Original Article

Examination Of The Biology Textbook Of Class-IX By Board Of Secondary Education Odisha: The Ideas Of The Science Teachers

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DOI: 10.47750/pnr.2022.13.S08.125

Abstract

This research aims to examine the physical and academical aspect of biology textbook for class-IX of Board of Secondary Education Odisha. The opinion of biological science teacher has been studied in this research. The present study is based on qualitative research techniques. Three focus group discussion has organised in order to collect the opinion of science teachers of Odisha regarding the pros and cons of biological science text book. The results show that he introduction of this chapters are not satisfactory, the pictures given in this chapters are small in size, not colourful, blurred and labelling is not cleared and not attracted by the students. and some important misconceptions, which can affect the learning, are found in biology textbook of class-IX.

Key words- Biological science text book, secondary education, teachers

Introduction

Textbook may be defined as a tool which facilitates in teaching and learning process, usually written on a prescribed syllabus, organized logically and according to the mental development of the students so as to facilitate teaching for achieving the goals of education. Usually, textbooks are called Teacher in Print. According to the Webster's Dictionary, "Textbook may be defined as a manual of instruction, a book containing a presentation of the principles of the subject used as a basis of instruction." Today, textbooks are assembled more than they are written. They are not usually written by a single author, nor are they a creative and imaginative endeavor. They are, in fact, usually specially made by a corporation to follow a set standard curriculum for a school system or large organization such as a province. (Encyclopedia of education-2008b).

The textbooks are the basic educational and instructional resources for teachers and students which help the teachers to set up objectives of teaching and suggest suitable ways to accomplish their goals. The material presentation in a text book is simple and ability oriented, considered as ready references. Text books are meant to clarify and extend information thus helping to make the content more vivid. In the teaching-learning process, the text book occupies a central place. There is a saying "as is the text book, so is the teaching and learning". A good text book can even replace class room teaching. Text books help in developing open mindedness, appreciation and understanding among the readers. Within biology education, studies that examine the biology textbooks are often found in national and international literature. Textbooks playing an important role in effective

biology education are fundamental sources of information in terms of the notions of evolution and ecology along with basic biological concepts, scientific research process and experimental activities (Haury, 2000; Tomlinson 2003, Saja Hamid Hantoush Al-Rubaie1 Yusef Faleh Muhammad Al-Saadi 2021). It is common to use textbooks in teaching biology (Kuechl, 1995). Studies made abroad indicate that 90% of the teachers actively use textbooks as their main instructional tool and to assign homework (Blystone, 1989; Stake and Easley, 1978). In Turkey, textbooks are used for various reasons like reference sources and assignments as well (Özay & Haseneko,lu, 2007, Oishi, Alifa Reza 2020). According to Kuechl (1995), if a textbook is the main source of information and order of content during biology lessons, then it should appeal to teachers' and students' needs. Teachers find it logical to follow the textbooks in order for the students to learn all the content areas (Kuechle, 1995, Zubair Ahmad Shah, Nasir Mahmood, Javed Hassan Akhtar 2020). However, it was found that students' realities or life were not related to the concepts covered in the textbooks or that students' background knowledge is not related to the new concepts and that these textbooks do not encourage the students to do research (Leonard and Chandler, 2003 Karel Vojir and Martin Rusek 2019). Studies concerning the issues faced in the biology textbooks are found both in the national and international literature. By examining 17 biology textbooks, (Jablon 1992, Kumkum Maurya, &Alka Rani2019, Rachna Sharma 2018) indicated that these textbooks are explicitly alike. Jablon, further stated that although these textbooks cover scientific process skills, and accurate claims about topics like Science-Technology-Society and collaborative learning, they do not completely integrate those strategies; so the experimental activities appear to be like a "cook book" and they do not allow the students to do active research. From another perspective, Gottfried & Kyle (1992) indicated that those textbook-oriented teachers are very dependent on the content of the textbooks; that they do not focus on topics like Science-Technology-Society, personal needs and career sensitivity and that they do not spend time on any of these topics; therefore, the central role that the textbooks claim in the educational process prevents the effective science education from reaching to the target demanded level. Lumpe & Scharmann (1991) emphasize that while the experimental activities prevalent in the biology textbooks provide students with such opportunities as manipulating the devices, developing observational skills; the close-ended and rigidly structured activities constrain students' development of higher order scientific thinking skills such as discussion, setting hypothesis and forming their own inquiry. In the biology textbooks, such phenomena as scientific thinking and the nature of science do not take a major role and these subject matters is not well integrated into the other chapters and topics (Gibbs & Lawson, 1992; Takın et al, 2005). However, Chaing-Soong & Yager (1992) state that the students can not perceive and acquire those specialized specific terms used in the biology textbooks. Kuechle (1995) has concluded that topics related to ecology and environmental principles appear in the last sections of these textbooks through examining the concept of ecology found across 12 mostly preferred biology textbooks. Özay & Haseneko,lu (2007) pointed to the issues observed in the visual materials found in 3 high school textbooks; and concluded that the visual materials make it difficult for students to comprehend as they are not clear and comprehensible and that the visual presentations don't induce a process of action and logic.

In light of the points mentioned above, this study fundamentally aims to examine the physical and academical aspect of biological science text book of Class-IX of Board of Secondary Education Odisha. Given this goal, the biology textbook was scanned in great detail at the page and unit level and content analysis was conducted.

Methodology

For the present study qualitative approach is used**.** The Board of Secondary Education Odisha has divided in to 5 zones namely Cuttack, Sambalpur, Berhampur, Bhubaneswar, Baleshwar. The researcher taken the sample. i.e., science teachers from Cuttack zone only. The researchers being a science teacher and teacher educator it is very helpful for them to organize FGD in Cuttack zone only. In the first stage of the study, the document analysis of the class-IX Biology textbook published by the Ministry of National Education was conducted (Yıldırım & Simsek, 2005). In doing so, the textbook was attentively read. The misconceptions, question types, content, visual

materials and measurement-assessment techniques that appear on the textbook were evaluated. In the second stage, FGDs were conducted. Also, the participants for FGD-1 were 10 high school science teachers who are teaching biology for class-IX of Cuttack municipality, FGD-2 7 teachers of Dhenkanal district who are teaching biology for class-IX and for FGD-3 9 high school teachers from Kendra Para district who are teaching biology for class-IX were participated in this study. The participants offered their views on the textbook's approach towards learning,
its readability, reliability, and all the other criteria. Moreover, the textbook's alignment with the
nature of science and its usability in instructional processes was questioned with the participants. Each FGD lasted for 45 to 60 minutes (Merriam, 1998). The results of the study are briefly stated in the findings of the study.

Findings

The biology (Science Part- II) textbook for class-IX is **JIBA BIGYAN.** The book has been authorized as per the syllabus of the Board of Secondary Education, Odisha, It has been written by Prof. Dr Tarini charan Kar, Prof. Pradeep Kumar Mohapatra, Dr Bijaya Kumar Mohanty. Dr Kishor Chandra Mohanty, Mr. Durga Prasad Das and Dr. Rajkishore Panda. The year of publication was 2016 and printed at Surekha Prints and Laxmi web prints Cuttack.

Analysis stands for process of breaking or separating a thing into its constituent smaller parts. The textbook of biology of class-IX consists of following chapters. Chapter-1- Biodiversity, Chapter-II- Cell and its Organization, Chapter-III- Tissue System, Chapter-IV – Improvement of Food Resources, Chapter-V- Diseases and its Treatment and Chapter-VI is Natural Resources and its pollution.

The name of the Chapter I of this book is bio-diversity. It comprises of introduction, basic issues of scientific naming, International Code of Biological Nomenclature (ICBN), basis of classifications, hierarchy of classifications, five kingdom classifications as Monera, Protista, fungi, plantae and animalia, classifications of plantae, animalia, classification of animalia like non chordate, protochordate, vertebrata, non-vertebrata. Plants are divided into five groups such as thallophytes, bryophytes, pteridophytes, gymnosperm and angiosperms. Animals are divided into ten groups: porifera, coelenterate, Platyhelminthes, nematodes, Annelida, Arthropoda, Mollusca, Echinodermata, protochordate and vertebrata. There is a chart on classification of animalia. Before end of the chapter what we learn and work for you is mentioned in the text book. At the end exercises also given in the biological science text book.

: The name of **Chapter- II** is "cell and its organization". It comprises a very good introduction with cell is the structural and functional unit of life. What are living organisms made up of? what is a cell made up of and the structural organization of a cell. In this chapter the structure of cell which is encircled by cell membrane inside it there is cytoplasm and nucleus is present. The cell organelles like cell wall, mitochondria, vacuoles, endoplasmic reticulum, Golgi bodies, ribosomes, lysosomes, plastids, chromosomes and nucleus. Difference between prokaryotic cell and eucaryotic cell, plant and animal cell is discussed. most plant cells contain plastids called as chromoplasts and leucoplasts. Chromoplasts contain chlorophyl pigment are called chloroplasts which performs photosynthesis. In plant cells there is cell wall but in animal cell it is not found.at the end the complete overview of chapter is provided. In last parts there are some activities are discussed then questions are designed.

The third chapter of this textbook is "Tissue system". It describes briefly the introductory part in which tissue is referred as a group of similar cells in structure and performing a single function. In this topic plant tissues are classified into two main types -meristematic and permanent. on the basis of position, it is divided into three types apical meristem, lateral meristem and intercalary meristem. On the basis of size, position and growth, meristem is divided into four times i.e., primary and secondary meristem. In this topic permanent tissue is classified into simple and complex tissue. Simple tissue is classified into parenchyma, collenchyma and sclerenchyma. Complex tissue is divided into xylem and phloem, xylem is comprised of four types, such as tracheid, vessel, xylem parenchyma,

and xylem fibre, whereas phloem is classified into four types, such as sieve tube, companion cell, phloem parenchyma, phloem fibre. Then animal tissue is described and classified by four categories, such as epithelial tissue, connective tissue, muscle tissue, nervous tissue. There is a chart is describing types of tissue is given: depending on shape and function epithelial tissue is categorized as squamous, cuboidal, columnar, ciliated and glandular. Different types of connective tissues in our body which include areolar tissue, adipose tissue, bone, tendon, ligament, cartilages and blood are described vividly. Different types of muscle tissues like striated, unsatiated and cardiac are discussed. Nervous tissue is made of neurons which receive and conduct impulses in our body. Some activities are given in this chapter. The figures of parenchyma, collenchyma, sclerenchyma, and figures of complex tissues are designed, but the figures are small in size, colourful figures and labelling of figures are not provided. Appropriate and interesting activities and experiments are not given for practical purposes. In last part objective and subjective questions are given.

The chapter-IV named improvement of food resources, Introduction about food resources is described briefly: crop yields and their improvements is given much importance. In this chapter crop variety improvements, sources of nutrient supply, manures and fertilizer are the main sources of nutrients supply to crop are focused. Detail description of fertilizer and manure are discussed: It gives emphasized on organic firming, tissue culture, mixed firming, inter cropping and crop rotation. Disease control of plant varietal improvement is required for higher yield, good quality, shortening the maturity duration and wider adoptability is discussed. Animal husbandry mainly focused on firm animal's new proper care and management like breeding, shelter, feeding and in this chapter disease control is stressed much. Diary on account of animal husbandry described, though the figures of various cows are given but it is blurred and not colourful so it does arouse interest of student. For the enrichment poultry firming is done to increase the production of domestic fowls. It includes both egg and broiler for poultry meat. For the better production of egg and poultry meat cross breading is done between Indian and exotic breeds for hybrid fowl. Pisciculture is described briefly, how it enhance production of fish and they can be cultured in both marine and inland echo system of aquaculture is also discussed. Marine fish is Captured by fishing net which is guided by latest technology like echo-sounder and satellite. Now a days for enhancement OF pisciculture, composite fish culture system is given highest importance. A brief discussion on done bee- keeping which is used to get honey and wax. Activities for the students is given in the books are not arousing interest in the mind of the student. Then summary is described briefly and in the last part various types of question are given as per the mental label of the student. Before the end the summary is discussed in detail. The chapter is too large, which can be distributed as two units, so that students can easily cover it.

Chapter- V comprises the chapter disease and its treatment, The introductory part is discussed health and how we maintain good health. And the significance of heath is focused both personal and community health are described and distinction between healthy and disease free is out lined. Diseases and its causes are focused. What do you mean by acute and chronic disease and what is the cause of infectious and not-infectious causes? What are the agents, means of spread and principles of prevention measures are taken for infectious diseases? Principles of prevention for healthy life is better than successful treatment. Communicable diseases can be prevented by using immunization through vaccine or any other means. It is discussed that effective prevention of contagious diseases in the comm unity regards that everyone should have access public hygiene and immunization in the last part of this topic, there are few communicable diseases are like typhoid, diarrhoea, malaria, hepatitis, rabies, aids, tuberculosis, and polio are given with reference to its cause symptoms, treatment and how to irradicate the disease is discussed in this chapter. In this chapter only seven pictures are provided which are small in size, blurred, and black and white in color. before the end of the chapter what is learnt by the students is given. There should be a few objective questions arranged in each part of sub-topics.

: The name of Chapter-VI is natural resources and its pollution. Introduction is described on natural resources. The classification of natural resources as renewable resources and non-renewable resources are defined in this chapter.in this topic life on the earth depends on resources like air, soil, water and energy from the sun. The air, role of atmosphere, the movement of the air , transpiration, rain, water, soil and its types are described in this

chapter. The pollution of air, water and soil is focussed. Detailed description of greenhouse effect is discussed in this chapter. How depletion of ozone layer occurs and all the biogeochemical cycles such as water cycle, oxygen cycle, carbon cycle and nitrogen cycle with detailed descriptions of charts are described but the students confused to study so many cycles at one time. No useful activities or experiments are not provided for the purpose of practical. In this chapter a number of projects are provided for the practical knowledge of students. What is learnt from the chapter is minutely discussed. Lastly various type of questions are set for testing the knowledge of students

In all the FGDs the teachers are opined about the physical aspect of the book that the papers are not good. The bindings of the book is not proper. The margins of the book is very less. The letter size is appropriate. The colour of the book is black and white and price is affordable. With regards to the academic aspects of the biological science text book unit wise analysis was done. The results of the FGDs are that the introduction of unit-1 is not satisfactory. The life span of a few numbers' organisms is provided where as more numbers of organisms will be provided. In biodiversity eco-system must be provided which is not described. The pictures given in this chapter are small in size, not colourful, blurred and labelling is not cleared and not attracted by the students. This chapter is lengthy which can be sub-divided into two parts. The scientific names of all the phylum and scientific terms are difficult to learn the students. There is a confusion in the chart of animal kingdom which is provided in portrait mode, if it will be provided in landscape mode it will be easily understood. Conceptual clarity is not cleared. The classification of plants and animals are not easily understood by students. Lessons are not arranged easy to difficult or simple to complex. there are no lively examples are not given to explain the concept clearly. All the definitions and scientific terms are mentioned in English with bracket but a few words are explained. As this is a hard topic which must give much importance. Lesser numbers of activities are provided for the experiment at the end of each chapter. In the section what we learnt all the important points are not given. In the question section descriptive questions are given much importance whereas objective questions are lesser in numbers. At the end of each chapter reference should be given but in this chapter no reference is given.

In unit-2 introduction and summary are discussed elaborately. One teacher said that the figures of plant and animal cell are of appropriate size but it is blurred and cannot be distinguished properly as per labelling. All the scientific terms are spelt in English and written in Odia. The term plastid in the page number 27 which is not explained in detail so it does not clear the concept of students. In the sub-heading nucleus the central part of cell is nucleus which is not provided. The picture of D.N.A is given which is blurred and colourless. If it will be multicolour, it must capture the student's attention. On the heading of chromosome, no picture is provided which can be designed by a nice coloured picture. There is no any lively examples which will clarify the students concept. In page number 30 there are 4 activities are given for the students but these activities are not much interesting to draw the attention of students. In page number 30 , 2.2 there is an example of Rhoeodiscolor leave for the experiment but which is not found in locality. This chapter mostly explains all the cell organelles but the materials given cannot clear the concept fully. A less numbers of questions are given in multiple section. There are 4 to 5 questions are designed for long type. More number of questions can be asked. There are no questions of yes/no and true/ false. In what we learnt section only ten points are focussed. All the important points can be described here.

In the third chapter of biological science textbook i.e., tissue system introduction is not linked with previous knowledge. to come to the main point. The sub-heading 3.1 tissue system is not discussed clearly that cell-tissue-tissue system-organ-organ system-animal/plant. This chart is necessary but it is lack in the textbook. In the sub-heading plant tissue and its classification, a chart is provided at last but it should insert at first for the easier explanation of plant tissue. Classification of plant tissue is not explained minutely so the students confused and they are facing problems in this chapter. All the figures of plant tissues are blurred and colourless which are not attractive, the size of picture is small and the labelling parts are not clear to see. The chart of epithelial tissue is given. there must be a chart for explaining the animal tissue. Enough activities are given for the experiment but which is arranged in each part of the chapter but it is given in the end of the chapter. In what we learn section there

are some important points are discussed. In the question section multiple and long questions are given and true/false questions are not given. Learning outcomes and objectives are not fulfilled properly. Reference is not given at the end of the chapter.

The Unit-IV biological science textbook is improvement of food resources. Introduction is not clarified appropriately. There is a chart which is explained about the disease of plants, insect pest and disease control. A few numbers of crops are described in detail. In page number 59 there are various figures of cows are shown but the pictures are blurred. In 4.6 poultry is discussed in detail but the pictures of different types of poultry are given in small size and all the pictures are blurred. The pisciculture and aquaculture is described but it is very brief. Activities are given at the end of the chapter. Multiple choice and descriptive questions are provided. The number of questions appropriate to test the knowledge of the students.

The chapter -V in biological science is disease and its treatment. Personal and community health issues are not discussed elaborately but it is discussed briefly. Distinction between healthy and disease-free is discussed with a chart but it is discussed paragraphs. Communicable and non-communicable diseases are given but only communicable diseases are given much importance. Sufficient questions are given but more multiple-choice questions must be provided. A few activities are given for the experiment. In what we learnt portion the important points are discussed briefly. No references are given at the end of this chapter.

The last chapter of this biological science is Natural resources and its pollution. There should be a chart provided on the point 6.1.1 classification of natural resources. Air is discussed in 6.2 but it is very briefly components of air isa tabulated. There should be short questions are provided in each sub-heading. Atmosphere and the layers of atmosphere is discussed. For the explanation of atmosphere there should an appropriate graph is provided. The picture which is given attractive and easy to understand the students. All the layers soil is shown in picture but in black and white which is not effective for students. Types of pollutions air, water and soil are discussed but not in elaborately. For the explanation of greenhouse effect there must be a good picture and the materials are given are not clear to understand. Ozone layer is given but the depletion of ozone layer is not discussed clearly. There are a number of biogeochemical cycles like water cycle, oxygen cycle, carbon cycle, nitrogen cycle and water cycle is provided. Nitrogen cycle and water cycle is discussed clearly but all other cycles are little bit confusing and not explained properly. The concept is not cleared. Excess number of activities are there which are not easy to execute the experiment easily. There are six numbers of projects are provided but the materials used in this project are not found easily. In the portion what we learnt only few points are focussed. Questions are arranged appropriately to test the knowledge of students.

Conclusion

In the light of findings given above, it is seen clearly that during preparation of the biology textbook, the bindings of the book were not taken care up. The papers are not good. Because of lack of the scientific research processes and questioning techniques, the textbook is weak and inadequate. Then, the visual materials are inappropriate and don't serve the goals of topics,

there are mechanic activities and measurement-assessment techniques aren't diverse. So, it is clear that the textbook doesn't serve to meet the needs of teacher, students, and even instruction. As a consequence, since the nature of science and questioning are altogether disregarded, it was designed in an inadequate manner. Lack of the usage of major learning approaches results in useless information which is far away from investigation. Firstly, textbook should be helpful to understand the main scientific concepts easily. Main scientific concepts should be presented deeply in the textbook, but the presentation should not bring on misconceptions. Secondly, history of science, nature of science, and science and technology, society issues should be perceived as an intellectual and social aim. At last, scientific research processes, questioning, inquiry-based instruction and problem-solving skills should be supported by the book.

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