'Biodiversity Contests': Indigenously Informed and Transformed Environmental Education

Chand, Vijaya Sherry, Indian Institute of Management, Ahmedabad, India

Shukla, Shailesh R., PhD Student, Natural Resources Institute, University of Manitoba, Canada

This is an electronic post-print version of an article published as Vijaya Sherry Chand, S. R. Shukla, Biodiversity Contests': Indigenously Informed and Transformed Environmental Education, Applied Environmental Education and Communication: An International Journal, Volume 2, Issue 4, Jan 2003, Pages 229 – 236.

Applied Environmental Education and Communication is available online at http://www.journalsonline.tandf.co.uk/link.asp?id=kxelv1uw64kjpvmk.'

ABSTRACT

The 'biodiversity contest' is an educational innovation designed to uncover the plant diversity knowledge of children. This article, based on the experiences of the winners of 31 such contests, seeks to identify the methods through which children learn from their elders and the beliefs that the elders communicate to them. While elders develop in children knowledge about plants, they do not communicate a belief in active conservation. Though elders have a culturally determined preference for boys as apprentices, they do accommodate the education of girls. Systematic instruction, demonstration, questioning to test knowledge and memory, encouraging observation, and supervised practice, are methods the elders use during an extended apprenticeship. The contests have helped recognize the knowledge that children have acquired outside the school, and have helped teachers introduce curricular relevance. In India, a national education policy formulated in 1966 led to the inclusion of environmental education within its scope. About thirty years later, a national plan for biodiversity conservation noted the need for formal environmental

education systems to create space for “community/ traditional knowledge systems and practices” (Pandey, 2000; Sharma, 1999; Raina, 1999). These systems were under threat since knowledge about conservation and management of biodiversity was being eroded as a result of degradation of biodiversity resources (Gupta 1996). This phenomenon has also been observed elsewhere (Atte, 1989; Peacock, 1995; Richards, 1987). Gupta (1996) also noted that areas where the threat of knowledge and resource degradation was high were also those which were economically backward, showed poor educational performance, and were inhabited by indigenous communities. Transferring the traditional knowledge that such communities possess into formal environmental education is one way of preventing the disappearance of the knowledge associated with biodiversity.

However, a crucial requirement for making such transfer possible, namely, an awareness of how indigenous knowledge about biodiversity is transmitted to children through the processes of socialization operating in their own environments, has not been studied adequately (Berkes, 1999). In non-Indian contexts, the educational approaches used by community elders to teach their children include the following: formal apprenticeship (Cordell, 1989), systematic individual and group interactions which are highly-structured but informal (Ruddle, 1993; Ritchie & Ritchie, 1979), and a primarily oral and intimate mode of communication, in contrast to a ‘distant’ and ‘literate’ mode (Ruddle, 2000; Battiste & Henderson, 2000). Daes (1994) organizes these approaches into three pedagogical elements: apprenticeship, ceremonies, and practice. In the Indian context, the role played by elders and the methods they use, need to be identified. A second requirement for helping the transfer of traditional knowledge into formal education is the identification of the knowledge that children have gained about biodiversity from their community elders. Formal curricula usually do not recognize such knowledge, and as Battiste & Henderson (2000) note, a focus on seeing indigenous thought and practice through the

perspectives of more dominant traditions may have led to indigenous knowledge's remaining outside the scope of formal educational systems. This paper intends primarily to answer the following questions: What, according to children who are identified as knowledgeable about biodiversity, are the methods through which they learn from their elders, and secondly, what are the rules that the elders use while teaching them? While answering these questions, the paper also describes the potential of a curriculum innovation, the 'biodiversity contest',[1] designed to uncover the biodiversity knowledge of children. These contests were also used to identify the most knowledgeable children.

The 'Biodiversity Contest'

In this study, a 'biodiversity contest' was designed as a means to uncover, in a healthy competition mode, the knowledge of children about local biodiversity. While the term 'biodiversity' refers to the whole range of living organisms like plants, insects, vertebrates, invertebrates, and microorganisms (Wilson 1988), we use it here in a limited sense to indicate just plant diversity. The specific goal of the 'biodiversity contest' was, therefore, to assess children's knowledge about the identification and uses of the plants found in their environment. Though the stated focus of the contests was plant diversity, in practice, children tended to emphasize medicinal plants and herbs that had medicinal uses. That is, material resources related to animal and human health, and the knowledge and cultural practices associated with indigenous health care, formed a significant part of plant diversity knowledge.

Methodology

The 'biodiversity contest', held through the village school, involves the following steps. The concept and purpose of the contest are first communicated through a printed pamphlet and a group meeting of the children and their parents. The pamphlet indicates that the children have to bring specimens of plants with which they are familiar, and be prepared to answer questions

about the uses and habitats of plants. Two days later the contest is held. The children bring the specimens they have collected and arrange them on sheets of paper supplied by the school. A three-member evaluation committee then interviews each child, and scores his or her knowledge on the following criteria: number of specimens brought and their novelty, responses to questions about uses and habitats of plants, and presentation style. The winners are awarded prizes like school bags or crayon sets. All participants receive a token gift.

This paper is based on case studies of 31 winners of biodiversity contests conducted in 31 village schools in western India during the years 2000 and 2001. A total of 1680 children took part in these contests. Since the winners were judged on the basis of their competence, they may be assumed to possess a better understanding of biodiversity, consistent with expert theory (Ericsson & Smith, 1991). At the time of the contests, their ages ranged from nine to 15. All of them belong to tribal communities. All, except two, belong to economically disadvantaged families. On an average, each child was rated to be knowledgeable about 66 species (range: 28 to 123). The 31 children were visited during the year 2002, for in-depth semi-structured interviews in their school and village settings, by a two-member team that was familiar with the biodiversity contests. Each visit lasted one to two days. These interviews were supplemented by interviews with elders identified by the children as key sources of learning, with teachers and other elders. Semi-processed data were checked with the participants soon after the interviews; logistical difficulties prevented the final data transcripts from being sent back to the interviewees.

Interview transcripts and field notes were the sources of data. The first step in analysis involved translation of data into English from the local language, Gujarati. Since the researchers were bilingual, this process may be assumed to be fairly robust. Further processing of data used inductive coding and interpretation (Miles & Huberman, 1994), with an iterative generation of

analytical statements based on the key questions being answered, and the testing of these against the data items (Bassey, 1999).

Transmission of indigenous knowledge: A gendered process?

The development of 'biodiversity competence', in a community context, begins with certain key sources. In the cases under discussion, the grandparent, rather than the immediate parent, generation has played a significant role as a source of knowledge and an active transmitter of plant diversity knowledge. More specifically, in 18 of the 31 cases, the grandfather is cited as the only significant teacher and mentor. In the other cases, the father or uncle (and in just one case, the mother), play this role. Thus, the family seems to provide the immediate context for transmission of indigenous knowledge. More importantly, almost all the sources happen to be male. Reproducing this pattern is the process of selection of children as proteges or apprentices by the elders. Seventeen of the 23 boys in this study could be clearly identified as boys who had been chosen by their elders (grandfathers mainly) as apprentices, to receive knowledge. This process is not evident in the case of some of the boys and all of the girls. An initial reading of these two complementary patterns—males as sources and purposeful selection of boys as apprentices—seems to suggest that at least as far as plant (specifically medicinal plant) knowledge is concerned, the process of selection of receivers of knowledge may be gendered. The feminist critiques of ecologists like Mies & Shiva (1993), and philosophers of science like Harding (1991) and Irigaray (1987), have noted that indigenous paradigms of science usually comply with patriarchal assumptions.

However, if a crude measure like the number of species about which the children are knowledgeable were to be used, there is little difference between boys and girls. The mean number of species for boys was about 66 (the range being 28 to 123), and the mean number for girls was about 64 (range of 47 to 101). There is a lesson here for curriculum developers.

Though boys tend to start with an advantage since they are deliberately selected by their elders as receivers of knowledge, girls who have had an opportunity to learn within the same indigenous cultures acquire comparable levels of knowledge. Use of girls as characters to convey curriculum messages, as in the successful 'Meena Communication Initiative' of UNICEF, may help overcome the tendency not to see girls as receivers of knowledge.[2]

'Rules' used by elders while transferring knowledge

This study identified four unwritten rules (with each rule being expressed in a variety of similar ways) used by elders to communicate certain values and beliefs. All the children in this study had 'learned' these rules over a period of time and believed that they were important in the management of plant diversity. The first rule indicates that many herbs cannot be grown near human habitations. The children justify this rule with the reason "the sanctity of the herbs may be lost." The underlying reason, as explained by the elders, is the traditional belief that menstruating women may "pollute" such herbs. This rule may have worked against conservation of diversity. While most children indicate that there is no need to cultivate useful herbs since they are "abundant in the forests", the older children indicate that the supply of herbs has been dwindling over time. Action to conserve existing plants or to develop new resources has not been evident. The need for a communication strategy to counter the lack of attention to conservation resulting from this belief is urgent.

A second rule that works against conservation is the belief that herbs should not be "grown"; rather, they should be allowed to develop in their natural habitat, and people should "take them according to need". While doing so, they should make certain offerings to the gods. Each family or community has a particular deity to whom offerings are made annually in return for the plants

collected from forests. However, this method of exchange does not contribute to the replenishment of the forest resources.

A third rule, important from the perspective of apprenticeship as a mode of education, is a very strictly followed one: “the one who knows about uses of herbs and serves people as a healer should not go alone to collect herbs. He has to choose someone to accompany him.” A few of the older children explain this practice as a way of teaching the younger generation the identification of herbs through on-site learning. This rule is stressed by most of the children and the elders as a very critical one. As one child put it, “When I was young I did not understand the importance and utility of this knowledge . . . . Later I realized I was my grandfather’s assistant when I collected herbs for him in his presence. . . . The one who cures has been given some supernatural powers by his ancestors and the herbs give proper results only when he himself or his chosen successor uses them.”

This belief also underpins the important choice made by an elder, discussed above, regarding the person who should be chosen as the successor. “An elder has to give his knowledge to someone, a disciple, from his own family. He not only gives away the theoretical and practical knowledge of identifying and using herbs, but also gives his supernatural power (*authors’ note: literally translated, this part of the quote would be: “gives his hand to his disciple”*) to cure people.”

A fourth rule, related to the uses of plants, is expressed best in the words of one student: “The first thing we are taught by our mentors is, ‘Do not tell this to anyone.’” This may sound paradoxical when one considers that the same children have listed the herbs and their uses during the biodiversity contests. However, as a few elders point out, the contexts are different, thus ruling out a dilemma. A contest is in the school and so in the formal education domain. Practice of one’s own plant knowledge is in a sacred domain that incorporates within it the responsibility to heal the sick with powers given by one’s ancestors and natural resources from the forests.

These four rules indicate that what knowledgeable children learn about management of biodiversity and plants does not promote the value of conservation; at the same time, the rules give a spiritual base to the importance of learning from their elders and to the knowledge so obtained. Thus, while transferring traditional knowledge to formal environmental education, village schools should develop specific communication and curricular strategies to promote a belief in active conservation, while retaining the importance of learning from knowledgeable adults by using the methods that elders employ successfully. The schools' approach should also be to develop systems of incentives for rewarding and conserving biological diversity. This, along with the communication of a belief in conservation, may halt the decline of resources noted by many participants in this study.

Methods and Processes of Education

If, as noted above, there is a culturally determined process of selection of boys (rather than girls) for apprenticeship, are there differences in the educational methods and processes employed to transmit knowledge? One aspect on which there is no disagreement is that the land-ecology complex (Daes, 1994) is the central 'classroom' site for biodiversity education. Thus, walks to the forests or farms, and practice of indigenous treatment at home, are the two major sites for learning. This is not surprising, since the features of apprenticeship which dominate the transmission of knowledge demand such sites. A second aspect on which there is remarkable uniformity is the age at which children start their deliberate learning about biodiversity: children are as young as five to seven years when they start learning. By the age of nine, many of them are well into their learning careers.

Regarding the methods used by the teacher-mentors (the elders), it should be noted here that there is a remarkable consistency among the methods reported by the child, its mentor, and other

elders who were asked about the methods used. The combined analysis of data from all three sources is summarized in Table 1.

Table 1: Teaching methods of mentors, by categories of children

Boys chosen to be receivers of knowledge	***Methods reported to educate girls***	***Boys not clearly identified as chosen receivers of knowledge***
Systematic instruction in identification, with detailed attention to morphological features of plants, and their uses	Systematic instruction in identification and uses Random instruction	Systematic instruction in identification and uses
Requests to bring specific herbs/ plants	Requests to bring specific herbs/ plants	Requests to bring specific herbs/ plants
Observation of use, practice by child Observation of treatment encouraged	Observation of treatment	Observation of treatment
Answers to questions Questioning about knowledge Questioning to check memory	Answers to questions Use of questions to arouse curiosity	Questions and answers important basis of instruction
Explanation and instruction through "kits" maintained by mentors	Child encouraged to listen to conversation and instruction	
"Utility perspective" instilled through deliberate instruction		

Though there is a significant similarity in the methods used for boys chosen to be receivers of biodiversity knowledge, other boys, and girls, a few crucial differences may be noted. With respect to boys who are expected to carry on the tradition, the attention to details—the morphological features of natural resources, the seasonal changes in the resource, and specific features like time of collection—is reported to be very high. The value attached to transmitting detail is important, since as one elder puts it, “Even a simple boil can be of many kinds; therefore, one needs to be specific.” This perhaps reflects a complex taxonomy and classificatory system that knowledgeable elders hold about natural resources, which may not be captured by a simple naming of a particular species. The application of an apprenticeship model also implies that among this category of children, their observation of practice is an important feature of their education. Most of the children in this study were in the apprenticeship stage; but there was one older child who saw himself as having progressed to the stage of “assistantship”. The process of apprenticeship seems to be fairly long, perhaps as long as eight to ten years.

A second difference is that boys who have been chosen as receivers of knowledge are subject to deeper levels of questioning—questions that test both knowledge and memory. An example of a knowledge-testing question is, “Why these leaves should be collected only in the mornings?” A more significant difference is that the chosen boys are exposed to the collections or practice kits of their mentors from a very young age, though they may not be allowed to practice. Such boys are expected by their elders to develop a “utility perspective” (a practical understanding of the use of plant material) and a familiarity with the material resources.

An important process that seems to apply to all children is the encouragement provided to, and a reliance on, questioning (Table 2). The processes of answering the questions posed by a child, or

commenting on its answers, appear to be crucial methodological features in the transmission of knowledge. However, in the case of boys not chosen to be receivers of knowledge, and girls, there appears to be more freedom among the children to explore and learn by discovery, with the mentors playing the role of knowledgeable coaches. In the case of boys selected to be receivers of knowledge, the process is clearly more structured and formal, with a greater emphasis on the accuracy of the knowledge transmitted. This emphasis underpins the important role of questions that check understanding and memory.

Table 2: Process elements, by categories of children

Boys chosen to be receivers of knowledge	***Methods reported to educate girls***	***Boys not clearly identified as chosen receivers of knowledge***
Formal process of checking whether requested samples have been identified correctly	Knowledge about uses of herbs monitored through questions, though practice not encouraged	Knowledge about uses of herbs monitored through questions
Questions encouraged Questions asked by mentors to check knowledge Child asked to reflect on answers to questions	Responsibility to ask questions more with the child Observation and questioning encouraged	Observation of practice Questioning encouraged Questions about particular plants to monitor learning posed by mentors
Stage of apprenticeship: observation, imitation of practice and monitoring by mentor identifiable. Sometimes, may extend to requests for assistance in practice	Though not identified as apprentices, many processes of observation, and practice, similar	
	Discovery encouraged by asking child to collect specific plants Informal learning by exposure to the practice environment encouraged	Listening to instructions given to patients Seeking by discovery encouraged

Implications for formal environmental education

The 'biodiversity contest' exposed the teachers and the schools to a curriculum innovation that brought out what children had learned in their community and family settings. Children's knowledge about local plant diversity is usually unrecognized since it is not directly relevant to the competencies the formal schooling system seeks to develop. However, recognizing such knowledge may counter the loss of self-esteem among some children who possess this knowledge but may have performed poorly in the formal system. This is an important insight noted by many of the teachers in this study. Thus, children who may have been labeled 'laggards' can be reoriented to the needs of the formal schooling system once a curricular innovation succeeds in tapping into the knowledge about other areas (plant diversity in this case) that the children possess. The biodiversity contest can also serve as a means to re-educate the local community and the children on what needs to be done to promote conservation. In only one of the 31 cases, was there evidence of the contest's having led to environmental action through the cultivation of plants that were rapidly disappearing. In this instance, the teachers discussed the results of the contest with the community, and changed beliefs about not allowing certain plants to grow outside the forests. This outcome was not planned, and indicates an area for improvement in contest design. When the teachers communicate the children's efforts to the elders, discussion on why certain plants that used to be abundantly available are now so rare, is bound to result. The teacher is then in a position to initiate further action. In other words, the contest should not end with the presentation of the children's efforts. Its results should be seen as a starting point for a discussion among the teachers, the community and the children.

Another set of unanticipated outcomes that the study uncovered was the effort made by teachers themselves after their participation in the contests. About half the teachers identify some changes

in their own pedagogical practices with regard to their teaching of environmental studies. They report an ‘imitation’ of the contest methodology, and trying to “bring the outside environment” into the classroom. Three other activities that seem to have been directly derived from the contest methodology are debates on issues of conservation, exhibitions and demonstrations, and initiating small experiments in conservation of local plants in school gardens. Some teachers have initiated ecology clubs which try to expand the ‘uncovered’ knowledge of the children through a range of activities like forest walks, building herbaria, preparing charts, establishing medicinal plant gardens, and so on. A few teachers have tried to identify new ‘sources’ of knowledge by inviting local ecological experts to spend some time in their schools. These results were unexpected since the teachers had not been instructed about possible follow up action. Perhaps the contests should have been followed up by systematic interaction with the teachers. If innovations like the biodiversity contest help teachers ‘make sense’ of the prescribed textual content, the result will be a pedagogy that is more exciting for the children.

Returning to the issue of transfer of biodiversity knowledge discussed earlier, this study indicates that knowledge of biodiversity seems to exist only in an “embodied” state (Bourdieu, 1997, 47). ‘Biodiversity capital’ resides in the person (and hence “embodied”) who has undergone a process of accumulation of knowledge through apprenticeship and informal learning through oral modes. When the issue of transmission of such capital arises, the apprentice selected has to undergo a similar process of learning. Under such circumstances, if this knowledge is to be conserved and transmitted—as it must be for the sustainability of environmental resources—systems must be created to record this knowledge in forms that can be used by others, so that it does not die out with its human possessors if they neglect to pass it on to the younger generation.

The culturally determined preference for boys as apprentices within indigenous traditions of knowledge transmission has been noted earlier. But the relatively minor differences between boys and girls as far as crude measures like the number of plants known and awareness of their uses are concerned; seem to indicate that the process of selection of apprentices need not be overemphasized. Indigenous knowledge transmission systems appear to accommodate the education of those children not chosen by elders to be future practitioners of traditional medicine. Secondly, the change in context from the sacred to a secular formal school seems to overcome any reservations that elders or children may have about discussing their knowledge and skills, thus enhancing the "discussability" of traditional knowledge. Thirdly, educational methods and processes identified above point towards certain learner-centered techniques like questioning to test knowledge, encouraging questioning and learning by discovery, and learning through observation. These three factors indicate a final conclusion: there is a clear window of opportunity for the formal schooling system to (i) draw upon the resources of local communities, for instance by devising clear roles for the elders as mentors of children, (ii) set conservation and educational agenda relevant to local contexts, and (iii) innovate by borrowing pedagogical and curricular elements of indigenous knowledge transmission processes, for instance, questioning processes and use of kits. Using this opportunity will help introduce a 'relevance reorientation' in formal education among disadvantaged indigenous communities.

Notes

[1] The biodiversity contests discussed here have been developed and conducted by field staff of SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutes), a non-governmental organization based in Ahmedabad, Gujarat, India. Further information is available at www.sristi.org. We thank all the staff who have been involved in the implementation of this educational innovation. Samir Joshi coordinated the fieldwork on which this paper is based.

Others who assisted in data collection were Shanti Hudiyal, Prabhu Bhadar, Ramesh Vaghela and Kiran Parekh. We wish to thank Professor Anil K. Gupta for his support in the field of biodiversity education.

[2] The cartoon character ‘Meena’ is a nine-year old South Asian girl who, with a lot of determination, addresses a number of development related issues—education, child rights, and health (see UNICEF’s website www.unicef.org for further details).

References

Atte, D. O. (1989). *Indigenous knowledge as a key to local development: possibilities, constraints, and planning issues in the context of Africa.* Seminar on Reviving Local self-reliance: Challenges for Rural/ Regional Development in Eastern and Southern Africa: United Nations Center for Regional Development and IRD, Africa.

Bassey, M. (1999). *Case study research in educational settings*. Buckingham: Open University Press.

Battiste, M. & Henderson, J.Y. (Eds.). (2000). *Protecting indigenous knowledge and heritage: A global challenge*. Saskatoon: Purich Publishing.

Berkes, F. (1999). *Sacred ecology: Traditional ecological knowledge and resources management*. Philadelphia: Taylor and Francis.

Bourdieu, P. (1997). The forms of capital. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds.). *Education: Culture, economy, society* (pp. 46-58). Oxford: Oxford University Press.

Cordell, J.C. (1989). Social marginality and sea tenure in Bahia. In J.C. Cordell (Ed.), *A sea of small boats: Customary laws and territoriality in the world of Inshore fishing*, Cultural Survival Report 26 (pp. 125-151). Cambridge, MA.: Cultural Survival.

Daes, Erica-Irene. (1994). Preliminary report of the special rapporteur: Protection of the heritage of indigenous peoples. E/CN.4/Sub-2/1994/31. Sub-commission on Prevention of Discrimination and Protection of Minorities, Commission on Human Rights. Paris: UNESCO.

Ericsson, K. A. & Smith, J. (Eds.). (1991). *Toward a general theory of practice*. Cambridge: Cambridge University Press.

Gupta Anil K. (1996). Getting creative individuals and communities their due: Framework for operationalizing Articles 8 J and 10 C. Paper presented to CBD secretariat. Ahmedabad: Society for Research and Initiatives for Sustainable Technologies and Institutions. Mimeo.

Harding, S. (1991). *Whose science ? Whose knowledge: Thinking from women's lives*. Milton Keynes: Open University Press.

Irigaray, L. (1987). Is the subject of science sexed? *Hypatia* 2 (3), 58-68.

Mies, M. & Shiva, V. (1993). *Ecofeminism*. New Delhi: Kali for Women.

Miles, M. B. & Huberman, A. M. (1994). *Qualitative data analysis*, 2d ed. Thousand Oaks: Sage.

Pandey, M. M. (2000). Curriculum transaction and evaluation: Some issues. *Journal of Indian Education*, 25 (4), 107-14.

Peacock, A. (1995). Access to science learning for children in rural Africa. *International Journal of Science Education*, 17 (12), 149-66.

Raina, V.K. (1999). Trends in curriculum development: International perspective. *Journal of Indian Education: Special Issue on Curriculum Development*, 25 (3), 126-36.

Richards P. (1987). *Local agricultural knowledge as a performance*. Paper Presented at IDS Workshop, University of Sussex, July 26-31, 1987.

Ritchie, J. & Ritchie, J. (1979). *Growing up in Polynesia*. Sydney: George Allen and Unwin.

Ruddle K. (2000). Systems of knowledge: Dialogue, relationships, and process. *Environment, Development and Sustainability*, 2, 277-304.

Ruddle K. (1993). The transmission of traditional ecological knowledge. In J. T. Inglis (Ed.), *Traditional ecological knowledge: Concept and cases* (pp. 17-31). Ottawa: Canadian Museum of Man and Nature.

Sharma, D. (1999). Curriculum development: Socio-cultural issues and problems. *Journal of Indian Education: Special Issue on Curriculum Development*, 25 (3), 74-85.

Wilson, E. O. (1988). The current state of biological diversity. In E. O. Wilson & Frances M. Peter (Eds.). *Biodiversity* (pp. 3-18). Washington: National Academy Press.