

ESSENTIAL FACILITIES FOR QUALITY BIOSCIENCE TEACHING IN SECONDARY SCHOOLS

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To ensure quality bioscience education the essential facilities like text book, teacher, teaching aids, library, laboratory and co-scholastic activities are required .The study was undertaken to analyse the status of bioscience education in secondary schools of Orissa. The data were collected from the bioscience teachers and analysed. The study found that textbooks need much improvement like prefacing the objectives and guidelines to the teachers, chapter-end summary, suggestions for practical activities, and clarity in concepts with clear, colourful and labelled diagrams. The study suggested provision for science laboratories in schools and more emphasis on co-scholastic activities and improvisation of apparatus to step up teaching learning process.

RATIONALE

Effective science education is the need of the day. Human thirst to acquire more knowledge for better life has been encouraging research on various branches of science and the results, discoveries and inventions in the twentieth century have been eye opener of the humanity. The global population at large feels exploration and acquisition of further knowledge to make life on the earth easier and comfortable, is the priority in the 21st century. Therefore, science, particularly Biological science assumes the highest importance. These basic objectives led nations, worldwide, to redesign with a view to developing the curriculum on science. In India too, there have been persistent efforts in this direction from the later part of the 20th century. Biology is concerned with the study of living organisms which are immeasurably diverse and complex than the non-living matter. Hence, Biology is also described as life science. Hence, fundamental knowledge of biological science is required for students To cope with the modern age, Biological science should be taught effectively in the schools so that every student acquires fundamental ideas related to biological science.. The essential facilities required for effective bioscience education are: science text book of good quality, competent science teacher, black board and chalk, library with adequate science related books, well equipped science laboratory, audio-visual aids, science club, science fairs and exhibitions, science museum, botanical garden, excursions and visits to places of scientific importance, and Improvisation of low cost teaching materials

OBJECTIVE

To analyse the essential facilities available in the secondary schools of Orissa for teaching biological science.

PLAN AND PROCEDURE

To collect both qualitative and quantitative information, it was decided to elicit information from teachers through a self devised questionnaire.

Sample

The data were collected on the basis of random sampling. The technique of stratified random sampling was adopted for the purpose. The sample for the study was drawn from secondary schools of Khordha district, Orissa, basing on the level of achievement of the school in the Annual High School Certificate Examination, 2007 conducted by the Board of Secondary Education, Orissa. The level of sum total of scholastic achievement of a school as a whole was taken in to consideration. Eleven high level schools (securing more than 80 percent result), ten average level schools (having 40-60 % result) and ten low level schools (with result below 30

percent) were selected. Thirty one Biological Science teachers were contacted and their thoughtful views and remarks were collected through questionnaire.

ANALYSIS

Teacher

It was revealed from the data that 90 % of the teachers were having B.Ed degree of whom 50 percent were science graduates and 40 % were science graduates with post graduation, 7 % were untrained graduates and 3 % having only +2 qualifications. Majority of the post graduates were having PG qualification in other subjects than Bioscience.

Quality of Science Text Book

The perceptions, views, opinions and suggestions of the teachers on different aspects of the prescribed text books "Science & Technology" for class IX and X as gathered through questionnaire are given as under. It was found that 83.87 % of the sample teachers in general, were of the view that the language, correctness of spellings and grammar in the text books are appropriate and effective. So also, 87.09 % opined that the titles and subtitles were appropriate to the content. With regard to the adequacy of the content provided in the text book in translating the objectives of teaching learning through appropriate Biological Science context, 77 % of the teachers responded positively. As regards the arrangement of the topics and sub topics in logical sequence in the text books, 81 percent of the teachers upheld the arrangement in the text books. Eighty seven per cent of the sample teachers expressed that universally accepted symbols, units and technical terminologies were used in the text books. In order to ensure enhanced visual attraction of the important words, sentences, illustrations and tables in a book it is necessary to high light such portions in bold letters, cater to colours and shades. In response to the point 87 % of sample teachers responded in agreement. Seventy four per cent of sample teachers mentioned that the illustrations in the text books were accurate and appropriate in shape and size, 70.96 % expressed appropriately labeled and captioned, 90.90 % opined relevant to the text and 83.87 % expressed that those are interesting and effective in communicating the desired ideas. Conversely, the illustrations were not accurate as perceived by 45.46 % of the teachers of high level schools, not appropriate in shape and size according to 25.81 % not appropriately labeled and captioned as viewed by 29.04 %. All the sample teachers expressed that there was no gender bias in illustrating the examples and all the examples in the text books were relevant to the text. The study found that 40 % of the sample teachers opined that the following concepts in the text books required solved examples for better comprehension by the students: Blood group, blood clotting (factors), Respiration (mechanism), Excretion (description), Circulation (mechanism), Tissue and cell structure, Autonomic nervous system, Cell division, Structure of chromosome and Mendelian proportion of genetic characters. There should be a picture of green house in appropriate colour to teach effect of green house. The summary at the close of each chapter of the Biological Science text book presented the overview of the contents of the chapter which was favoured by 84 % of the sample teachers. On the chapter end exercises in the Science & Technology text books, 87 % of the sample teachers mentioned that there were varieties in the form of items (e.g. multiple choice type, short answer type, very short answer type), 90 % mentioned that the exercises cover the content of the chapters and test different objectives (knowledge, understanding, application, attitude and skill). To mention about the impact of the exercises, if catered to the requirement of slow, average and bright students, 65 % of the sample teachers opined that the exercises catered to slow and bright learners and 90 percent mentioned that those catered to the average students. Conversely 35 % of the teachers opined that the exercises did not slow and bright students.

Laboratory

Experiment plays a vital role in the process of learning science. Many intricate scientific concepts and principles can easily be grasped by the learners through direct involvement in practical experiment. The visual observation leaves an imprint in the mind of the learner. A laboratory is essential in secondary school to practice various experiments by the students and get convinced about the facts, events, phenomena etc. Regarding presence of laboratory in schools, facilities and scope extended to the students to observe experiment done by the teacher and to do experiment themselves. There was science laboratory in only 19.35 % of the sample schools, 80.65 % of the schools used to go without science laboratory. There was no science laboratory in all the low level schools which included Government schools. Science store was available only in 29.03 % schools. Separate Biological Science laboratory was available only in one private school. Facilities for doing Biological Science experiment by the teachers were available only in 12.90 % schools. Facilities for doing Bioscience experiments by students were available only in 6.45 % schools. Conversely experiment facilities by teachers and students were not available in 87.10 % and 93.55 % schools respectively.

Audiovisual Aids

It was found that 80.64 % of the sample schools had microscope, 77.41 % had maps, charts and models and only 68.75 % of the urban schools were having microscope. 72.72 % of high level schools and 62.5 % of urban schools were having computer facilities.

Improvisation of Apparatus and Field visit

Information elicited from the sample teachers about other measures taken to make bioscience teaching effective through improvisation of apparatus and field visits. It revealed that in maximum high level schools(72.72 percent) apparatus were improvised but 70 percent average level school conduct field visit and it happened in 60 percent low level schools, but unfortunately 54.55 percent high level schools found not to have the facility. In comparison to urban schools ,the schools located in rural set up used to conduct more field visit (66.66 percent) but contributed less (26.66 percent) improvising apparatus. High level schools were best among all the schools for making improvisation of apparatus and it was very poor in case of low level schools. The figure shows that performance of teachers for improvisation of apparatus is very good in respects of high level schools and very poor in respect of average level, low level and rural schools.

Availability of Garden in the Sample Schools

Garden is a vital necessity in imparting biological science knowledge to the students. Different aspects and scientific concepts of plants can be advantageously explained to the students by instant demonstration through the components available in the garden. From the information provided by sample teachers regarding availability of garden in the sample schools it is revealed that out of 31 schools garden was available in 20 schools which constitute 64.51 % of total schools and the gardens were not adequately equipped as per the requirement of studies in Biological Sciences.

Biological Science Museum

Though Biological Science museum plays a vital role in teaching biology, none of the sample schools was having a Biological Science museum as ascertained from the sample schools.

Science Exhibition and Science club

It was found that 58.06 % and 19.35 % of schools in general organize science exhibition and science club respectively. More average level schools (80 percent) organize science exhibition than other category of schools.

Library

A good library is the treasure of knowledge. Every learner ought to frequently visit the library in pursuit of knowledge as and when he or she finds leisure. In the secondary schools of Orissa the existence of full fledged library is very rare. In most of the schools library was limited to some *almirahs* and a teacher remains in-charge of library. There is a provision of classroom library and library period in the time table of each class. The transaction of library books takes place during the period. Students get rarely a chance to visit library for reading books in reading room, which is mostly non-existent in the schools. It is revealed from the data that 52.5 percent of the students of sample schools visited library.

SUGGESTIONS

Review of the existing text books is essential. The objectives should preface each unit in Science and Technology text book along with a word to teacher regarding method of teaching, co-scholastic activities and practical suggestions for improvising the relevant bioscience apparatus. Bigger, simpler, well labelled and self explanatory multi coloured clear diagrams should be provided in the text book. The textual material should possess clarity and should be organized in a systematic manner. A summary of the subject matter should be given at the end of each unit. Glossary of important scientific terms should be appended at the end of the book. The supplementary activities for the topics must be suggested at the end of the unit. Life sketches of Biologists like Linnaeus, Camillo, Golgi, Robert Hook, Lamark, Hill, Mendel, Darwin, Edward Jenner and their contribution should be briefly placed in the text book to set role model in front of the learners. The text of the book needs to be reviewed for use of simpler and colloquial words as far as possible. The text books should be attractive with hard cover binding. Keeping the present Biological Science Curriculum in view, the minimum qualification of the secondary school Bioscience teacher should be post graduation in Botany /Zoology / Life Science with a degree in Education. A biological science laboratory cum bioscience room is the basic requirement of the high school. In bioscience room charts, diagrams, graphs are to be displayed. Laboratory equipments and chemicals are to be stored as per requirement. There should be an aquarium and terrarium in each school. Till laboratories are established in the schools, alternative arrangements like high school students doing experiments in the nearest college laboratory may be explored. Schools should have adequate audio-visual aids. Every school must have a garden with plants, involving the bioscience syllabus. The students should be encouraged to take interest in maintenance of garden to acquire practical knowledge of plants and gardening. Every school should endeavour to maintain a bioscience museum displaying at least objects, specimens available in the surroundings. The community members should be associated in maintenance and growth of the museum. Every school must have a library with books supplementary to the test books with arrangement of sitting and reading by the students. Periodical magazines on bioscience should be available in the library. The existing arrangement of holding annual state level and circle level science exhibition / fair should be extended to school level. There should be a science club in every school.

CONCLUSION

For imparting quality Biological Science education, to meet the national aspiration in line with the present curriculum, it is essential to provide adequate numbers of qualified and trained Biology teachers. Keeping in view the new text books, the teachers need to be well oriented on the topics in the textbooks and be aware of up-to-date developments in the field of Biological Science. Although laboratory is a basic prerequisite for a secondary school, it remains a dream for the high schools; even the schools have no store room. Provision of a well equipped laboratory in every school is essential. The text books need to provide, index, chapter end summary, suggestions for practical activities etc. They need to be reviewed and redesigned with clear, colourful and labelled diagrams for better comprehension of the concepts.