SCIENCE

CLASS VI

Published by Government of Andhra Pradesh, Hyderbad.

The secret of Education is respecting the children

Ralph W. Emerson

Respect the Law
Get the Rights

Grow by Education
Behave Humbly

New Edition

First Published 2012

This Book has been printed on 80 G.S.M. Map litho,
Title Page 200 G.S.M. White Art Card

Free Distribution by Government of Andhra Pradesh

Printed in India
at the Andhra Pradesh Govt. Text Book Press,
Mint Compound, Hyderabad,
Andhra Pradesh.

— o —

What is done to children they will do to society

Dr. Karl Menninger

FOREWORD

Thought process is a unique boon given to human kind by Nature. Man creates and reconstructs knowledge through the process of thinking and analysis. Man generates knowledge by way of doing, imagining, redoing works in a different way. These may be called the processes of Science.

Science is a systematic logical thought oriented process and a path to truth. Science and Technology have improved human life by way of scientific inventions, discoveries and their applications in various fields.

Human beings understand Nature through Science and use Nature for their benefit while at the same time respecting and protecting Nature. However it is evident that we give importance to the first i.e., harnessing Nature and forgetting to protect and sustain Nature in its pristine form. As a result we experience several calamities leading to destruction of Nature, climate, Earth and finally life on Earth.

The future of the country is being shaped in the classrooms and science learning can never be limited to learning of principles, theories and introduction of experiments. Scientific attitude and thought shapes human beings in such a way so as to make them sensitive to Nature and strive to uphold and maintain bio-diversity. Science learning means commitment towards the good and welfare of society and all life forms including human kind.

Children should learn that science is not only in textbooks but also in the works of peasants, the artisanship of potters, food prepared by mother etc., The local knowledge should enter into science textbooks and must be discussed in the classrooms. Specific observations and logical thinking is required in order to inculcate values and develop life skills. This is possible through study of science. The inquisitiveness and creativity should be developed through science learning. The skill of asking questions, critical observations and developing the spirit of investigations and enquiry shall be facilitated through science teaching and learning.

Science teaching should promote the spirit of knowing and experimenting rather than keep these abilities dormant. The traditional attitude of treating science as a body of facts, theories, principles and information needs to be transformed. The re-learning of the true nature of science must happen as recommended by the National Curriculum Frame Work-2005.

The textbooks are developed based on State Curriculum Framework and its Position Paper on Science and also reflect the spirit of Right to Education Act. Science textbooks are developed to facilitate construction of knowledge jointly by the teacher and the pupil but never as merely an information provider.

The textbook facilitates learning through activities, discovery, exploration in a child centered manner. The activities i.e., group, individual and whole class, experiments, field investigations, information collection, questioning, analysis, synthesis, projects etc., must become a part of learning and as well as assessment in the context of science education. The pupil assessment procedures facilitate thinking in critical and multiple ways. Critical pedagogy and social construction become a part of classroom pedagogies in search of truth. The spirit of continuous and comprehensive evaluation is reflected in the assessment procedures. Certainly the revised textbooks facilitate the teachers in effective transaction of science duly reflecting the nature and spirit of science.

We are very grateful for the kind of support from the National and State level experts in designing a textbook of science that transforms the very nature of science teaching learning in the state classrooms. We are also thankful to the Textbook Writers, Editors, Illustrators, Graphic Designers for their dedicated work for the cause of children's science education.

We humbly request the educationists, parents, NGOs and children for appropriate suggestions to improve the science textbooks. We also expect that the teachers and teacher educators will welcome the proposed reforms in science teaching learning process and implement them with appropriate professional preparation and referencing. It is also expected that a habit of scientific enquiry and nature of questioning would be developed among children within the contextual transaction set out in the revised science curriculum and textbooks.

Smt. B. Seshu Kumari
Director
S.C.E.R.T., A.P., Hyderabad.

BEFORE STEP INTO TEXTBOOK ....

The textbook is designed duly considering th e Inquiry Nature of childhood and their power of imagination. Children's world is creative and they are more inquisitive and want to find out everything they come across and ask several questions until they satisfy on any incomprehensive issue / objects. This nature of the child is the basis for an enquiry mind and for pursuing the scientific knowledge in a systematic way. Let us discuss some of the issues before preparing the children for the learning of science in a scientific way.

The National Curriculum Frame Work – 2005 and State Curriculum Frame Work – 2011 defined science as questioning, and observing the nature and also trying to understand the nature. For this purpose one should question Why? What? How? When? on the observed phenomenon. The children imagine and expect what happens? and what will be the outcomes? Children must experiment and observe by utilizing the available resources in the local environment to find out answers to their questions.

It must be theorized and generalized based on repeated observations. The natural phenomenon and resources which influence our life viz., day and nights, water, air, earth, heat, light, food, flora and fauna must be understood primarily from our life experiences. For this purpose one should reflect on our daily experiences and impact of human interventions in various natural activities / processes. Children must be made to appreciate the applications of science for the betterment of human life, natural phenomenon such as rain, wind, day and nights and growth of life on the earth, bio diversity etc.,

Teachers must think and design strategies for appropriate science education and its classroom transaction to realize the constitutional values, goals and aims of science education and the philosophical perspectives of science education at school level. The transformation of young minds as potential scientists must be explored and afforded. This requires lot of planning on the part of teacher and professional preparation, referencing, collaborative work with the children and encourages bringing children's knowledge into the classrooms.

About Academic Standards....

The National and State Curriculum Frame Works, the Right to Education Act clearly envisaged on the role of the school in achieving the expected academic standards which are subject specific and grade specific. Learning of science does not include learning of information alone, but it includes doing projects to understand the science concepts, undertaking observations and experiments, collection of information, analysis of information and finally arriving to conclusions and generalizations.

Children must draw the illustrations on the observed things and appreciate the interdependence of the living beings in the nature. Appropriate attitudes on keeping the bio diversity and sustaining it is also one of the objectives of science learning in schools. Teachers must play a vital role and take the responsibility in developing such scientific spirit and academic standards.

Teaching Learning Strategies ....

Teaching does not mean transferring information from the textbooks. Teachers must understand the philosophical base of science i.e., why science is as a subject in school curriculum? And what are the expected goals and objectives of science teaching? What is the expected behavioral change in children through science teaching? How to motivate the children to peruse science with increased interest and dedication. The teacher shall plan strategies for science teaching. Following are the expected strategies of the science teaching.

- Textbooks must include various learning strategies to construct knowledge on various science concepts through observations, discussions, experimentation, collection of information.
- Using mind mapping as one of the initial whole class activity and develop debate and discussion on the given concepts.
- Prepare children for discussions by posing appropriate questions. The questions given in the textbook exercises make along with planning additional questions must be used.
- Textbook reading is a must to understand and to get an overall idea on the concepts introduced in the lessons.
- Textbook may be appropriately used while teaching the lesson both by children and as well as teachers.
- Teachers must prepare / collect appropriate equipment, plan and well in advance for a meaningful transaction of the science lessons and plan for children participation through group / individual / whole class work.
- Teacher preparation includes collection and reading of appropriate reference books, sources in the internet, library books, children exercises, appropriate questions to children to think on the given concepts and sharing the prior ideas of the children.
- Appropriate activities to appreciate the nature and natural phenomenon.
- Plan for discussions for improved understanding and appreciation of bio-diversity and efforts to environmental protection and specific roles of the children in doing so.

Conduct of Activities ....

The basic objectives of science teaching facilitate the learning of how to learn. Therefore, children must be facilitated to construct knowledge collaboratively through participating in whole class, group and individual activities.

- Provide advanced information and awareness on the experiments, observations to be done both in side and out side the classrooms along with study of reports.
- The exercises given in the textbooks must be performed during the classroom teaching learning processes without delay or skipping.
- The activities in the lesson shall be performed not only during its transaction but also during the entire academic year for specific units Eg: food for the animals and changes around etc.,
- The observations, information collection, field investigations etc., must be taken up under the teacher guidance / presence. Some of the work may be given as homework also.
- Local resources may be used as alternative equipment for designing and undertaking activities / experiments.
- Teacher must develop a year plan duly distributing the projects, assignments, field trips given in the textbooks so as to complete with in the available 180 working days.
- Teachers are advised to collect information about recent studies of the areas discussed in the textbook for every year.
- The information given in the bottom line boxes of every page is only for extensive reading.

About assessment ....

The present practice of testing children to what extent they learnt the information must be replaced by understanding how children are learning. What are the learning problems? What is difficult for children? etc., This may be possible by observing children notebooks, assignments and sitting besides them while doing the work / problem solving. Therefore, importance must be given for the Assessment For Learning than Assessment Of Learning. An effort was made to provide variety of assessment exercises in the textbooks, assess the different competencies to be

developed as per the goals and objectives of science teaching in schools. Teachers must understand the continuity and appropriateness of varieties of assessment.

- It is expected that every child must understand the concept and try for his own answer rather than repeating the text given in the textbooks without any value addition.
- Teachers shall not try for uniformity in the answers across the students in the class but encourage them for a variety of responses.
- Some of the exercises for display in the wall magazine, bulletin board, school community meeting are not only for the sake of assessment but it reflects the nature of academic activities to be performed in the schools.

The revised science textbook is all together an improved design reflecting the nature and spirit of science learning and certainly make the children to think and contribute his / her ideas creatively and facilitate the construction of concepts based on the child's prior ideas / experiences. There is no doubt that children would develop creatively while following and performing the activities and exercises given in the science textbooks. It is a challenge for teachers to make children as constructors / creators of knowledge rather than receivers of information.

ACADEMIC STANDARDS

S.No.	Academic Standard	Explanation
1.	Conceptual understanding	Children are able to explain, cite examples, give reasons, and give comparison and differences, explain the process of given concepts in the textbook
2.	Asking questions and making hypothesis	Children are able to ask questions to understand, to clarify the concepts and to participate in discussions. They are able to make hypothesis on given issues.
3.	Expermentation and field investigation.	To understand given concepts in the textbook children are able to do experiments on their own. They are able to participate in field investigation and making reports on them.
4.	Inforamtion skills and Projects	Children are able to collect information (by using interviews, internet etc.) and analyses systematically. They are able to conduct their own project works.
5.	Communication through drawing and model making	Children are able to explain their conceptual understanding by drawing figures and making models.
6.	Appriciation and aesthetic sence and values	Children are able to appreciate man power and nature, and have aesthetic sense towards nature. They are also able to follow constitutional values.
7.	Application to daily life and concern to bio diversity.	Children are able to utilize scientific concept to face their daily life situations. They are able to show concern towards bio diversity.

CONSTITUTION OF INDIA
Preamble

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a ***SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC*** and to secure to all its citizens:

JUSTICE, social, economic and political:

LIBERTY of thought, expression, belief, faith and worship:

EQUALITY of status and of opportunity: and to promote among them all

FRATERNITY assuring of the individual and the unity and integrity of the Nation:

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949. do ***HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.***

Salute our Great Scientists

INDEX (VI Class)

OUR NATIONAL ANTHEM

- Rabindranath Tagore

Jana gana mana adhinayaka Jaya he
Bharatha bhagya-vidhata
Punjab Sindhu Gujaratha Maratha
Dravida Utkala Banga.

Vindhya Himachala Jamuna Ganga
Uchchala Jaladhi taranga,
Tava shubha name jage
Tava shubha asisha mage
Gahe tava jaya gatha

Jana gana mangala-dayaka jaya he,
Bharatha bhagya –vidhatha,
Jaya he, jaha he, jaya he,
Jaya jaya jaya jaya he

PLEDGE

"India is my country; all Indians are my brothers and sisters.
I love my country, and I am proud of its rich and varied heritage.

I shall always strive to be worthy of it.

I shall give my parents, teachers and all elders respect,
and treat everyone with courtesy. I shall be kind to animals.

To my country and my people, I pledge my devotion.

In their well-being and prosperity alone lies my happiness."