A New Curriculum for Primary Science

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Prof. Jayashree Ramadas
Homi Bhabha Centre for Science Education
Tata Institute of Fundamental Research
V. N. Purav Marg, Mankhurd
Mumbai 400 088, INDIA

email: jr@hbcse.tifr.res.in
fax: 91-22-2556 6803, 2558 5660

Over the last few years, schools around the country have been testing out a new curriculum developed by the Homi Bhabha Centre for Science Education (HBCSE) of the Tata Institute of Fundamental Research (TIFR). This curriculum is unique in that it is emerging out of a systematic process of research, field-work and classroom trials. Its content is based on simple, cognitively and contextually appropriate, activities that link textbook science with the immediate environment of the child. The books for Classes 1-5 are titled "Small Science" in English and "Halka Phulka Vigyan" in Hindi and Marathi.

About the books

"Small Science" builds upon the natural curiosity of young children. The activity-based approach derives from the idea that first-hand concrete experiences at an early age gradually strengthen the child's capacity to construct abstract formulations. Curriculum units are therefore developed around a series of activities and exercises which help children explore and understand the world around them.

The books interweave a story about two curious children, Mini and Apu, who learn many things by observing, doing, inquiring and reflecting on their experiences. A large number of questions stimulate students to observe and think beyond the book, while stories and poems enliven their reading. A WorkBook provides a format for recording results of the activities and exercises. The same format enables continuous assessment of the student's work.

A Teacher's Book provides conceptual guidance and practical hints. Substantial effort has gone into providing the teacher with background information relevant to the Indian socio-cultural, geographical and natural-historical context. Results of classroom trials are conveyed through first-person accounts in the Teacher's Book. The set of books are professionally designed to make them attractive, functional and easily adaptible under conditions prevailing in Indian schools.

More information about the curriculum along with sample PDF chapters can be found at **http://www.hbcse.tifr.res.in/smallscience.**

Aims of the curriculum

The need today to release children and teachers from the tyranny of rote learning. "Small Science" discourages memorisation of text, focusing instead on acquisition of tools of learning: namely, observation, design drawing and construction, along with basic scholastic skills of speaking, reading, writing and calculating - as elaborated next.

Language development: Primary school children are actively developing their language ability. Language is a tool that will help them to conceptualise, to understand, and to express their thoughts. The exercises in the curriculum require students to observe, describe and construct arguments through both speaking and writing.

Quantitative thinking: This is usually missing from science curricula. We introduce estimation and measurement in Classes 1 and 2 and then use it progressively throughout the curriculum. Tables, charts and graphs are frequently used.

Design, drawing and construction skills: These have always been a weak point in Indian education. This curriculum integrates, with each science theme, situations for students to develop their skills of drawing and construction. Students put down their plans or their observations in drawing, thereby developing both visuospatial and manual skills.

Values: Implicitly conveyed are attitudes of inquiry, working with the hands, social equity, care for living things and conservation of natural resources. The books encourage gender and social equity and concern for the environment. They also try to communicate that scientific enquiry into the external world does not exclude a role for feelings and emotions.

Literary and aesthetic sensibilities: The books include exercises on story and poetry writing. Another area of the arts that we seek to integrate with the science curriculum is acting or role-playing in which students might act out the parts of say, different animals, or molecules of air, or the organs of the digestive system.

Usage and feedback

"Small Science" is currently being used by about 2500 students in classes 3-5. The schools span a wide range: from elite urban schools to schools for children of tribal communities and migrant workers; from conventional mainstream to progressive "alternative" schools. The curriculum is known and viewed favourably within National and some State education bodies. In the last two years two States have adapted or incorporated portions of these books into their own textbooks.

We have found that students very much enjoy learning from these books; but systematic studies of their learning need to be carried out.

Teachers' perspective

Over the last few decades, ideas of inquiry learning have slowly permeated into the education community in India. Enlightened teachers and decision-makers realise the need to reduce rote learning and get students to think for themselves. But there remains widespread scepticism about of the practicability and value of activity-based teaching. A common question is, such activities might be enjoyable and motivating, but do they lead to any learning? The problem is compounded when learning is defined in terms of performance in examinations, which tend to test rote reproduction.

Yet we find that teachers appreciate this curriculum's combination of enjoyment in science with accountability in learning (through the workbooks) along the level of support extended to them through teacher's handbooks. A common reaction is, "these are the kind of books that we have been looking for."

Some of the schools have adopted a compromise solution on examinations: they determine 50% marks through continuous assessment from the WorkBook while the remaining 50% are allotted through formal tests and exams. This solution has also helped satisfy some anxieties expressed by parents.

Follow-up is in progress in two schools within the city of Mumbai to assess how the teachers are able to handle the curriculum. An email list functions to collect feedback from schools in other parts of the country. FAQs are posted on the curriculum website. At the same time teacher orientation remains a pressing need. A program of orientation has been initiated, first with a few schools working in rural Maharashtra.

Parents' perspective

Participation of the larger community is critical to the success of any curriculum. In schools for disadvantaged students such participation tends to be hard to obtain while elite urban schools sometimes have to deal with excessive parental anxiety.

Feedback on "Small Science" from urban parents has generally been positive. But there are concerns too in having to deal with a new kind of curriculum, where there are no fixed answers and where rote learning does not work. There are no "guides" for this curriculum and in fact there is no place for guides in the entire methodology. Such problems need to be discussed with teachers so that they are in turn empowered to discuss them with parents. As a start, a letter addressing concerns of parents has been sent to participating schools and is put up on the curriculum website.

This then is a report of work in progress. Feedback from the Learning Network will be important for the further development of this curriculum and we hope to obtain it at the forthcoming conference of the Network.