



# A Critical Analysis Of 'Curiosity' - Grade 6 NCERT Science Textbook

<sup>1</sup>Subashini V, <sup>2</sup> Venkataraman S

<sup>1</sup>Ph.D., Research Scholar, <sup>2</sup>Professor

<sup>1</sup>Department of Education, Central University of Tamil Nadu, Thiruvarur., <sup>2</sup>Department of Education, Central University of Tamil Nadu, Thiruvarur.

## ABSTRACT

This research study analyses the Grade 6 Science textbook, "Curiosity" published by NCERT in light of new educational reforms implemented through National Education Policy (NEP) 2020 and National Curriculum Framework for School Education (NCFSE) 2023. The study focuses on the textbook's alignment with competency-based learning, integration of Indian Knowledge System (IKS), use of ICT, inclusivity, cultural relevance and pedagogical approaches. A comparison with previous NCERT textbook reveals a shift from content-loaded, outdated assessment to more inter-disciplinary and student-centered approach. Findings suggest that while the new textbook has significant merit in incorporating IKS and pedagogical approaches, it needs further refinement in use of ICT to fully execute NEP 2020 goals.

**Key words-** NCERT Science textbooks, NEP 2020, NCFSE 2023, Indian Knowledge System

## INTRODUCTION

Textbooks play a crucial role in shaping students' experiences. They not only serve as repositories of knowledge but also serve as powerful tools that define the scope and boundaries of academic discipline (Srivastava, G.,2016). A book is more precisely defined by UNESCO as, a non-periodical printed publication of at least 49 pages, exclusive of the cover pages, published in the country and made available to the public." Within this framework, textbooks take a vital role in the teaching-learning process, especially in nations like India, where a common educational framework is followed in diverse educational contexts. Textbooks are more than just an educational resource, it is a tool to encourage imagination, creativity and critical thinking. They incorporate national, global and human themes connecting students to their social realities. Educational experts select textbook contents based on age, cognitive abilities and contexts of the learners (Srivastava, G.,2016).

Concerns about the quality and usefulness of the textbooks, especially in Science and Mathematics have been highlighted by pedagogical changes and changing educational approaches within the past two decades. Tayson (1997) states that textbooks acts as de facto curriculum, which determines what is taught and learnt in a classroom. Supporting this statement, Robitaille and Travers (1992) highlights that the textbook usage and contents can significantly impact students' learning. However, textbooks have less educational impact as compared to teachers (Weiss et al. 2003).

Regardless of their importance, textbooks exhibit drawbacks. Studies conducted worldwide have noticed the issues like poor updation, lack of ecological awareness, and limited representation of human-nature interaction in science textbooks of middle schools in the US (Sharma and Buxton 2015). As a means of addressing such issues, UNESCO (2014), recommends textbooks that are age-appropriate and have specific learning objectives and also foster critical thinking, innovation, inclusivity, cultural diversity and global citizenship. The need for engaging, age-appropriate, cost-effective, inclusive and international standard textbooks are also highlighted by the recent educational reforms in India, including National

Education Policy (NEP) 2020 and National Curriculum Framework for School Education (NCFSE) 2023. These policies urge the need for pedagogical shift and change in teaching methods that incorporate Indian Knowledge system and technology.

In this context, this study aims to critically analyse the new NCERT Science textbook for Grade 6 titled, "CURIOSITY", in terms of its pedagogical design, alignment with national goals, Integration of technology and Indian Knowledge system (IKS). By evaluating various components of the textbook, this study highlights its alignment with new educational reform in India.

## **RATIONALE OF THE STUDY**

The Indian education system is changing significantly with the implementation of NEP 2020 and NCFSE 2023. In accordance with this, NCERT has published new textbooks for various school subjects and grades based on the changing educational needs such as, student- centered approaches, inclusion, integration of technology and cultural rootedness. To ensure if these needs are met, the new Science textbook for Grade 6 titled, 'Curiosity' needs to be critically analysed. This study intends to analyse physical and internal aspects of the textbook, its alignment with national curricular goals and integration of IKS, inclusivity and technology. This analysis will thus aid in understanding the effectiveness and relevance of the textbook.

## **METHODOLOGY**

The analysis is qualitative and descriptive in nature. It is based on the textual examination of the new NCERT Grade 6 Science textbook. Parameters of the review were as follows:

### **1. General Information about the textbook**

- a) Title of the textbook
- b) Year and place of publication
- c) New or revised edition
- d) Number of chapters
- e) Pricing

### **2. Physical aspects of the textbook**

- a) Cover page
- b) Foreword
- c) Quality of paper and binding
- d) Font size
- e) Illustrations and picture

### **3. Internal properties of the textbook**

- a) Chapter structure
- b) Introduction section
- c) Language usage
- d) Activities and experiments
- e) Reflection points
- f) Assessment
- g) End of the chapter elements

### **4. Alignment with NEP 2020 goals and NCFSE 2023 frameworks.**

### **5. Content with respect to**

- a) Indian Knowledge System
- b) Inclusivity
- c) ICT integration.

### **6. Other Features**

## ANALYSIS AND INTERPRETATION

The textbook was analysed from the cover page to every aspect of the content.

### 1.General information of the textbook

Table 1 General information of the textbook

a) Title of the textbook	CURIOSITY- A textbook of Science for Grade 6
b) Year and place of publication	2024, Publishing Division, National Council of Educational Research and Training, New Delhi.
c) New edition or revised	New Edition
d) Number of Chapters	12
e) Pricing	Rs. 65

### 2.Physical Aspects of the Textbook

#### a) Textbook Cover design

The cover page of the textbook has an appealing design. It depicts a vibrant and thematically aligned image with CURIOSITY written on it. It has a picture with 3 children actively exploring nature. It shows a mixed gender representation. The colour is attractive and the overall outlook of the cover page is appropriate to the theme.

#### b) Foreword

The foreword is written by the Director, NCERT, stating that the textbook is based on the NEP 2020 goals and NCFSE 2023. It also states that the textbook is focused on experiential learning using an integrated approach. It focuses to develop creativity, innovation and various other competencies as envisaged in NCFSE 2023.

#### c) Quality of Paper and Binding

The textbook is printed on 80 GSM paper. It is considered to be good quality paper and can last for a long run. The binding is also good and it can be easily handled by the students.

#### d) Font

The font size is appropriate and readable. It has colour- coded headings and subheadings. The line spacing is also found to be convenient for students to read.

#### e) Illustrations and Pictures

The textbook contains numerous visual aids, images and illustrations to enhance the clarity of content. They are appropriately placed near the content and are of adequate size. These are not merely used for decorative purposes and for filling up space. They are used to picturize abstract ideas and the images show how to do the experiments, for example in the chapter magnets, picture shows how to convert an iron nail into a magnet and in measurements, an image shows where exactly to keep the scale while measuring. Images are also clean, clear and easily distinguishable. Every key concept is accompanied by a relevant image. Pictures have equal representation of boys and girls, which reduces gender disparity. However, there are few images, such as the solar system in chapter 12, which are not labelled and might cause confusion for learners.

#### f) QR codes

Each chapter is provided with a QR code, which gives digital content access helpful for both students and teachers. It links to the e-pathshala website which gives audio resources and a digital version of the chapter.

### 3. Internal features of the textbook

#### a) Chapter structure

The textbook contains 12 chapters adapting an integrated science curriculum across Physics, Chemistry, biology and earth science. It gives an opportunity for the students to understand the interconnections among these subject areas.

Table 2 Chapter distribution

Subject area	No. of chapters	Chapter Numbers
Physics	3	4,5 and 7
Chemistry	3	6, 8 and 9
Biology	4	2,3,10 and 11
Earth sciences / General science	2	1 and 12

It is found that these chapters have some inter- relation among them. For example, Chapter 1 is an introduction for general science and chapter 2 is about diversity of organisms. Both these chapters focus on the development of exploration and observation skills of the students. The chapters promote interdisciplinary thinking and promote application of concepts across domains. It reinforces the previous learning, thus supporting spirality.

The chapters given in grade 6 serve as a connecting bridge between basic concepts introduced in grade 5 and the more complex concepts introduced in grade 7. There is a continuity in themes and progress in complexity across grades. For example, the concept of water introduced in grade 5 as, 'Water- The essence of life' is extended in grade 6 as 'States of water'. These concepts are further expanded in grade 7 as 'Physical and Chemical changes'. Similarly, the theme of Food and nutrition is introduced in grade 5 as, 'The Mystery of food', in grade 6 as 'Mindful eating' and in grade 7 it is deepened as a nutrition concept in 'Life processes in Animals'.

#### b) Introduction sections

Each chapter begins with real-life stories, which are contextual. These stories help the students to relate the new knowledge to their previous knowledge. It also engages the students and brings in curiosity to learn about the new concept. A few chapters begin with Sanskrit slogans, Kabir ke dohe, Thirukkural and some quotes. These cultural elements not only capture students' attention but also incorporate a sense of nationality among students. It creates a connection between scientific knowledge and India's diverse literary heritage.

#### c) Language usage

The textbook is written in language which is comprehensible for grade 6 students. Simple scientific terminologies are introduced gradually. Some inclusions of local terms are also found. The language used is conversational and engaging in nature.

#### d) Activities and experiments

Activities are embedded throughout the textbook. Each chapter has numerous hands-on and minds-on activities, which instils curiosity. The textbook is centered around activity- based learning and experiential learning. There are numerous scopes for the students to actively explore, experiment and reflect on activities. Sections like, "Let us explore", "Let us identify", "Let us investigate", encourages students and engages them in an active learning process. It motivates them to experiment, observe, question and analyse. The activities are designed in such a way that it promotes peer discussion and collaboration. It is also found that enough space is given for the students to note down their observations and reflections within the textbook. They are also aligned in a way that they lead to progressive skill building- from simple observations to more structured experiments. These activities lead to active learning while reading the textbook as the content gives scope for imagination and reflection. The activities reinforce the concepts learnt simultaneously. Activities also encourage multi- modal learning such as speaking, drawing, observing and writing.

#### e) Reflection points

The questions given post activities and conversations between the characters mentioned in the chapters provides an opportunity to think critically and reflect on students' understanding. These questions also stimulate higher- order thinking among students.

#### f)Assessment

The content provides scope for continuous evaluation of the students. There are several questions such as, “What if?”, “Why is”, “how is”, which promotes curiosity among students. It helps them to deeply inquire about the concepts. At the end of each chapter, a section” Let us enhance our learning” is also given. These questions are inclusive in nature as they include MCQs, short answer questions, pictorial questions and narrative questions. It also has puzzle-based questions and open-ended questions, which helps the students to think critically and analytically.

#### g)End of the chapter elements

At the end of each chapter, keywords, summaries and activities and content for extended learning are included. These help in reinforcing the learning.

### 4.Alignment with NEP 2020 goals and NCFSE 2023 Framework

The contents of the textbook strongly aligns with NEP 2020 goals like inquiry- based learning, experiential learning, student- centric and competency- based learning. Content given in the textbook promotes creative thinking, critical thinking and scientific temper. NEP 2020 strongly envisages interdisciplinary and multidisciplinary approaches. The textbook has scope for interdisciplinary connections. In line with the vision of NEP 2020, the textbook also fosters national integration, cultural relevance, inclusion of local context and value education. It also offers multiple pathways for exploration. NCFSE 2023 emphasises on learning standards and particular curricular goals and competencies for each stage and subject areas. For middle school levels, the following are the curricular goals:

Table 3 Curricular goals for middle school and corresponding examples from the textbook

CURRICULAR GOALS	EXAMPLES FROM THE TEXTBOOK
Explores the world of matter and its constituents, properties, and behaviour	Chapters- Methods of separation, States of water, encourages students to explore materials their properties.
Explores the physical world in scientific and mathematical terms	Experiments involving measurement, temperature, using measurement tools
Explores the living world in scientific term	Chapter on diversity of living organisms and their adaptations.
Understands the components of health, hygiene, and well-being	Chapters address health and hygiene and importance of clean environments.
Explores the nature and processes of science through engaging with the evolution of scientific knowledge and conducting scientific inquiry	Chapter 1 introduces scientific methods- observation, hypothesis, testing and conclusion
Communicates questions, observations, and conclusions related to Science	“Let us think and write”- provides scope for reflection and recording observations.
Understands and appreciates the contribution of India through history and the present times to the overall field of Science, including the disciplines that constitute it	“Know a Scientist” boxes explains the contributions of Indian scientists.
Develops awareness of the most current discoveries, ideas, and frontiers in all areas of scientific knowledge in order to appreciate that Science is ever evolving and that there are still many unanswered questions	Discussions on space explorations and Indian contributions.
Understands the interface of Science, Technology, and Society	Discussions on how science integrates agriculture, technology, industry and medicine.

## 5. a) Inclusion of Indian Knowledge System

Adhering to the NEP 2020's focus on Indian Knowledge System, certain chapters use verses from ancient Indian literatures, encouraging cultural rootedness. This creates a sense of cultural connection with science. Some chapters also mention Indian scientists and their contributions, in the "More to know" sections. This helps students to understand India's history and advancements in science. These sections are motivational and they are "Non evaluative". In certain activities, students are invited to engage with family elders and farmers, connecting them to local customs and knowledge. There are discussions on traditional and modern cooking methods, which gives opportunity for the students to explore sustainability practices and health in India. There are examples of healthy and balanced food from various parts of India. This encourages students to appreciate their local food and enjoy them. The textbook also connects the biodiversity conservation strategies followed in India.

## b) Inclusion and diversity

Activities in the textbooks are designed in such a way that there are opportunities for collaboration and discussions regardless of gender and background. The materials used for activities are also low- cost or locally available. This ensures that students from underprivileged backgrounds can also afford to buy the materials. The "Do you Know", "More to do" sections are non- evaluative in nature. This ensures students do extended learning in a stress- free manner and promotes curiosity without pressure. Themes like gender equity, environmental awareness and regional diversity in the textbook ensures students learn the values and become more sensitive and inclusive citizens of India.

## c) ICT Integration

The textbook effectively integrates ICT tools to enhance student learning. Each chapter is provided with a QR code, which directly links to the e-pathshala website. An audiobook and digital version of the chapter are attached on this website. This supports hybrid use of the resources both for students and teachers. The content also encourages students to actively use ICT tools to support their inquiry and learning. The textbook does not explicitly suggest students to use mobile phones or any devices for learning.

## 6. Other features

The textbooks use a joyful and encouraging tone like, "Are you ready to embark on this exciting journey of science?". The content is gender- neutral and inclusive in nature. "It is not the end, my friend!" The note at the end of the textbook is motivating and encouraging.

## DISCUSSION

Although it was well- structured and pedagogically aligned, the previous NCERT textbook (2018-19), for grade 6, primarily focused on constructivist approach. Characters like Paheli and Boojho were used to draw attention and curiosity of the students. Its application of technology and cultural rootedness were limited. The assessment exercises mostly used rote- based forms like fill in the blanks, true or false, short and long answers etc. It had very few references to Indian scientific history and contributions. It was more oriented towards content transmission indicating a lag with the objectives of NEP 2020.

This disparity is also noticed in textbook analyses of varied educational contexts. Chaudhari (1997), noticed that Indian textbooks lacked instructional consistency and specific learning objectives. This suggests a need for textbooks that are competency based, properly structured and contextually relevant. In contrast, the new textbook is significantly improved in incorporating scientific inquiry and supports interdisciplinary connections. The textbook illustrates how well the content can promote pedagogical change as emphasized by Weiss et al. (2003). Thus, this new textbook represents a significant pedagogical and philosophical shift in Indian science education.

## RECOMMENDATIONS

While the textbook excels in encouraging curiosity and active learning, few aspects can be added, which will make the textbook more effective. QR codes links to audio lessons. It would be better if it also includes animations, audio- video visuals and question banks related to the content. It can also have support materials for teachers. This could further enhance the technology integration aspect of the textbook.

## CONCLUSION

NCFSE 2023 emphasizes that pedagogy should carefully encourage inquiry and exploration along with direct instructions. It helps students to think divergently and also provides them a chance to learn from their mistakes. It also states that assessments in this stage should shift from lower- order skills to higher order skills like analysis and synthesis. As envisioned by the framework, the textbook includes rich local contexts, customs, language and environments. The textbook also gives a scope for direct and hidden value

education based on Indian ideology of respect for all organisms. As mentioned in the textbook title, the textbook sparks “CURIOSITY”.

## REFERENCES

- [1] Chaudhari, I. S. (1997). Evaluation of school textbook and improvement programme in India. In Sixth survey of educational research (Vol. 1). NCERT.
- [2] Feather, J., & Sturges, P. (2003). International encyclopedia of information and library science (2nd ed.). Routledge.
- [3] Ministry of Education. (2023). National curriculum framework for school education (NCF-SE). National Council of Educational Research and Training. <https://ncert.nic.in/pdf/NCF-SE.pdf>
- [4] Ministry of Human Resource Development. (2020). National Education Policy 2020. Government of India. [https://www.education.gov.in/sites/upload\\_files/mhrd/files/NEP\\_Final\\_English\\_0.pdf](https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf)
- [5] National Council of Educational Research and Training. (2018). Science: Textbook for Class VI. NCERT.
- [6] National Council of Educational Research and Training. (2024). Curiosity: Textbook of Science for Class VI. NCERT.
- [7] Robitaille, D., & Travers, K. (1992). International studies of achievement in mathematics. In D. A. Grouws (Ed.), Handbook of research on mathematics teaching and learning (pp. 687–709). Macmillan Publishing Company.
- [8] Sharma, A., & Buxton, C. A. (2015). Human–nature relationships in school science: A critical discourse analysis of a middle-grade science textbook. *Science Education*, 99(2), 260–281. <https://doi.org/10.1002/sce.21151>
- [9] Srivastava, G. (2016). Analysis of the textbooks of Assam, Bihar, Chattisgarh, Gujarat, Haryana, Himachal Pradesh, Odisha, Maharashtra, Manipur and Rajasthan: An overall report. Department of Gender Studies, National Council of Educational Research and Training.
- [10] Tyson, H. (1997). Overcoming structural barriers to good textbooks. *The School Administrator*, 54(2), 18–21.
- [11] UNESCO. (1985). Revised recommendation concerning the international standardization of statistics on the production and distribution of books, newspapers and periodicals. In *Standard-setting at UNESCO* (pp. 593–604). Martinus Nijhoff Publishers.
- [12] UNESCO. (2014). Textbooks and learning resources: Guidelines for developers and users (ED-2013/WS/37). <https://unesdoc.unesco.org/ark:/48223/pf0000227720>
- [13] Weiss, I. R., Pasley, J. D., Smith, P. S., Banilower, E. R., & Heck, D. J. (2003). Looking inside the classroom: A study of K–12 mathematics and science education in the United States. Horizon Research, Inc.