EVOLVING AND TESTING A STRATEGY FOR CURRICULUM DEVELOPMENT IN SCIENCE RELEVANT TO THE INDIAN SCHOOL SYSTEM AT THE PRIMARY AND SECONDARY LEVELS

A Thesis

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by

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SYNOPSIS (REVISED)

Background

The work described in this thesis arose out of two curriculum development projects in Science undertaken by the Homi Bhabha Centre for Science Education (HBCSE), Tata Institute of Fundamental Research, Bombay. The first project, called the Khiroda Project, was undertaken in 15 primary rural schools around Khiroda in the Jalgaon district of Maharashtra. The second project was called the BMC Project and it was undertaken in 50 secondary schools of the Municipal Corporation of Greater Bombay. Two aspects of these projects may be mentioned. First, that the idea was to bring about an improvement in Science Education through the development of human resources rather than by pumping in material resources. Factors like textbooks, profile of teachers, physical facilities in the schools ~~etc.~~ that can not be changed easily, were taken for granted and efforts were concentrated on changing the teaching methods. Secondly, tools for evaluation were constructed, field tested and used to evaluate the extent to which the objectives of these projects were fulfilled.

The motivation for undertaking the work reported in this thesis and the details of the thesis proper are presented below.

Introduction

The main components of a curriculum are the syllabus, textbooks,

method of teaching, and examination system. In India, the syllabus and textbooks are uniform over a State, while the method of teaching is decided by each individual teacher. It is the teachers who have to translate the objectives of the curriculum into practice in the classroom.

However, although in principle teachers have considerable flexibility in the choice of teaching method, they often do not go beyond the letter of the syllabus (or the textbook) and the requirements of the examinations. Such a teaching strategy can not adequately fulfill the general aims of the curriculum as stated in the syllabus, especially the aims listed below.

1. To create interest and curiosity in the observation of natural and physical phenomena and their scientific interpretation.
2. To develop scientific habits and attitudes in the pupils.
3. To help the pupils acquire an understanding of basic concepts in science without routine memorization of facts.
4. To develop in the pupils an ability to apply scientific principles in the solution of day-to-day problems[1].

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[1] Objectives of the curriculum drawn from the statement of objectives of the Maharashtra Government syllabus for Standards I to VII (1966) and the Maharashtra State Board of Secondary Education Syllabi for Standards VIII, IX and X (1975).

Ideally, the above objectives should be built into the textbooks and the examination system. However, in the absence of this provision, it might still be possible to adapt teaching methods to the requirements of the curriculum objectives. The formulation of teaching methods will have to take into account the conditions in Indian classrooms and the present nature of teacher-pupil interaction. Specifically, the methods will have to assume the lack of laboratory facilities in primary schools, and the availability of only the bare minimum of facilities in secondary schools. The needs of the first generation learners, who form a large fraction of the student population, will have to be taken into account in the proposed teaching methods.

This thesis is concerned with the formulation of operational objectives to be met by Science teachers in the classroom, the implementation of these objectives and the evaluation of their effectiveness in terms of changes in teacher and pupil behaviour. The experiment has been done for the teaching of 'General Science' in standards I to VII of the primary schools in the Khiroda Project and for the teaching of Physics in standard IX of selected secondary schools of the Bombay Municipal Corporation.

Organisation of the thesis

There are seven chapters in this thesis. In chapter 1 the problem is stated and its relevance to the Indian school system brought

out. The strategy of approaching the problem of curriculum change through the teachers has been discussed for its advantages and limitations. The relevant aspects of the history of science curriculum development in India have been briefly outlined to describe the motivation for the present investigation.

Chapter 2 deals with the formulation of the objectives of science teaching. In this chapter, the objectives of the science curriculum as stated by syllabus committees at the primary and secondary school levels, have been reviewed in the context of the changing nature of pupil profile in schools, the present teaching practices, and the nature of teacher-pupil interaction in Indian classrooms. These factors have been taken into account in the formulation of operational objectives for science teachers at the primary level in the Khiroda Project and at the secondary school level in the BMC Project. The viability of the operational objectives has been examined in the light of research findings in classroom instruction.

The tools developed for evaluation of the teaching objectives are described in chapter 3. For the primary school level, tools for classroom observation, and an interview schedule for teachers, were prepared. The classroom observation tools have been compared with these devised by previous investigators. The data for agreement between independent observers has been presented and discussed. The complementary relationship between the interview schedule and the classroom observation tools has been brought out.

For the secondary school level, written tests for pupils were prepared for evaluation of the teaching objectives. The use of these tests in providing inputs for the formulation of teaching methods (formative evaluation) and in testing the effectiveness of the methods (summative evaluation) has been discussed.

Chapter 4 deals with the design of this study, choice of samples, selection of the control groups, implementation of the teaching methods, and collection of the data used for evaluation. The strengths and limitations of the design are discussed.

Chapter 5 deals with the method of treatment of the data. The construction of new variables from the data has been discussed in the context of the curriculum objectives. Intercorrelations between the teachers' scores on a set of rating scales have been analysed using a cluster-directed method and an increase in reliability and validity has been shown to follow from a grouping of the rating scales into clusters. The statistical techniques used have been described and their appropriateness is discussed.

Results of the evaluation have been presented in chapter 6. The objectives formulated in chapter 2 have been reviewed and the successes and shortcomings in their implementation have been discussed. In general the comparison of the exporimental and the control groups shows some significant changes such as, willingness on the part of teachers to go

beyond the textual material to include real life experiences, increased participation of pupils, and an improvement in the pupils' ability to apply concepts in physics to non-textual situations. Quantitative measures of these gains are presented. In some areas, the expected changes were not observed, and the reasons for these results are discussed.

In chapter 7, the important results of the study are reviewed, and some experiences which may be useful for other workers in the field, are presented. Implications of this study for curriculum change on a larger scale are discussed. A detailed scheme for implementing these findings to an entire district or to a set of districts has also been presented as an appendix.