

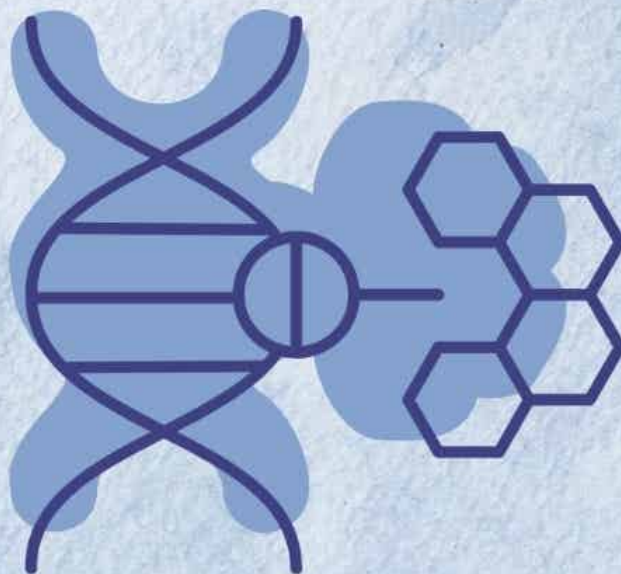


**B.Ed.**

**2nd Year**

**SEMESTER- 3**

# **PEDAGOGY OF BIOLOGICAL SCIENCE**



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**III<sup>rd</sup> Semester**

**PEDAGOGY OF  
BIOLOGICAL SCIENCES**

*Authors :*

**Well Experienced Teacher Educators**

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Course - X

Second Year, III<sup>rd</sup> Semester

## PEDAGOGY OF BIOLOGICAL SCIENCES

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# UNIT - 1

## BIOLOGICAL SCIENCE

### CURRICULUM AND TEXT BOOKS

1. Write the meaning and definitions of Curriculum.

**Ans : Meaning :** The origin of the word is from the Latin 'Curriculum' a racking chariot, from which is derived a racetrack, or a course to be run and from this, a course to study (ROSS 2000).

The term curriculum is used very widely in the literature to refer to instructionally related educational experiences of students. It encompasses educational philosophy, values, objectives, organizational structures and materials, teaching strategies, students' experiences, assessment and learning outcomes.

- Leithwood

Curriculum is the base of education on which the teaching learning process is planned and implemented. It is the totality of all the learning to which students are exposed during their study in the school.

"Curriculum is the sum-total of student activities which the schools sponsors for the purpose of achieving its objectives."

Alberty A. and Alerty E

Curriculum is a tool in hands of the artist (the teacher) to mould his material (the pupil) in accordance with his ideals in his studio (the school).

- Cunningham

Curriculum is all the experience, which a pupil has under the guidance of the school.

-Blonds Encyclopedia of Education

A simple way of considering the curriculum is to see in terms of four facts : Content, methods, purposes and evaluation.

The whole life of the school becomes the curriculum, which can touch the life of the students at all points and help in the evolution of balanced personality.

2. **What are the principles of curriculum construction?**

**Ans : Principles of curriculum construction :**

Curriculum organization is a scientific process involving the basic principles on which the entire credibility of the curriculum rests. Some important principles of curriculum organization are :

**1. Principle of Readiness :** The curriculum should be based on the sound principles of learning. They should be based on the level of maturity of the learner and the degree of receptivity.

**2. The principle of child centeredness :** The curriculum should be able to provide suitable opportunities for fulfilling the varied needs of the learner. It implies that the curriculum should satisfy the physical, emotional and social needs of the learner.

**3. Principle of creativity :** The curriculum should place the child in the place of a discoverer and time for creative activities should be included in the curriculum.

**4. Principle of integration :** Curriculum should integrate the child's need on one hand and needs of the society on the other. The curriculum should be based on individual needs as well as the priorities of the nation.

**5. The principle of utility :** Curriculum should help the learners to live a whole some and fulfilling life. It should provide opportunities for the academic and social growth of the child.

3. **Describe organizational approaches of curriculum; Logical, Psychological.**

**Ans : Logical Approach :** In this approach the topics in the syllabus would be arranged in orderly. Pattern using some logical principles like simple to complex. This could be applied to the topics in the same class or it could be spread over some classes. This approach can be logical while organizing the different parts of the same unit. Therefore in the logical approach, the emphasis is on the presentation of the topics in the logical order.

This approach is based on hierarchy or level of difficulty. It is also called as funnel approach. In biology subject matter is from the primitive virus or bacteria to the highly diversified mammals or plants.



**Psychological Approach :** In the psychological approach the content is organised according to the psychological needs of the students. In this approach the focus is on the type of logic which is more appropriate for the students of a particular age group and what kind of logic and develop such logic thinking. In this method of organizing the curriculum due consideration is given to the student's age, maturity, needs, power of assimilation and previous knowledge.

4. Write a short note on a) Topic approach curriculum  
b) Concentric approach curriculum.

Pedagogy of learning sciences should be designed to address the aims of learning science is to learn the facts and principles of science and its applications consistent with the stage of cognitive development. To acquire skills and understand the methods and processes that lead to generation and validation of scientific knowledge. To develop a historical and developmental perspective of science and to enable her to view science as a social enterprise. To relate to the, local as well as global, and appreciate the issues at the interface of science, technology and society. To acquire the requisite theoretical knowledge and practical technological skills to enter the world of work. To nurture the nature curiosity, aesthetic sense and creativity in science and technology. Integrity, cooperation, concern for life and preservation of environment and to cultivate scientific temper - objectivity, critical thinking and freedom from fear and prejudice.

5. Write about Andhra Pradesh state curriculum frame work 2011-Science.

**Ans: Andhra Pradesh State Curriculum Frame Work - 2011**

**Nature of Science :** Science is a process of constructing knowledge. The process depends on making careful observations of phenomenon and on inventing theories for making sense out of



those observations.

**Scientific Inquiry :** Science asks three basic questions what is there ? How does it work ? How did it come to be this way ? Fundamentally, the various scientific disciplines are alike in their reliance on evidence, the use of hypothesis and theories the kinds of logic used and much more.

**Primary Stage :** The main objectives of science teaching at this stage are to maintain the curiosity about the world and have the child engage in exploratory and hands on activities that would lead to the development of basic cognitive and psychomotor skills.

**Upper Primary Stage :** Science education at this stage should provide a gradual transition from an exposure to ideas of science through environmental studies of the primary stage to elements of science including its concepts, processes and methods.

6. **Write the Basic criteria of validity of a science curriculum content, Cognitive Process Historical, Environmental Science and Ethical validity.**

**Ans:** Cognitive validity requires that the content, process, language and pedagogical practices of the curriculum are age appropriate and within the cognitive reach of the child.

Process validity requires that the curriculum should engage the learner in acquiring the methods and process that lead to the generation and validation of science knowledge and nurture the natural curiosity and creativity of the child in science.

Historical validity requires that the science curriculum be informed by a historical perspective, enabling the learner to appreciate how the concepts of science evolve over time.

Environmental validity requires that science be placed in the wider context of the learners environment, local and global, enabling the learner to appreciate how the concepts of science evolve over time.

Ethical validity requires that the curriculum, promote the value of honesty, objectivity, cooperation and freedom from fear and prejudice and inculcate in the learner a concern for life and preservation of the environment.

**7. Explain the curriculum at upper primary, secondary and higher secondary stages.**

**Ans: The Science curriculum**

**1. At Lower primary stage (Classes I - IV)**

a) In the lower primary classes the focus should be on the child's environment - biological (b) personal hygiene and sanitation.

**Higher primary Stage (Class V -VII)**

At this stage science should be taught as

a) Biology b) Physics c) Chemistry

The allocation of these subjects among the three classes is below.

Class V - Biology, Physics, Geology

Class VI - Biology, Physics, Chemistry

Class VII - Biology, Physics, Chemistry, Astronomy

**2. Lower Secondary Stages (Class VIII - IX)**

a. Biology b. Chemistry c. Physics d. Earth Sciences

These subjects should be compulsory to all the students.

**8. Mention steps involved in the development of Science Curriculum.**

**Ans :** Essential considerations for curriculum development.

1. Issue / Problem/Need is identified

2. Characteristics and Needs of Learners.

3. Changes intended for learners

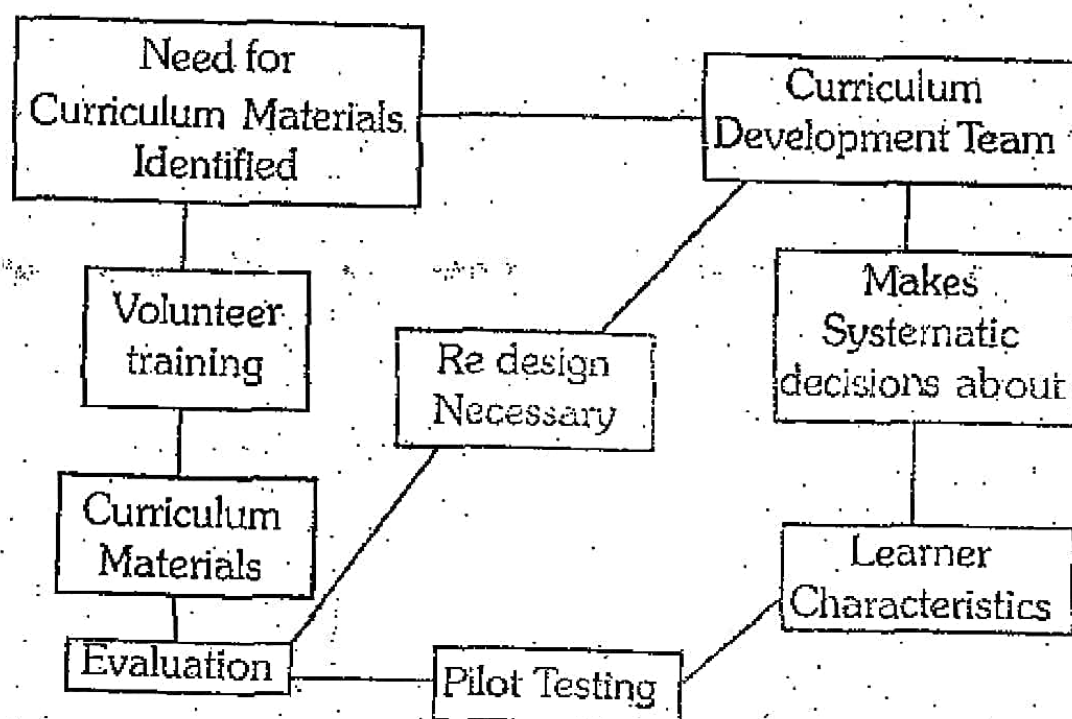
4. The important and relevant content

5. Methods to accomplish intended outcomes

6. Evaluation strategies for methods, content and intended outcomes.



### Curriculum Development Model



#### Phases and steps in curriculum Development

##### Phase 1 : Planning

Step 1 : Identification of Need

Step 2 : Formation of curriculum Development Team

Step 3 : Conducting Needs Assessment and Analysis

##### Phase II : Content and Methods

Step 4 : State intended outcomes

Step 5 : Selection of content

Step 6 : Designing Experimental Methods

##### Phase III : Implementation

Step 7 : Production of curriculum product

Step 8 : Testing and Revising Curriculum

Step 9 : Recruitment and Training of Facilitators

Step 10 : Implementation of Curriculum

##### Phase IV : Evaluating and Reporting

Step 11 : Designing Evaluation Strategies

Step 12 : Reporting and Securing Resources.

**9. Write about curriculum organisation In terms of National Curriculum Frame work - 2005 position paper on science.**

**Ans : National Curriculum Frame work - 2005 :**

Good Science education is true to the child, true to life and true to science. This simple observation leads to the following basic criteria of validity of a science curriculum.

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

**The curriculum at different stages : Primary stage**

The child should be engaged in joyfully exploring the world around and harmonising with it. The objectives at this stage are to nurture the curiosity of the child about the world, to have the child engage in exploratory and hands on activities for acquiring the basic cognitive and psychomotor skills through observation, Inference etc; to emphasise design and estimation and measurement as a prelude to the development of technological skills at later stages and to develop basic language skills.

**Upper primary stage :** Scientific concepts are to be arrived at mainly from activities and experiments. Science content at this stage is not to be regarded as a diluted version of secondary school science.

**Secondary Stage :** Students should be engaged in learning science as a composite discipline in working with hands and tools to design more advanced technological modules than at the upper primary stage and in activities and analyses on issues concerning the environment and health, including reproductive and sexual health.

**Higher Secondary Stage :** Science should be introduced as separate disciplines, with emphasis on experiments.

**National curriculum frame work for Teacher Education (NCFTE 2009)**

According to NCF 2009 act they should be design some norms of the school level teachers.

- 1) Educational aims 2) Peace Education 3) School and



Health Education 4) Child rights 5) Educational Philosophers thoughts 6) Teacher Education Curriculum.

### **10. What are the qualities of a good Biological Science Test Book ?**

**Ans : Qualities of a Good Science Text Book :**

There is a need for good science text books. As the present day text books are not up to the mark. They are not maintaining the standards in presenting knowledge or defective in the appearance. Hence the selection of a text book became a big problem to the education departments. In what aspects we should consider the quality of a text book ? It is a question to think about. **The characteristics of a good science text book.**

#### **1. Author**

i) The author should have basic academic qualification in the concerned subject. ii) Experienced persons can deal some of the controversial points tactfully. So certain amount of experience is required. iii) Parents want their children drink from running water rather than stagnant pools. So the knowledge presented should be up to date. For this he has to consult experts in the field or refer various books. iv) He should have authority in language, and clear in expression, simple in presentation.

#### **2. The content**

i) The content selected should be appropriate to the age level of the students. ii) It should be related to the prescribed syllabus of particular grade. iii) Text book should stand for the objectives of science teaching. iv) It should lead to the inculcation of scientific attitudes, disciplinary and culture values. v) It should be based on previous background. vi) Statements and facts should be correct. vii) Application to life situation should be given. viii) The topic should be illustrated with diagrams, charts and pictures. The major headings and subheadings should be appropriated to the content.

#### **3. Organization**

i) The subject matter should be developed as far as possible in psychological sequence. ii) Care must be taken about the mental growth and interests of the students. iii) There should be main

themes. Topics should be arranged around these themes. iv) Logical approach should also be followed in organizing the content. v) Mere narrative type lessons should not be included. vi) A discussion on a topic should not merely raise a problem and give the solution also. vii) While organizing the content seasonal arrangement of topics is more advisable. For example, the study of a frog life history. It should be undertaken in the rainy season. viii) New type of self-assessment tests should be introduced. ix) Suggestions for experimental work of projects should be given. x) Suggestions for further study should be given. xi) Various examples of local environment whenever necessary should be given. xii) Good methods of learning should be indicated. xiii) Quotations should be in italics. xiv) Correlation with other subjects and daily life should be there. xv) Brief introduction and summary should be there for every lesson.

#### **Mechanical features or Physical aspects**

i) Text book should have attractive cover page and binding. Print and paper should be of good quality. ii) Illustrations and diagrams should be bold, distinct and attractive. iii) The size of the book should be proportional, nor too large, nor too small or narrow. iv) The cover design should be appealing. v) There should be think binding. vi) The get-up of the book has psychological implications. The first look at the text book creates an impression on the minds of the pupils which determines their desire to hand and study it.

#### **General aspects**

i) The text book should usually be accomplished by a laboratory manual. ii) It should contain helpful and practical suggestions for preparing and improving the science apparatus. iii) The problems and numerical examples should be graded according to difficulty. iv) Adequate provision should be made to connect general science with craft, social environment and physical environment. v) It should also help to develop technical skill scientific attitude and train the students in the scientific method.



Thus a text book should be selected based on the above qualities. Teachers should use text books as a tool of learning along with other tools such as maps, graphs and charts. For this teacher should be well trained in using a text books.

### 11. Analyze the secondary school Biological Science Text book.

**Ans :** The teacher while recommending a good text book has to consider a number of criteria two score cards have been developed for rating the text books.

♣ Hunter's score card ♣ Vogel's spot check Evaluation scale.

Evaluation of Biological text book - George W. Hunter Score card.

|                                   | Points      |
|-----------------------------------|-------------|
| 1. Educational rank of the author | 50          |
| 2. Mechanical make-up and cost    | 100         |
| 3. Psychological soundness        | 300         |
| 4. Subject-matter                 | 250         |
| 5. Literary style                 | 110         |
| 6. Learning exercises             | 140         |
| 7. Teacher's help                 | 50          |
| <b>Total</b>                      | <b>1000</b> |

Louis F Vogel spot check evaluation scale May also be used for the evaluation of science text book. Vogel's spot check Evaluation scale.

|             |                   |
|-------------|-------------------|
| Text book : | Author :          |
| Publishers: | Copy right year : |
| Price :     | Score (Total) :   |

**Qualifications of the author :** ♣ The author should have experience in teaching the subject he/she has written ♣ The author should have advanced degrees in related subjects.

**Organization of the content :** ♣ The text books should be organized into units ♣ The chapters are graded in difficulty

**Content matter :** ❖ All the contents should be linked  
❖ Latest advancements in science should be included

**Presentation of the material :** ❖ Important principles to set in bold or Italics ❖ Introduction of a new topic should follow inductive approach.

**Accuracy of the Material :** ❖ The items are scientifically correct ❖ Personification is avoided

**Readability :** ❖ The words and sentences are simple and easy to understand

**Adaptability :** ❖ The text book caters to individual differences

**Teaching aids :** ❖ References are in annotations  
❖ Summaries questions area adequate

**Illustrations :** ❖ The Illustrations are modern ❖ The diagrams are well labeled

**Appearance :** ❖ The appearance of the cover is attractive  
❖ The design is pleasing.



## UNIT - 2

### BIOLOGICAL SCIENCE LABORATORY

1. Explain the importance of practical work in Biological Science.

**Ans : Importance of Practical work in Science**

1. Learning by doing is the principle of science teaching, and it is fulfilled through practical work in the laboratory.

2. It fills the gap between theoretical work and practical work. Knowledge is integrated with correlation of head and hand activities.

3. Students get direct experience. Knowledge gained through purposeful activity is fixed in the minds of the pupils.

4. With theory only students are like frogs in a well, totally unaware of experimental techniques. Experimental study is dispensable to create scientific method of thinking among students.

5. Facts become everlasting if pupils perform experiments themselves instead of memorizing everything.

6. The curiosity of handling things of children will be satisfied.

7. It provides opportunity for training in scientific method. While doing work in the laboratory students come across various problems. So they get training in attacking the problem in a scientific way.

8. As a result of laboratory work pupils develop good habits like patience, co-operation, resourcefulness, initiative, self-confidence and self-dependence etc.

9. Pupils develop certain skills like experimental skills, manipulating skills. They learn skill in using some instruments used in the laboratory (scalpel, tongs, blowpipes, tweezers, forceps etc).

10. Pupils use their leisure time properly by using the spare time in practical work in the laboratory.

### **Practical work to be done in the Biology lab**

1) Preparing slides 2) Preserving specimens 3) Dissecting animals like earthworm, cockroach etc. 4) Maintaining aquarium vivarium. 5) Conducting experiments of physiology.

**2. Describe how you would plan, equip and organize a science laboratories? Explain lecture room-cum-Biological science laboratory? What do you mean by mobile science Laboratory?**

**Ans : Planning of Science Laboratories :** For planning a laboratory and equipment, the following factors should be considered:

1) The Number of students 2) The number of science teachers 3) Method of teaching 4) Finance available 5) Time available for practical 6) Design of the lecture cum demonstration type labs.

**Lecture cum laboratory plan :** Punjab Education Department has approved the plan devised by Dr. R.H. Whitehouse, Lahore, for high schools. Its details are as follows

**The Layout** A Lay out of 45' x 25' for a class of 40 students in demonstration and 20 for practical work. Half of this can be used as classroom and half as laboratory.

**Walls :** Walls are about 1 ½ thick. Some paint or distemper is better than white washing, as they do not need annual white washing.

**Floor :** It should be cemented. The smooth floor can be easily cleaned. A slight slope in the floor is better for it can be swept easily and round corners avoid lodging dirt.

**Windows :** For side lighting 3 windows of 6' cross 7' or 8' high are provided; one near the practical benches and 2 in the classroom. These should open towards outside. So that inner windowsills can be used as shelves. Window blinds can be used for keeping the lab dark when required. Wire gauze should be fitted to avoid the flies and mosquitoes.

**Doors :** There are two door one near the lecture room and another near the lab. Like windows they also open out side for easy and quick exit.



**Furnishing :** Towards the lecture room side is provided a wall black board 10' x 4'. It can be simply cemented area of the wall. At a distance of 3', from it is the teaching table 6' x 2 ½' high. This tables can be used both for demonstration and for writing also.

The seating area for the class is on the same level and no gallery is provided. Twenty dual tables and forty chairs are provided for the students. The dimensions of the dual table are 3 ½' long 1 ½' wide and 2' high. A shelf for books can be provided in the tables. The tables and chairs are made of sheesham wood and are perfectly polished. The chairs are 1 ½' high. Iron chairs may also be provided. The area allowed for dual tables and chairs is 3 ½' x 3 ½' with a passage way of 1 ½'. For 40 seats 18 ½' x 17 ½' is quite sufficient. This arrangement allows

1) Easy passage 2) Students can stand in their seats without any disturbance 3) Economical 4) Natural seat arrangement is provided, 5) To accommodate guests also, it is convenient, 6) To clear the floor it is useful.

#### **Towards laboratory side**

1) A wall black board of 10 x 4'. 2) Ten tables for practical with wax coating 3) A demonstration table with lead top- some times for keeping common article also with 6' x 3 ½' x 3'. Should be arranged. No sinks are with the tables as the tables are used for all subjects' practicals.

Drainage system is not suggested, instead three sinks one for the teacher and two for students, should be attached in the walls with drain board.

Balances can be placed in the recesses of the walls. Eight almirahs with 7' x 5' x ½' deep are suggested.

**Water supply :** It is suggested that water is stored in galvanized iron tanks for regular supply. This plan became popular because it is economical, seating accommodation comfortable, furnishing is cheap, easy seating and storage arrangement is there. It provides unity in theoretical and practical work.

**All purpose laboratory** It is different from lecture cum laboratory in some features.

1) Same tables in the classroom are used both for teaching and practicals. 2) An additional preparation and storage room is there. 3) Provision is made in the walls for reagent bottle etc. 4) Cupboards are provided to practical benches

### **Biology Laboratory**

It should be equipped with

- 1) A long work table where 3-4 students can work comfortably. Drawers should be there for keeping books.
- 2) Teacher's demonstration table should measure 8' x 2' on the raised platform at 7' high demonstration table should have gas and water fittings.
- 3) A black board should be provided measuring 8' x 3' near teacher's table.
- 4) There should be sufficient shelves in the lab for keeping chemicals.
- 5) Glass paned almirahs should be there for keeping specimens so that students can frequently see them.
- 6) A green house should be attached to the biology lab. There different plants should be grown up.
- 7) Students can sit on the stools of the lab.
- 8) A special feature for the student's tables is that sinks should be attached to the tables to make it convenient while doing dissections.
- 9) There should be provision for maintaining aquarium and vivarium in the laboratory.
- 10) Kerosene oil gas or coal gas plant or petrol gas or gober gas plant is installed. Out of all these a petrol gas plant is economical. A moderate capacity plant can feed 10-20 gas taps.

The list of equipment recommended at Tara Devi Seminar for biology lab.

- 1) Tables 6' x 2' x 2 ½' with water fittings and drawers.
- 2) Two sinks at the corners of the lab.
- 3) Almirahs
- 4) Stools
- 5) Wall black board
- 6) Small tables racks
- 7) Wall shelves
- 8) A forger where necessary

**3. What do you mean by procurement in science laboratory? How do you care and maintenance of laboratory equipment.**

**Ans :** Procuring the equipment of laboratory : The success of the practical work depends on the arrangement, maintenance of the laboratory. The enthusiasm of the science teacher appears in the procuring and maintenance of the



apparatus in the laboratory. The most important aspect in the administration of laboratory is the method adopted by the teacher to purchase the equipment and material in the lab. It should be done in a systematic way.

a) The teacher should study science curriculum of different classes before going to prepare a list of equipment for the lab.

b) Then teacher has to decide the number of articles required for each class. It should be based on certain factors.

i) Number of students work at a time.

ii) **Number of subjects they study** : For senior secondary students separate laboratories in each subject should be established. Where in school education science is taught as general science up to 7th class.

iii) **Financial resources** : The quality of apparatus to be purchased depends on this factors mainly. When there are sufficient financial resources more number of apparatus can be purchased. Otherwise a set of apparatus for demonstration is purchased.

iv) **Methods of teaching** : If teacher follows individual methods of teaching - more number of apparatus of same type are required. For group method - some sets are enough.

v) **Capabilities of the students** : There is no use of purchasing costly and sensitive apparatus, which can not be used properly by the students.

vi) **Availability of time in the time table** : When there is not time allotted for practical work in the time table. There is little use of apparatus in large quantities.

vii) **Lack of accommodation** : A science teacher should consider the factor of accommodation also.

viii) **Abilities of the teacher** : Teacher should be skilled in using certain equipment like epidiascope, overhead projector etc.

ix) **Locality in which the school is situated** : It is also important to be considered because in some rural areas it is very difficult to get some apparatus repaired when problems occur.

So by considering the above factors, the teacher should prepare a list of apparatus required.

4. To prepare a list of apparatus Teacher should use the proforma given below.

| Sl. No. | Name of the Article | Quality             | Size   | Quantity  |
|---------|---------------------|---------------------|--------|-----------|
| 1.      | Beaker              | Pirex glass         | 500 ml | One dozen |
| 2.      | Copper              | Turnings            |        | 250 gm    |
| 3.      | Magnetic Compass    | Glass on both sides | 1 cm   | 6         |

5. Then teacher should send the lists to different firms and invite quotations.

6. Teacher should maintain a register for requirement of apparatus and quotations.

7. Teacher should select the firm or company which is offering the apparatus of good quality within the financial resources of the school.

8. Teacher should place the orders to the companies selected for supply.

There are some procedures to purchase the apparatus in schools.

1. There will be one central agency for all schools. It prepares lists for all schools and place orders to a firm.

2. The central agency will receive goods and check the apparatus then it supplies apparatus to school as per the lists.

3. School receives government grants directly and it purchases what they need from wherever they consider appropriate.

4. Grants from government are placed at the disposal of the schools which select equipment out of an approved list of items and firms already prepared by a central agency and place orders, receive and check the goods.

5. Part of the purchases by the school and part of the purchases done by the government.



### **Care and maintenance of laboratory equipment**

For the effective and efficient management of laboratory proper care and maintenance of apparatus are the two principles that should be followed compulsorily. After purchasing the required apparatus they should be arranged in an order and regular checking of apparatus should be done.

### **Precautions to be taken while arranging apparatus in the biology lab.**

1. Breakable and permanent apparatus (wooden stands, iron stands and test tube holders) should be kept separately.
2. Specimens should be arranged either in alphabetical order or phylum wise.
3. Specimens of Botany and Zoology should be separated.
4. Specimens on the small bottles should not be kept behind the big bottles. If so, they may not be visible.
5. Microscopes should be kept under back.
6. Specimens should be arranged either in racks or in glass paned almirahs.
7. Glass rods, delivery tubes and other glass apparatus should be properly spaced.

**Maintenance of the apparatus :** The care and maintenance of apparatus is even more important than the storing of it. If the apparatus is not cleaned or polished from time to time it may lose its quality.

According to NCERT report the maintenance of laboratory is concerned with the proper up keep of apparatus, equipment and environment. Some of the suggested ideas for care and maintenance of apparatus are given below.

1. The teacher should keep the demonstration table clean after completing the demonstration.
2. Uncleaned apparatus should be kept at one place when they are not cleaned immediately.
3. After washing the apparatus they should be drained before keeping them in their place.
4. The iron articles should require a weekly rubbing with a slightly oil rag to prevent rusting.
5. All the metal and wooden articles should be polished at least once a year.
6. The wooden paints can be painted with paint. Iron one should be painted with black paint.
7. Precautions against moisture, rust etc. must be taken. For this the oil, grease, polythene covers etc must be used.

### **Precautions to be taken while using apparatus and equipment**

1. While adjusting the lens in the microscope, slides should not be broken.
2. Pupils should not waste the laboratory stains and glycerin while preparing slides.
3. After completing the dissection the waste material should be disposed at a given place.
4. Labels of the specimen bottles should not be made obscure.
5. Specimens should not be removed from the bottles.

### **4. Write about First Aid.**

**Ans :** There is a space for everything and everything should be kept in its space in the laboratory. This is the secret of maintaining safety in the science laboratory. Laboratory is a place where certain chemicals may be stored. So sometimes accidents may happen by anticipating these accidents science teacher should take some precautionary measures also.

1. Every laboratory should be equipped with fire extinguishers, buckets with sand.
2. First aid kit is a must for the science lab.
3. Rules to be followed should be displayed on the notice board of the laboratory.
4. Gas and electric connections should be checked frequently.
5. Dangerous chemicals should not be within the reach of the students.
6. Students should be strictly instructed that the accidents or breakage of articles must be immediately reported to the teacher.

### **The following are the items to be kept in the first aid**

1. Adhesive tape
- 2) Bandages
- 3) Blanket
- 4) Boric acid
- 5) Burnol
- 6) Castor oil
- 7) Camel brush
- 8) Cotton
- 9) Dettol
- 10) Droppers
- 11) Dressing
- 12) Ether
- 13) Elastoplasts
- 14) Funnel
- 15) Glycerin
- 16) Gause
- 17) Gentian violet
- 18) Starch
- 19) Hydrogen peroxide
- 20) Lime water
- 21) Liquid paraffin
- 22) Milk of magnesia
- 23) Salt
- 24) Sodium sulphate
- 25) Scissors
- 26) Splint
- 27) Safety pins
- 28) Silver Nitrate
- 29) Tincture Iodine
- 30) Tannic acid
- 31) Thermometer
- 32) Tweezers
- 33) Universal antidote
- 34) Potassium permanganate
- 35) Sodium bicarbonate.



## UNIT - 3

### TEACHING LEARNING MATERIALS

#### 1. Explain the Edgar Dale's cone of Experience ?

**Ans:** Edgar Dale developed from his experience in teaching and his observations of learners the cone of experience. The cone of experience presents a visual metaphorical model for learning that span from direct experience (doing) to observing to indirect abstraction (symbolizing). According to Dale, all the experiences developed by human beings are derived mainly from the following sources :

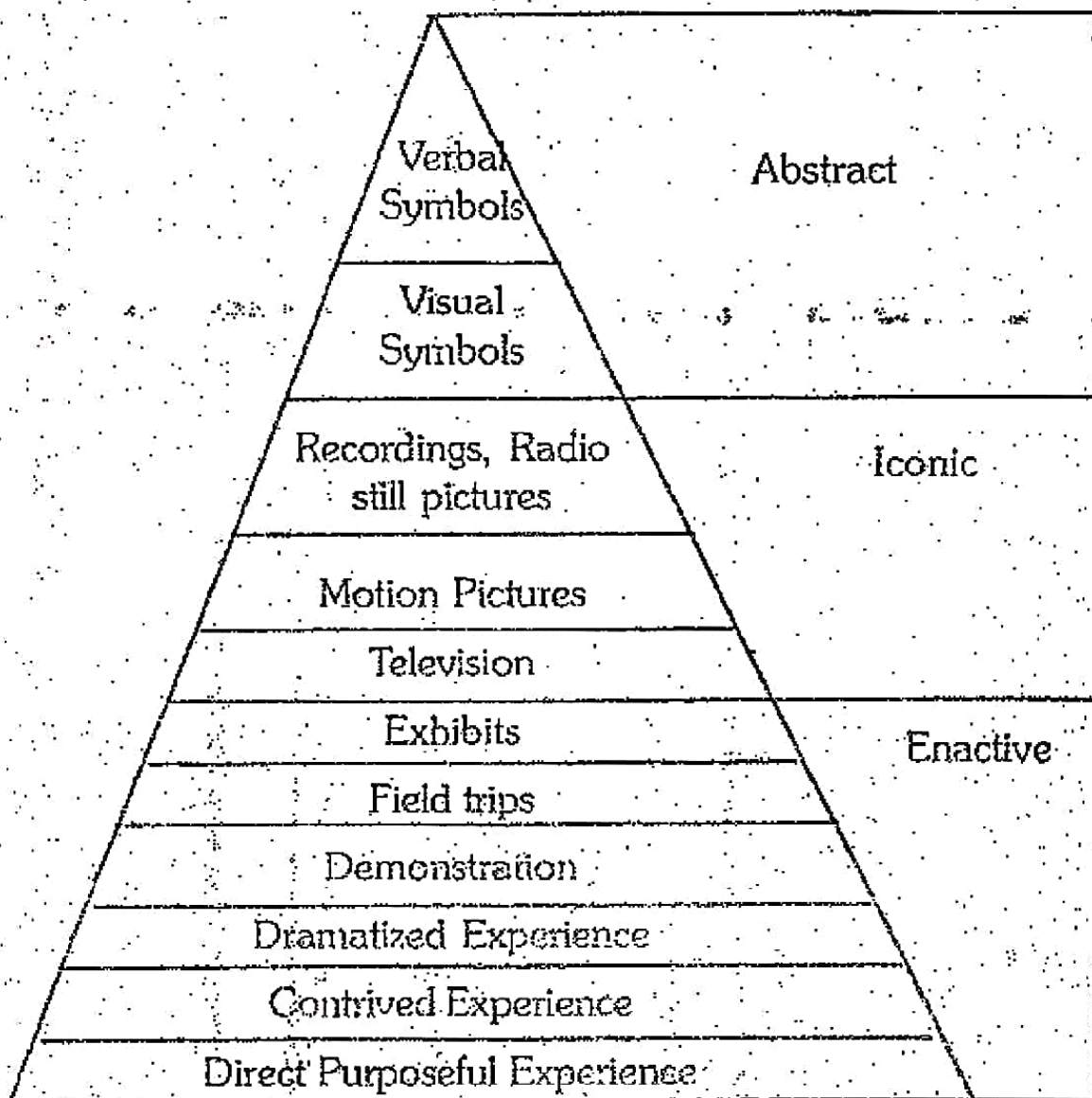
**1) Enactive :** The experiences gained through the direct sensory contact, which involves practical participation are direct and purposeful.

**2) Iconic :** When a real things cannot be perceived directly, it is simplified through other experiences like observing which involves observing pictorial representations or any pictures or like working a model which is an editing of reality and differs from the original either in size or complexity.

**3) Symbolic :** Symbolizing which involves oral or printed words.

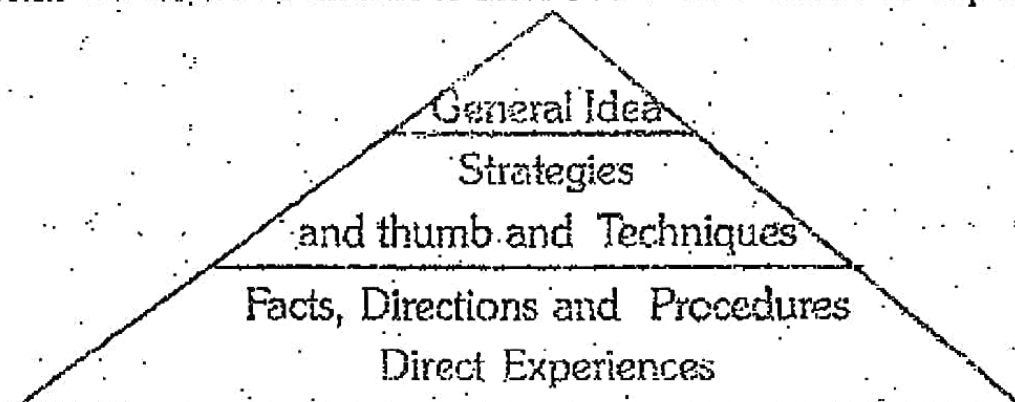
Edgardale shows all the learning experiences which can be included for class room teaching, in a pictorial device called the pinnacle form - which he called "Cone of Experience"

The cone classifies the audiovisual aids according to their effectiveness in communication. The first three divisions of the cone are three - dimensional.



### Edgar Dales ane of expeirence

Dale proposed that active and passive modes of participation could be contrasted by assigning a percentage of what we tend to remember after two weeks after our experience.



Simplified cone of Experience



Edgar Dale suggests the following criteria for evaluating the audio visual materials.

(1) Do they materials give a true picture of ideas they present?

(2) Do they tend to improve human relations

(3) Is the physical condition of the materials satisfactory?

### **Importance of Dale's cone of experience.**

The importance of Dale's cone of experience is that it helps a teacher make decisions about resources or activities. Using the knowledge of the cone the potential value of a resource to student learning can be known.

### **2. What are audio - visual aids? How far are they useful for science teaching?**

**Ans :** The supply of teaching aids to every school is essential for the improvement of the quality of teaching. It would indeed bring about an educational revolution in the country

- **Kothari Commission (1964-66)**

### **Definition of Audio-visual aids:**

Audio visual aids are those sensory objects or images which initiate or stimulate and reinforce learning - **Burton**

Audio-visual aids are any device which can be used to make the learning experience more concrete, more realistic and more dynamic - **Kinder, S. James.**

### **Types of Audio - Visual aids**

For the sake of convenience, we can classify the aids into the following categories

- (a) Visual aids (b) auditory aids (c) audio visual aids
- (d) Aids through authority.

**Visual Aids:** These aids involve the use of the sense of sight and hence called as visual aids the type of aids include

1. Chalk - board
2. Charts, diagrams, model etc
3. Motion pictures, film strips and slides
4. Flannel graph and Bulletin Board

### **Importance of visual aids**

- ✦ Where the subject is too small to be seen with naked eyes
- ✦ Where the subject is non visual
- ✦ When the subject is complex to be understood in its Natural form.

**Auditory Aids :** These aids involve the use of the sense of hearing and include

1. Radio 2. Gram phone 3. Tape-recorder

**1. Radio:** Almost all the important centres of A.I.R broadcast special programme on science education

**2. Tape-recorder:** The following points can be considered while selecting the tape recorder

- ✦ Versatility
- ✦ Price
- ✦ Construction

**Audio visual aids:** These aids involve the use of the sense of hearing and seeing. These include a. Films b. Television

**Films:** Educational films can be divided into the following types

- a. class room films b. Industrial filing c. News reels

**Television:** this is the latest addition to the list of number of audio visual aids. It combines the best elements of the radio and the potentialities of the film.

### **3. Write a short Note on Activity aids**

**Aquarium :** An aquarium is a vivarium of any size having at least one transparent side in which water dwelling plants or animals are kept and displayed. The term coined by Philip henry gosse, combines the latin root aqua, meaning water, with the suffixarium meaning a place for relating to. The aquarium principle was fully developed by Robert warington who explained that plants added to water in a container would give off enough oxygen to support animals, so long as their numbering do not grow too large.

**Vivarium:** A vivarium is an area, usually enclosed, for keeping and raising animates or plants for observation or research vivarium the first of its kind, was created by Philippe devosjoli in sandiego California to share information about the keeping of reptiles, amphibians and other terrestrial animals in captivity.



**Terrarium:** Terrariums are usually sealable glass containers that can be opened for maintenance and to access the plants inside. Terrariums are kept as decorative or ornamental items. Closed terrariums create a unique environment for plant growth, as the transparent walls allow for both heat and light to enter the terrarium.

**Herbarium:** A herbarium is a collection of preserved plant specimens and associated data used for scientific study. The specimens in a herbarium are often used as reference material in describing plant taxa.

**Natural study garden:** Natural study is one of the important aspects at the elementary stage and is only possible if the school has a garden of its own. In the secondary school where gardening is one of the subjects the teaching of plant life and animal life becomes easy.

**4. Discuss the need and importance of Improvisation of teaching aids**

**Ans. Process of developing low cost materials or improvisation of apparatus.**

**1. Definition of objectives:** Before starting the preparation of low cost material of the objectives of the apparatus.

**2. Designing the product:** The design for the improvised apparatus is developed based on the type of materials used the cost of production and availability of the resources.

**3. Development of material:** Actual preparation of the material is done at this stage, teachers and community students are involved in the development.

**4. Pilot testing:** The material prepared should be used to a sample of students and the effects of using the material are checked.

**5. Finalization of materials:** The materials which successfully pass the pilot testing are finalized for mass production.

**6. Distribution:** Adequate number of copies is produced and they are distributed to various schools for academic usage.

**Advantages of improvisation :**

1. Improvisation brings the list of apparatus down as funds are scarce. It is a good step to make the school self reliant.

**2. Instructional value:** During preparation, and in using after preparation pupils develop ideas and concepts clear. It is quite related to the cardinal principle of learning by doing.

**Some of the examples for improvised material**

**1. Spirit lamp:** An ink bottle with wick can be used as a spirit lamp

**2. Working Model of Lung** A glass bottle can be taken with a rubber sheet covered at the bottom. A cork should be fitted to the neck with 'Y' tube in it. On each of the lower limbs of the Y tube should be attached with rubber balloons. Rubber sheet acts as diaphragm. When it pulls downwards air enters the balloons through Y tube.

**3. Deflagrating spoon:** Make a circle at the middle of the wire to fit soda bottle lid in it and twist the end of the wire to the remaining part so that the lid is gripped tightly.

**4. Water filter with 3 pots** Coal on one pot, gravel on the second pot and the third pot as collecting pot of water. They should be arranged one above the other, with a tube inside connecting 3 pots.

**5. Poor man's fridge :** Take two clay plant pots, which can be fitted one inside the other. Fill the gap between the two pots with wet sand and cover the pots with a wet gunny cloth by keeping vegetables in the pot which is inside.



## UNIT - 4

### RESOURCES FOR TEACHING BIOLOGICAL SCIENCE

#### 1. Write briefly on science kits

**Ans : Science kits:** Mini science kit may be a small portable box which can be carried away. It may be of wood, iron or aluminum.

Kits serve the purpose of mini laboratory. Science kit is a device of preparing folded apparatus and material and then to arrange them in a box which can serve as demonstration table also.

According to the recommendations of kothari commission, disciplinary approach is being followed from 8th class.

#### **Types of kits employed in science at different levels:**

NCERT developed different types of kits used at different levels

**Primary level:** Science kits for demonstration and for students work. The articles in the kit are a) General items b) chemicals

**Middle level science kits :** There are 6 kits for demonstration 3 and for students 3 items.

#### **Importance of kits in the use of teaching life science**

✦ It is economical ✦ It provides a basis for understanding the fundamentals ✦ Develops skills ✦ It serves as a mini mobile and improvised lab

#### 2. What are the functions of school science library? How do you organize science Library in your school?

**Ans.** The library is the intellectual nerve center of a good school, and the hub of it's a academic life In the words of Kramy kollier, books are guide to youth and an entertainment for old age.

**Objectives:** ✦ To improve their critical thinking skills

- ✦ To help the students acquire good reading and self learning skills
- ✦ To teach the students proper utility of their leisure time

### **Functions of a science library:**

- ✦ To help the teachers in updating their knowledge
- ✦ To develop the reading habits in the students
- ✦ To reduce the chance of indiscipline in the school

### **Organization of a science library**

The main components in the effective organization of a school library are 1. Accommodation 2. Finance 3. Selection of books 4. Arrangement of the resources

**Limitations:** ✦ The books are beyond the comprehension of the students ✦ The acquisition of knowledge is restricted to the curriculum. ✦ The students study only their course books to pass the examination.

### **3. What do you mean by science club? How do you organize science club?**

**Ans:** The basic principles is involved in the formation of science clubs the organizations formed to lay emphasis on the principles of learning by doing.

### **Importance of science clubs:**

- ✦ They create scientific out look among the students
- ✦ They develop manual skills in the students
- ✦ They enhance the interests of pupils

### **Objectives of science clubs**

- ✦ To develop orientation and awareness towards science in students
- ✦ To promote heal they living conditions among students
- ✦ To teach the importance of manual work

### **Types of science clubs:**

**1. General science club:** These clubs are concerned with any type of science activity

Example: Biology club

**2. Specialized interest science clubs:** These clubs under take projects dealing with some specialized subjects

Example: Photographic club



### **Important activities in science clubs:**

- ✦ They organize science exhibitions and fairs at regular intervals
- ✦ Science clubs celebrate science days and important scientific events
- ✦ Science clubs conduct seminars, essay writing competitions

#### **4. What is the importance of science exhibition?**

**Ans:** Places where models, pictures chart depicting science are arranged and where the exhibitors explains the visitors about their work is called a science fair or exhibition

#### **Need for the science fairs:**

- ✦ Science fairs also enhance students hidden creative skills
- ✦ They get better understanding of experiments and method when they prepared models
- ✦ A science fair provides an excellent opportunity for the students to display their work which they have done in their science club.

#### **NCERT objectives for organizing science fairs.**

- ✦ To identify talented students in science and nurture the future scientists
- ✦ To provide a competitive forum to various science clubs in the area
- ✦ To make science activities more popular amongst the students there by hoping to improve standards of performance.

**Types of exhibits:** A typical science fair should have the following exhibits ✦ Models ✦ Specimen ✦ Experiments ✦ Charts and diagrams ✦ Improvised apparatus

- Benefits:** ✦ Students communicate their scientific research
- ✦ Students observe record and organize data and draw conclusions
  - ✦ Students use reading research and computer skills

#### **5. How do you organize science Museum in school?**

**Science Museum:** The first science museum known as the Birla Industrial & Technological Museum, Calcutta was established in 1959 by to government of India and CSIR. Two more museums, Visweswarayya Industrial and Technological Museum (Bangalore), and Nehru Science Center (Bombay) were started in 1965 and 1977 respectively. BITS at Pilani have also prominent science museum, besides having permanent galleries

These museums organize science activities such as science exhibitions and fairs, demonstration lectures and training programmes.

### **Indian Association for extra curricular science activities:**

It was founded in 1968 and has been actively involved in conducting out of school science programmes. It organized all students fair in 1970 and organized UNESCO regional seminar for leaders of the youth science activities in Asia in cooperation with NCERT.

### **Role of state in popularizing science:**

1. Science fairs are being conducted at different levels, namely Mandal, Zonal, State levels, to popularize science and its developments. 2. State Council has stated district science centres, they conduct quiz and other competitions related science regularly. 3. National green Corps (NGC) was introduced in many schools. Members of the NGC are participating in Eco-friendly activities and canvassing environment protection measures. 4. Children's science Congress was established. Every year this organization invites creative science projects from students. Selection of projects will be done at district, state and national levels, the aim of this organization is to

### **6. Explain different community resource in Biological science?**

Ans. In a Biological a resource is a substances or object in the environment required by an organism for normal growth, maintenance and reproduction resources can be consumed by one organism and as a result, become unavailable to another organism for plants key resources are light, Nutrients water and place to grow. For animals key resources are food, water and territory.

**Key resources for plants:** ✦ Carbon dioxide ✦ Nutrients ✦ Pollination ✦ Seed dispersal

**Key resources for animals:** ✦ Foragins ✦ Territory ✦ Water

**Resources and ecological processes:** ✦ Biological competition ✦ Carrying capacity



## UNIT - 5

### EVALUATION IN BIOLOGICAL SCIENCE

1. Explain the following concepts.

a) Test b) Measurement c) Evaluation

**Ans:** Concept of Test, Examination/Measurement and Evaluation :

**1. Test :** A test is a set of standardized or controlled occasions for responses presented to an individual with design to elicit a representative sample of his behaviour when meeting a given kind of environmental demand.

A psychological test is a standardized instrument designed to measure objectively one or more aspects of a total personality by means of samples of verbal or nonverbal responses or by means of other behaviour.

**Examination :** Generally the instruction is followed by various kinds of evaluation throughout the academic schedule. Teachers who provide the instruction or involve directly in the process of instruction also devise different types of tests from time to time and evaluate the students performance. Basically they can be broadly divided into two categories of examinations i.e., internal and external.

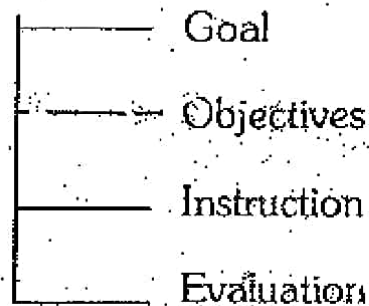
**Measurement** Measurement is an important feature of our daily life "From birth to death " says Ross

According to R.N. Patil, Measurement is an act or a process that involves the assignment of a numerical index to whatever is being assessed.

According to Anthony J. Measurement is a procedure for assigning numbers to specified attributes or characteristics of a person in a manner that maintains the real world relationship among persons with regard to what is being measured.

Prof. Richard & Lindemand defines measurement is the assignment of one of a set of number to each of a set of persons or objects according to certain established rules

**Concept of Evaluation :** Evaluation is supposed to judge the worth of all educational outcomes as a result of teaching learning process. The process of teaching learning can be represented like this



Evaluation is a process by means of which changes in the behaviour of students are studied and guided towards goals sought by a school.

Evaluation is a continuous process. It starts from the beginning of the education and continues till the end.

## 2. Define Evaluation ? Describe the process of Evaluation ?

**Ans: Evaluation**

Evaluation is a new term in the field of education which is introduced to replace the terms like testing or examinations etc. It has a wider meaning as it includes assessing all educational outcomes and outputs of the teaching learning process.

In the words of the Kothari Commission

"Evaluation is a continuous process, it forms an integral part of the total system of education and is related intimately to educational objectives

**Objectives, learning experiences and evaluation :** The interrelationship among objectives, content, learning activities and evaluation procedures is shown below

- |            |                          |
|------------|--------------------------|
| Objectives | 1. Content               |
|            | 2. Learning activities   |
|            | 3. Evaluation procedures |

The above figure clearly indicates that evaluation involves continual appraisal of objectives and of the testing procedures used by the teacher.



**Purpose of Evaluation :** These are 1. To monitor pupil progress 2. To improve the quality of learning environment 3. To improve courses and curricula, texts and teaching - learning materials 4. To diagnose students weakness and determine the need for remedial work

**Types of evaluation :** 1) **Diagnostic Evaluation :** It determines the causes of learning problems and formulates a plan for remedial action.

2) **Formative Evaluation :** Formative Evaluation is the assessment made by the teacher during teaching learning process in order to know about learner's progress in learning and make essential changes to improve teaching learning process. Formative evaluation is a continuous process that simultaneously happens with teaching. Asking questions during classroom teaching, classroom assignments, home assignments informal interviews with students etc. are examples of formative evaluation.

**Need and Importance :** Formative evaluation is must to provide immediate feedback to teacher so that he/she modify and improve instruction.

- \* It is also necessary to provide feedback to students enable them to identify their learning errors and rectify them immediately.

- \* Since it is child centered, it gives more importance to student's achievement or their learning.

- \* It is a flexible way of evaluation.

- \* It helps in designing remedial teaching by providing data of student's performance regularly.

**3. Summative Evaluation :** Summative evaluation is the assessment made at the end of the term, semester, course or instructional program to assign a grade for learners. The term summative means the summing up of all the available information regarding a program at its terminal point. Unit test, quarterly examination, half yearly examination, semester examination and annual examination are examples of summative evaluation. Summative test is given to a learner after he/she has passed all the formative tests.

**Need and Importance** The summative evaluation is conducted to give overall

## **Process of Evaluation :**

### **Steps involved in the evaluation process :**

1. First and foremost is to formulating and selecting worthwhile objectives of teaching in a subject.
2. The objectives and the behavioural changes are brought through proper content and subject matter.
3. Learning experiences can be brought through reading good number of text books listening and acquiring the subject matter.
4. In accordance learning experience, use devise proper evaluation procedures.
5. The expected output can be obtained and suggest in turns by results or behavioural changes.

### **Evaluation tools and techniques**

A tool of evaluation is used in education as a technique that will facilitate the process of measuring and recording the characteristics of pupils. The following are the some main tools of evaluation in education

#### **1. Tests:**

**a. Achievement tests:** Essay type, short answer type, objective type

**b. Personality tests:** Paper and pencil tests

**2. Questionnaires:** The information collected with a questionnaire helps in evaluation of personality traits, interests etc.

**3. Observation :** They are two types

a. Direct observation      b. Indirect observation

**4. Check lists :** It is a simple tool or evaluation which tests various aspects of an individual's behavioural adjustment

**5. Rating scales:** There are 5 types of rating scales

a. Numerical   b. Graphic   c. Scorecards   d. method of paired comparison   e. man of man scale

**6. Anecdotal record :** It is a record of written description



of a specific incidents / which a teacher has observed the students behaviour from time to time.

**7. Interview :** There are two types

a. Structured interview b. Unstructured interview

**3. Explain the qualities of a good test ? Explain the classification tests.**

**Ans: Qualities of Good test**

The following figure represents the criteria of a good test.

**Good Test**

| Technical Criteria | Practical criteria                       |
|--------------------|------------------------------------------|
| ✦ Reliability      | ✦ Ease of application/<br>administration |
| ✦ Validity         | ✦ Cost(Economy)                          |
| ✦ Objectivity      | ✦ Time Frame                             |
| ✦ Discrimination   | ✦ Acceptability                          |
| ✦ Standardization  | ✦ Scoring and Interpretation             |

**Reliability :** A test is reliable to the extent that it measures consistently from one time to another. It must function similarly with similar groups. It should rate the same candidates with the same or different examiners at the same or different times. The difference in score should be negligible.

**Validity :** A test is said to be valid when it measures what it claims to measure. For example, a test of science should not measure linguistic ability. It must measure the acquisition of scientific knowledge for it to be valid.

**Objectivity :** A test should yield a clear score value for each performance the score being independent of the personal judgement of the scorer i.e. an objective test should yield the same or nearly the same score, irrespective of the person scoring it.

**Economical :** A test should be economical both in terms of cost and time.

**Clarity :** The language used in the questions should be

simple, clear, precise, specific, easy to comprehend and unambiguous.

**Practicable** : It should be easy to administer. It should be suitable for both bright and dull students. It should neither be too long nor too short. It should be useful and acceptable to both teachers and students.

**Score able** : The test should be such that during scoring subjectivity can be kept at a minimum and the scorer doesn't get bored due to monotony or laborious nature of paper.

**Simplicity of Administration, Scoring and Interpretation** : It should be easy to administer, score and interpret. Clear-cut instructions for administration must be provided. A scoring key/guide must accompany the test.

**Interesting** : An interesting test would automatically secure the cooperation of the students. The test should encourage reflective thinking and not rely on mere recall/ reproduction of knowledge.

**Graded** : A test should be graded according to the age, intelligence, maturity level of students.

### TYPES OF TEST

**Written tests** : Written tests can be further classified into essay-type, short answer type and objective type.

**Essay-Type tests** : Students write essay on the concerned topics, expressing the over all meaning.

**Advantages** : ✦ Easy to construct ✦ Free to express his in heart ability skill, Ideas ✦ It does not give scope for copying.

**Limitations** : Low validity and reliability ✦ Time taken in scoring ✦ Lack of comprehensiveness.

**Short -answered type questions** : These types of tests are testing high through - providing. They used in testing some what we actually expert from the students.

**Objective type tests** : It tests the factual information an objective type test is importing to the objectivity rather than the subjectivity.

**Advantages** : ✦ No bluffing ✦ Economy of time ✦ Speed and accuracy



**Limitations :** ✦ Often Antiguan ✦ providing guessing priority

**Practical Tests :** These test are used to primarily test the ability of students to

a) Manipulate simple apparatus b) Make simple deductions from observed facts c) Apply their knowledge of practical methods and procedures to new experiments.

#### 4. Explain planning, preparation and conduct of Achievement Test in CCE Model.

**Ans : Concept of Achievement Test** Achievement may be defined as a change in the behaviour of students in a desired direction. It is an important and essential constituent in the process of evaluation. 'Achievement' means one's learning attainments, proficiencies, accomplishments etc.

According to N.M. Downie, any test that measures the attainment or accomplishments of an individual after a period of training or learning is called an achievement test. Waters says that Achievement tests are useful aids for diagnosing a student's specific learning needs, for identifying his relative strengths and weaknesses, for studying his progress and for predicting his success in a particular curriculum.

Good defines an achievement test as a test that is designed to measure a person's knowledge, skills, understanding etc., in a given field taught in a school.

Assessment involves collecting information about student's knowledge, skill and abilities. An achievement test is a formal assessment. The test helps the teacher to understand the level of comprehension of the students in a particular subject and helps him to estimate the capabilities of the students.

In the school evaluation programmes, various forms of achievement tests are used to measure the extent of learning of the pupils. So, it is necessary for the teacher to know how to construct an achievement test efficiently.

### **Important features of achievement test**

- ❖ Achievement tests measure the modification of behaviour brought about by learning.
- ❖ It is a standardised test to suit needs of the students.
- ❖ It is based on the difficulty level of students.
- ❖ It contains a number of items in all three domains.
- ❖ It is accompanied by a test manual for administering and scoring the test.

### **Functions of Achievement Tests**

The major functions are :

- ❖ To provide basis for promotion to the next classes.
- ❖ To motivate students before a new assignment is taken up.
- ❖ To know the placement of a student in a particular section.
- ❖ "A teacher can use achievement to see for himself how effectively he is doing, what is getting across to his pupils and what is not."
- ❖ It helps in ascertaining quantity and quality of learning, attained in the subject of study or group of subjects after a period of instruction by measuring the present ability of the individual.
- ❖ To know the performance of the students.
- ❖ To know the efficiency of learning experiences provided.
- ❖ To know the extent of teaching - learning process.

### **Construction of a Scholastic Achievement Test (SAT)**

#### **In CCE modal**

A teacher prepares the test, and gives due weightage to academic standards distribution and difficulty level. These tests help in :

- a) Understanding the success of a teaching method.
- b) Identifying the strengths and weakness of the students.

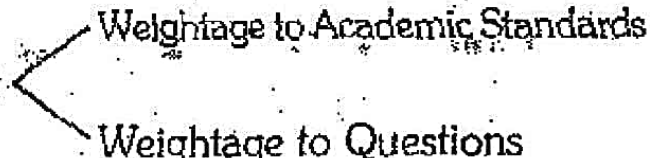


c) Developing the remedial measures.

d) Application of knowledge gained.

### **Steps in the Construction of an Achievement Test:**

The following figures represents the steps based on which an achievement test is constructed :

- 1) Planning the test 
  - Weightage to Academic Standards
  - Weightage to Questions
- 2) Preparing the Blue print
- 3) Designing questions and Editing question Papers
- 4) Administering the test

### **IX CLASS MODEL QUESTION PAPER SUMMATIVE - 3**

| Academic Standard | %of weightage | Marks Allotted |
|-------------------|---------------|----------------|
| AS-1              | 40%           | 16             |
| AS-2              | 10%           | 04             |
| AS-3              | 15%           | 06             |
| AS-4              | 15%           | 06             |
| AS-5              | 10%           | 04             |
| AS-6              | 100%          | 04             |

#### **Question wise weightage table**

| Types of Question           | Allotted Marks | No. of Questions |
|-----------------------------|----------------|------------------|
| Essay type questions        | 16             | 04               |
| Short answer questions      | 04             | 05               |
| Very Short answer questions | 06             | 04               |
| Multiple Choice Questions   | 06             | 20               |
|                             | 40             | 33               |





The data can be analysed in many different ways:

**a) Objective-wise Analysis**

| S/No  | Name of the pupil | Objective |               |             |       | Total |
|-------|-------------------|-----------|---------------|-------------|-------|-------|
|       |                   | Knowledge | Understanding | Application | Skill |       |
| 1.    |                   |           |               |             |       |       |
| 2.    |                   |           |               |             |       |       |
| 3.    |                   |           |               |             |       |       |
| Total |                   |           |               |             |       |       |

**b) Question Type wise Analysis**

| RegNo              | Name | Essay | Short answer | V.S.A | Objective type | Total |
|--------------------|------|-------|--------------|-------|----------------|-------|
| 1.                 |      |       |              |       |                |       |
| 2.                 |      |       |              |       |                |       |
| 3.                 |      |       |              |       |                |       |
| Total              |      |       |              |       |                |       |
| Average % Of Marks |      |       |              |       |                |       |

**c) Individual Pupil Analysis**

| Reg.No. | Name of the Pupil | % of Marks Obtained | Mistakes Committed | Probable Causes for Measures | Remedial Measures Suggested |
|---------|-------------------|---------------------|--------------------|------------------------------|-----------------------------|
|         |                   |                     |                    |                              |                             |
|         |                   |                     |                    |                              |                             |

**d) Unit wise Analysis for individual pupils**

| Topic | Student Name | Reg.No. | Unit 1 | Unit 2 | Unit 3 |
|-------|--------------|---------|--------|--------|--------|
| 1.    |              |         |        |        |        |
| 2.    |              |         |        |        |        |
| 3.    |              |         |        |        |        |

These type of analysis help in assessing the students achievement objective wise, unit wise. It helps the teachers to

identify the level of the students in the class and obtain classwise average. The measures of variability central tendencies and divergence can be used to find out the relation between the marks obtained by the students. The results can also be graphically interpreted. The statistical analysis of the data will help the teacher in understanding the achievement of the objectives, the relevance of the learning experience provided, the appropriateness of the teaching method used, and the adequacy of the content provided.

Analysis and interpretation of the results using the statistical measures will help the teacher to bring about required changes in teaching methodology, and develop quality in the teaching - learning process.

**Conclusion :** Evaluation is an integral part of teaching learning process. In practice evaluation is used to pass judgements and improve students and teacher teaching. Evaluation is an inseparable part of the teaching - learning process and the data so obtained can be used as a diagnostic device so that proper remedial Instruction could be initiated to improve students learning.

Thus educational evaluation is a systematic process, which determines.

- ❖ The extent to which educational objectives are achieved.
- ❖ The effectiveness of the various learning experiences provided in the class room.

## 6. Explain the Assessment of performance of the student.

**Ans : Electronic Assessment :** Electronic assesement also known as e-assessment, online assessment and computer-based assessment is the use of information technology in various forms of assessment such as educational assessment. This may utilize an online computer connected to a Network. Specific type of e-assessment include multiple choice, online submission, computerized classification Testing Different types of online assessments contain elements of one or more of the following components, depending on the assessment purpose formative, summative or Diagnostic.

Test and other assessment procedures can also be classified in terms of their functional role in class room instructions. The sequence in which assessment procedures are likely to be used in



the class room are 1) Formative Assessment 2) Summative assessment 3) Diagnostic assessment 4) Prognostic assessment

**Formative assessment :** The assessment activities undertaken during the instructions is called formative assessment. Formative assessment is an on going class room process that keeps students and teachers informed of students progress towards achievement of learning objectives. Formative assessment is used to monitor learning progress during instruction.

**Summative assessment :** Summative assessment typically comes at the end of a course of instruction. The essential characteristic of a summative assessment is that, a judgement is made about the effectiveness of learning or instruction after the learning or instruction has taken place.

**Diagnostic assessment :** A diagnostic assessment is designed to locate the particular source of a students difficulties in learning diagnostic assessment is used for diagnosing the problems through carefully prepared diagnostic test as well as observational techniques.

**Prognostic assessment :** The assessment activities undertaken before the instruction is called prognostic assessment. Prognostic assessment is concerned with students entry behaviours. The various techniques used for prognostic assessment includes readiness tests, aptitude tests, pretests, observational techniques and so on.

#### 7. Explain the preparation of port Folios.

**Ans:** Port folio assessment is in vogue for the last two decades. It is also used as the basis for grading to report to parents. It helps in keeping the records of the child, which may help even when it goes to the next class to know about the achievement of the child.

Port folios provide a means for collecting a variety of assessments over time in order to detect students pattern of success and failure to achieve instructional objectives - Wiggins

Systematic collection of student work into portfolios can serve a variety of instructional and assessment purposes. The value of port folios depends heavily on clarity of purpose, the guidelines for inclusion of materials, and the criteria to be used in evaluating port folios - Rober L.Linn & M.David Miller



**Types of Portfolios :** There are a variety of portfolio types, each designed to help assess either the process or the products of learning.

**Show case portfolios** Showcase portfolios highlight the best products over a particular time period or course. For example, a showcase portfolio in a composition class may include the best examples of different writing genres, such as an essay, a poem, a short story, a biographical piece, or a literary analysis. In a business class, the show case portfolio may include a resume, sample business letters, a marketing project and a collaborative assignment that demonstrates the individual's ability to work in a team. Students are often allowed to choose what they believe to be their best work, highlighting their achievements and skills. Showcase reflections typically focus on the strengths of selected pieces and discuss how each met or exceeded required standards.

**Process portfolios :** Process portfolios, by contrast, concentrate more on the journey of learning rather than the final destination or end products of the learning process. In the composition class, for example, different stages of the process - an outline, first draft, peer and teacher responses, early revisions, and a final edited draft - may be required. A process reflection may discuss why a particular strategy was used, what was useful or ineffective for the individual in the writing process, and how the student went about making progress in the face of difficulty in meeting requirements. A process reflection typically focuses on many aspects of the learning process, including the following : what approaches work best, which are ineffective, information about oneself as a learner, and strategies or approaches to remember in future assignments.

**Evaluation portfolios** Evaluation portfolios may vary substantially in the content. Their basic purpose, however remains to exhibit a series of evaluations over a course and the learning or accomplishments of the student in regard to previously determined criteria or goals. Essentially, this type of portfolio documents tests, observations, records, or other assessment artifacts required for successful completion of the course. A math evaluation portfolio may include tests, quizzes, and written



explanations of how one went about solving a problem or determining which formula to use, whereas a science evaluation portfolio might also include laboratory experiments, science project outcomes with photos or other artifacts, and research reports, as well as tests and quizzes. Unlike the showcase portfolio, evaluation portfolios do not simply include the best work, but rather a selection of predetermined evaluations that may also demonstrate students' difficulties and unsuccessful struggles as well as their better work. Students who reflect on why some work was successful and other work was less so continue their learning as they develop their metacognitive skills.

**Online or e-portfolios.** Online or e-portfolios may be one of the above portfolio types or a combination of different types, a general requirement being that all information and artifacts are somehow accessible online. A number of colleges require students to maintain a virtual portfolio that may include digital, video, or Web-based products. The portfolio assessment process may be linked to a specific course or an entire program. As with all portfolios, students are able to visually track and show their accomplishments to a wide audience.

**Purposes : Specify purpose :** Basically the purpose of a portfolio should be known while designing the portfolio.

**Instructional purpose :** According to Arter et al, the two global purposes of portfolios identified by her are : the primary purpose of portfolio in instruction.

**Assessment purposes :** The collected material in the portfolios over the year, semester etc. could be useful for both summative and formative evaluation.

#### **Guidelines for portfolio entries :**

The minimum guidelines are :

- ✦ Use made of that portfolio ✦ Who will have access to it?
- ✦ What types of works are appropriate to include. ✦ What criteria will be used in evaluating the work ?

#### **Steps involved in creating portfolio**

**1. Define your purpose :** It is to be used for formative purposes to document student progress. It is also used for summative evaluation also.

**2. Determine the content and skills to be assessed:** The teacher should specify the instructional objectives the content and skills of the students which are supposed to be mastered.

**3. Determine whom you would assess and at what grade levels :** If the teacher wants to assess all students of his



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