

**ECOLOGICAL KNOWLEDGE OF RURAL CHILDREN: EDUCATIONAL
INNOVATION AND NATURAL RESOURCE CONSERVATION**

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Abstract

Erosion of biodiversity has been an issue of concern for quite some time. But it is only of late that the erosion of the knowledge associated with such biodiversity has attracted attention. Two key local-level processes that may help in stemming this erosion are: (a) generating an attitude of curiosity and a sense of commitment to this issue among children and (b) enabling children to draw upon biodiversity knowledge extant in the older generations. At another level, a third process of valorizing alternative modes of knowledge may be required. Biodiversity-rich areas also exhibit poor educational performance. Children in these areas, however, possess a fund of informally-imbibed knowledge about biodiversity. Very often, such knowledge is unrecognized since it is not directly relevant to the competencies the formal schooling system seeks to develop. Thus, recognizing biodiversity-related knowledge may counter the loss of self-esteem that results from being labeled "laggards" and highlight the importance of conserving such knowledge. "Biodiversity contests" have the potential to initiate all these three processes. A biodiversity contest aims at uncovering, in a healthy competition mode, the ability of children to articulate their knowledge about local biodiversity, by drawing upon their own knowledge or that of their elders. This paper focuses on the methodological aspects of biodiversity contests, drawing on the experience gained with 14 contests held in various schools of Gujarat, India, in which 1562 children participated. These contests were limited to knowledge about flora. In a few villages, data regarding academic performance of the children were collected. The paper examines some preliminary results regarding the relationship of age, caste status, sex, and academic performance of the children with their performance in the contests. It concludes with some pointers for future action.

1.0 BACKGROUND

A biodiversity contest, in simple terms, is uncovering, in a healthy competition mode, the knowledge of children about local biodiversity.¹ In the experiment under discussion, the

¹ The "contest" mode is often criticized for its promotion of unhealthy competition and for succumbing to the "competition-based social ethos". This criticism is valid in the context of an increasingly visible tendency in society to let the ends override the means. The rewards system associated with the examination process supports this tendency. However, when the basis of taking part in a contest is an academic ethos which promotes uncovering of the knowledge base of children and which provokes curiosity and a desire to explore nature, the participation *per se* becomes important. This spirit is best exemplified by the participation of a twelve year old 'drop out' girl, Amriben Thakore, in village Tadav, who brought just one leaf of the Neem tree as her entry. This gesture was appreciated by the judges who awarded her a special gift. The prizes awarded to the best performers serve to reward the children for the knowledge they have imbibed and for the effort they put in for collecting the best specimens. Future contests could explore alternative ways of organizing, for instance, working through small teams, cooperative ways of collection and display of specimen.

definition of biodiversity was limited to plant diversity, primarily because of ease of implementation. Thus, in the present context, biodiversity contests included uncovering the children's ability to identify the plants in their environment and to catalogue their uses. The contests were limited to school-going children and were conducted as an extra curricular innovation with the help of school teachers. The specific goals were the following:

1. Scouting out of children knowledgeable in ecological matters
2. Strengthening the process of lateral learning among children through display of specimens and dialogue
3. Generating respect for excellence in ecological knowledge through recognition and reward
4. Inventorying children's knowledge of local plant diversity and eco-indicators (specific knowledge or thumb rules which indicate status of natural resources or presage occurrence of natural events)
5. Examining the value of biodiversity contests in enriching formal curricula.

Three such contests were initially held; two in Gangagarh, Uttar Pradesh (Mukhia 1994) and one in Madurai (Vivekanandan and Athimuthiah 1992).² The most striking feature of the Madurai contest was that the student of grade 5 who came first listed as many as 116 different species of plant along with their uses. The adult who was considered the best could identify 240 species. In other words, the student, only 11 years old, had already covered almost half the intellectual journey of the most knowledgeable adult of the community. Building on the knowledge base of such children can possibly prepare them for leadership positions in nature and conservation-related matters. The tragedy is that the reward systems in society do not appreciate such talent and rely on formal qualifications in spite of the well-known “diploma disease”. The next section describes similar contests held in Gujarat in collaboration with primary school teachers.³ In Gujarat four rounds of contests, covering 14 schools, have been held over the last three years. (See Appendix 1 for the list of schools.) These contests were

² All the prizes were sponsored by SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions), Ahmedabad and the Honey Bee network, and conducted by local partners of the network.

³ These contests, as well as the three contests mentioned earlier, focused only on flora.

primarily meant for school-going children. The participants included 905 boys (38.6 percent of a school enrollment of 2346) and 657 girls (47.2 percent of a school enrollment of 1372). Thus, 1562 children, out a total of 3718 children in the 14 schools (42 percent) participated.

2.0 PROCESS

1. The first step was to communicate the concept and purpose of the innovation (biodiversity contests) through initial letters followed by a group meeting of the teachers involved.
2. It was decided that parallel contests be held for students and the community. The idea was to tap the knowledge available in the community as well as to promote community-school links.
3. A printed pamphlet explaining the aims of the contest and the procedure for participation (see Appendix 2) was distributed to students and villagers. Since the schools were *ashram shalas*, the evening prayer gathering which is attended by all students was used as a forum for explaining the concept of biodiversity and distributing the printed pamphlets. The pamphlets were also distributed to parents, either informally or through the cooperative societies in the villages.
4. *Pilot testing*: Ten days after the first meeting with the teachers, a second visit to the host schools was made in order to expose the students to the concept of biodiversity. Groups of students, each group consisting of six to seven children, were formed at random. They were then taken to nearby farms and forest land. The children identified plants they were familiar with. Things worth noting, but which they had missed, were also pointed out -- for instance, the specific micro-locations of plants. This exposure served to familiarize the students with the contextual dimensions of biodiversity.
5. *Program scheduling*: The program schedule was announced in advance so as to enable the parents to adjust their timings. The contests were held in the afternoons of the specified days.
6. *Evaluation of the participants*: On the day of the contest, all the children were arranged in class-wise groups. A list of the participants (class-wise) had been prepared by the teachers in advance in order to facilitate the administration of the contest. Each child had brought

specimens which he or she had collected and arranged on thick sheets of paper or cardboard. Evaluation committees of three members each, were formed. Each committee covered one or two classes, meeting the students allotted to it one by one. Every school had at least one teacher very knowledgeable about and interested in local biodiversity. The evaluation criteria used were the following:

- Number of specimens brought by the student.
- Number of plants listed by the student.
- Presentation style.
- Novelty of the specimens brought.
- Knowledge about uses and habitats of plants.
- The committee members graded the children separately. All three scores were then combined to arrive at an average figure for every child. The children were then ranked according to their average scores.
- The winners were awarded prizes which included school bags, crayon sets or art material. All participants received a token gift (a pencil set).

7. *Parallel activities:* On-the-spot drawing competitions for children on themes related to environment and biodiversity, were also conducted. The drawings were displayed in the school classrooms and evaluated on the bases of the idea, use of colour and composition. Prizes were awarded to the best drawings. Singing folk songs and writing poems on environment-related issues were other activities conducted when spare time was available. In addition, a quiz program on environment-related issues was conducted in Jalotra.

3.0 PRELIMINARY FINDINGS

3.1 Knowledge about biodiversity and related factors: A preliminary analysis

The contests under discussion were aimed at scouting out children who were knowledgeable about plants and inventorying their capabilities in this field. They were not specifically designed to examine the relationship between the plant diversity knowledge of children and the potential of children to perform in the schooling system (academic performance). Nor were they

designed to determine the correlates of biodiversity knowledge. However, a few tentative explorations to generate issues for in depth examination later, were made. Specifically, academic performance, as measured by the rank obtained by the students in their school examinations over the previous year, was compared with the number of plants brought or listed, which was assumed to indicate knowledge about biodiversity. The results of this exploration are summarized below. (It should be noted that the contests were held with the help of volunteers and school teachers. Data collection tended to concentrate on the factors which were locally relevant. For instance in a few villages, lists of plants were prepared by children. Such lists were not prepared in all villages. These variations are reflected in the summary reported below.)

3.1.1 Plants brought and listed

The average numbers of plants brought and listed are presented in Table 1.

Table 1: Number of plants brought and listed (eight villages)

<i>Village</i>	<i>Children</i>			<i>Mean # of plants</i>		<i>Highest # of plants</i>	
	<i>Boys</i>	<i>Girls</i>	<i>Total</i>	<i>Brought</i>	<i>Listed</i>	<i>Brought</i>	<i>Listed</i>
Tadav	79	32	111	4.1	135.0	35	305
Jalotra	70	71	141	4.5	52.4	34	300
Thalvada	51	33	84	2.3	-	14	-
Padan	40	3	43	6.8	-	16	-
Ambla	216	172	388	18.0	-	70	-
Dholwani	79	82	161	12.1	-	60	-
Makhiyala	79	62	141	31.4	-	72	-
Ninghat	31	26	57	6.1	-	32	-

The performance of the children of Tadav and Jalotra schools, broken down by caste (scheduled castes and tribes, other backward classes and other communities), by sex (boys and girls) and by stage of schooling (lower primary—grade five and below; upper primary—grades six and seven) is described in Table 2.

Table 2: Performance of children, by sex, caste, stage of schooling: Tadav and Jalotra schools

Category	Participants			Mean # of plants	
	Boys	Girls	Total	Brought	Listed
All children	149	103	252	4.3	88.4
Boys				4.8	103.2
Girls				3.5	66.9
Scheduled castes/ tribes	31	23	54	4.2	117.1
Other Backward Classes	64	32	96	4.3	73.8
Others	54	48	102	4.3	87.8
Lower Primary	57	67	124	3.8	55.8
Upper Primary	92	36	128	4.8	120.6

In these two villages, about 80 percent of the students had brought five samples or less. However, the highest number of samples brought in Tadav was 35. Likewise, while 43 percent of the children listed 50 plants or less, 39 percent had listed more than 100. These figures indicate the existence of a rich knowledge base among primary school children, perhaps unevenly distributed, in matters relating to identification and utilization of plants. This base needs to be explored further.

The differences between the means of the plants listed are displayed in Table 3. There are significant differences between boys and girls, and between the children lower and upper primary stages. The differences between the scheduled castes and tribes (these categories were clubbed together since there were only three children belonging to the scheduled tribes) and other communities are also significant. Knowledge about plants appears to be significantly high among those castes ranked lowest in the caste hierarchy. This issue needs further exploration.

Table 3: Differences between means of plants listed

Categories compared (means in brackets)	<i>t</i> value	df	<i>p</i> values
Boys (103.2) Girls (66.9)	3.57	250	0.000
SC/ST (117.1) OBC (73.8)	3.14	148	0.002
SC/ST (117.1) 'Others' (87.8)	2.20	154	0.029
Lower primary (55.8) Upper primary (120.6)	-7.11	250	0.000

3.1.2 Correlation between academic rank and performance in biodiversity contests:

Jalotra and Tadav

In an effort to explore the relationship between the performance of children in the biodiversity contests and their academic performance, the correlation between their ranks in the

biodiversity contests and their academic ranks (ranks obtained in the latest annual examination conducted by the schools) was examined. Academic rank appears to be positively and significantly correlated with biodiversity rank (correlation value of 0.2063, significant at 0.01 level), though the value of the coefficient is small. One reason for this correlation may be that since all the students come from relatively homogeneous environments—in the sense that they are all exposed to the same environment of biodiversity, it is reasonable to expect those who do well in class also to perform well in biodiversity. Perhaps if the contests were to be held for mixed groups (students from different environments) the relationship of biodiversity knowledge with academic performance may be brought out better.

Academic rank is not significantly correlated (though the sign is negative) with number of plants brought and listed (Table 4).

Table 4: Intercorrelations: Plants brought and listed, academic and biodiversity ranks, Tadav and Jalotra

	Plants brought	Plants listed	Academic rank	Biodiversity rank
Plants brought	1.000	0.2336**	-0.0572	-0.2320**
Plants listed		1.000	-0.0873	-0.2607**
Academic rank			1.000	0.2063**
Biodiversity rank				1.000

The biodiversity rank appears to have incorporated the number of plants brought and listed into it quite well, since its correlation with the plants brought and listed are negative and highly significant. The rank, then, also reflects the evaluation of the students’ verbal and presentation skills. Disregarding these skills, that is equating the biodiversity knowledge with only the number of plants listed and brought, indicates that there is no significant correlation between the latter and academic rank. This issue needs further exploration.

3.2 Pedagogical value of the contest : Feedback from teachers

Thirty-six teachers from the five schools of Padan, Tadav, Jalotra and Thalvada and Valavada provided written feedback on the contests. Their comments were coded and are presented below (Table 5).

Table 5: Feedback from teachers

<i>Dimension</i>	<i>Frequency</i>
A: Identification of alternative knowledge systems	
Knowledge of various plants uncovered, environment subject links clearer	14
Medicinal uses of plants were brought out	4
B: Pedagogical value	
Children's interest in school and their curiosity went up	7
Visit to nearby farms and other locations initiated	3
The methodology of the contest was novel and interesting	1
C: Possible methodological modifications	
Parallel activities like debates on the issues of conservation and exhibitions, demonstrations can be introduced	7
Initiating conservation of local plants in a school garden is necessary	2
Contests should include not just the identification and knowledge but also action taken to increase local biodiversity; for instance conservation	2
Contests should be organized in other seasons like monsoon	6
Evaluation may be done on the basis of therapeutic uses of the plants	1
Contest may be organized in groups, involving community	3

The feedback illustrates an important linkage between the biodiversity contest and the environment subject taught as part of the formal syllabus. If such efforts can help teachers 'make sense' of the prescribed textual content, the result will be a pedagogy which is more exciting for the children. The teachers have also indicated the nature of some of the follow-up activities necessary. An important suggestion is extension of the contest to conservation action. However, a larger program of extending the biodiversity contests, to be sustainable, will have to be 'owned' by the teachers themselves. Those who were involved in the contests could form an informal forum to discuss the related issues and carry forward a program of action.

4. MAJOR LESSONS AND FUTURE PLANNING

This section deals with the major lessons which have been learnt from this experience and suggests follow-up activities.

4.1 Participation: Most of the contests were held in semi-arid or forest areas of Gujarat, where the educational problems of 'drop-out', poor enrollment and low achievement are more severe. About 42 percent of the enrolled children participated, with boys being more

enthusiastic. Though the contests were conducted through the schools, and therefore were perceived to be for school-going children, in a few villages a few physically handicapped children and children who had dropped out of school did take part. Future contests should aim at participation of all sections of children, especially girls, 'drop-outs' and the non-enrolled.

4.2 Methodological aspects: In all the contests held so far, the focus was on flora. Future plans may include other forms of biodiversity like fauna. Some of the teachers who participated in the contest suggested that the jury should go to the children instead of the children coming to the jury. One way to do this is making children sit in rows (group-wise) with their specimens, and to ask each member of the jury to visit them individually. Other ways can be worked out in consultation with the partners. The contests should also be replicated in different seasons in order to encompass the seasonal diversity. Also if specimens can be obtained in pairs, one can be sent for identification and the other can be preserved in a herbarium.

4.3 Accountability towards partners: The schools which helped in the organization of the contests were presented with token gifts like wall-clocks or books. However, it is very important that they should be aware of the major outcomes of the contest. Some of the schools have shown interest in developing biodiversity conservation centres. The idea of helping schools prepare their own herbaria was tried out successfully in one school and may be replicated in other schools. A mobile exhibition on general information on biodiversity is another activity that may be taken up. Follow-up activities like creating school nurseries and gardens, and in-situ conservation banks of valuable local plant diversity may need the support of local institutions like the panchayats.

4.4: Networking interested teachers: The feedback provided by teachers of five schools was presented above. Many of them have been motivated by the contests to explore the alternative knowledge systems of children in greater detail. Such teachers may be networked in order to develop a group of teachers who can work consistently on biodiversity conservation-related issues.

4.5 Rich knowledge base of eco-indicators: Another spin-off benefit of these contests was the identification of about 60 eco-indicators (local proverbs, saying or beliefs that indicate

the occurrence of some natural phenomenon—impending rainfall, high soil-fertility, presence of water etc.) through discussions with the parents and also some children. This process was related to the discussions that children had with their parents before the contests. In other words, in some places the contests may have spurred the children to gain knowledge by talking to their parents. If contests were to be organized twice at the same place—the first a surprise contest and the second a planned one which gives enough time for preparation—the inter-generational transfer of knowledge may be assessed.

4.6: The future of “little geniuses”: Regardless of the relationship between academic performance and biodiversity knowledge, it is evident that there are many children in educationally-backward areas who possess a wealth of knowledge about biodiversity. Unfortunately the reward systems in society are so structured that they often discount alternative knowledge systems. It is likely that such children, from the dry and forest areas, will find their way into the ranks of the “unskilled labour”. The formal schooling system does not provide scope to such children to develop as naturalists or herbalists. The nurturing of such children should be a matter of great concern. Simple steps like organizing nature-tours for the winners of the contests, or setting up nature clubs or a newsletter, or running summer camps, may provide some rewards to these children.

If such children can be encouraged to become teachers themselves, the transfer of their knowledge to the next generation would be greatly facilitated. Any program of biodiversity conservation must ensure a sense of belonging and active participation by children and the community. Mentoring of the knowledgeable children with outstanding primary teachers who have developed educational innovations on nature-related aspects, may also be thought of.

References

- Mukhia, S. 1994. Contacts with young minds. *Down to Earth*, April 15.
Vivekanandan, P., and Athimuthiah. 1992. Report on biodiversity exploration. Mimeo.

APPENDIX 1

List of schools in Gujarat where biodiversity contests have been held

Virampur, Banaskantha district
Amirgadh, Banaskantha district
Sembalpani, Banaskantha district
Thalvada, Banaskantha district
Jalotra, Banaskantha district
Taday, Banaskantha district
Padan, Banaskantha district
Nandanvan Ashram school, Chhikari, Sabarkantha district
Valavada, Valsad district
Ambla, Bhavnagar district
Dholwani, Sabarkantha district
Ninghat, Bharuch district
Two schools of village Makhiyala, Junagadh district

APPENDIX 2

Invitation to participate in biodiversity contest

Dear friends,

Our country is richly endowed with a wide variety of natural wealth. However, this wealth is getting eroded. Knowledge about such wealth and about conserving our biodiversity is also eroding. In order to reverse these trends we have to make this kind of knowledge important. Children, who are the future citizens of this country, need to be involved in this movement. If children are to be involved, the schools also have to be involved. If the schools have to be involved, the matter taught in the schools and the ways of teaching will have to accommodate such knowledge about biodiversity and its conservation.

One starting point is to recognize and reward children's practical knowledge of plants. We plan to do this through a biodiversity contest to be held at your primary school on the date and time given at the end of this pamphlet.

Who can participate: Any child, whether going to school or not attending school, girl or boy, can take part. There will a separate contest for parents also.

How to participate: On the day of the contest, each participant should bring as many samples of plants or plant parts as he or she can identify and name the uses of. The samples of plants should have at least the fruit, flower or sufficient leaves so as to facilitate identification. The participants will be 'quizzed' by a panel comprising of local herbalists, elders and scientists and the evaluation will be based on the quality of information and the number of samples brought. The best performers will be awarded prizes.

How to prepare samples: The samples should be collected before the contest and dried by pressing in between old newspapers. The well dried samples pasted or stitched on thick paper. On the reverse, or on a separate paper, the names of the plants and their uses should be written down. The teachers of the school will be happy to help in the writing down in case you have any difficulties in writing.

We wish the participants all the best.

Date of contest: _____ **Time:** _____
Venue: _____ **Primary School**

In case you need further information please contact the teachers of the primary school