

# Evaluation of Class IX MBSE Science Textbook with Reference to NCF 2005

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**Abstract-** Textbook is an important tool for the students and teachers in the teaching learning process. It helps the teachers as well as the students in their studies by providing guidance. Textbook evaluation on the basis of content aspect is needed to see and check whether the prescribed textbook follow the criteria needed in a science curriculum according to NCF 2005. Science textbooks require consistent supervisions from curriculum developers in order to keep the contents and quality updated. This paper evaluates content aspects of Secondary Science for Class IX prescribed by the Mizoram Board of School Education, Aizawl. The evaluation is done based on 6 (six) aspects namely; Cognitive validity, Content validity, Process validity, Historical validity, Environmental validity and Ethical validity.

**Keywords-** Textbook, NCF, MBSE, Science, Evaluation

## INTRODUCTION

The practice of analyzing and assessing the effectiveness, relevance, and quality of a certain textbook for a given educational goal is known as textbook evaluation. According to Cunningsworth (1995), textbook evaluation would entail a careful selection of materials to determine whether they match the needs of the learners, the purposes, techniques, and values of a given educational programme. It is a thorough analysis of the textbook's content, structure, presentation, and pedagogical qualities to determine whether it satisfies the intended learning objectives and requirements. The review process usually includes a set of criteria or standards that are used to assess the quality and applicability of the textbook for its target audience. Some of the main characteristics of textbook evaluation involve content precision and relevance, clarity and coherence, pedagogical features, appropriateness of target learners, visual aids and illustrations, cultural sensitivity and inclusivity, etc. The objective of textbook evaluation is to determine whether the materials' technique and content are appropriate for a certain language teaching setting. The evaluation would put to the test the claims that materials make for themselves, such as if they actually develop autonomy, include problem solving, and are learner-centred (Littlejohn, 1998).

The Secondary Science for Class IX is prescribed by the Mizoram Board of School Education, Aizawl. The textbook was published by Arya Publishing Company, New Delhi. The authors of the textbook are RR Mishra, AP Shreelatha, Neetu Singh, Yash Pal and Joginder Singh. The first edition of the textbook was published in 2016 and was reprinted in 2017 and again in 2018.

## EVALUATION OF TEXTBOOK

The evaluation of the textbook is done using the following criteria provided by NCF 2005 in Science Education:

1. Cognitive validity
2. Content validity
3. Process validity
4. Historical validity
5. Environmental validity
6. Ethical validity

### Chapter 1: Motion

This chapter motion talks about the movement of things in the physical world. It describes the meaning of motion and how motion occurs. The textbook defined motion as "A body is said to be in motion if it changes its position with respect to its surrounding with the passage of time". The chapter explained about speed, distance, time and velocity in a very simple manner. This is relevant for the age group studying in Class IX. The chapter also includes in-text questions that will help evaluated the understanding of the learners and their application level in real life situation.

In this chapter, the criteria included in NCF 2005 which is Cognitive validity can be seen, because it helps in building pedagogical knowledge, knowledge of the content and understanding which is given importance by the framework in science education.

### Chapter 2: Force and Laws of Motion

This chapter force and law of motions is a continuation of the first chapter i.e. Chapter 1: Motion. This chapter explained about force, and the different laws of motion with the help of mathematical representation of Newton's Laws.

This chapter includes two activities that will help in developing a proper understanding of the Laws of Motion. Demonstration and activity helps in building a strong and proper understanding and cognitive thinking skills for the learners. This chapter is prepared with reference to cognitive and process validity prescribed by NCF 2005.

### Chapter 3: Gravitation and Floatation

Gravitation and Floatation is a continuation chapter of the previous chapter i.e. Chapter 2: Force and Laws of Motion. This chapter includes gravity, acceleration caused by gravity, thrust and pressure and Archimedes' Principle.

There are two activities included, which will enable the students in deeper understanding of the chapter. This chapter is prepared based on the cognitive and process validity as prescribed by NCF 2005.

#### **Chapter 4: Work and Energy**

Work can be defined as "Work can be said to be done when force acting on a body produces displacement in the direction of the force". Energy can also be defined as "The capacity of doing work". This chapter includes the different action of works and energy.

There is one Activity included in this chapter which will help the students in their understanding and application level. The chapter also includes many numerical problems with examples and also questions that have to be solved by the students.

#### **Chapter 5: Sound**

This chapter Sound is the last chapter of Physics portion. There are three activities included in this chapter. Propagation of sound, speed of sound in different medium, nature of sound waves, characteristics of sound and reflection of sound are included. It also included ultrasonic waves and their application in everyday lives of a person.

This chapter is related to everyday lives of an individual because sound is what an individual come across every day.

Numericals based on sound are given with examples and also problems for the students are included which will help the students in the understanding and application level of the students.

#### **Chapter 6: Matters in Our Surroundings**

Matters in our surrounding define matter as "Anything that occupies space and has mass is defined as matter". This chapter included the properties of matter and the different states of matter i.e. Solid, Liquid and Gas along with their properties.

Activity 6.1: To show that particles of different types of matter are moving with different speed.

Activity 6.2: To show that the speed of the particles increases with increase in temperature.

This chapter along with the activities will help the students in understanding the inter-conversion of the different states of matter that we come across every day. The two activities included will help the students in developing a permanent knowledge because when learning by doing takes place it help in proper and deep understanding of the knowledge.

#### **Chapter 7: Is Matter Around Us Pure**

This chapter is matter around us pure, is a continuation of the previous chapter i.e. Chapter 6: Matters in our Surrounding. This chapter includes elements, compounds, mixtures, colloidal solution and techniques for separation of mixtures.

Activity 7.1: To distinguish between elements and compounds

Activity 7.2: To show the difference between a solution and a mixture

Activity 7.3: To prepare a saturated solution of common salt in water

Activity 7.4: To show the formation of colloid

Activity 7.5: To separate a mixture of common salt and water

Activity 7.6: To separate out a mixture of ammonium chloride and sodium chloride

Activity 7.7: To separate ethanol from water

Activity 7.8: To separate a mixture of kerosene oil and water using separating funnel

Activity 7.9: To separate the components of dyes in black ink

These activities will be able to help the students in understanding the separation of mixtures. These activities can be performed at home and in laboratories. The chapter is prepared based on the cognitive, content and process validity prescribed by NCF 2005

#### **Chapter 8: Atoms and Molecules**

This chapter atoms and molecules includes laws of chemical combination, symbols of atoms, atomic mass, molecules, method of writing chemical formula, rules for writing chemical formula, mole concept. This chapter mainly intends to help the students in basic understanding of the subject chemistry.

There are different numerical problems with examples and problems for the students to solve. This chapter is based on cognitive and historical validity of NCF 2005.

#### **Chapter 9: Structure of Atom**

In this chapter, Structure of Atom, the chapter introduces the different structure of atom discovered by Thompson, Rutherford and Bohr. The features of atoms, is also included. The ways of arranging atoms in the shells, electronic configuration, significant of atomic number and their characteristics are included.

This chapter will help the students on how to write electronic configuration which is needed in chemistry. This chapter is based on the cognitive validity and historical validity as prescribed by NCF 2005.

#### **Chapter 10: The Fundamental Unit of Life**

This chapter is the introduction of Biology Subject. It includes the two types of cells i.e. prokaryotic and eukaryotic cells. The structures and properties are also included along with their functions. Plasma membrane, protoplasm, cell organelles are motioned as well with their functions.

Activity 10.1: To make a temporary stained mount of onion peel and study it under microscope

This activity will help the students in understanding the different stages of cell formation along with handling of microscope.

### Chapter 11: Tissues

This chapter defined tissues as “A group of cells of same origin performing a definite function”. The chapter defines plant tissue and animal tissue, their different types along with their characteristics. This chapter mainly focuses on content validity. The chapter mainly aims to let the students have knowledge and understanding of tissues in plants and animals.

### Chapter 12: Diversity in Living Organisms

Diversity in living organisms focuses on the ways of naming organisms. Binomial system nomenclature, classification of organisms, kingdom plantae, and kingdom animalia are mentioned along with their characteristics, properties and examples.

This chapter defines the different kingdom of organism with the help of relevant examples. This chapter is based on content validity prescribed by NCF 2005.

### Chapter 13: Why Do We Fall Ill

In the chapter, why do we fall ill, it mentioned about the significant of health. This chapter defined health as “Health is a state of complete physical, mental and social well being”. It distinguishes between healthy and unhealthy and the different diseases and its causes.

Activity 13.1: To study the effect of antibiotics on common diseases.

Activity 13.2: To study the effect of illness and its treatment.

Activity 13.3: To study the adequacy of vaccines in your area.

These different activities will help in understanding about diseases how they are treated and the importance of vaccines. It will help in building a strong cognitive ability among the students. The chapter meets cognitive, content and process validity as prescribed by NCF 2005.

### Chapter 14: Natural Resources

This chapter includes different resources like air, water and land and the formation of these different resources. It also includes air pollution, water pollution and soil pollution which is a relevant topic that the students need to know in the present generation. This chapter represents the environmental validity that is required in science education. It helps in making the students aware of their environment and what changes needs to be made.

Activity 14.2: To study water-harvesting techniques

Activity 14.3: To compare plant and animal life in dry and wet areas

Activity 14.4: To study plant and animal life in a barren area

These activities aim at improving the application level of the students. These activities will help the students in knowing how to harvest water and comparing plant and animals' life in wet, dry and barren areas.

### Chapter 15: Improvement in Food Resources

In this chapter, it was found that the chapter talks about the improvement that is needed in food resources. The different in-text questions provided mainly focuses on the content validity. In this chapter includes hoe crops can be yield using suitable methods and animal husbandry, which are needed for every individual in their day to day lives. This chapter also includes the environmental validity where awareness of the environment is given importance. The effect of drought and importance of irrigation is motioned.

## SUGGESTIONS AND CONCLUSION

From the content evaluation of textbook it was found that ethical validity suggested by NCF 2005 is not included. If this can be included it will help the students to appreciate science in a more ethical aspect. Because ethical validity promote values of honesty, objectivity, cooperation, and freedom from fear and prejudice (NCF-2005) which is needed by the students. This will help the students appreciate science and see the true beauty of science.

It can be concluded that the science textbook used by MBSE will enable the students to use their critical thinking skills and help them in understanding science from basic which is needed by the students. Overall the textbook is appropriate for the students studying in class IX and it build a strong foundation for the upper classes. There exist proper balance in the content as well as the exercises in the textbook.

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