To Identify and Structure Technology that Has Already Crept into the School Curriculum

P. K. Bhattacharyya

National Council of Educational Research and Training, New Delhi, India

The 20th Century has seen an extraordinary growth of information base and development in Science and Technology. 80% of the technologies we shall work with by the year 2050 have not been invented yet. As per current rate, knowledge is doubling every three years. The quantum of knowledge today will grow a million times by the time a seven year old of today reaches seventy. In a decade or two scientific and technological skill sets of higher order will be required for any job. So children of today must have scientific and technological literacy if they are to live productive lives and participate effectively in the work place.

The projection of turn-over in IT in 2007 in India is Rs 40 lakh crores; there will be 22 lakh jobs by then. The parallel growths of technological knowledge and IT have left the school curriculum totally stunned – how much more to stuff in the school bag? Perhaps the solution lies in planning a flexible science and technology curriculum which will use IT for teaching and learning at all levels in the school. In this context portions of the National Policy on Education (NPE –1986) of the Govt. of India concerning science and technology, which will be relevant for our discussion, are reproduced here:

> 'As computers have become important and ubiquitous tools, a minimal exposure to computers and a training in their use will form part of professional education. Programmes of computer literacy will be organized on wide scale from the school stage' (NPE – 6.5).
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> With the recent introduction of computers in the schools, educational computing and the emergence of learning through the understanding of cause-effect relationships and the interplay of variables, the teaching of mathematics will be suitably redesigned to bring it in line with modern technological devices' (NPE – 8.17).
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> Science education programmes will be designed to enable the learner to acquire problems solving and decision making skills and to discover the relationship of science with health, agriculture, industry and other aspects of daily life. Every effort will be made to extend science education to the vast numbers who have remained outside the bane of formal education' (NPE – 8.19).
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> 'In order to meet the continuing needs of updating curriculum, renewal should systematically phase out obsolescence and introduce new technologies or disciplines' (NPE – 6.11).

Technology Policy was announced by the Govt. of India in 1983**.** This Policy foresaw "attainment of technological competence and self-reliance" and "consolidation of existing scientific base and selective strengthening of thrust areas". The Science & Technology Policy of Govt.of India- 2003 has elaborated a 16- point strategy and implementation plans, e.g. S&T governance and investment, optimal utilization of existing infrastructure and competence, strengthening of infrastucture in academic institutions, new funding mechanism for basic research, human resource development, etc. These aims demand development of human resources right from the school level.

NPE – 6.11 stressed the need to update curriculum to phase out obsolescence and introduce new technologies which rule our activities today. This prompted researchers to bring out dimensions like frontline curriculum, cutting edge curriculum, flexible curriculum, renewal cycle of curriculum, ways and means to teach science as 'Science and Technology'. Science education was renamed as S&T education by the UNESCO in the eighties. World Council of Association for Technology Education was set up with UNESCO,s initiative in 1993.

In India, school science textbooks of today have in fact enough *technology* content, though unfocussed and unstructured. This has been analysed in this paper, as this exercise will be able to give input to the research for bringing out the next generation of text books on *science and technology. Technological* terms numbering nearly 300 in books for classes III to V and nearly 900 in science books for classes 6 to 8 were found. Going by the number of lessons carrying technology in the text books of classes III to V, 59%-68% of lessons in Environmental Studies (social studies), 23%-

32% of lessons in English , 14-21% of lessons in Hindi and 50-69% of lessons in Mathematics carry science and technology terms, topics, names of inventors, etc.

If we seriously want to decide the dose of *technology* for the age group 9-14 , we might catch them at this stage for effectively taking part in decision-making process required by any technological community of this century. Terms like satellite communication, mobile phone, internet, microwave oven, fuel cell imply newer technologies reforming older ones like telegraph, telephone, primus stove, lead-acid cell, etc.

For each technological term, establishment of language connection is most important, *Technology* is a typical ally to science. Could the *technological* term be linked with history, geography, mathematics, SUPW/work experience? If, yes, history part of *technology* should go to the history book, mathematics part to the mathematics book, and so on. This will reduce the burden on the teacher and the taught, reduce the weight of the school bag, as well as will contribute to *technological literacy*.

Any curriculum has basically six elements: rationale, objectives, implementation strategies, curricular materials, transaction method, evaluation. It might take a few years to introduce *technology* as a separate subject at the lower and upper primary levels in the school. Just now we should integrate *technology* with science in the S&T text book.

The textbook of S&T must have at least the following sections:

(a) There will be a box giving he list of keywords/ *technology* terms used in the chapter at the very beginning of the chapter

(b) Another box with the title 'hands-on activitity' or 'Quick- Lab' has to be given at a suitable place illustrating how to go about the activity. Such illustration should be 'worth one thousand words' .

(c) A third box will contain *problem solving questions*, which could be *convergent*, *divergent ,literal, interpretive* . Success of introduction of technology will depend on the quality of these problem solving questions.

(d) A fourth box will detail the references to resources, eg. Science museum, planetarium, industry, scientists and technologists, laboratories, lectures, science magazines, etc.

Classroom transactions will have a mandatory component of hands-on activities somewhere in the cycle of *pre- plan, focus, teach, apply, re-teach*.

References

Rasinen, A., (2003) An analysis of Technology Education Curriculum of Six Countries, *Journal of Technology Education*.

Davis R. S. et. al., (2002) Elementary School Students' Understandings of Technology Concepts, *Journal of Technology Education*.

Bhattacharyya, P. K., (2003) Technology for All, Science for Some, DREAM 2047, Vigyan Prasar (DST).

Bhattacharyya, P. K., (1991) Science and Technology Education through Exhibitions, NCERT, New Delhi. pp. 270