowledge of cultural beliefs. Delphi-technique involves the collection of information on a particular problem from those who are knowledgeable in the area. The diverse views of students are collated on the basis of frequency count. Views that were mostly mentioned (highest frequency) were considered and used to develop the questionnaire administered in the study. This was achieved by requesting from the students a list of cultural beliefs in their environment. A total of 53 cultural beliefs were obtained after sorting of which 20 had direct relationship with school science and 33 were meant to instill fear and maintain discipline, peace and order in the society. The cultural beliefs were on the following topics: Reproduction, nutrition, nervous system, carbon and components, colours of light, water cycle and lightening. Those topics have been taught in school at the time of the study.

The 20 cultural beliefs were organized and put under the heading: Socio-cultural beliefs and practices and sub-divided into three columns: Cultural explanations/ activities, specific science concepts and scientific explanations.

Validation of instrument: Two science educators in the university validated this instrument. The perceptions of the teachers on the cultural beliefs, cultural meaning and scientific interpretations were collated using Delphi-technique. Eighty percent of the teachers were able to give appropriate scientific interpretation of the cultural beliefs. A split half reliability method gave a value of 0.80 as the reliability of the instrument. It was thereafter used to structure the discussion during the school club and society day for a period of three consecutive weeks.

Procedure for administration of instrument: This study employed Focus Group Discussions (FGD) strategies, which involved planned discussions in 3 interactive sessions. The first session inquired from the students the meanings of each of the 20 cultural beliefs earlier identified. It enabled the researcher to determine the extent to which values and cultural beliefs permeated their understanding of natural phenomena. The second session provided opportunity to interact with the students by inquiring from them and also bringing to their awareness the scientific meanings and interpretations (school view) of each of the cultural beliefs.

Evaluation of lessons learnt at the 2 previous stages formed the focus of the third stage. This was done in order to find out whether students could hold on to the two views (compartmentalization of knowledge) differently in different domain without losing self-identity in any of the domains.

RESULTS

Discussions during the interactive sessions were recorded and transcribed as presented below:

Findings revealed that majority (85%) of the students were able to give cultural meanings to the cultural beliefs. However, many of the students (96%) were unable to give their equivalent scientific explanations. It therefore means that world view pre-occupied students' knowledge despite the fact that related scientific concept have been taught. One would have expected that students would be capable of applying the knowledge of science acquired in school in their response. Some excerpts from the discussions held on cultural meanings of some natural phenomena are presented.

Question: What could be responsible when it rains and the sun shines at the same time?

Response: The general response was that "an elephant or a cow is giving birth to its new born".

Question: Why is it that anytime there is a thunderstorm there is always lightning preceding it?

Response: Majority (96%) responded that it is a sign that evil things are about to happen. Or that the thunder was send to kill somebody.

Question: Explain the appearance of a rainbow?

Response: On this, diverse views were obtained. Some believed that.

- It is a sign of drought in the land. (48% response).
- Python is giving birth to its newborn. (33% response).
- Prominent person or king is about to die. (19% response).

Question: What is the cause of frequent sneezing?

Response: The general response was that somebody is speaking ills of the person from afar.

Question: What is responsible for a baby developing the upper teeth before the lower teeth?

Response: The observation is regarded as an abomination. Such a baby should be very careful because whatever is said by the baby will come to reality.

Question: What is the cause of high mortality rate in children of the same parents?

Response: It is the handwork of evil spirits. Such dead children are regarded as *"abiku"*, which literarily means, a dead child who returned back to life. The belief is that they entered the mother's womb during gestation period by forcing the foetus out.

The second session afforded the researcher opportunity to give the scientific meanings to the issues raised on natural phenomenon. The following are the excerpts from the interactive session the teachers held with the students.

Question: What could be responsible when it rains and the sun shines at the same time?

Scientific meaning: There is always water vapour in the atmosphere, which varies in quantity. The vapour comes from evaporation of the surfaces of ponds, rivers, lakes and seas as well as from transpiration in plants and respiration of living things. The incidence of rain on a sunny day was a result of sudden condensation of the cloud. The cloud was not dense enough to overshadow the rays of the sun.

Question: Why is it that anytime there is a thunderstorm there is always lightning preceding it?

Scientific meaning: Lightning occurs as a result of sudden discharge of heavy charge, which accumulates high up in the atmosphere. The discharge is normally noticed by the loud sound (thunder) and light (lightning). However, the light is seen before the sound because the

speed of light is greater than the speed of sound. Of course, the discharge can be hazardous because the lightning can set the tall buildings ablaze unless a lightning conductor is installed at the top corner of the tall building.

Question: Explain the appearance of a rainbow.

Scientific meaning: Several colours of the rainbow are due to dispersion of sunlight by water droplets suspended in the air after a rain. White light has seven components colours. With white light from the sun, dispersion occurs within each droplet as soon as light enters it. The result is that coloured rays emerge from the droplet.

Question: What is the cause of frequent sneezing?

Scientific meaning: Teeth formation usually occurs in stages starting from the lower gum. However, there can be a congenital abnormality, which consequently leads to a reverse of the process. Although an abnormal process but it has no adverse effect.

Question: What is the cause of high mortality rate in children of the same parents?.

Scientific meaning: The death of the children could be as a result of sickle cell anaemia or some other inherited diseases. Counselling on Blood group was scarcely available in traditional African Society. The tendency of 2 carriers (AS) intermarrying is so high, of course there is every likelihood that they will give birth to a sickler.

At the 3rd session, evaluation of lessons on the concepts discussed at the two earlier stages was carried out. It was quite revealing, majority (97%) of the students were now able to provide scientific and cultural meaning to each of the natural phenomena or cultural beliefs investigated. The students were also able to realize that most of the cultural beliefs were nothing but illusion that finds no place in modern scientific world.

DISCUSSION

The findings of the present study are quite revealing. That science students' were only able to give cultural meaning to naturally occurring phenomena showed the predominance of their worldview over the school view. It also implied gross defect in the teaching of the teachers, more so that majority of the science teachers were able to give correct scientific interpretation of natural phenomena. Perhaps teachers teach as if science is an immutable body of facts and rhetoric of conclusions instead of showing that science itself is real. This ugly situation would not have occurred where teachers relate what they teach to real life experiences of learners by bringing out the scientific interpretations and meaning of naturally occurring phenomena. Perhaps most of the science textbooks in use in Nigerian schools have done little to relate scientific concepts to the daily experience of the students. Science teachers should cultivate the habit of using students' everyday experiences to elucidate the meaning of science concepts. Improved understanding can be achieved where teachers recognize the existence of worldview and the school view, teach the two (worldview and the school view) side by side such as to demystify the worldview and promote the school view.

CONCLUSION

In conclusion therefore, future curriculum review should take cognizance of the potency of worldview in the learning of science. Science teachers should always endeavour to probe into the worldview of students in order to neutralize their beliefs with appropriate scientific interpretations and meanings. This demand from the teacher critical-mindedness and resourcefulness. A glossary on cultural beliefs, cultural meanings and scientific interpretations and meaning could be ideal to help in the disillusionment process.

REFERENCES

Aikenhead, G.S. and O.J. Jegede, 1999. Cross cultural science education. A cognitive explanation of a cultural phenomenon. J. Res. Sci. Teaching, 36: 26-270.

Aikenhead, G.S., 1991. Towards a first national cross-cultural science and technology curriculum. Sci. Edu., 81: 217-238.

Ivowi, U.M.O., 1992. Raising the standard of performance in public examination in Science, Technology and Mathematics. Science Teachers Association of Nigeria position, pp: 4.

Jegede, O.J. and P.A.O. Okebukola, 1991. The effect of instruction on socio-cultural beliefs hindering the learning of science. J. Res. Sci. Teaching, 28: 275-282.

Jegede, O.J., 1995. Collateral learning and the eco-cultural paradigm in Science and Mathematics Education in Africa. Studies in Sci. Edu., 25: 97-137.

Kay, S., 1975. Curriculum innovation and traditional cultures: A case history of Kenya. Comparative Edu., 11: 183-191.

Ogawa, M., 1995. Science education in math-science perspective. Sci. Edu., 79: 583-593.

Okebukola, P.A.O., 1995. Effects of students-student intervention affective outcomes of science instruction. Res. Sci. Tech. Edu., 3: 5-17.

Schutz, A. and T. Lucksmanns, 1973. Structure of the life world. London Heinemann Books.

Waldrip, B.G. and P.C.S. Taylor, 1999. Students' worldviews and school-views. Int. J. Sci. Edu., 17: 695-704.

Wasagu, M.A., 1999. The Relationship between science students cultural beliefs and their academic achievement at the secondary school level in Sokoto State. J. Sci. Teachers Assoc. Nig., 12: 18-23.