Appendix 11

MEETING AT INDORE ON 21-22 APRIL, 2007 TO DISCUSS CLASSES IX-X SCIENCE A REPORT

Uma Sudhir and Arvind Sardana, Eklavya Indore,
May, 2007.

PEOPLE PRESENT: Lalima Tiwari, Bharti K, Umesh Singh Rathore (all three teachers from Choithram School, North Campus), Uma Sudhir, Arvind Sardana, G. S. Holkar, R. K. Khambete, Anil Dixit, Aamod Karkhanis, Javed Siddiqui, P. Manaswini, Rama Chari, Anu Gupta, Bholeshwar Dube, Kishore Pawar, Jaishree Sikka, N. K. Jain, Tushar Tamhane, Bharat Poorey, Sushil Joshi.

In our last meeting in Indore (Feb 18-19, 2007), it had been decided to approach the work towards a curriculum / materials for classes IX-X Science by a) reviewing the present class IX NCERT textbook and b) reviewing the literature in Science Education. Further, it had been decided to fix a time-frame for this work and present it in April. So, the broad agenda for these two days was to:

- discuss the reviews of the various chapters.
- discuss new ideas emerging from research in Science Education.
- cover the various issues that had been brought up during the Delhi meeting and by people on e-mail.
- chart out the course at least for the immediate future.

This report covers these discussions broadly. This should be read along with the detailed review documents.

It was decided to start by discussing the 'Chemistry' chapters. Since only Sushil had reviewed all the chapters, the discussion was centred on his review. The focus was on the shabby manner in which foundational concepts like the particulate nature of matter had been covered and dismissed. In addition, the obsession of the textbook with fine definitions came in for sharp criticism with which Holkarji agreed.

During the discussions, the futility of giving activities that are not meant to be done was discussed. It was also pointed out that hurrying the students to some conclusion without adequate analysis wasn't helpful in forming concepts. Many of the activities in the first four chapters were pseudo-activities. This comes from not being clear about what is being attempted. Sushil suggested that alternative approaches were possible.

The discussions on the 'Physics' chapters were a lot more lively – we had multiple reviews of most chapters, and we had both physicists and physics teachers present. There was broad agreement that the topics that were covered in these chapters could be and should be covered at high school level. Unlike in chemistry, there was an un-stated consent on what is to be taught. But in most cases, the approach adopted in the textbook met with disapproval and the lack of examples from daily life was particularly galling. Aamod also made a point that most examples of inertia that were given involved two loosely coupled bodies. Further, some concepts were not dealt with in sufficient detail or linked properly, nor were explanations possible at that stage (for example – the graphical representation of velocity *vs.* time – the area under the curve giving distance travelled).

Other problems with the text that were discussed were : measurement as a scientific skill had not been covered at all; the direction of the velocity was not mentioned in each case even after saying that velocity is a vector; and numericals had been introduced in a manner that would overwhelm the child. Manaswini, Rama, Aamod pointed out many loose statements. While discussing velocity and acceleration, Aamod wanted to know if there was any way of measuring acceleration directly, to give the children a feel for how acceleration changes.

The discussion on the first three 'Biology' chapters was incomplete because the review had focused more on errors and presentation in the content without taking into account the approach to the subject. The discussion digressed into a tangent about the purpose of the entire exercise. There were two lines of thought. One view was that, while accepting the broad subject areas, one could still come out with a better text that would have a wider audience. The other line of thought was that this exercise would soon come up against constraints of syllabus, exams, availability of equipment etc. While marginal improvements were necessary, we should really be looking at the approach to the subject, and eventually come up with

an alternative curricular framework. Dixitji would circulate the biology review of the Indore group.

Aamod presented a poster they had prepared to teach the process of soil formation. It substituted photos from field-trips and tried to get children to think about how processes they can see around them could lead to soil from rock. This was presented as an alternate approach to one of the topics which are a regular feature in middle and high school textbooks.

Among the other issues that came up for discussions was the feasibility of preparing a source-book for teachers. Lalima and Tushar were quite emphatic that there would be many takers for such material. The need to develop a totally new outlook on curricular objectives was also discussed, but this, of course, requires a more extended discussion. It was suggested that one should explore multiple approaches to a concept as Satyajit Rath had been pointing out. These reviews of the class 9 text should be collated and a document prepared which could be shared with the NCERT team. It would be useful in the process of revision whenever that is taken up.

Uma presented the findings of a few studies on how the prior formulations or alternate conceptions of children affect the way they learn science. A detailed note on this would be circulated later. There was also a need to address the issue of the nature of Science while teaching science at a classroom level. Two relevant issues came up for discussion. One, we need to know what frame of mind the child is in before we plan new material. For this, besides reading up on studies done elsewhere, it would be important to do our own mapping of these issues and maybe take up some areas for detailed analysis. Second, how the knowledge of the tentative nature of science influences the way we present it as a subject. The practice of science, history of an idea, current policy controversies (GM crops, polio vaccinations, *etc.*) do not usually find a place in textbooks. These issues would require separate workshops to discuss their implications.

Tushar suggested a project-mode and Aamod gave some examples of projects that had been presented in the National Science Exhibition. He suggested that we could make use of such fora to encourage children to go beyond textbook knowledge.

We shared Vijaya's note with the people present before we went on to consider the work ahead. We would, of course, have to put together the reviews we have received into a coherent whole. Regarding the fresh work on class IX-X curriculum / materials, the following points came up:

- Whether we would develop a broad framework first or prepare suitable materials on specific topics that we choose – in the latter case, what topics we would consider first.
- We would need to know the level of the students – what is the feasibility of doing various studies for this? Or, do we base our work on the studies that have already been done? Interaction with schools with this purpose in mind was suggested. This would start with a training for high school teachers during the summer holidays followed by monthly meetings during the academic year. Some of the topics that could be covered were also discussed.
- It was suggested that we work on various alternative approaches to any topic, and later decide whether there was any particular approach we would like to espouse. That is, there should be an open-ended quest initially on what to teach and how one would go about teaching it.
- In addition to the content matter that would be dictated by various disciplines, were there any specific skills that the children needed to develop in high school?
- There was general consensus that the children would need to move towards quantification and abstraction at high school level, but 'how' and 'how much' of this needed to be worked out.
- It was by and large agreed that we should work on resource materials for teachers.

After the workshop, Sushil wrote a note that adequately sums up the dilemma:

"Looking at the recently held meeting at Indore (21-22 April, 2007), I feel that two trends are clearly discernible. This can also be read from the chapter reviews presented by various people. One trend is a desire to make improvements in the textbooks prepared by NCERT. These improvements may relate to correction of mistakes, making activities more do-able,using language more friendly and lucid, including some new text etc. In fact, this approach takes the present curriculum and syllabus as given, although most

of us have not had a look at them. The group suggesting this approach would like to accept that the books are what needs to be looked into. Although it might be true that what ultimately reaches the students are the textbooks, but one must also look into the theoretical framework, which informs these. The main argument in favor of this approach is that it would give quick results at the school level and the material so prepared would have lots of takers.

The second approach is to have a look at the curriculum and syllabus and review the textbooks with respect to them and see if an alternative treatment of the given curriculum is possible and desirable, or whether the curriculum framework and syllabus also need to be challenged. It is possible that this approach would take a long time to come to some tangible results and if at all it produces such material results, there might be few takers for the same…. However, given the composition of our own group and its diverse expertise, I am sure we would need to proceed on both approaches."

What is being suggested is that we work on both ends. At one end we identify some 'core' topics selected tentatively and allow small teams to develop these along with teachers in a manner that would be desirable. At the other end we conduct workshops whereby we can examine studies on how children learn concepts in science and plan our own mappings\investigations. Besides this we need to look at the theoretical underpinnings of various curricula in science.

Science Intiative

Eklavya – CSEC Consultation meeting
28-29 May 2007
Delhi

Agenda was as follows:

Summary of discussions

Possible things we can do

1. Critique NCERT textbooks, suggest improvements
2. Work on developing an alternate curriculum
    A. Vertical development of HSTP
    B. Develop a new curriculum for Classes VI-X
3. Develop supplementary materials
4. Work towards a major change in the exam system

Route 1: Improving NCERT textbooks

- This involves critiquing the books and 'improving' selected chapters
- Pluses
    - Short time scale
    - Ready takers
    - Some members of the group want to do primarily this
- Minuses
    - Limited in scope
    - May take away precious human time
    - Legitimises the idea of national textbooks

Route 2A: Developing HSTP vertically

- We assume that the curriculum organisation and the pedagogical principles of HSTP are all valid, and develop Bal Vaigyanik IX and Bal Vaigyanik X
- Pluses
    - Can be done without too much reading/research
- Minuses
    - HSTP is 35 years old, much subsequent work on science education exists, some of it may question assumptions of HSTP

Route 2B: Developing a new curriculum for classes VI-X

- Revisit HSTP, including its assumptions; create a new curriculum for classes VI-X
- Pluses
    - It's the most exciting thing to do!

- Minuses
  - Will involve extensive reading/research
  - We may not have the human resources for the task
  - The time scale will necessarily be long
  - Who will be the takers?

Route 3: Creating supplementary materials
- Develop supplementary materials, loosely linked to the overall curriculum
- Pluses
  - Short time scale
  - Least likely to attract opposition
- Minuses
  - "Where is the time?"

Creating supplementary materials II
- How about teacher-independent materials?
- Thematic modules

Route 4: Working to change the exam system
- Work as a pressure/advocacy group towards major changes in the exam system
- Pluses
- Minuses
  - Nothing, it has to be done, alongside whatever we decide to do

Options before us
- 0.5, 2A and 3
- 0.5, 2B and 3

Here 0.5 stands for ½, i.e. critique the NCERT books but don't spend time on improving them

Mode of working
- Essential ingredients:
  - In-house academic core group (at Indore?)
  - Extended resource group
  - Partner agencies (Eklavya + CSEC + VBS +??)
  - Access to schools (~25) – where??
  - Funding (possible sources – DST, MHRD, MAPCOST, …)

Phase-wise plan of action
- Phase I July 2007- June 2008
  - NCERT textbook review

- Read & review Sc. Edu. Literature
- Seminar – share ideas on science education
- Create some (say 4) modules (for teachers)

- Phase II January 2008 – June 2009
  - Create a draft curricular structure
  - Create and try out pilot curricular materials

- Phase III July 2009 -
  - The Real Thing

Modules for Phase I

- Thematic modules for children
  - Teacher-independent, to be read and done by children at home, Examples:
- Sourcebooks (?) for teachers
  - Attractive, well-produced materials, including background reading, suggested activities, conceptual clarifications, etc.
  - Note: see Harvard Project readers

Who will do what

- Identify modules for Phase I (incl. looking up Sandarbh, BV, Chakmak) – Javed, RKh, VSV, PKS
- Coordinate textbook review – Arvind, Sushil
- Read & share Sc. Edu. Literature – Uma, Sushil
- Prepare concept note for seminar – VSV
- Prepare proposal – AM, AS, HKD
- Circulate this summary – AM