

UNIT I

Physical Science: Meaning, Nature, Scope, Need and Significance of Physical Science – Values, Aims and objectives of teaching Physical Science in schools – Instructional objectives and behavioural objectives of Physical Science -Need and importance of Instructional objectives. Bloom's taxonomy of Instructional objectives: Cognitive, Affective, and Psychomotor domains, Revised Bloom's Taxonomy 2001(Anderson&Krathwohl).

UNIT I: AIMS AND OBJECTIVES OF TEACHING PHYSICAL SCIENCE

Physical science: meaning

Science is built of facts as a house is built on stones but an accumulation of or facts is no more a science than a heap of stones.

- Henri Poincare

Nature:

1. It is ever changing subject, leading to changes in our way of thinking and doing things.
2. The development of science is due to experimentations and observations.
3. It can be considered as a body of knowledge and method of enquiry.
4. It is a systemised knowledge teaching to success.
5. It is an accumulated form of empirical observations arranged in an orderly way.
6. It brings in scientific attitude.
7. It explains superstitions out looks.
8. It is both a process and product.

9. Science is more a verb than it is a noun. It is clearly seen only during action. Science is doing.
10. Scientific facts are tentative and open to various interpretations.

Scope of teaching physical science:

1. It develops social competence of the individual.
2. It can give knowledge about vocational guidance and helps in counselling.
3. It can make the individual to become producers and potential consumer.
4. It can help to solve problems and develop a pattern of appreciation.
5. It can give as the proper and useful way of utilising our leisure time.
6. It can develop a desirable group attitude and co-operation.

Need and significance of teaching physical science:

7. Understanding the nature of science.
8. Skill acquisition
9. Development of scientific attitude.
10. Development of interest and appreciation towards science.
11. Training in scientific method.
12. Helping student's in adjust better with society.
13. Developing suitable career methods.
14. To develop high problem solving ability.
15. To increase good ability for logical and abstract thinking.
16. To develop method investigation and method enquiry.

Values of teaching physical science:

Science has claimed an important place in curriculum. It is made us compulsory subject from the elementary stage. The rapid advancement in science impact on life has made the science to be included in the curriculum. Its values can be considered as follows.

1. Value:

17. It increases our intellectual power and leads us to critical and creative thinking.
18. Gives as great mental satisfaction
19. It can make us interpret superstitions believes on the basis of scientific facts and principles.

2. Utilitarian Value:

1. We utilise all the facts and principles of science to enhance our way of living in this dynamic world.
 2. The universe itself has shrunken due to the transportation facilities, telecommunications facilities and space researches.
 3. The discovery of atoms, isotopes help in improving our healthy life and our production in several fields.

3. Vocational Value:

1. Almost all science students get one or other job and they are not left unemployed.
2. It serves even for self-employment purposes small scale production (soaps, inks).

4. Leisure Time Value:

1. Studying science in school helps us to take up useful hobby in our life.
2. Our hopes should be such that they should be more useful: Eshwarbai Patel commission has recommended SUPW (Socially Useful Productive Work) as our leisure time activity.

5. Cultural Value:

1. Science will change our way of thinking and living. So, old traditional belief and superstitions outlook may be change.

2. By means of new techniques and development science has taught man and his important in this universe.

3. Science will refine and stabilize our emotion.

4. An Indian education commission reports, science must become an integral part of my cultural and spiritual heritage.

6. Moral Value:

1. Truthfulness is the backbone of success in science.

2. Objective thinking without biased feeling can be developed by science education.

3. Systematic work will add on beauty to a type of work. This is brought about by

7. Aesthetic Value:

1. Science brings about self-satisfaction.

2. Science makes our life charming and interest.

3. Truthfulness and systematic work itself is a beauty.

4. The power derives from science namely self-confidence, self-reliance and scientific attitude all add on our personality.

8. Psychological Value:

1. Direct experience and satisfaction when we perform experiments. The joy of success will be the motivation for our next step.

2. Science follows the principles and methods of psychology.

Science is an important tool which can would the future of an individual. Its scope gives intellectual thinking power opportunity for a good job. Talents developed in solving problems.

Aims and objectives of teaching physical science:

Aim: Long term process. It is considered as final. It is a final we attain after going through the objectives fulfilling process. Aims are summative process.

Objectives:

1. They are smaller steps guiding and talking us towards final goal
2. It may change according to the mode of developments.
3. Formative process.
4. It brings in behaviour changes.
5. It is short time process.

Aims and objectives of teaching physical science:

Primary level:

1. Arousing and maintaining interest in nature.
2. Developing the habit of observation exploration classification and a systematic way of thinking.
3. Developing the child's power of manipulation and the creative and inventive faculties.
4. Developing neat and orderly habits.
5. Inculcation of habits of healthful living.

Secondary school level:

6. Developing the ability to solve problems.
7. Developing interest in scientific habits.
8. Inspiring students by stories about scientist and the discoverers.

Higher secondary school level:

9. To provide science as a discipline and with the help of this the students will be prepared for higher education.
10. To give the students a historical perspective so that they may understand the evolution of scientific developments.
11. To develop scientific attitude

Bloom's Taxonomy of Educational Objectives

Benjamin Bloom classifies the objectives under three domains. This classification is called as Taxonomy of Educational Objectives under each domain there are hierarchy of steps through which they can be attained. The classification can be indicated as follows.

Cognitive	Affective	Psychomotor
Knowledge	Receiving	Perceiving
Understanding	Responding	Imitation
Application	Valuing	Manipulation
Analysis	Organisation	Precision
Synthesis	Characterisation	Articulation
Evaluation		Naturalisation

Cognitive domain: It mainly deals with knowledge recall and recognition.

- **Knowledge**

The main specific objectives under this category are to get knowledge of scientific terminology, facts and information. Knowledge of correlation with other subjects. Students must be able to recognise and recall what they have learnt.

- **Understanding**

It refers to a type of understanding of the materials or literal message contained in a communication.

- **Application**

This third level includes the ability to apply abstract ideas to a concrete situation. This abstract may be in the form of general ideas, rules or procedures or generalized method.

- **Analysis**

It means the breakdown of the materials into the constituent parts and detection of the relationships of the parts. Analysis includes analysis of elements, analysis of relationships and organization principles.

- **Synthesis**

It is the putting together of elements and parts so as to form a whole. It is the just opposite of analysis.

- **Evaluation**

It involves judgement in terms of internal evidence as well as external criteria.

Affective domain

- **Receiving**

It is the sensitivity to the existence of certain phenomena and stimuli.

- **Responding**

It requires active participation. It implies active attending doing something with or about the phenomena and not merely perceiving them.

- **Valuing**

Valuing implies perceiving them as having worth or value. The three sub- categories of this objective are acceptance of value, preference for a value and commitment.

- **Organisation**

This involves building up of organised system of values.

- **Characterisation**

In this step the individual displays the integration of values and it becomes a life style.

Psychomotor domain

- **Perception**

Skill of keen observation, skill of sensing a problem and skill of developing self-motivation are the specification objectives under this category.

- **Imitation**

Skill of repeating the actions and skill reflective thinking are the specific objectives under this category.

- **Manipulation**

Skill to operate, upon with intelligence and manage cleverly are the specific activities that fall in this category.

- **Precision**

Independently perform the skill or product with accuracy, proportion and exactness at an expert level.

- **Articulation**

It consists of skill of logical thinking, reflective thinking, skill of mind and body and development of mathematical skill.

- **Naturalisation**

As we practise a skill in due course it becomes our natural habit. Skill of attaining success and skill of multiple actions are the specific activity under this category.

Test and its items

- i. Measurement**

It is numerical data (example 75 marks)

- ii. Evaluation**

It refers to assessment of all round development of students in both the scholastic and non-scholastic areas.

Revised Bloom Taxonomy of the cognitive domain (2001)

Bloom's original taxonomy was revised by his old students Loris W. Anderson and David R. Krathwohl in 2001.

Level	Cognitive	Affective	Psychomotor
Highest To Lowest	Creating		
	Evaluating	Characterization	Naturalization
	Analyzing	Organisation	Articulation
	Applying	Valuing	Precision
	Understanding	Responding	Manipulation
	Remembering	Receiving	Imitation

It is divided into six levels these are-

Level-1: Remembering:

Bring, recognize, and recall relevant knowledge from long-term memory.

Example: Memorize poem, recall state name, and remembering maths formula.

Level-2. Understanding:

Constructing the meaning of oral, written, and graphic messages through summarizing, interpreting, classifying, comparing, etc.

Level-3. Applying:

Constitute using the procedure for executing.

Example: Use a formula to solve a new problem

Level-4. Analysing:

Breaking materials or concepts into small parts, determining how one parts relate to other parts or how the parts related to overall structure or purpose.

Example: Why are Dolphins called mammals, identify why the machine is not working.

Level 5. Evaluate:

Making a judgment based on criteria and standards through checking and critiquing.

Example: Making a judgment regarding an ethical dilemma, interpreting the significance of the given law of physics.

Level 6. Create:

Positioning elements together to form a rational or functioning whole; recognizing elements into a new pattern or structure through generating, planning or procedure. Example: Design a new solution to an 'Old' problem that acknowledges the previous failures, write an essay based on a given theme

2. The Affective domain

Skills in the affective domain describe the way people react emotionally and their ability to feel other living things' pain or joy. Affective objectives typically target the awareness and growth in attitudes, emotions, and feelings.

There are five levels in the affective domain moving through the lowest-order processes to the highest:

1. **Receiving:** The lowest level; the student passively pays attention. Without this level, no learning can occur. Receiving is about student memory and recognition as well.

Attending the learning session

Be aware of what knowledge is being imparted.

Be willing to hear/ receive the knowledge that is being imparted

Be attentive to listen to whatever knowledge is being imported.

Example: Listen to and be aware of the names of newly introduced participants.

2. **Responding:** The student actively participates in the learning process, not only attends to a stimulus; the student also reacts in some way

Be willing

React

Be satisfied to respond (be motivated to respond)

Example: Participating in a group discussion or giving a presentation.

3. **Valuing:** The student attaches a value to an object, phenomenon, or piece of information. The student associates a value or some values to the knowledge they acquired.

Attach value to the phenomenon

Strongly associated with the topic

Demonstrate commitment to a certain value

Example: proposing a plan to bring about improvement on a social level.

4. **Organisation:** The student can put together different values, information and ideas and accommodate them within his/her own schema: comparing, relating and elaborating on what he has been learned

Prioritize different value, and resolve conflicts.

Emphasis prioritise to other people

Example: Emphasis priorities on work-life balance at the workplace or freedom of speech with responsive behaviour.

5. Characterisation by value set:

The student at this level tries to build abstract knowledge

Completely internalize his/her values and behave in accordance

Be predictable in his/her behaviour and in supporting these values

Let his value system control behaviour.

Example: Displays consistently through commitment towards the ethical practice of the value system or Multilevel marketing business need employees to associate this level of emotion.

3. The Psychomotor domain

The psychomotor objective is specific to physical function, reflex actions, and body movements to interpret information and learn. It implies that physical activity supports or is a vehicle for cognitive growth and furthering knowledge or skills. The learner uses physical action to achieve a cognitive or affective objective.

It is further divided into 5 levels, these are:

1. Imitation: At this level, the learner will-

Directly copy action seen

Replicate what's directly observed

Example: Aling his/her own car seat exactly as advised by the driver's instruction.

2. **Manipulation:** At this level, the learner will-

Reproduce activity by instruction.

Reproduce activity by memory

Example: Look into the back and side mirror every time intend to take a turn

3. **Precision:** At this level, the learner will-

Execute skill independent of help

Example: Slow the car down in anticipation of a red light without being instructed.

4. **Articulation:** At this level, the learner will-

Adapt expertise to complete a non-standard objective.

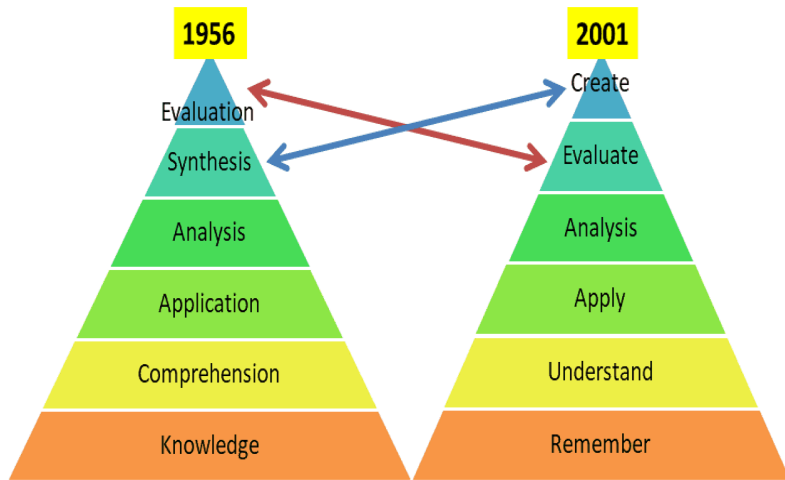
Example: Stop behind a parked car to give away to an incoming vehicle without instruction.

5. **Naturalisation:** At this level, the learner will-

Automate skills

Unconscious mastery skills.

Example: Pass a practical driving test by independently driving satisfactorily.



NOUN  **To VERB form**

BLOOM'S REVISED TAXONOMY.

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CREATING.

Creating Generating new ideas, products, or ways of viewing things.

Designing, constructing, planning, producing, inventing.

EVALUATING.

Justifying a decision or course of action.

Checking, hypothesising, critiquing, experimenting, judging.

ANALYSING.

Breaking information into parts to explore understandings and relationships.

Comparing, organising, deconstructing, interrogating, finding.

APPLYING.

Using information in another familiar situation.

Implementing, carrying out, using, executing.

UNDERSTANDING.

Explaining ideas or concepts.

Interpreting, summarising, paraphrasing, classifying, explaining.

REMEMBERING.

Recalling information.

Recognising, listing, describing, retrieving, naming, finding.

Higher Order Thinking.

