Digital Resources in School Science and Mathematics in Regional Language

S. C. Agarkar*, N. D. Deshmukh**, V. D. Lale*** & V. C. Sonawane****

Homi Bhabha Centre for Science Education, TIFR, Mumbai, India
*sca@hbcse.tifr.res.in, **ndd@hbcse.tifr.res.in, ***vdl@hbcse.tifr.res.in, ****vcs@hbcse.tifr.res.in

Homi Bhabha Centre for Science Education (HBCSE), a constituent unit of the Tata Institute of Fundamental Research (TIFR), Mumbai has launched an ambitious programme to design and test digital resources for schools (OER4S) in science and mathematics. These are web-based resources developed collaboratively by academicians, teachers and enthusiastic parents. They are made available to all the stakeholders (teachers, parents and students) through internet and also through the distributed classrooms set up by the Maharashtra Knowledge Corporation Limited (MKCL). The programme aims at supporting the education system to offer quality school education in Marathi (the language of the state of Maharashtra). The digital resources are being field-tested for their suitability and relevance in the schools run by well organised big educational societies / organisations in two regions of the state of Maharashtra. The philosophy of the programme, the strategy of its implementation, mechanism of obtaining feedback from stakeholders for mid-course corrections etc are described in this paper.

Introduction

Indian education system is full of diversities. There are schools run by local self governments, central government bodies and private organizations in the country. The curriculum followed and the facilities provided in these systems are widely different. In spite of these differences one thing is common in all these schools. They are trying to prepare students to face the school leaving examinations. They are happy if their students fare well in these examinations. Concern for quality education and for developing personality of the child is often missing in Indian education. A variety of reasons like crowded classrooms, poor educational facilities in schools, lack of in-service training programme for teachers etc, are put forth for this pathetic situation. These reasons are genuine and need to be looked into critically. At the same time one needs to pay attention to educational resources that are available to students, teachers and parents associated with Indian school system. A cursory look at these resources brings out the fact that attempts to develop supporting instructional material in regional languages are almost non-existent. For a majority of population the only resource available is the text book written for school children. There is, therefore, an urgent need of development of appropriate educational resources in regional languages that would influence pupil-pupil, teacher-pupil and parent–pupil interaction to bring about quality improvement in school education. Moreover, this material has to be made available through distance mode as the face to face interactions have severe limitations (Sharma, 2005). With this view in mind, Homi Bhabha Centre for Science Education (HBCSE), a constituent unit of the Tata Institute of Fundamental Research (TIFR) has launched a project for development of Open Educational Resources for Schools (OER4S).

The Project

The main objective of the project is to make available resources that can be used to provide quality education to the students studying in Indian schools. The project is being funded by the Rajiv Gandhi Science and Technology Commission of the Government of Maharashtra and is being jointly conducted by HBCSE, Maharashtra Knowledge Corporation Limited (MKCL) and the Indian Consortium for Educational Transformation (I-CONSENT). The project aims at designing suitable material in science and mathematics for all the stakeholders of school education: teachers, students and parents. This material is made available through the website specially designed by MKCL (www.mkcl.org/mahadnyan). Stakeholders are then encouraged to make use of these resources and give feedback. Thus, the project has three phases: Material development, uploading on the website and Field Testing and validation. Each of these aspects are discussed in the following sections.

Material Development

Over the past three decades, HBCSE has developed methods and materials to provide quality education in school Science and Maths. Most of this material has been field tested through field projects undertaken by HBCSE,
both, in rural as well as urban areas of the country. Part of the open educational resources for the present project is drawn from the pool of material that HBCSE already has developed in such projects. Apart from HBCSE there are a large number of organizations associated with HBCSE, working for the improvement of school education. Those organizations were persuaded to share their resources. In addition, special resource generation workshops were organized periodically to prepare material taking into account the needs and requirements of students, teachers and parents associated with school education.

Participants for these workshops were chosen from the pool of innovative school teachers, teacher educators, social workers and enthusiastic parents. The participants were oriented in the concept of open educational resources and were asked to prepare material suitable for students, teachers and parents. Material, thus, developed was processed at HBCSE using Unicode package and the printout was sent to the author for editing, modifications and revision. Once the corrections were incorporated, the material was subjected to quality editing. Suggestions received from Quality Assurance Teams were incorporated and the materials were tagged for uploading to the website. The tagging involved classification into two categories: Science and Mathematics. Resources designed for each of these subjects are further categorized taking into account the end users: Students, Teachers and Parents. In addition there is material that is categorised as common material that is useful for all the three stakeholders. Such a classification facilitates both loading of the material to the website and using it.

Uploading Material on the Website

The website of the project is designed and maintained by the Maharashtra Knowledge Corporation Limited. Before publishing the material on the website it was necessary to upload it on a specially designed software package called CDIT (Content Development and Integration Tool). For convenience of use, this material is put on the website as 1. Material for Students, 2. Material for Teachers and 3. Material for Parents.

Material for Students

Material in this section is designed to support learning of concepts in school science and mathematics. As stated above it is conveniently categorised into primary, upper primary and secondary stages. At each level central concepts are identified and a folder is created for it. Within each folder, there are subfolders created for each sub-concept. There are in all 38 folders for Science and 46 folders for Mathematics. Titles of the folders along with subfolders are given in Appendix. In general, it is attempted to provide content related matter to facilitate concept formation and self assessment of the school students.

Material for Teachers

HBCSE has been conducting in-service training courses for practising science and mathematics teachers for the last three decades. Through these courses it could gain insights into the needs and requirements of teachers teaching these subjects in different set ups. Based on these insights following types of material is developed for teachers.

1. Conceptual Discussion that consists of Concept Maps, Lesson Plan and Explanatory Notes.
2. Teaching Aids which include PowerPoint Presentations, Models / Charts / Posters / guidelines etc. for using them as teaching aids.
3. Activity / Experiment / Project comprising concept-based experiments, activities involving games / skits / puzzles and relevant projects.
5. Research and Innovations, providing survey of recent researches, innovative practices in school Science and Mathematics teaching and action research projects completed by school teachers.
6. Assessing students’ learning encompassing Diagnostic testing, Cognitive and affective assessment and Outcome based assessment

Material for Parents

Since a large number of parents in India take great interest in the education of their children, the material is planned according to their requirements. It is essentially of six types:

1. Everyday science and mathematics: It has articles and information on how science and mathematics are influencing our day to day life.
2. Issues related to health and hygiene: This section attempts to highlight the importance of individual health, social as well as community health. A lot of inputs to maintain them are also provided.

3. Parenthood in 21st century: This century has witnessed a large number of changes in parent-child interaction. Generally parents are found confused about the social demands, likes and dislikes of the child and their personality development. Inputs to tackle this situation are offered through this section.

4. New ideas in teaching and learning: Teaching of science and mathematics has witnessed considerable changes in the last few decades. It has led to new ideas in teaching, concept formation and assessment. These ideas are presented for the benefit of parents.

5. Out of school activities to support school education: Students are greatly influenced by the activities planned by their parents. Many of these activities can be used to support school education like a visit to Zoo or to museum. Some of such useful activities are suggested along with concrete examples of how to use them effectively.

6. Identification and nurturance of talent: Identification and nurturance of talent is a challenging task for many parents. In the absence of such understanding, the child is forced to take up the studies that might not suit to his aptitude and interests. Suggestions are offered to avoid such wastage of talent.

Common Material

The material common to all the three stakeholders is designed taking into account the needs and requirements of students, teachers and parents. It includes the following types of material:

1. Biographies: life histories of 120 scientists and mathematicians who have contributed to the growth of these disciplines.

2. Question-answers: More than 550 questions raised mainly by school children are included in this folder. Answers to these questions are prepared taking into account there linguistic and social background.

3. Published articles: Different articles (253) related to school science and mathematics is published in daily newspapers and magazines. Some of these articles are chosen and uploaded with the permission of the author.

4. Published books: A variety of books are also published regularly that has relevance to school science and mathematics education. Some of the relevant books (45) are also uploaded with the permission of the publishers.

5. Open forum: This forum is planned to achieve a free dialogue between teachers, teacher educators, researchers, students and parents. Teachers, parents and researchers have so much to share with each others. Open Forum (OF) provides them a platform for getting doubts clarified and for sharing ideas / experiences. In addition, OF attempts to inform various stakeholders about conferences, seminars, workshops, contests, etc. related to school education. There are various schemes to recognize the work of intelligent students, innovative teachers and creative researchers. The Forum makes available relevant information about them.

Field Testing

An attempt is made to field test the digital material put on the website. In order to facilitate the use of digital material by students, teachers as well as by parents the website is made easily accessible to these stakeholders through the network of distributed classrooms managed by MKCL. Two big educational societies, conducting hundreds of schools in the state of Maharashtra are identified for field work. Workshops are arranged both at HBCSE and in the field to create digital literacy among the teachers of these organizations. They are then encouraged to make use of the material available on the website and provide us feedback related to their experiences, its relevance and utility. Based on the feedback received from the stakeholders appropriate modifications are being made in the material. In addition, for giving feedback the stakeholders are also appealed to contribute creatively to the development of new and relevant material.

Opportunities and Challenges

E-learning as stated by Zemsky and Massey (2005) has a tremendous potential. The present web based programmes offer ample opportunities to cater to the needs of students, practising teachers and parents. Since the material is prepared in regional language (mother tongue), a larger number of these stakeholders can access and use it. Once this programme is validated, the material can be translated to other regional languages. This effort would hopefully bring in qualitative changes in the classroom interaction in rural as well as in urban schools.
In spite of great potential the project poses many challenges. Firstly, the teachers and parents may not be psychologically prepared to receive inputs offered through digital mode. Developing appropriate computer literacy among the stakeholders is, therefore, a big challenge. Yet another challenge is to develop appropriate material to be put on the website. A lot of useful material exists in print form that needs to be converted into digital form so that it can be directly used by teachers, as well as, by parents.

Summary and Implications

The project described in this paper is a model of collaborative developmental work in school education. Three different organizations namely a HBCSE (a research institution), MKCL (a corporate company) and I-CONSENT (a voluntary agency) have joined hands to work for a common cause of improving school science and mathematics education. The experience of past five years has shown that such collaboration can work. One more important aspect of the project is to bring people together for knowledge creation. The material put on the website has been prepared by practising teachers, enthusiastic parents and voluntary works. The project thus was a model of co-creation and collaboration among different stakeholders of school education. It has created a network of about 1500 persons associated with this project.

National Knowledge Commission (2007) set up by the Government of India clearly brings out the importance of open access to information and Global Open educational Resources. The work reported in this paper is in tune with the recommendations of the commission, especially open access nature. It must however be noted that the work envisaged in this project is of gigantic nature. It needs the cooperation of people in developing content, pedagogy, technology as well as in assessment strategies. It is basically a collaborative activity on the lines of Wikipedia: a free encyclopaedia. It will bear fruits only if people with different expertise come together to develop, test and modify the material. The process is expected to be an ongoing activity where the developmental work continues for ever. We are trying to seek the help of different organizations and personnel for this activity. The project is still going on and the work done so far has given positive feedback. Teaching community has welcomed the idea of OER material. At the same time there are encouraging responses from students and parents also. It is hoped that this work will take a shape of a movement soon and will make available field-tested useful OERs for Indian school system. India shares common educational problems with many developing countries. It is, therefore, hoped that the open educational resources developed and strategies and systems generated in this project will have a global relevance to bring about qualitative improvement in teaching and learning of science and mathematics all over.

Acknowledgements

The project referred to in this paper is funded by the Rajiv Gandhi Science and Technology Commission (RGSTC), Government of Maharashtra. This is to acknowledge the generous financial support of RGSTC. The project is planned and implemented jointly by HBCSE, MKCL and I-CONSENT. The authors would like to express their gratitude to the heads of these organizations for their unreserved support. They also would like to appreciate colleagues at HBCSE and participants of resource generation camps for their untiring work to make the project successful.

References