

**A COMPARATIVE STUDY OF TEXTBOOKS OF CBSE
AND GSEB FOR BIOLOGY
AT THE HIGHER SECONDARY LEVEL**

**A
DISSERTATION
SUBMITTED TO SARDAR PATEL UNIVERSITY
IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE DEGREE OF**

MASTER OF EDUCATION

GUIDE
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APRIL, 2017

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SUBMITTED BY

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CHAPTER 1

INTRODUCTION

- 1.1 Introduction
- 1.2 Definition of Textbook
- 1.3 Importance of the textbooks
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1.1 Introduction

Textbooks have always been an integral part of education. This is especially true in developing countries where it remains the only instruction material, and there are no technological advances to supplement textbook teaching. Science remains a key subject in school education and textbooks are an important part of school science. Textbooks provide a framework for what is taught and how it is taught. Textbooks also impart a sequence that is followed in a particular subject. Given the sequential nature of biology, the biology textbook becomes a vital component for science achievement. It is also imperative to see to what extent the school biology textbook reflects the changes in the biology curriculum that have taken place.

Textbooks provide to the teacher with several advantages in the classroom. Textbooks are especially helpful for beginning teachers. The material to be covered and the design of each lesson are carefully spelled out in detail. Textbooks provide organized units of work. A textbook gives you all the plans and lessons you need to cover a topic in some detail. A textbook series provides you with a balanced, chronological presentation of information. Textbooks are a detailed sequence of teaching procedures that tell you what to do and when to do it. There are no surprises everything is carefully spelled out. Textbooks provide administrators and teachers with a complete program. The series is typically based on the latest research and teaching strategies. Good textbooks are excellent teaching aids. They are resource for both teachers and students.

In education textbooks are very important because these are helping in attaining the school curriculum. Textbooks state that the heart of educational enterprise. In case of developing countries where other instructional materials are not available, the role of textbook is vital. Generally we know that a textbook is a prescribed book for the student of a particular age group. It covers the items as given in the syllabus. Such a book forms the basis of teaching learning in the class. In this assignment we discuss about the share of textbook in curriculum, it means what is the part of textbook in school curriculum and how textbooks are helping or aiding to achieve the objectives of school curriculum and facilitating the teaching learning process.

A textbook is only as good as the teacher who uses it. And it is important to remember that a textbook is just one tool, perhaps a very important tool, in teaching arsenal. Sometimes,

teachers over-rely on textbooks and don't consider other aids or other materials for the classroom. Some teachers reject a textbook approach to learning because the textbook is outdated or insufficiently covers a topic or subject area. As a teacher, you need to make many decisions, and one of those is how you want to use the textbook. As good as they may appear on the surface, textbooks do have some limitations.

Science has invaded every branch of modern life. It is the noise of machines, cars, mills and factories, etc. which awakens us every-day in the morning. The food we eat, the clothes we wear, the books and papers we read, the recreations we enjoy, the games we play – all have something or other to do with the application of science. Every person feels the effects of science in every sphere of life. It is not merely the electric light or the electric fan, the radio or the cinema that displays the power of science in our daily life, but everything we do or is done to us is in some way or another connected with science.

In the higher education, the textbook is one of the many tools used for learning. In some courses, the textbook is central to class discourse. In other courses, the text is supplementary and acts as a guide for segueing among the topics covered. Whatever role the faculty chooses for the textbook to play in the course, instructors and students alike consider the textbook an essential learning tool. Biology is all about studying life and living organisms. We're living organisms and we eat living organisms, so you could probably guess that it has something to tell us about what's going on all around and inside our body.

Let see how important is biology to our everyday routines, exactly. It's Literally Everywhere. Like, Understanding Our Bodies - Treating Disease, Proper Nutrition, and Exercise Science; Understanding Our Environment – Conservationism, Using Natural Resources, Harvesting Food etc.

Importance of teaching Science is a basic human motivator is to try to understand WHY. Why did something happen? How does something work? Curiosity about the world around us, about what makes it and us mark is at the foundation of invention, of creativity. Teaching science well can nurture that curiosity, can satisfy some of that yearning to understand WHY. Understanding why a year is what it is for us on planet Earth feels good. Understanding how organisms are all connected by the long thin thread of evolutionary change gives depth to our sense of stewardship of the Earth. Having a methodology to turn our native curiosity into knowledge gives us the power and possibility of invention, of finding solutions to problems.

A knowledge and love of science is the ultimate equalizer, the pathway to human rights and a better quality of life. Countries with strongly supported science programs are better off economically have greater numbers of people creating new technologies.

Our knowledge of how and why things are the way they are in the natural world is our greatest natural resource, second only to water. The way we acquire that knowledge and understanding, called the scientific method, is not difficult, nor does not require memorizing a list of words: observations, hypothesis, experimentation, interpretation. These are simply ways we go about learning.

1.2 Definition of textbook

Francis Bacon (1960), an English philosopher defines the textbook as a book designed by experts in the field and equipped with the usual teaching devices.

Encyclopedia of Educational Research (1960) defines textbook as “in the modern sense as commonly understood, the textbook is a learning instrument usually employed in schools and colleges to support a programme of instruction, In ordinary usage the textbook is printed and it is non-consumable. It is hard bound it serves an avowed instructional purpose as it is placed in the hands of learner.

The International Encyclopedia of Educational Technology (1989) explains the term text book in these words; “A book used as a standard work for the study of a particular subject now usually one written specifically for this purpose, a manual of instructional in any science or branch of study, especially a work recognize as authority”.

According to Agrawal and Biswas (1971) “Textbook is a book used as a principal source of study material for a given grade in a specific subject. It determines enriches and supplements the curriculum.”

According to Buckingham (1960), the textbook in the modern sense is a learner instruments usually employed in schools and colleges to support a programme of instruction.

Dave (1968) suggested a textbook is usually designed for producing variety of instruction inside and outside the classroom which ultimately results into learning. Thus, textbook is a powerful instrument for generating a variety of education interactions.

1.3 Importance of the textbooks

- There is some debate over what constitutes a school textbook. Questions have been raised about whether textual material held in school and local libraries are text book or reference books.
- Similarly it can be asked whether novels studies in class rooms are textbooks. Warren's (1981) answer to such questions was provides in following definition. "A textbook is printed instructional material in bound form, the content of which are properly organized in elementary or high school curricula." Apple (1991) claims that in the United States out of 75 per cent of instructional time in secondary classroom 90 per cent of time assigned to home work involves the text materials.

Teachers find textbooks are important for the following reasons.

- Numerous teachers perceived textbook as being concerned with content.
- Home work, self practice and revision.
- Text books are portable, relatively inexpensive and reasonably durable.
- Text books are often used to provide the structure for the course of study and sequence of instruction.
- Well constructed text content provides an orientation to an area of study encompass basic information.

Text books have been an integral part of education since long. Textbooks are a standardized collection of the sub-matter that has to be taught to the students. They facilitate the first of new concept and skills and maintain knowledge already acquired and keep the correlation of the theoretical knowledge with practical aspects of life or it may be described as being an aid to teaching and learning which is specially prepared by experts for the use of pupils and teachers presenting a course of study usually in a single subject. There are three categories of textbook such as reference book, main textbook and supplementary book.

Gain (1958) has pointed out that textbooks have become an inseparable and integral part of most of the educational system in the developing countries like India. Textbook is the only instructional material which is easily available to the majority of the students. Textbook are helpful in developing expected aptitudes and concepts. Textbook is one of the important curriculum material which helps in generating educative interaction in the classroom between

the teacher and learners and co-learners as a result instruction objectives can be achieved in some instance. Textbook are used as source securing information for the students.

1.4 Views of different Commissions on textbooks

The following are the views of different commissions on the quality of the textbook.

- The Secondary Education Commission (1964-65) for quality of textbook mentioned as under. “We are greatly dissatisfied with the presented standard of production of school textbooks and consider it essential that this should be radically improved. Most of the books submitted and prescribed are poor and there are numerous printing mistakes. If such books are placed in the hands of students it is idle to expect that they would acquire any love for books or feel interest in them of experience joy that comes from handling an attractively produced publicly.”
- Education Commission (1964-66) noted “A good textbook, written by a qualified and competent specialist in the subject and produced with due regard to quality of printing, illustration and general get up stimulates the pupils interest and helps the teacher considerably in his work. The need to emphasis it is all the greater because it requires only a relativity small investment of resources moreover a quality book need not cost appreciably more than the one that is indifferently produced.”
- Education Commissions (1964-66) reflections are as: There are malpractices in the selection and prescription of the textbook. The unscrupulous faculties are adopted by several publishers. The observation of the above views reveals that it is the textbook which arouse interest among the students towards teaching – learning process and helps teacher in teaching task. It is therefore imperative to maintain the quality of textbook.

1.5 Textbooks as an important source of curriculum implementation

Curriculum is the heart of the education institute around which all different kind of education activities are organized and designed by taking into account the knowledge of society, human development and nature of learning. The word curriculum is derived from the Latin word “curre” which means to run. In other words curriculum means a course to be run for

reaching for the certain goal. The comprehensive and acceptable definition of curriculum is the list of planned learning experience offered students under the direction of the school in and outside the classroom. The curriculum is always pre-planned. It is not a set of activities developed on the spot or spontaneously. Therefore it is clear that to achieve pre-decided educational aims, it is needed to other specific kind of material to teachers.

According to the Bhatt and Sharma (1992) such materials involved:

Textbook, standard reference-book, pamphlet, current magazines and newspaper, Audio visual materials like radio, television etc. community curriculum resource professional discussion.

Among all those above stated material textbook plays a pivotal role even today, in the 21st century. One of the reason could be textbook is still presented by the developing countries. Textbook is the inevitable teaching tool through which curriculum is percolated because curriculum framework is drawn out according to the suggestion of the committee and the commission on education.

In short the present system of education is such that one cannot imagine the schools without the textbook though more advanced innovations are going on in the field of technology but it remains sure as well that textbook will be important source of curriculum implementation in the nearer future.

Textbook of higher quality attempts to presents the materials in consonance with the syllabus of a particular manner and language which can be easily understood by the children for whom the book is written. Moreover it is built upon what the children have learnt previously and is a preparation for what they will be expected to learn at the next level ideally. Textbook serves as the true on the thread continuity and the central focus for learning that is expected to take place. It provides basis for learning, knowledge attitudes and skills in a specific subjects for which it is written and it may have to be supplemented by numerous other resources. A textbook cannot be preserved single handed. It needs the involvement of a group consisting of subject specialist educationist and classroom teacher and so on.

1.6 Nationalization of the Textbook

According to Krishnamurthy (1966) the government wanted to promote university standards, improve quality of textbook and lower the prices. Pal (1973) describing the situation remarks that various states have nationalized the textbook because of the defects in Textbook. Nationalization of textbooks contemplates complete control of all aspects of textbook. Nationalization of textbook in different states took place in 1969. But it was only after 1979-80 all the schools started using nationalized textbook as the quality of books has improved in several instances of books but still remain poor. Shortcoming like failure is inadequate organization of the agencies which have taken over the responsibility of textbook production. There for Uttar Pradesh state was the first to nationalize the texts (1942) and Himachal Pradesh was the last state to nationalize it (1979). The state of Nagaland and Manipur has not yet nationalized their textbooks. Various reports of NCERT also indicate the different types of agencies are set up in different states textbook production.

Hence, textbook evaluation becomes imperative. Evaluation is a process of determining the value of an attribute or a thing in relation to pre-determined objectives. Textbook evaluation means finding out the worth whiteness of a book as a teaching to the objective of the course assigned the age group. And to study this, a critical analysis of the textbook of CBSE and GSEB schools was undertaken by the researcher.

1.7 Rationale of the study

The present study is a comparison between textbooks of two different boards. The given details may help to individual associated with education system, teachers.

As the student of Biology background from GSEB the researcher wanted to identify differences between CBSE and GSEB textbooks. The researcher was interested in knowing the difference between the CBSE and GSEB textbooks because the textbooks are very important in teaching learning process and wanted to find out the merit and demerits of CBSE and GSEB textbooks.

The textbooks of the CBSE and GSEB now focus upon and written based on the theoretical approach of subject learning. Whether these textbooks provide students all the material as per the requirement of their age including theme, content as per the need of the psychology of the

students, and whether practical skills are focused upon in the textbook? It was with this thought of comparing the textbooks in CBSE and GSEB schools that the researcher took up the present study.

1.8 Statement of the problem

The problem of the present study can be stated as under

A Comparative Study of Textbooks of CBSE and GBEB for Biology at the Higher Secondary Level

1.9 Operationalization of important terms

The following terms have been used in the statement of the problem which have been explained and operationalized as under with reference to the present study

Comparative

- The study of the two textbooks in order to understand the differences between the two with regard to physical layout, content , language used and tasks given.

Textbook

- A book prescribed by CBSE and GSEB as a standard work for the study of Biology at standard XII.

CBSE

- Central Board of Secondary Education

GSEB

- Gujarat Secondary Education Board

Higher Secondary

- Students studying in 11th and 12th Std

1.10 Objectives of the study

- To compare the approach of teaching Biology
- To compare the language of both the books
- To relate the way of explanation given in the books for some topics
- To compare the creativity in designing the textbooks
- To compare the problems given in the textbooks
- To compare the textbooks with reference to physical layout, content variety, themes, length of the units, activities and task
- To provide suggestions for the textbooks of CBSE and GSEB boards

1.11 Research questions

1. What is the approach to the teaching of Biology?
2. What is the difference between CBSE and GSEB textbooks?
3. What are the differences in the physical layout of CBSE and GSEB textbooks?
4. What are the differences in the content of CBSE and GSEB textbooks?
5. What are the differences in the length of units in CBSE and GSEB textbooks?
6. What are the differences in the themes of units in CBSE and GSEB textbooks?
7. How far are the problems same or different in the textbooks?
8. What is the difference between the language used in textbook of CBSE and GSEB textbooks?
9. What are the different activities prescribed in the CBSE and GSEB textbooks?
10. Which types of tasks have been prescribed in the CBSE and GSEB textbooks?
11. What different suggestions can be provided for the CBSE and GSEB textbooks?

1.12 Delimitations of the study

- For the present study, the selected textbooks are the source of the data.
- The study includes comparative analysis and interpretation of the data gathered.
- This study is delimited only for the textbook of 12th Biology of CBSE and GSEB.

1.13 Scheme of Chapterization

A brief description of the content in the forthcoming chapters of the thesis has been given in the following paragraphs.

Chapter 1 is regarding the meaning and importance of the textbook, discussion regarding views of different commissions on Textbooks, Nationalization and rationale of the Textbook, Statement of the problem, operationalization of important terms, objectives of the study, research questions and delimitations of the study.

Chapter 2 contains a review of the previous researchers and literature conducted in the area of textbook analysis and biology teaching methods. It includes research article review, research review and book review conducted in India and abroad.

Chapter 3 describes design and procedure of this study. It presents details relating to data collection, the methodology adopted and tools used for investigation and techniques of analysis employed for study.

Chapter 4 describes about the data analysis, interpretation and discussion. Data analysis includes opinions of teachers who teaches in CBSE and GSEB textbook curriculum, review of critical points regarding selected textbooks and unit wise analysis of textbooks.

Chapter 5 describes about the overall conclusion, suggestion for further studies and education implication of study.

CHAPTER 2

REVIEW OF LITERATURE

- 2.1 Introduction
- 2.2 Review of related research articles
- 2.3 Review of related dissertation work
- 2.4 Learning value of the review of related literature
- 2.5 How present study different from the studies reviewed?
- 2.6 Conclusion

2.1 Introduction

A literature review is the effective evaluation of selected documents on a research topic. A review may form an essential part of the research process or may constitute a research project in itself. The literature review is a critical synthesis of previous researches. The evaluation of the literature leads logically to the research question. The literature review provides a background to the study being proposed. The background may consider one or more aspects. The aim is to extract key points by comparing and contrasting across studies, instead of reading one paper after another.

2.2 Review of related research articles

2.2.1 Approaches to Biology Teaching and Learning: Understanding the Wrong Answers – Teaching toward Conceptual Change (Kimberly Tanner, 2005)

- Learners come to formal science instruction with a diverse set of alternative conceptions concerning natural objects and events.
- The alternative conceptions that learners bring to formal science instruction cut across age, ability, gender, and cultural boundaries.
- Alternative conceptions are tenacious and resistant to extinction by conventional teaching strategies.
- Alternative conceptions often parallel explanations of natural phenomena offered by previous generations of scientists and philosophers.
- Alternative conceptions have their origins in a diverse set of personal experiences, including direct observation and perception, peer culture, and language, as well as in teachers' explanations and instructional materials.
- Teachers often subscribe to the same alternative conceptions as their students.
- Learners' prior knowledge interacts with knowledge presented in formal instruction, resulting in a diverse set of unintended learning outcomes.
- Instructional approaches that facilitate conceptual change can be effective classroom tools.

2.2.2 Approaches to Biology Teaching and Learning: Learning Styles and the Problem of Instructional Selection - Engaging All Students in Science Courses (Kimberly Tanner and Deborah Allen, 2004)

To provide open access to science learning and encourage a broader spectrum of students to pursue studies in the sciences, we as teachers, instructors, and faculty must begin to address the diversity of learning styles among the students in our classrooms. So, what is a learning style? An individual's learning style can be defined in many ways, including, "the complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn" (James, 1995) or, alternatively, "the preference or predisposition of an individual to perceive and process information in a particular way or combination of ways" (Sarasin, 1998). From a biological perspective, the brain is the organ of learning, and as such, a learning style is likely to be a complex, emergent interaction of the neurophysiology of an individual's brain and the unique developmental process that has shaped it through experience and interaction with the environment. Learning style, thus, is a phenotypic characteristic of an organism like any other. Given the plasticity of the human brain and its propensity to learn and likely change synaptically over time, learning styles should be considered to be flexible, not immutable an individual's learning style could be actively adapted, to a certain extent, to different learning environments.

The study of human learning styles is a well-established field within the discipline of cognitive psychology. Shelves of books and hundreds of papers by leading researchers in the field are beyond the scope of this short introduction to learning style theory. To provide entry into the core ideas for interested science faculty, we have chosen to briefly explore three accessible frameworks for characterizing differences in the way learners prefer to learn: the VARK, Multiple Intelligences, and Dimensions of Learning Styles in Science. No one school of thought is superior or inferior to the others, and those presented here are but a sampling of the ideas in this field of cognitive psychology research. There are many common strands and themes among these examples. Other approaches to describing and categorizing learning styles have been proposed that are not dissimilar to the ideas presented here (Honey and Mumford, 1982; Kolb, 1984, 1994). In particular, Isabel Briggs Meyers and her mother, Katherine Briggs, adapted the theories of Carl Jung to produce the Meyers-Briggs Type Indicator assessment, which explores the connection between personality, temperament,

learning style, and career choices and is commonly used in both corporate and academic environments (Meyers and McCaulley, 1986; Meyers-Briggs, 1980). It is important to keep in mind that all of these frameworks and research literature on understanding learning styles are attempts to simplify what is fundamentally a complex issue; namely, who we are and how we learn.

2.2.3 The effect of teaching methods on cognitive achievement in biology Studying (Snezana Stavreva Veselinovska, 2011)

Teachers in the pedagogical and didactic theory encounter general guidelines for the innovation of teaching, such as: instruction should not be conceived as memorizing facts and concepts, definitions and phenomena, individual differences among students should be respected, student should be brought into a situation to develop their knowledge, etc. But such demands do not trigger response if not observed and re-shaped into precise and specific methodological guidelines aimed at current programmed content. The introduction of innovation will be facilitated by providing complete didactic materials which will help teachers to apply these innovations in practice more easily.

The use of modern instructional technology does not mean only modernization of the school with new and modern teaching aids, but providing clear guidelines for implementation of the active forms and methods in the context of current educational contents. The teacher must know how to combine modern methods, forms and methods of teaching, or what the advantages and disadvantages of such models and frameworks are, and in what frames they can be successfully applied in our teaching practice.

In an attempt to avoid generalized didactics and out of the desire to leave using teaching methods, which can easily be transformed into routine practice and bare practicing, the basic idea of the work was to show how to shape innovative models of educational organization in teaching biology, i.e. the kind of effect they have on the success of students, or what dimensions the teacher has to take into account in order to meet the frames of contemporary teaching of biology.

The aim of the work is to show the application of teaching methods used in the teaching process in teaching the content area of biological sciences or biochemistry, as well as their empirical confirmation by measuring the achievements of the student. Intentional causes for this paper to be written can be found in the fact that in our teaching practice empirical studies

that aim to entrust successful application of contemporary models of learning and teaching are extremely rare, which is especially the case in teaching the area of natural sciences, or, more precisely, biology. Institutions of higher education and training within the European Union offer their own proposals for the modernization of the educational process in our schools, but only as examples and ideas that need to be upgraded to suit the conditions of our teaching practice. Models of learning and instruction for teaching biology that will be proposed in this paper rely on the achievements of teaching practice and compatible teaching subject in the countries of the European Union under the title "Science" and "Primary science".

Modern methodological and didactic theory needs experimental verification of the application of teaching methods in teaching organization for setting clear signposts of teaching practice. The acceptance of innovation and improvement of competencies must be the foundation of the professional development of teachers, particularly in the areas of effective instruction and management in the classroom, for the development of the desired pupils' competencies for a life in the contemporary environment, as well as in the goal of getting to an effective teaching and contemporary forms of learning in practice.

2.2.4 Recent Research in Science Teaching and Learning (Deborah Allen, 2011)

The authors describe a study that used diagnostic question clusters (DQCs) to examine undergraduate students' reasoning patterns about carbon-transforming processes. DQCs are "diagnostic" because they aim to provide information about specific reasoning tendencies, and "clusters" because they are sets of questions designed to identify patterns in thinking about interrelated, core concepts. As stated by the authors, this work moves beyond studies that look at single and perhaps unrelated misconceptions about the carbon cycle to identify patterns in students thinking that connect to fundamental principles ones that extend across and constrain biological systems and processes at multiple scales. The DQCs were taken from published sources or developed by the authors, and delivered in several formats: multiple-choice, multiple true-false or mixed (e.g., choice of response, followed by explanation of choice). A pair of DQCs was used; one cluster focused on conservation of matter, and the other on conservation of energy. The DQCs were administered to 525 students enrolled in biology courses 13 universities representing diverse institutional types. In each course, one of the DQCs was administered at the beginning of the semester, and again as a "post test" for

half of the students; the remaining half of the class received the other (new) DQC as the post test to compare the levels of difficulty of the two clusters. One of three active learning lessons about tracing matter and energy through the carbon cycle intervened between the two DQC tests. The course instructors scored the tests, using a rubric that categorized responses to indicate whether they exhibited use of “scientific principle-based,” “informal,” or “mixed” (principle-based and informal) reasoning. The article includes numerous examples of sample questions and corresponding student responses for these categories. Among several qualitative trends in the data, the authors describe two that predominated: 1) students often avoid the necessity of separately tracing matter and energy by using energy as a “fudge factor;” and 2) lack of fundamental understandings about atoms and molecules can explain inability to use principle-based reasoning. Quantitative analysis of trends revealed that a majority of students applied a combination of principle-based and informal reasoning across all topical categories like, matter, energy, photosynthesis, transformation, and oxidation in both the pre- and post tests. Additionally, although the percentage of students whose responses evidenced principle-based reasoning doubled after instruction from an average of 12–27% across all categories, 16% of the students persisted in using informal reasoning, 22% exhibited this reasoning pattern prior to instruction. The authors conclude by discussing the relationship of their findings to existing research on the deep-seated nature of informal reasoning, and the implication of their findings for use of standard biology textbooks and for college biology teaching.

2.2.5 The Colorado Learning Attitudes about Science Survey (CLASS) for Use in Biology (2011)

- This paper describes a newly adapted instrument for measuring novice-to-expert-like perceptions about biology: the Colorado Learning Attitudes about Science Survey for Biology (CLASS-Bio). Consisting of 31 Likert-scale statements, CLASS-Bio probes a range of perceptions that vary between experts and novices, including enjoyment of the discipline, propensity to make connections to the real world, recognition of conceptual connections underlying knowledge, and problem-solving strategies. CLASS-Bio has been tested for response validity with undergraduate students and experts (biology PhDs), allowing student responses to be directly compared with a consensus expert response.

- Use of CLASS-Bio to date suggests that introductory biology courses have the same challenges as introductory physics and chemistry courses: namely, students shift toward more novice like perceptions following instruction. However, students in upper-division biology courses do not show the same novice-like shifts.
- CLASS-Bio can also be paired with other assessments to:
 - Examine how student perceptions impact learning and conceptual understanding of biology
 - Assess and evaluate how pedagogical techniques help students develop both expertise in problem solving and an expert-like appreciation of the nature of biology.
- One way to examine student perceptions about biology is on a continuum of novice-to-expert level. Hammer (1994) proposed that differences between how experts and novices view a discipline can be characterized into three main areas:
 - Content and structure of knowledge
 - Source of knowledge
 - Problem-solving approaches.
- In the first area, content and structure of knowledge, experts believe knowledge is structured around a coherent framework of concepts, while novices believe knowledge comprises isolated facts that are not interrelated. In the second area, source of knowledge, experts believe knowledge about the world is established by experiments that describe nature, while novices believe knowledge is handed down by authority and do not see a connection to the real world. Finally, with regard to problem solving approaches, experts rely on concept-based strategies that are widely applicable to multiple problem-solving situations, while novices will often apply pattern-matching to memorized problems and focus on surface features, rather than underlying concepts. Examination of all three of these areas demonstrates that experts not only have a deeper conceptual knowledge of a discipline, but they also hold more sophisticated views about how scientific knowledge is obtained, expanded, and structured, as well as how to approach unsolved problems.
- Biologists have long been concerned about the quality of undergraduate biology education. Indeed, some biology education journals, such as the American Biology Teacher, have been in existence since the 1930s. Early contributors to these journals addressed broad questions about science learning, such as whether collaborative or

individual learning was more effective and the value of conceptualization over memorization. Over time, however, biology faculty members have begun to study increasingly sophisticated questions about teaching and learning in the discipline. These scholars, often called biology education researchers, are part of a growing field of inquiry called discipline-based education research (DBER).

- DBER investigates both fundamental and applied aspects of teaching and learning in a given discipline; our emphasis here is on several science disciplines and engineering. The distinguishing feature of DBER is deep disciplinary knowledge of what constitutes expertise and expert like understanding in a discipline. This knowledge has the potential to guide research focused on the most important concepts in a discipline and offers a framework for interpreting findings about students' learning and understanding in that discipline. While DBER investigates teaching and learning in a given discipline, it is informed by and complementary to general research on human learning and cognition and can build on findings from kindergarten to std. 12 science education researches.
- DBER is emerging as a field of inquiry from programs of research that have developed somewhat independently in various disciplines in the sciences and engineering. Although biology education research (BER) has emerged more recently than similar efforts in physics, chemistry, or engineering education research, it is making contributions to the understanding of how students learn and gain expertise in biology. These contributions, together with those that DBER has made in physics and astronomy, chemistry, engineering, and the geosciences, are the focus of a 2012 report by the National Research Council (NRC, 2012).

2.2.6 Bioethical education in teaching Biology carried out by Mariana Iancu (2013).

Education stands as the subject matter of Pedagogy; the word comes from Latin, respectively, “educo-educare (educere)”, meaning to grow, to cultivate, to guide, to educate; “education” - growth, cultivation, guidance, education. It is the socio-human phenomenon which enables students to acquire theoretical and practical knowledge on the basis of what mankind has accumulated throughout the social and historical evolution, shaping the personality and professional skills of the young generation as useful social entities.”(Ciobanu, 2009) The bioethical (Greek. bios = life, ethikos or ethos = character, ethical, moral) education is a

component of moral (lat. mos, moris, moralis = manners, moral behavioural customs) education and also a cornerstone of it, has ethics as a fundament, which represents the science which studies moral laws. The bioethical education aims to educate young people so as to apply moral laws in close correlation with the laws of biology in scientific research and scientific advances in biology, medicine, agriculture, and also in everyday aspects of their social, professional and family life and life in general on Earth. The concept of bioethics was introduced by Van Rensselaer (1970), who considered it necessary to combine biological knowledge and knowledge about life with knowledge on the human, moral and ethical values. "Bioethics has emerged as a new discipline which unites biological knowledge with knowledge of human value systems. I chose bio - to represent biological knowledge, the science of living systems, I chose ethics - to represent human value systems." (Van Rensselaer, 2000). In the context of the new scientific discoveries, it is absolutely necessary, as a means of moral education, for the young people to become aware of the importance of bioethical education. Such an educational approach should lead to practical and theoretical scientific results and scientific phenomenon and, also, should result in understanding of their use in a responsible, ethical and moral way in human relationships with their peers, with other living creatures and nature.

Various biology-based subjects taught in high school, such as Biology or Health Education, which are part of the optional school curriculum within "The Health Education Programme 2005", or several specialized academic courses, such as Genetics taught at the Faculty of Biology, contribute to the moral education of the youth by enlarging teaching upon bioethical issues. "Teaching is the teacher's activity that mustn't overlook, but on the contrary, requires becoming aware of them. It cannot be separated from the learning activity of the student, but must be modified in design and in our practice in the classroom. This should be the initiation, coordination, stimulation, support, checking students' learning activities by the teacher." (Ciobanu, 2008) Examples of biology lessons where teaching contributions to bioethical education can be successfully incorporated include: "Scope and bioethical considerations in human genetics-genetic advice, prenatal diagnosis, in vitro fertilization, therapeutic cloning, and genic therapy" (grade 12), „Conception and contraception" (grade 11), "Sexually transmitted diseases" (grade 10), "Cloning" (grade 9) and others. Classes on "Health Education" can promote an effective bioethical education through lessons such as: "Identity and sexual orientation, STI/HIV/AIDS", "In vitro fertilization", "Legislation on sexuality. Pornography and prostitution". Bioethical education requires the use of deductive heuristic

strategies, analogies, interactive methods in the teaching process. On the one hand, these methods will boost analytical thinking, analogic reasoning, synthetic and flexible approaches and, on the other hand, they will encourage personal responses, opinions backed by scientific arguments, scientific demonstrations and interactions in groups and teams. The atmosphere emerging in this teaching environment will be similar to that characteristic of scientists and decision-makers who can impact the humankind in a positive and non-intrusive manner. Therefore, the methods underlying these teaching strategies are diverse, ranging from traditional active methods (lectures with opponents, lecture-debate-discussion, Socratic dialogues) to modern methods (fishbowl, clustering, cooperation). For example, fish bowling is based on educational interaction as the students are divided into two groups (8 – 10) and will take turns getting involved in the discussion, being observed / not involved in discussion, acting as observers in order to come up with solutions to controversial issues and to develop good relationships in their group, to increase their observation skills and others. “Through its interventions, the teacher-moderator will try to bring new ideas, new viewpoints and arguments to the overall task completion” (Cerghit, 2006).

2.3 Review of related dissertation work

2.3.1 Nair, V.V (1996) conducted a study on evaluation of the 11th std. Physics textbook prescribed by Gujarat state higher secondary board. The objectives of the study were:

To study the extent of fulfillment of the academic and physical aspects of the textbook to meet the needs of the reader and student

To assess the textbook on the basis of prescribed syllabus with respect to the following aspects-

- deficiency or inadequacy of the content
- defects in the illustration
- defect in exercise or question
- terms used but have not been explained
- discontinuity in content organization
- content seem unnecessary
- dissimilarity in table content language

- spelling mistake

To evaluate the end of chapter exercise of the textbook in terms of

- Use fullness in revising the content
- Comprehensibility and
- Development of the creative linking
- Questionnaire for the teacher and students and interview were used as tools

Findings of the study were

- The content given the textbook was found to be according to the requirement of the syllabus
- Size and typography are satisfactory but paper, cover, binding are not satisfactory
- The textbook contains a number of spelling mistakes
- Illustration given in the textbook is helpful for understanding content up to a limit
- Certain chapters of the textbook are difficult because of task of correlation with the corresponding mathematics treatment.

2.3.2 Arya (2005) carried out a study entitled Comparative analysis of NCERT and GSHEB Textbook for subject of Commerce of Standard XI the M. S. University Baroda. The objectives of the study were:

- To study both the physical as well as the academic aspects of textbook provided by both
- To study content of the both textbook.
- To study the feedback of teachers and students with regarding to the level of satisfaction in term of both physically as well as academic aspect.
- To study and list out the desire changes as per the teachers and students with regards to objectives.

The tools used were content analysis sheet, questionnaire for the teachers and questionnaire for the students sample of the study was five schools of affiliated to GSHEB. One commerce teacher from each school was selected and 10 bright students. Finding suggested that there is

difference between both the textbooks but GSHEB textbook need attention. The NCERT textbook is rich in comprehension.

2.3.3 Marques, S., (2007) A comparative study carried out about Proportion in school mathematics textbooks. To conduct this study, first, they begun by choosing the topic. We selected proportion because, in most countries, it is a central topic of the curriculum for the 11-12 year old age range and allows for possible variations according to cultural traditions and emphasis. Second, we selected the countries to study. We were interested in comparing the Portuguese textbooks with the textbooks of countries with which Portugal has stronger cultural or educational connections. We chose: (i) Brazil, as it speaks the same language; (ii) Spain, as it speaks a similar language and has a common cultural root; and (iii) the USA, because it plays a leading role internationally in setting the mathematics curriculum. One must note that the NCTM (1989, 1991, 2000) documents have been quite influential in Portugal. On the other hand, curriculum documents and educational materials from Brazil and Spain are little known in our country and we are interested in knowing possible similarities and differences given the cultural affinities. Third, and finally, in these four countries we selected a textbook that would have a strong share of the market and could be readily available. Following were the findings.

All textbooks have a clear language, accessible to the students of these grade levels. The American, Brazilian and Spanish textbooks, show concern in focusing students' attention in new mathematics terms, whereas the Portuguese textbook does not. Furthermore, all textbooks are widely illustrated by pictures, drawings, or photographs that are, in one way or another, related with the issue or problem in question but often do not present relevant information for its solution. The organization of the chapters follows a pattern that does not vary much from textbook to textbook. All the textbooks include introductory tasks, application tasks, and final consolidation tasks in different quantities and levels of complexity. All textbooks except the Brazilian present revision tasks in the beginning of a new chapter. In introducing new concepts the Portuguese and Spanish textbooks begin by presenting a problematic situation and its solution, explain the concepts that follow from that example, present a synthesis, and, finally, propose a battery of tasks for practice. The American textbook follows the same pattern, but it stresses more the need for revision introducing at the beginning of each new section a small set of routine tasks to review

concepts formerly studied. The Brazilian textbook is noteworthy because it begins with problematic situations that are solved through a “conversation” among cartoon characters and only afterwards it proposes some tasks for the student to do. Furthermore, this is the only textbook that does not include an early formalization of the concepts.

2.3.4 Tok (2010) went about the evaluation of another ELT textbook, known as Spot On, which is utilized in primary public schools in Turkey. To conduct the research, initially 46 English teachers were randomly chosen by the researcher, and then a five-point Likert type questionnaire was disseminated among them. The practicality of the aforementioned textbook was judged in terms of a number of salient features such as its tasks and activities, design and layout, language type, content and subject. Based on the obtained results, this course book was found not to be sufficient enough in addressing the learners' real needs. Conducting a post-use textbook evaluation with local teachers within the Hong Kong ELT context. in their evaluation of four ELT textbooks, namely Top Notch, Interchange, Headway, and On your mark, at the elementary level of proficiency, Raseks et al. (2010) resorted to McDonough and Shaw's internal and external evaluation criteria. In keeping with the findings of the study, several pros and cons were reported for each of the four series. Yet, the privileges ascribed to Top Notch outweighed those reported for the other three textbooks.

2.3.5 In an attempt to scrutinize the pragmatic and communicative adequacy of New Interchange series in the Iranian ELT context, **Soleimani and Dabbaghi (2012)** administered a discourse completion test to 50 upper intermediate Iranian learners who had completed their studies with these books. Indeed, what these researchers strived to find was gauging the effect of these books on the learners' skills in coping with different interactive needs in varied real-life contexts. In line with the gained results, they held that the books had been practical in providing the learners with ample pragmatic input, and had prepared them well for dealing with diverse interactive needs in the society.

2.3.6 A comparative study done by **Courduff, J., (2012)** about Electronic versus traditional print textbooks: A comparison study on the influence of university students' learning. The purpose of the study was To date, research has demonstrated that students find digital

textbook formats to be generally usable but not convenient due to lack of availability in mobile formats and restricted linear navigation inherent in the majority of older versions of mobile e-reader devices (Foasberg, 2011; Reynolds, 2011; Sheppard et al., 2008). The key to widespread adoption of e-textbook technology appears to rely mostly on the development of mobile devices and student exposure to academic reading using these devices (Connell et al., 2012). Currently, little research exists on how the use of mobile devices to access e-textbooks in reflowable format over a course semester impacts learning. This study sought to extend previous findings and contribute to the body of literature and provide an improved understanding of how a text format impacts the learning of university students. For the purposes of this study, efficacy of textbook format is defined by grades and student perceptions of cognitive, affective, and psychomotor learning. This research study investigated the following questions: (a) Is there a difference between participants' perceived learning based on the format of textbook they choose for a course? (b) Is there a difference between participants' learning (e.g., final grade) based on the format of textbook they chose for a course? The study also examined students' use and study behaviors related to the chosen textbook to insure that results for the two research questions were not mediated by study habits and use of the text. The e-textbook group was also asked about future desire to use an e-textbook. To carry out this study, during the last three weeks of the identified course, students were sent e-mail messages from the researcher forwarded by their course instructor. The e-mail requested that they complete an informed consent and web-based assessment. Grades of participants who signed informed consent were obtained from the instructor's online grade book upon the finalization of grade for the term. Following were the findings: This casual comparative research study used a one-way multivariate analysis of variance to examine if university students' cognitive learning, affective learning, psychomotor learning, and grades differed based on their textbook format choice.

2.3.7 A Comparative Study of Textbook of Elements of Accountancy and Book keeping of CBSE and GSEB Schools of Standard XI carried out by Panchal C., (2013). Which contain objectives like, To compare the planning of content of Elements of Accountancy and Book Keeping textbooks of CBSE and GSEB of standard XI, To compare the content presentation of Elements of Accountancy and Bookkeeping textbooks of CBSE and GSEB of standard XI. To compare the syllabus of elements of Accountancy and Bookkeeping textbooks of CBSE and GSEB of standard XI, To compare the assignment given at the end of each chapter of

Elements of Accountancy and Bookkeeping textbooks of CBSE and GSEB of standard XI, To compare the external factor of Element of Accountancy and Bookkeeping textbooks of CBSE and GSEB of standard XI. To conduct the research, researcher has employed the survey method. It is most popular and most widely used researcher method in education. Researcher can gather information in terms of individual's opinion by a simple questionnaire. Following was the findings: The analysis and interpretation of data in every research work requires keen observation of calculation, there classification and categorization. The present study deals with the textbooks of CBSE and GSEB of standard XI. In this chapter the Elements of Accounting and Book keeping textbooks of CBSE and GSEB is compared with the help of Chi Square method and has been analyzed and interpreted by testing of formulated hypotheses.

2.3.8 Vaezi, R., (2014) A Comparative Study of Speech-acts in the Textbooks by Native and Non-native Speakers: A Pragmatic Analysis of New Interchange Series vs. Locally-made EFL Textbooks. To carry out the study, the materials used in this study were the dialogue sections included in the two series of EFL course books. "Right Path to English" is a locally-made textbook series for national purposes written by Birjandi and Soheili (2005) who are native speakers of Persian. "New Interchange Intro" is a series developed for international purposes. This series has been written by Richards, Hull and Proctor (1998) who are all native speakers of English. The instrument used in this study to analyze the materials was Searle's (1979) model of classifying speech acts like, Assertive, Directives, Commissive, Expressive and Declarations. Each of these categories consists of some sub-categories. As seen in the table 3.1, the category of Directives, for instance, includes several sub-categories like requesting, inviting, ordering, commanding, advising, recommending, suggesting, daring, defying, and challenging. The following was the findings: The results of this study revealed that dialogues used in these two series were different in the number of utterance included in each turn. For example, in 172 turns selected from Intro, there were 277 utterances. For Right path to English series, only 225 utterances were found. The mean number of utterance per turn used in Intro was 1.6, while the mean number of utterance per turn occurred in Right Path to English was 1.3. As the findings of this study shows, the dialogues of Right Path to English are generally shorter than the dialogues of Intro.

2.3.9 Mahdavi, H., (2015) carried out a study about a comparative study on the authenticity of the new English textbook prospect 1 with the old one right path to English 1 taught at junior high schools in Iran. The study needed, Teaching English in Iran, being based on textbooks, begins in the first grade junior high school, as it used to be, but in this academic year (2013-14) a new English textbook entitled ‘Prospect 1’ was published under the supervision of the Ministry of Education and is claimed to be based on CLT and to be a remedy to cover students' inability to communicate in English. One of the important features of CLT is authenticity of materials. As Larsen-Freeman (2011, p. 126) maintains, “to expose students to natural language in variety of situations, adherents of CLT advocate the use of authentic language materials”. O’Neill (1990) believes that students feel more confident and secure when handling authentic materials as long as possible. This research is a comparative study of the authenticity of the text book ‘Right Path To English 1’ by Birjandi and Soheili (2011) which is used to be taught in Iran and the newly published textbook ‘Prospect 1’. To carried out this study, A survey was done to gather the information needed. This is a method of data gathering from samples which are representative of a population. Brown and Rogers (as cited in Alamri, 2008, p.142) state “surveys are any procedures used to gather and describe the characteristics, attitudes, views, opinions and so forth of students, teachers, administrators or any other people who are important to a study”.

2.3.10 Siddiqi, S., carried out research entitled A Comparative Study of Creativity among Boys and Girls of Class VII. To carried out this research, A sample of 50 boys and 50 girls studying in two secondary schools of Aligarh city was selected on random basis for the study. The sample was equal on age and socio-economic status; and mean, standard deviation and t-test were calculated to analyze the data. Following were the findings: Comparison between boys and girls on originality shows significant difference between the two groups. The mean scores of boys and girls were 6.84 and 5.07 and standard deviations were 8.01 and 6.32 respectively. The ‘t’ value was 2.14 which is significant at 0.01 levels. As such, it may be concluded that boys with their significantly higher mean score possessed significantly greater originality than girls.

2.4 Leaning value of the review of related literature

While there might be many reasons for conducting a literature review, following are four key outcomes of doing the review.

- **Assessment of the current state of research on a topic.**

This is probably the most obvious value of the literature review. Once a researcher has determined an area to work with for a research project, a search of relevant information sources will help to determine what is already known about the topic and how extensively the topic has already been researched.

- **Identification of the experts on a particular topic.**

One of the additional benefits derived from doing the literature review is that it will quickly reveal which researchers have written the most on a particular topic and are, therefore, probably the experts on the topic. Someone who has written article on a topic or on related topics is more than likely and more knowledgeable. From the articles written by the author and the number of times the writer has been cited by other authors, a researcher will be able to assume that the particular author is an expert in the area and, thus, a key resource for consultation in the current research to be undertaken.

- **Identification of key questions about a topic that need further research.**

In many cases a researcher may discover new angles that need further exploration by reviewing what has already been written on a topic. A researcher who is interested in pursuing this topic would then do well to follow up existing studies with a new study, based on previous research, which tries to identify which styles of music are most beneficial to retention.

- **Determination of methodologies used in past studies of the same or similar topics.**

It is often useful to review the types of studies that previous researchers have launched as a means of determining what approaches might be of most benefit in further developing a topic. By the same token, a review of previously conducted studies might lend itself to researchers determining a new angle for approaching research.

Upon completion of the literature review, a researcher should have a solid foundation of knowledge in the area and a good feel for the direction any new research should take. Should

any additional questions arise during the course of the research, the researcher will know which experts to consult in order to quickly clear up those questions

2.5 How present study different from the studies reviewed?

Comparing with the studies carried out in the past, the present study differ in the way that,

- It is not the comparison of textbook chapters with another one.
- It depends on data collected through questionnaire, teacher's opinions.
- It is also depends on the analytical study of textbooks carried out by the researcher himself.
- It deals with problem of teachers while dealing with the textbooks which were not included in the past studies.
- It also depends upon whether textbooks raises contemporary life and able to create sustainable development.
- It depends upon the view and problem faced by teachers that was also not found in past studies.
- It also deals with the comparison of textbooks based on the balance of theory as well as activities.
- It also deals with the comparison of methodology of teaching in both the textbooks.

2.6 Conclusion

This chapter gives detailed accounts of meaning of teaching biology, methodology of teaching biology, difference view on teaching biology. This chapter also includes a historical perspective of teaching biology, different methodology and different tools to assess biology learning, the researcher has reviewed 6 research articles and 10 studies on various problems regarding comparison of textbooks, methodology and assessment methods. It also provides learning values of reviewing literature. The whole chapter provides background of study.

CHAPTER 3

RESEARCH PLANNING AND PROCEDURE

- 3.1 Introduction
- 3.2 Research Design
- 3.3 Research Method
- 3.4 Tool for data collection
- 3.5 Features of good textbooks
- 3.6 Research Methodology
- 3.7 Data Collection
- 3.8 Conclusion

3.1 Introduction

The present chapter describes the methodology adopted by the researcher for the research on hand. Any type of research requires prior planning so that it moves ahead in the right direction and is focused on the research objectives. In the present study also proper planning and procedures to be adopted were finalized beforehand so that the work could be carried out in a focused way. This chapter deals with this very aspect only. It mentions about the research design of the study, the method/technique and procedures adopted for carrying out the work.

3.2 Research Design

The present study is descriptive and comparative in nature. Comparative research, simply put, is the act of comparing two or more things with a view to discovering something about one or all of the things being compared. This technique often utilizes multiple disciplines in one study. There are certainly methods that are far more common than others in comparative studies, however.

Quantitative analysis is much more frequently pursued than qualitative, and this is seen by the majority of comparative studies which use quantitative data. The general method of comparing things is the same for comparative research as it is in our everyday practice of comparison.

3.3 Research Method

The present comparative study has been carried out using the method of Content Analysis. Content analysis is a research method that uses a set of procedures to make valid inferences from text. These inferences are about the sender(s) of the message, the message itself or the audience of the message. The rules of this inferential process vary according to the theoretical and substantive interests of the investigator. There are two general categories of content analysis: conceptual analysis and relational analysis. Conceptual analysis can be thought of as establishing the existence and frequency of concepts in a text. Relational analysis builds on conceptual analysis by examining the relationships among concepts in a text.

3.3.1 Procedure for Content Analysis

The book was personally reviewed by the researcher. First the researcher read the textbook and tried to attempt critical analysis of the Biology textbooks for the std. XII of CBSE and GSEB board. Researcher prepared master sheet for analyzing content, language, subject matter, diagrams, activities, practical, task and exercises. Keeping in mind all above mentioned criterions researcher analyzed the Biology textbooks for the std. XII of CBSE and GSEB board.

3.3.2 Procedure followed for collecting Teachers' views on the Textbooks

Along with critical analysis of the textbooks carried out by the researcher himself it was felt that the views of the teachers teaching through the textbooks can also be of importance to further strengthen the researcher's findings. With this point of view the following procedure was used to collect data from the teachers.

3.4 Tool for data collection

A questionnaire was constructed to collect the data. The construction procedure has been presented below.

- First of all, with reference to the objectives of the study, it was decided that the textbook will be analyzed by keeping in mind components like, subject matter, organization and presentation of learning material, activities, illustrations and exercises.
- Statements were formed keeping in context the above domains.
- The statements formed were then selected and modified appropriately with the help of research guide.
- The questionnaire was given to experts for their comments, suggestions and modifications.
- The suggestions given by the experts were again incorporated and the questionnaire was thus modified in consultation with the guide.

- The final draft of the questionnaire for teachers regarding their comments, opinion about the textbooks of Biology for the std. XII of CBSE and GSEB board contain several statements.
- The statements consisted of five options - Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree from which the teachers were required to select the most appropriate option.

3.5 Features of good textbooks

- The size of the book should be handy. It should be possible for the students to carry them properly.
- Printing and get-up of the books should be interesting and attractive. They should be printed in the letters that they do not require strain on the eyes of the students. On the other hand they should be correctly and neatly printed.
- The exterior of the picture should be attractive. If the exterior is attractive, students would like to carry them and keep them.
- They should serve the purpose of the subject- matter as well as the aims and objects of teaching. They should be written with a view on the aims and objects of the teaching.
- The textbooks should be accurately written. They should present the subject-matter in such a manner that there is no fault in them. The subject-matter, presented therein should be up to date.
- The style of the textbooks should also serve the psychological requirements of the students of different stages. Textbooks intended for the students of the primary classes should be written in a story form. In the textbooks meant for higher classes the author may use the regional method or some other method that is useful for the students of the stage.
- The textbooks should continue to keep the interests of the students alive in the subject-matter. The subject-matter should be presented in a simple and lucid style and clear form.
- The textbooks should contain all the necessary and relative material required for a particular stage of education.

- Textbooks should be free from prejudice. The presentation of the subject-matter should be unbiased. There should be no material which can injure the susceptibility of any class or category of people. They should contain objective description of the people and conditions of different countries.
- The textbooks should contain charts, maps, diagrams etc. as and where required. Without the charts, maps and diagrams etc. The subject matter of cannot be taught properly. It is, therefore, necessary to give place to all these things in the textbooks.
- At the end of every chapter of the text-book there should be certain questions that may be used for the revision of the subject-matter. Without these questions the textbooks shall not be useful.
- If required the textbooks may give a substance of the chapter at the end of each lesson. Such a provision will help the students to grasp the subject matter properly.

3.6 Research Methodology

Type of Research: Descriptive Study / Comparative Analysis

Research Type: Critical study of different points, Survey method

Population study: All textbooks for Science that are used to teach 11th and 12th.

Sample: 12th Biology textbooks of CBSE and GSEB

Data collection: Questionnaires, Teachers' opinions

Data analysis: Content analysis

3.7 Data Collection

The researcher personally interacted with the teachers of CBSE and GSEB schools during the month of December, January 2017. Researcher gave the questionnaire to the teachers/parents/trainees and collected data from CBSE school teachers and GSEB school teachers. The teachers of various CBSE and GSEB schools were selected through convenient random method.

3.8 Conclusion

In this chapter researcher tried to show research design, research method, tool for data collection and features of good textbooks. Research design includes the type and nature of study, and how researcher has planned out research as per formulation of hypothesis. A research method includes procedure used for research i.e. which methods researcher has implemented to collect data. Tool for data collection included questionnaire survey, review and discussion of critical points regarding textbook which was done by researcher himself. Features of good textbook gives look regarding ideal textbook.

CHAPTER 4

DATA ANALYSIS, INTERPRETATION & DISCUSSION

- 4.1 Introduction
- 4.2 Opinions of teachers who teaches CBSE textbook curriculum
- 4.3 Opinions of teachers who teaches GSEB textbook curriculum
- 4.4 Discussion of critical points regarding CBSE and GSEB textbooks
- 4.5 Unit wise analysis of CBSE school textbook of standard XII
- 4.6 Unit wise analysis of GSEB school textbook of standard XII
- 4.7 Conclusion

4.1 Introduction

This chapter is regarding data analysis its interpretation and discussion. Analysis means breaking a whole into its separate components for individual examination. Data analysis is a process for obtaining raw data and converting it into information useful for decision-making by users. Data is collected and analyzed to answer questions, test hypotheses or disprove theories.

The researcher personally interacted with the teachers of CBSE and GSEB schools during the month of December, January 2017. Researcher gave the questionnaire to the teachers and collected data from CBSE and GSEB school teachers. Teachers were selected randomly from the different school of Gujarat.

4.2 Opinions of teachers who teaches CBSE textbook curriculum

Questionnaire has given to the different teacher who teaches in CBSE schools of Gujarat by email as well as personally. Researcher gave questionnaire to 40 teachers of CBSE schools, among them 28 teachers has responded with their opinions. From their response, researcher has calculated the percentage of opinions. Each value shows in the given table is percentage of opinions with respect to the particular question (Table – 1).

Table – 1

Sr. No	Statements	Opinions (in percentage)				
		Strongly Agree %	Agree %	Average %	Disagree %	Strongly Disagree %
1	The price of the textbook is reasonable.	04	71	25	00	00
2	The binding of the textbook is proper.	00	61	36	00	03
3	Printing of the textbook is proper.	00	75	25	00	00
4	Quality of the pages is appropriate	00	93	07	00	00
5	The layout of the textbooks	00	61	36	03	00

	is attractive.					
6	The textbook materials are accurate and free of errors	00	71	29	00	00
7	The textbook contains a variety of themes and topics.	00	71	29	00	00
8	Themes are suitable to the social and cultural background of the learners.	00	68	32	00	00
9	The content of the textbook is generally realistic in terms of time.	00	82	18	00	00
10	The textual materials are able to create and sustain interest of the learners.	00	86	14	00	00
11	The content of the textbook is relevant for the learners of Biology.	04	75	21	00	00
12	The textbook materials are challenging enough to motivate students.	00	57	43	00	00
13	The textbook units reflect contemporary life.	00	71	25	04	00
14	The materials provide an appropriate balance of theory and practice.	00	71	29	00	00
15	The subject matter of the textbooks is appropriate and adequate to accomplish instructional objectives.	00	75	25	00	00
16	The illustrations in the textbooks are appropriate.	00	68	32	00	00
17	The activities are realistic and purposeful.	00	89	11	00	00

18	The textbook has an even distribution of information and application based exercises for students.	00	68	32	00	00
19	There are exercises for analysis and synthesis.	00	71	29	00	00
20	The exercises range from easy to challenging ones.	18	64	18	00	00
21	The activities encourage rich interaction in the classroom.	00	82	18	00	00
22	The activities incorporate individual pair and group work.	00	71	29	00	00
23	The activities promote creative, original and independent response.	00	71	29	00	00
24	The textbooks raise further interest to study Biology.	00	79	21	00	00
25	The explanation and instructions for exercises and tasks are clear.	00	86	14	00	00

4.3 Opinions of teachers who teaches GSEB textbook curriculum

Questionnaire has given to the different teacher who teaches in GSEB schools of Gujarat by email as well as personally. Researcher gave questionnaire to 40 teachers of GSEB schools, among them 24 teachers has responded with their opinions. From their response, researcher has calculated the percentage of opinions. Each value shows in the given table is percentage of opinions with respect to the particular question (Table – 2).

Table – 2

Sr. No	Statements	Opinions				
		Strongly Agree %	Agree %	Average %	Disagree %	Strongly Disagree %
1	The price of the textbook is reasonable.	04	83	13	00	00
2	The binding of the textbook is proper.	00	67	29	04	00
3	Printing of the textbook is proper.	04	67	29	00	00
4	Quality of the pages is appropriate	04	83	13	00	00
5	The layout of the textbooks is attractive.	00	67	33	00	00
6	The textbook materials are accurate and free of errors	04	63	29	04	00
7	The textbook contains a variety of themes and topics.	00	71	29	00	00
8	Themes are suitable to the social and cultural background of the learners.	00	62	38	00	00
9	The content of the textbook is generally realistic in terms of time.	00	83	17	00	00
10	The textual materials are able to create and sustain interest of the learners.	00	92	08	00	00
11	The content of the textbook is relevant for the learners of Biology.	00	88	12	00	00
12	The textbook materials are	00	79	21	00	00

	challenging enough to motivate students.					
13	The textbook units reflect contemporary life.	00	67	33	00	00
14	The materials provide an appropriate balance of theory and practice.	00	63	37	00	00
15	The subject matter of the textbooks is appropriate and adequate to accomplish instructional objectives.	00	88	12	00	00
16	The illustrations in the textbooks are appropriate.	00	63	37	00	00
17	The activities are realistic and purposeful.	00	92	04	04	00
18	The textbook has an even distribution of information and application based exercises for students.	00	70	25	05	00
19	There are exercises for analysis and synthesis.	00	75	25	00	00
20	The exercises range from easy to challenging ones.	25	75	00	00	00
21	The activities encourage rich interaction in the classroom.	00	75	25	00	00
22	The activities incorporate individual pair and group work.	00	80	20	00	00
23	The activities promote creative, original and independent response.	00	67	29	04	00
24	The textbooks raise further interest to study Biology.	00	71	29	00	00

25	The explanation and instructions for exercises and tasks are clear.	00	83	17	00	00
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4.4 Discussion of critical points regarding CBSE and GSEB textbooks

The two textbooks were critically analyzed by the researcher keeping in mind the different parameters to be judged in accordance to the research objectives and henceforth the research questions formulated for the study.

In the present chapter, the analysis of the CBSE and GSEB textbook carried out by the researcher has been presented separately followed by the comparison of the opinions of the teachers towards the two textbooks. The analysis has been presented as under-

4.4.1 The textual materials are able to create and sustain interest of the learners.

Biology is very vast subject including different sub subjects and topics. Both the textbooks are very well planned for teaching and learning of biology. Chapters in the both textbooks are well arranged to maintain the interest of the students towards biology subject. It starts from the previous learned topics and gradually takes to the new one. Students will develop the curiosity in their mind about the further chapters and topics.

As in the CBSE textbook all the chapters has divided into different units. That too also goes like easy one to difficult one. Starting from the general topic reproduction, it discusses about the different reproduction methods in humans and flowering plants. Then after genetic and evolution of the different species and their variation discusses about the variation and evolution of the animals. Another unit of the textbook discuss regarding the role of biology in human welfare. That includes about the human health and disease, food production strategies, and microbes in human welfare. Next unit discuss about the biotechnology of the genetic molecules. It discuss about its principle process and applications. Last unit talks about the main part of the environment, i.e. Ecology. That includes organism and population, ecosystem, biodiversity and conservation and different environmental issues. As per the questionnaire responses, near about 80 % of the teachers are agree that it creates and sustain interest of the learners.

As in the GSEB book, textbook is divided in to two parts according to semester. The first part of the book includes chapters starting from the plant physiology. That includes chapters like transport in plants, minerals nutrition, photosynthesis and respiration. After that the chapter regarding anatomy of human and their systems includes digestion and absorption, breathing, body fluids and circulation and excretory products and their elimination. Chapters regarding ecology, like ecosystem, biodiversity and conservation and different environmental issues are included at the last of the book. The second part of the book includes chapters like neural control and coordination in animals, chemical coordination and control as a part of nervous system. Gradually it moves towards the reproduction part. That includes reproduction in organisms, sexual reproduction in flowering plants, growth and development in plants, human reproduction and reproductive health. Chapters regarding heredity and variation, molecular basis of inheritance and evolution also included in the later part of textbook. At last the biotechnology of the genetic molecules discuss about its principle, process and applications. As per the questionnaire responses, near about 90 % of the teachers are agree that it creates and sustain interest of the learners.

4.4.2 The textbook materials are challenging enough to motivate students.

Textbook material is designed to motivate students to learn biology. All the chapters in both the books are enough challenging to the learners. It challenges to the demand of learning biology and its scope. For example chapters in CBSE textbook like reproductive health, molecular basis of inheritance, Strategies for Enhancement in Food Production and biotechnology principles, process and its applications, biodiversity and its conservation and environmental issues. All these chapters are challenging enough for the students to learn biology. As per the questionnaire responses, near about 60 % of the teachers are agree that textbook materials are challenging enough to motivate students.

As in the GSEB textbook chapters like mineral nutrition, breathing and exchange of gases, biodiversity and its conservation, environmental issues, neural control and coordination, chemical coordination and control and heredity and variation. This all chapters are enough challenging to motivate students to learn biology. As per the questionnaire responses, near about 80 % of the teachers are agree that textbook materials are challenging enough to motivate students.

4.4.3 The textbook units reflect contemporary life.

Textbook also contains different chapters that lead the modern life style. As we are living in the modern scenario, everyone wants to update themselves regarding the latest knowledge and information, and if that is regarding biology and life of individual than it becomes must for them to learn. While studying biology, student explores new knowledge and understanding regarding the subject and life style.

Different chapters in CBSE book that reflect contemporary life are, reproductive health, principles of inheritance and variations, molecular basis of evolution, strategies for enhancement in food production, Biotechnology principles, process and its application, biodiversity conservation and environmental issues. As per the questionnaire responses, more than 70 % of the teachers are agree that textbook units reflects contemporary life.

Different chapters in the GSEB books like mineral nutrition, locomotion and movement, biodiversity and its conservation, chemical coordination and control, reproductive health, molecular basis of evolution and biotechnology principles, process and its application. As per the questionnaire responses, near about 70 % of the teachers are agree that textbook units reflects contemporary life.

4.4.4 The materials provide an appropriate balance of theory and practice.

Biology is a kind of subject that includes both practical as well as theory learning. Theory part gives explanation of the topics and the practical part gives the experimental understanding of the topics. Theory and practical both are very important part of biology learning. Some of the topics are self understood by theory only and some of the topics required experiment to understand it well. Theory part is useful for understanding the basics of the topics. But practical part gives better and deep understanding regarding the subject matter. There are chapters in both textbook that explains theory as well as practical.

As in CBSE textbook chapters like reproduction in organisms, sexual reproduction in flowering plants, human reproduction, reproductive health, molecular basis of inheritance, evolution, human health and disease, biotechnology principles, process and its application, organisms and population and environmental issues can be explain through theory classes. But chapters like principles of inheritance and variation, strategies for enhancement in food production, ecosystem, biodiversity and conservation can be explain through laboratory

method. As per the questionnaire responses, more than 70 % of the teachers are agree that textbook materials provide an appropriate balance of theory and practice.

As in the GSEB textbook chapters like, mineral nutrient, digestion and absorption, body fluids and circulation, excretory products and their elimination, locomotion and movement, organism and population, heredity and variation can be explain through theory part. But chapters like transport in plants, photosynthesis, respiration, ecosystem, environmental issues, growth and development in plants, and reproductive health can be explained through experimental methods. As per the questionnaire responses, more than 60 % of the teachers are agree that textbook materials provide an appropriate balance of theory and practice.

4.4.5 The illustrations in the textbooks are appropriate.

Illustration or examples are required to understand the topic and theory part. Illustration links that topic with real life situation and that gives better knowledge. Biological illustration is the use of technical illustration to visually communicate the structure and specific details of biological subjects of study. This can be used to demonstrate anatomy, explain biological functions or interactions, direct surgical procedures, distinguish species, and other applications. The scope of biological illustration can range from the whole organism level to microscopic.

As in CBSE textbook illustrations and diagrams are given in almost all chapters. Like, reproduction process, various methods of reproductions, images of organisms, parts of flowers, human reproductive organs, various contraceptive devices, principles of variation, evolution and principles of evolution, various organism causing diseases, different food production practices, biotechnology and its process, ecosystems and biodiversity. As per the questionnaire responses, near about 60 % of the teachers are agree that textbook illustrations are appropriate.

As in GSEB textbook also illustrations and diagrams are given in almost all chapters. Like, transport in plants, different minerals, photosynthesis process, respiration process, digestive systems and their functional parts, breathing system, circulatory system, locomotion and movement of organisms, ecosystem, biodiversity, neural control and coordination, growth and development in plants, reproductive health, heredity and variation etc. As per the questionnaire responses, more than 60 % of the teachers are agree that textbook illustrations

are appropriate.

4.4.6 The activities are realistic and purposeful.

Realistic means having a sensible and practical idea of what can be achieved or expected and representing things in a way that is accurate and true to life. As person is learning biology so activities should be realistic and useful for the future study and career.

As in the CBSE textbook chapter named reproduction in organisms contains different activity topics that are realistic and purposeful. Like vegetative propagation and different grafting methods. Various methods are likely to be used by farmers in their farms and gardeners. Another chapter named Biotechnology – principles, process and its applications are very much useful in higher studies. Where, different gene processing and cloning techniques are important and realistic. Ecosystem chapter also contains activities and topics that are realistic and purposeful. Students can prepare simple models of various ecosystems in laboratory and learn from that. As per the questionnaire responses, near about 90 % of the teachers are agree that activities given in textbook are realistic and purposeful.

As in the textbook of GSEB chapter named photosynthesis, breathing and exchange of gases contains various activities that fulfil the learning of students. As the activities like analysis of photosynthesis mechanism and prepare the model of breathing system are realistic in nature and that are purposeful. Chapter like biodiversity and conservation teaches different values like how to protect and conserve our natural environment. As per the questionnaire responses, more than 90 % of the teachers are agree that activities given in textbook are realistic and purposeful.

4.4.7 The activities encourage rich interaction in the classroom.

As philosophers has described that interactive classroom can impact more on learning process. So interaction is must in learning something new. As biology learning is sometime difficult for students. So interaction of student's in discussing theories as well as activities makes learning more meaningful and interesting.

As in CBSE textbook chapters like reproduction in organisms, inheritance and variations, evolution, human health and disease, food production, biotechnology principles and ecology

can be learn through interaction and group work of students. By discussion knowledge can be shared by them and new knowledge can be gained through different ideas and thinking. As per the questionnaire responses, more than 80 % of the teachers are agree that activities given in textbook encourage rich interaction in the classroom.

As in GSEB textbook chapters like photosynthesis, respiration, breathing and exchange of gases, biodiversity and conservation, environmental issues, neural control and coordination in animals, chemical coordination and control, growth and development in plants, molecular basis of inheritance and evolution can be learn through discussion and interaction in classroom. As per the questionnaire responses, 75 % of the teachers are agree that activities given in textbook encourage rich interaction in the classroom.

4.4.8 The exercises range from easy to challenging ones.

Exercise means a way of learning about a subject that involves studying alone at home, rather than in a classroom with a teacher. Exercises are given at the end of the chapter in both the books. Questions given in the exercises are related to the particular chapter only.

As in CBSE textbook all chapters contains exercises at the end containing questions like objective and subjective type. Objective type includes questions like multiple choice questions, definitions, fill the blanks, true or false, match the following and one word answer. Subjective type includes long answer, short answer, short note, give reasons and draw diagrams. In CBSE textbooks all questions are given randomly and in one series. There is no grouping of different questions together. As per the questionnaire responses, near about 20 % of the teachers are strongly agree and 60 % teachers are agree that exercise given in textbook exercises range from easy to challenging ones.

As in GSEB textbook also all chapters contains exercise at the end containing questions like objective and subjective. Objective type includes questions like multiple choice questions, definitions, fill the blanks, true or false, match the following and one word answer. Subjective type includes long answer, short answer, short note, give reasons and draw diagrams. Exercise of GSEB differs than CBSE at point of pattern of giving questions. GSEB textbook exercise contains group of questions. For e.g. first question contains only multiple choice questions, second question contains only short answer type questions only. Exercise of GSEB

gives challenging task to students and gives better scope to students for easy learning. As per the questionnaire responses, near about 25 % of the teachers are strongly agree and 75 % teachers are agree that exercise given in textbook exercises range from easy to challenging ones.

4.4.9 Mechanical aspects of both CBSE and GSEB textbooks

Mechanical aspects of textbook includes the price, type of binding, printing of pages, quality of pages, layout of textbooks, errors in text, etc. Physical aspect of textbook is also very important part in learning process. As if the size of the book is very thick or large, it will be difficult for a learner to carry and handle. Type of binding also affects the easiness of handling book. Also the quality of paper and quality of printing also matters. As low quality pages will not give that much strength to the book and low quality print also make situation difficult for learner, reader as well as teacher. Layout of the book also affects the mind of learner and reader. If layout is very colorful and attractive then it will motivate a person to read and give at least a look. An error in the text makes false understanding and sometimes changes the meaning of the point. At last and important is regarding the price of the textbook. Price of textbook should be reasonable as it is a primary material to read for students. It should be affordable to any class of students.

As CBSE textbook is having very good and attractive layout. It also has good quality pages and printing. All diagrams are colorful, neat and clear with well labeling. Price of the book is almost affordable to students and parents. As per the teachers' opinion, 70 % of the teachers are agree with that price of the textbook.

As GSEB textbook is divided in to two parts as per the semester. Layout of the textbook is good. It also has good quality pages and printing. All diagrams are colorful, neat and clear with well labeling. Price of the book is affordable to students as it is less costly than CBSE textbook. Also Government of Gujarat is giving free books to the school students as per their norms. As per the teachers opinion, more than 80 % of the teachers are agree with that price of the textbook.

4.4.10 The textbooks raise further interest to study Biology.

As Biology is one of the parts of Science subject. It develops scientific attitude in learners. Biology is a subject that students want to learn deeply. Biology subject deals with plants, animals, humans, microbes, diseases, environment, etc. In higher standards textbook of Biology gives basic ideas regarding all topics. It can build up further interest in higher learning and further study. As chapters like biotechnology-principles, process and application is very wide topic. It has further scope for better career and learning. These types of topics can raise interest in students mind regarding further reading and learning. After choosing biology in higher secondary standards students have scope to join professional courses like medical science, pharmacy, dental science and research and development laboratories. These professions create further interest in learning biology.

As with the CBSE textbook near about 80 % of the teachers are agree that it raises further interest to study biology.

As with the GSEB textbook about 70 % of the teachers are agree that it raises further interest to study biology.

4.5 Unit wise Analysis of CBSE School Textbook of Standard XII

Textbook using by CBSE board in standard XII is published by National Council of Educational Research and Training (NCERT). Higher secondary syllabus has divided into several units. Some units are covered in standard XI and remaining units are there as a part of standard XII syllabus. Here, textbook of standard XII is divided in to five units. Each unit contains group of chapters. There are sixteen chapters in standard XII textbook.

UNIT VI: REPRODUCTION

Chapter 1: Reproduction in Organisms

This chapter is regarding of the reproduction in living organisms. This includes Asexual and sexual reproduction of living organisms. In this chapter each topics are explained with diagrams and definitions. All diagrams show different stages of reproduction

and are labeled. It will be easy for students to understand the topics and theory part. Each topic is divided in different subtopics for elaboration and explanation. Tabular chart for Chromosome Numbers in Meiocytes and Gametes of Some Organisms is given for better understanding. For self study exercise is given at the end of the chapter. It covers all types of questions like short, objective, definition, and subjective type. The length of the chapter is appropriate as per topics covered.

Chapter 2: Sexual Reproduction in Flowering Plants

This chapter is regarding the sexual reproduction in flowering plants. This includes Pre-fertilisation, double Fertilisation and post-fertilisation. In the beginning of the chapter different sexual parts of the flowers are explained well with well labelled diagrams. This will help students to understand the chapter well. It includes different stages of pre-fertilisation and post-fertilisation. It also includes pollination and its types as main part of reproduction. Students will be able to understand the chapter well by definition and diagrams. At the end exercise is given that includes question like short answer, long answer and differentiate type, which will be better for students to learn chapter. The length of the chapter is appropriate as per topics covered.

Chapter 3: Human Reproduction

This chapter is regarding human reproductive system. It includes male and female reproductive systems, organs and their functions, menstrual cycle and fertilisation. Both the systems are well explained with diagrams and definition including the functions of each part of organs and their role. It also includes the role of hormones in each stage. Student will be able to understand the topics well and learn well with the help of explanation and definitions. At the end of the chapter there is exercise which includes questions like fill in the blanks, draw diagram, short answer type, subjective type and true or false type. This will better for students to learn the chapter well. The length of the chapter is appropriate as per topics covered.

Chapter 4: Reproductive Health

This chapter is based on reproductive health, problems and strategies, which includes population explosion and birth control, medical termination of pregnancy, sexually transmitted diseases and infertility. This chapter explains about reproductive health in which India was the first country to initiate programme like “family planning”. It also includes

meaning of population explosion and various methods of birth control including theory of medical termination of pregnancy. This chapter also explains about sexual transmitted disease and infertility. This chapter will give better impact on students as in our country there is explosion of population. At the end of the chapter there is exercise which includes questions like short answer type, long answer type, true or false type and correct the statements type. The length of the chapter is appropriate as per topics covered.

UNIT VII: GENETICS AND EVOLUTION

Chapter 5: Principles of Inheritance and Variation

This chapter is based on the principles of inheritance and variation. It includes Mendel's laws of inheritance, sex determination, mutation and genetic disorders. Each topic in this chapter has explained well with diagrams of various examples. Also a topic of sex determination has explained well with illustration. Also there is a diagrammatically representation of di-hybrid cross where the two parents differed in two pairs of contrasting traits: seed color and seed shape. There is tabular representation of genetic basis of blood group in human population will give better understanding to students. In spite of explanation some time it feels like that few points are too much stretched to explain. At the end of the chapter there is exercise that includes questions like short answer type, long answer type, differentiate type and explain type. Overall the length of the chapter is little long.

Chapter 6: Molecular Basis of Inheritance

This chapter is regarding molecular basis of inheritance. It includes about DNA, RNA, Replication, Transcription, Genetic Code, Translation, Regulation of gene expression, Human Genome Project, DNA Fingerprinting etc. this chapter explains the structure of the DNA molecule and RNA molecule. It also explains the process of replication, transcription and translation. It also explains about the genetic code and regulation of gene expression. All the theories and topics in this chapter are explained well with illustration of diagrams and definitions. Students will be able to understand that which process is carried out for each system. Students will be able to understand about the role of each enzyme in the each process. Topic of mutation and genetic code is explained well in this chapter. Students will have the better knowledge regarding the human genome project and DNA fingerprinting. At the end of the chapter there is an exercise which includes questions like short answer type,

long answer type, differentiates type and explained type. Overall the length of the chapter is appropriate as per the topics covered.

Chapter 7: Evolution

This chapter is regarding origin of life, evolution of life forms, evidences for evolution, mechanism of evolution and evolution of man. This chapter explains about the origin of life on earth. That is from single cellular to Multicellular. It explains to students regarding the ancestors and the evidence of them. It also explains that how man has evolved from animal like monkey and how it resembles to the organs of the animals. Students will be able to learn about biological evolution and the mechanism of evolution. There is chart representing the evolution of life in brief. At the end there is an exercise which includes questions like short answer type, descriptive type and discussion type. Overall the length of the chapter is appropriate as per the topics covered.

UNIT VIII: BIOLOGY IN HUMAN WELFARE

Chapter 8: Human Health and Disease

This chapter is based on the human health and affecting disease. It covers common disease in humans, immunity, AIDS, cancer, drug and alcohol abuse. This chapter explains about the health of human body and disease affecting it. Students will be able to understand about infectious and non infectious agents, various disease and their causing agents. It also explains about innate immunity and different barrier of it. It also covers regarding vaccination and immunization. It also explains in detail about the disease AIDS and cancer and their cause. As we know our generation is moving towards alcohol consumption, so this chapter covers topic like alcohol consumption and its harmful effect on body. At the end of the chapter given exercise covers questions like short answer type, long answer type, full form type and differentiate type. Overall the length of the chapter is appropriate as per the content covered.

Chapter 9: Strategies for Enhancement in Food Production

This chapter covers various aspects of food production like animal husbandry, plant breeding, single cell proteins and tissue culture. Students will be able to understand about the various food production aspects. Animal husbandry like poultry farm management, animal breeding, bee-keeping and fisheries are explained well in this chapter. Plant breeding for

various food productions is also explained well in this chapter. Students will come to know about different plant breeding for improved food quality as well as single cell protein. At the end of the chapter given exercise covers questions like short answer type and long answer type. Overall the length of the chapter is appropriate as per the content covered.

Chapter 10: Microbes in Human Welfare

This chapter includes various topics like use of microbes in household products, industrial products, sewage treatment, production of biogas, biocontrol agents and biofertilisers. In the beginning of the chapter various diagrams of microbes have given. This gives clear idea about usefulness of microbes in daily life. Students will be able to understand regarding importance of microbes. At the end of the chapter given exercise covers various questions like demonstration of practical, short answer type and long answer type. Overall the length of the chapter is appropriate as per the content covered.

UNIT IX BIOTECHNOLOGY

Chapter 11: Biotechnology: Principles and Processes

This chapter is based on the Principles of Biotechnology, Tools of Recombinant DNA Technology, Processes of Recombinant DNA Technology. Biotechnology deals with techniques of using live organisms or enzymes from organisms to produce products and processes useful to humans. Student will be able to understand about engineering of genetics in this chapter. All the process of genetic engineering has explained well with diagrams. It can be one of the most important chapters for the base of further studies. At the end of the chapter given exercise covers various questions like short answer type and long answer type. Overall the length of the chapter is appropriate as per the content covered.

Chapter 12: Biotechnology and its Applications

This chapter is regarding Biotechnological Applications in Agriculture, Medicine, Transgenic Animals and various Ethical Issues related to it. Theories in this chapter regarding all aspects are explained well with necessary diagrams. Students will be able to understand about the importance of Biotechnology field in subject. At the end of the chapter given exercise covers questions like reasoning, short answer type and long answer type. Overall the length of the chapter is appropriate as per the content covered.

UNIT X: ECOLOGY

Chapter 13: Organisms and Populations

This chapter is regarding organism and its basic environment and their populations. It includes topics like abiotic and biotic factors. It also explains about where all organisms live and how do they maintain their population. It also explains the calculation of population growth and its equations. Students will be able to understand about the habitat and population of various organisms. At the end of the chapter given exercise covers questions like short answer type, long answer type listing out type, short note type and define type. Overall the length of the chapter is little longer as per the content covered.

Chapter 14: Ecosystem

This chapter includes various topics like Ecosystem–Structure and Function, Productivity, Decomposition, Energy Flow, Ecological Pyramids, Ecological Succession, Nutrient Cycling and Ecosystem Services. It explains how living things on this Earth produce and how it gets decomposed and get back to the nature by natural process. Students will understand diagrammatic representation of decomposition cycle and diagrammatic representation of trophic levels in an ecosystem in a terrestrial ecosystem given in this chapter. Students will also get to know about the energy flow through different trophic levels and nutrient cycle. At the end of the chapter given exercise covers questions like multiple choice questions type, short answer type, long answer type and define type. Overall the length of the chapter is appropriate as per the content covered.

Chapter 15: Biodiversity and Conservation

This chapter is based on Biodiversity and its conservation. It explains about various patterns of biodiversity and importance of species diversity to the ecosystem. It also explains how biodiversity gets lost due to the natural as well as manmade factors. It also raised the question that why should we conserve biodiversity and how can we conserve it? At the end of the chapter given exercise covers questions like short answer type, long answer type and justify type. Overall the length of the chapter is appropriate as per the content covered.

Chapter 16: Environmental Issues

This chapter covers various Environmental issues like Air Pollution, Water Pollution, Solid Wastes, Agro-chemicals and their Effects, Radioactive Wastes, Greenhouse Effect and

Global Warming, Ozone Depletion, Degradation by Improper Resource Utilization and Maintenance and Deforestation. This chapter is very much important in biology learning because it imparts value education among students as it discusses about the issues related to environment. It explains all major issues and ways to prevent. Diagrams and flow chart explain in depth about given topics. At the end of the chapter given exercise covers questions like short answer type, long answer type, match the following type, discussion type and justify type. Overall the length of the chapter is appropriate as per the content covered.

4.6 Unit wise Analysis of GSEB School Textbook of Standard XII

Textbook using by GSEB board in standard XII is published by Gujarat Secondary Education Board (GSEB). Higher secondary syllabus has divided into four semesters. First and second semester are part of standard XI and third and fourth semester are part of standard XII. Semester 3 includes 13 chapters and semester 4 includes 12 chapters. So in all there are 25 chapters in standard XII textbook.

Semester - 3

Chapter 1: Transport in Plants

This chapter talks about different means of transport in plant system. Content in this chapter is explained well with help of diagrams. Different water transport theories have explained well with detailed explanation of mechanism. All the theories have explained point-wise which leads to easy remembering to students. Students will be able to understand about mineral absorption in plants by various transport method. At the end of the chapter given exercise covers different types of questions like multiple choice, do as directed, short question and answer the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 2: Mineral Nutrients

This chapter talks about methods to study the requirement of nutrient in plants, types of hydroponics, essential mineral elements and nitrogen cycle. All the topics have explained in depth with necessary diagrams. Mineral nutrients also explained in detailed. Students will be

able to understand easily about nitrogen cycle and its whole process. At the end of the chapter given exercise covers different types of questions like multiple choice question, short answer, short notes, define, comparison and answer the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 3: Photosynthesis

This chapter deals with the process of photosynthesis. The beginning of the chapter covers various scientist and their experiments. Students will be able to understand about why the photosynthesis takes place and how many pigments are involved in it. Students will also get knowledge about light reaction, electron transport system and photophosphorylation. All the process and mechanisms have explained with the help of diagrams and flow charts. Also students will learn about factors affecting photosynthesis. At the end of the chapter given exercise covers different types of questions like multiple choice question, short answer, do as directed and answer the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 4: Respiration

This chapter is regarding of respiration in plants. It covers various topics like glycolysis, fermentation, aerobic and anaerobic respiration and different energy generation pathways. All the topics and theories have explained in detailed with help of diagrams and flow charts. That enables students to learn in easy way. At the end of the chapter given exercise covers different types of questions like multiple choice, do as directed, short question and answer the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 5: Digestion and Absorption

This chapter talks about the very important system of human body that is digestive system. In the starting of the chapter a diagram showing different parts of digestive system is given. That clears the basic idea in mind of students regarding the same. Different parts of the system like mouth, salivary gland, pharynx and oesophagus, stomach, small intestine and large intestine are explained in detail with diagrams. Functions of each organ in elementary canal are given in a list. Students will be able to understand how digestion is occur and how nutrients will absorb through system. At the end of the chapter given exercise covers different types of questions like multiple choice question, do as directed, short note, sketch and label,

define, short question and answer the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 6: Breathing and Exchange of gases

This chapter talks about another important system of our body that is breathing system. It explains about different parts of the respiratory system starting from nose to lungs. A very clear and labeled diagram is given of respiratory system that clears the idea about system. Students will be able to understand about the mechanism of respiration and exchange of gases with their equations. At the end of the chapter given exercise covers different types of questions like multiple choice questions, do as directed and short note. Overall the length of the chapter is appropriate as per the content covered.

Chapter 7: Body Fluids and circulation

This chapter deals with the circulatory system. In the starting of the chapter there is discussion about blood, blood plasma and blood constitution. Different blood corpuscles type with their occurrence in blood and their functions along with their figures is given. Students will be able to understand about blood group and their variation. Students will be able to understand about the structure of heart and its mechanism. Students will learn electrocardiogram and its use in medical science. At the end of the chapter given exercise covers different types of questions like multiple choice questions, do as directed, short note and sketch and label. Overall the length of the chapter is appropriate as per the content covered.

Chapter 8: Excretory products and their Elimination

This chapter talks about the excretory system of human body. It explains how body removes waste materials from body. Content in this chapter is explained with clear diagrams. Students will be able to understand different parts of kidney and their function in waste generation and mineral absorption. It also explains about disorders of excretory system. At the end of the chapter given exercise covers different types of questions like multiple choice questions, do as directed, short question, answer in detail and sketch and label. Overall the length of the chapter is appropriate as per the content covered.

Chapter 9: Locomotion and Movement

This chapter talks about movement of body in living organism. It explains about types

of movement skeleton system and disorders of skeletal system. Students will be able to understand regarding the mechanism of muscle in movement of the body. At the end of the chapter given exercise covers different types of questions like multiple choice questions, short question and answer in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 10: Organisms and Population

This chapter is regarding organism and its basic environment and their populations. It includes topics like basic concept of ecology, abiotic and biotic factors. It also explains about where all organisms lives and how do they adapt with their surroundings. It also explains the calculation of population growth and its equations. Students will be able to understand about the habitat and population of various organisms and factors affecting population growth. At the end of the chapter given exercise covers questions like multiple choice questions, define, short note, short question and explain the following in detail. Overall the length of the chapter is little longer as per the content covered.

Chapter 11: Ecosystem

This chapter includes various topics like types of ecosystem, food chain and food web. It explains how living things on this Earth produce and how it get decomposed and get back to the nature by natural process. Students will also get to know about the energy flow through different trophic levels and nutrient cycle. Students will be able to get knowledge regarding different biological cycles like carbon cycle and phosphorous cycle. At the end of the chapter given exercise covers questions like multiple choice questions type, short answer type, define, do as directed, short note and draw outline structure. Overall the length of the chapter is appropriate as per the content covered.

Chapter 12: Biodiversity and its Conservation

This chapter is based on Biodiversity and its conservation. It explains about various aims and patterns of biodiversity and importance of species diversity to the ecosystem. Students will be able to gain knowledge regarding national biodiversity and diversity at Gujarat state. It also explains how biodiversity gets loss due to the natural as well as manmade factors. Chapter contains maps showing national park of India as well as wild life sanctuaries of India. At the end of the chapter given exercise covers questions like multiple

choice questions type, short answer type, define type, do as directed, short note and long answer. Overall the length of the chapter is appropriate as per the content covered.

Chapter 13: Environmental Issues

This chapter covers various Environmental issues like Air Pollution, Water Pollution, Solid Wastes, Eutrophication, Greenhouse Effect and Global Warming, Ozone Depletion and Deforestation. Students will be able to learn about case study of Gujarat related to air pollution. This chapter is very much important in biology because it discusses about the issues related to environment. It explains all major issues and ways to prevent. At the end of the chapter given exercise covers questions like multiple choice questions, short question, do as directed and explain the following in detail. Overall the length of the chapter is appropriate as per the content covered.

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Chapter 14: Neural Control and coordination in animals

This chapter talks about nervous system of living organisms. It covers various topics like structure of nerve cell, conduction of nerve impulse, central nervous system, structure of brain, mechanism of hearing etc. All the topics have been explained well with labelled diagrams and information. Students will be able to understand about the nervous system and disorders of it. At the end of the chapter given exercise covers questions like multiple choice questions, short question and explain the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 15: Chemical Coordination and control

This chapter is regarding chemical coordination and control. It covers topics like endocrine glands and hormones, disorders of them and mechanism of them. All the glands and hormones have been explained well with necessary diagrams. Students will be able to acquire knowledge about mechanism and role of hormones and glands. At the end of the chapter given exercise covers questions like multiple choice questions, short question, do as directed and explain the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 16: Reproduction in Organisms

This chapter is regarding of the reproduction in living organisms. This includes Asexual and sexual reproduction of living organisms. All diagrams show different stages of reproduction and are labeled. It will be easy for students to understand the topics and theory part. Each topic is divided in different subtopics for elaboration and explanation. Tabular chart for Chromosome Numbers in Meiocytes and Gametes of Some Organisms is given for better understanding. At the end of the chapter given exercise covers questions like multiple choice questions, short question, short note and explain the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 17: Sexual Reproduction in flowering plants

This chapter is regarding the sexual reproduction in flowering plants. In the beginning of the chapter different parts of the flowers are explained well with well labeled diagrams. It includes different stages of pre-fertilisation, post-fertilisation and double fertilization. It also includes pollination and its types as main part of reproduction. Students will be able to understand the chapter well by looking at explanation and diagrams. At the end of the chapter given exercise covers questions like multiple choice questions, short question, define, short note and explain the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 18: Growth and development in Plants

This chapter is regarding the growth of plants and how it occurs. It covers topics like growth, rate and phase of growth, factor affecting growth, growth regulators and promoters, seed germination and dormancy. Each topic has explained well with diagrams. Students will be able to understand regarding the growth and development in plants easily by referring this chapter. At the end of the chapter given exercise covers questions like multiple choice questions, short question, short note and explain the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 19: Human Reproduction

This chapter is regarding human reproductive system. It includes male and female reproductive systems, organs and their functions, menstrual cycle and fertilisation. Both the systems are well explained with diagrams and definition including the functions of each part of organs and their role. There is a chart of embryo development in each stage of time is given. Student will be able to understand the topics well and learn well with the help of

explanation and definitions. At the end of the chapter given exercise covers questions like multiple choice questions, short question and do as directed. Overall the length of the chapter is appropriate as per the content covered.

Chapter 20: Reproductive Health

This chapter is based on reproductive health. It includes various topics like population explosion and birth control, medical termination of pregnancy, sexually transmitted diseases and infertility. It explains about various methods of birth control including theory of medical termination of pregnancy. This chapter also explains about sexual transmitted disease and infertility. This chapter will give better impact on students as in our country there is explosion of population. At the end of the chapter given exercise covers questions like multiple choice questions, short question and do as directed. Overall the length of the chapter is appropriate as per the content covered.

Chapter 21: Heredity and variation

This chapter is based on the principles of inheritance and variation. It includes Mendel's laws of inheritance, sex determination, mutation and genetic disorders. Each topic in this chapter has explained well with diagrams of various examples. Also a topic of sex determination in different living organism has explained well with illustration. In spite of explanation some time it feels like that few points are too much stretched to explain. At the end of the chapter given exercise that includes questions like multiple choice questions, short question, match the following, true or false and answer in detail. Overall the length of the chapter is little longer.

Chapter 22: Molecular Basis of Inheritance

This chapter is regarding molecular basis of inheritance. It includes about DNA, RNA, Replication, Transcription, Genetic Code, Translation, Regulation of gene expression, Human Genome Project, DNA Fingerprinting etc. This chapter explains about the structure of the DNA molecule and RNA molecule. It also explains the process of replication, transcription and translation. It also explains about the genetic code and regulation of gene expression. All the theories and topics in this chapter are explained well with illustration of diagrams and definitions. Students will be able to understand about the role of each enzyme in the each process. At the end of the chapter given exercise covers questions like multiple choice questions, short question, short note and explain the following in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 23: Evolution

This chapter is regarding origin of life and evolution of life forms. This chapter explains about the origin of life on earth from single cellular to Multicellular. It explains to students regarding the ancestors and the evidence of them. Students will be able explain that how man has evolved from animal like monkey and how it resembles to the organs of the animals. Students will be able to learn about biological evolution and the mechanism of evolution. At the end of the chapter given exercise covers questions like multiple choice questions, short question and do as directed. Overall the length of the chapter is appropriate as per the content covered.

Chapter 24: Biotechnology: principals and Process

This chapter is based on the Principles of Biotechnology, Tools of Recombinant DNA Technology and Processes of Recombinant DNA Technology. Biotechnology deals with techniques of using live organisms or enzymes from organisms to produce products and processes useful to humans. Student will be able to understand about cloning vectors and engineering of genetics in this chapter. All the process of genetic engineering has explained well with diagrams. It can be one of the most important chapters for the base of further studies. At the end of the chapter given exercise covers questions like multiple choice questions, short question, do as directed and answer in detail. Overall the length of the chapter is appropriate as per the content covered.

Chapter 25: Biotechnology and its Applications

This chapter is regarding Biotechnological Applications in Agriculture, Medicine, Transgenic Animals and various Ethical Issues related to it. Theories in this chapter regarding all aspects are explained well with necessary diagrams. Students will be able to understand about the importance of Biotechnology field in subject. At the end of the chapter given exercise covers questions like multiple choice questions, short question, do as directed and answer in detail. Overall the length of the chapter is appropriate as per the content covered.

4.7 Conclusion

In this chapter researcher has discussed about the responses of questionnaire filled by teachers of CBSE and GSEB. Also researcher has discussed about the critical points regarding textbooks of CBSE and GSEB. In which researcher has tried to compare about the content, mechanical aspect, activities, illustration, interest and balance of theory as well as practical aspect in each textbooks.

CHAPTER 5

FINDINGS, SUGGESTIONS AND EDUCATIONAL IMPLICATIONS

- 5.1 Introduction
- 5.2 Summary of the research
- 5.3 Findings
- 5.4 Suggestions for Further Study
- 5.5 Educational Implications
- 5.6 Conclusion

5.1 Introduction

After analysis and interpretation of the data, the next step is presentation of the main findings, discussion of the results and the most important of all the educational implications of the results. In the end, suggestions for further research are also given here.

5.2 Summary of the research

The study carried out by researcher was descriptive study and type of the research was comparative analysis. Statement of the problem was “A comparative study of textbooks of CBSE and GSEB for Biology at the higher secondary level”. As a student of Biology background from GSEB, the researcher wanted to identify differences between CBSE and GSEB textbooks. The researcher was interested in knowing the difference between the CBSE and GSEB textbooks because the textbook are very important in teaching learning process and wanted to find out the merit and demerits of CBSE and GSEB textbooks. Whether these textbooks provide all the material as per the requirement of student’s age including theme, content and whether practical skills are focused upon in the textbooks. It was with this thought of comparing the textbooks in CBSE and GSEB schools that the researcher took up the present study. The present study was descriptive and comparative in nature. Comparative research, simply put, is the act of comparing two or more things with a view to discovering something about one or all of the things being compared. The comparative study has been carried out using the method of Content Analysis. Content analysis is a research method that uses a set of procedures to make valid inferences from text. Here researcher has compared book of same subject but from different boards. Sample of the study was textbooks of Biology subject of XII std. It is a kind of qualitative research. The book was personally reviewed by the researcher. The researcher read the textbook and tried to attempt critical analysis of the Biology textbooks for the std. XII of CBSE and GSEB board. Researcher prepared master sheet for analyzing content, language, subject matter, diagrams, activities, practical, task and exercises. Keeping in mind all above mentioned criterions researcher analyzed the Biology textbook for the std. XII of CBSE and GSEB board. Along with critical analysis of the textbooks carried out by the researcher himself it was felt that the views of the teachers teaching through the textbooks can also be of importance to further strengthen the researcher’s findings. With this point of view the researcher has constructed a questionnaire and gave it to the teachers to get their opinions. Data collection was done in the month of

December 2016 and January 2017. At end of the study researcher feels that overall both the textbooks are equal in nature.

5.3 Findings

The major findings are indicated below.

- There were some questions which were raised during the study of the textbooks. As an answer to these questions after studying and analyzing the books and by taking opinions from the teachers of both the CBSE and GSEB schools the researcher found that to some extent the content in the CBSE textbooks are better than the GSEB.
- The diagrams and illustrations are clearer in CBSE textbook than GSEB textbook. The activities and lab sessions in chapters of the CBSE textbook are varied and there is more focus on laboratory skills. The content is need based according to the requirements of the students of the standard XII to develop their cognitive competence.
- The difference that the researcher found in the textbooks was firstly in the physical layout of the textbooks. Also designing and graphics are not provided in every chapter of the GSEB while in case of the CBSE there are images almost in the every chapter of the textbook.
- After going through the textbooks the researcher found that there are 16 chapters in the CBSE textbook while in the GSEB textbook there are 25 chapters divided into two textbooks. So this was the major discrepancy in the textbooks.
- Lessons in the GSEB textbook are more than the CBSE text book although both have been prepared for the same age and grade level. The content length of the chapters is different of the both textbooks. There is more clarity in the CBSE textbook than the textbook of GSEB textbook. The pictures in the GSEB textbook are not that much good in the comparison of the CBSE textbook.
- As we know that in present time the schools are in competition. In CBSE schools, teachers are not only teaching in the classroom through the textbook but they are also using other teaching learning materials. The CBSE textbook has presented more illustration and more pictures in the comparison of the GSEB textbook.
- In GSEB textbook the researcher has found that exercise given in every chapter splits into different questions and each questions covered same type of questions. Also all

chapters contain multiple choice questions as exercise. This leads to brain storming and knowledge gaining for students. While in the CBSE textbook, mixed variety of questions has been given in exercise. There is no fixed pattern of giving exercise.

- There are more activities in the CBSE textbook than in the GSEB textbook and more emphasis has been given on the activities in the class. CBSE textbook is more focused on the collaborative learning in the way that it provides more freedom to the students. The textbook of the CBSE is served primarily to supplement the teacher's instructions. Demonstration method is focused in the CBSE textbook.
- Overall both the books were found to be good but some modifications can make them better.

5.4 Suggestions for Further Study

- Biology textbooks of both standard XI and XII can be critically evaluated to improvise them if necessary keeping in view the methodology of teaching for teachers and learning for students.
- Similarly, textbooks of different subjects like Mathematics, Chemistry, and Physics of higher secondary standards can also be critically evaluated.
- Like that textbooks of 9th and 10th for all subjects can also be critically evaluated.

5.5 Educational Implications

- The analysis of the textbooks should be taken from time to time so as to modify them and constantly improve them according to the changing needs of the time and also of students. It would also be a good idea to take feedback from students themselves on the textbooks they are studying. Hence, such studies are of great value in improving upon the teaching learning process.

5.6 Conclusion

After doing the analysis of textbook the researcher found that more or less both the textbooks are equal in the major content part. Some of the points like illustration, diagrams, activities and layout are better in the CBSE textbook than the GSEB textbook. Pattern of exercise and question arrangement is better in GSEB textbook than CBSE textbook. The textbook of

CBSE contains 16 chapters and textbook of GSEB contains 25 chapters. Some of the chapters in GSEB textbook are lengthy in comparison to the CBSE textbook. While looking at the mechanical aspect of textbook, the CBSE textbook is more attractive than the GSEB textbook. There are more activities in the CBSE textbook than in the GSEB textbook and more emphasis has been given on the activities in the class. Overall both the textbooks were found to be good and equal. As researcher I learned that qualitative analysis in terms of content analysis is very important task for the textbooks publishers and other experts. I also learn that how to analyse textbooks and what are the point keep in mind while referring textbooks. I also learn about the different studies carried out in the field of comparative analysis so far. I also learn how to construct a good questionnaire and how to implement it. At last I learn that the analysis of the textbooks should be taken from time to time to modify them and constantly improve them according to the changing needs of the time and also of students.

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APPENDIX

QUESTIONNAIRE

Topic: A comparative study of textbooks of CBSE and GSEB for Biology at the higher secondary level

Institute: Waymade College of Education, Vallabh Vidyanagar, Anand

Researcher:

Mr. Shrikant Panchal

Research guide:

Prof. Sulabha Natraj

Respected Teachers/Trainee/Parents

Here is a small questionnaire on a topic 'A comparative study of textbooks of CBSE and GSEB for Biology at the higher secondary level'. As a part of my research work I need your genuine response/answers to analyze the textbooks. Kindly spare some time to fill it up. Your answers will be kept confidential and will be used for research purpose only. Kindly, put a mark in suitable column given below for each statement as 1, 2, 3, 4 and 5 resemble strongly agree, agree, average, disagree and strongly disagree respectively.

I assure that this information will be use only for the research I am working with.

Thanking you in anticipation

Shrikant Panchal

Name of teacher: _____

School/Institute/college: _____

Sr. No	Statements	Opinions				
		Strongly Agree	Agree	Average	Disagree	Strongly Disagree
1	The price of the textbook is reasonable.					
2	The binding of the textbook is proper.					
3	The printing of the textbook is proper.					
4	Quality of the pages is appropriate					
5	The layout of the textbooks is attractive.					
6	The textbook materials are accurate and free of errors					
7	The textbook contains a variety of themes and topics.					
8	Themes are suitable to the social and cultural background of the learners.					
9	The content of the textbook is generally realistic in terms of time.					
10	The textual materials are able to create and sustain interest of the learners.					
11	The content of the textbook is relevant for the learners of Biology.					
12	The textbook materials are challenging enough to motivate					

	students.					
13	The textbook units reflect contemporary life.					
14	The materials provide an appropriate balance of theory and practice.					
15	The subject matter of the textbooks is appropriate and adequate to accomplish instructional objectives.					
16	The illustrations in the textbooks are appropriate.					
17	The activities are realistic and purposeful.					
18	The textbook has an even distribution of information and application based exercises.					
19	There are exercises for analysis and synthesis.					
20	The exercises range from easy to challenging ones.					
21	The activities encourage rich interaction in the classroom.					
22	The activities incorporate individual pair and group work.					
23	The activities promote creative, original and independent response.					
24	The textbooks raise further interest to study Biology.					
25	The explanation and instructions for exercises and tasks are clear.					