

## 1 Audio aids

- (a) Broadcast talks Radio broadcast and audio recordings are the sources of audio learning experiences for the children.
- (b) In order to provide learning experience beyond the school syllabus and to relate it to the real life outside the classroom, school broadcast programmes could be one of the best medium.
- (c) It may not always be possible for a science teacher to invite eminent persons of science for the lecture or talk.
- (d) In such cases the lectures or speeches can be pre-recorded and can be played in the classrooms.
- (e) There are various types of programmes, such as discussion forums, question-answers, debates, quizzes, speeches, dramas, which can be either played live or can be pre-recorded, to be used in teaching learning of science.
- (f) The All India Radio has regular programmes for school children.
- (g) Programmes generally include talks on educational, scientific, current topics, etc.
- (h) The topic, date and time of broadcast of such talks are given in advance.
- (i) The schools can take advantage of such talks. Sometimes, it is also possible to synchronise the broadcast on a topic with the actual teaching-learning time of that topic in the class.
- (j) To get the maximum benefit from such talks, the following points should be kept in mind.
- (k) To keep students' interest alive, they are facilitated to get familiar with the background of the talk beforehand.
- (l) A discussion could be arranged after the talk.
- (m) Preferably short duration talks are arranged.
- (n) The students having hearing problems are seated near the source.

## (B) Audio tapes

- a) The major advantage of a magnetic audio tape over a disc is that one can record programmes easily and economically.
- b) When the material becomes outdated, or is no longer useful, it could be erased and the tape can be reused.
- c) Tapes are not as easily damaged as discs, and they can be easily stored.
- d) Records of talks on interesting topics by eminent scholars can be easily reproduced in the classroom.
- e) These talks provide an inspiration to the students. Such a recording could be used to introduce a topic or to develop it. T
- f) hese devices are seldom used these days.

## Advantages

- ❖ Audio media are inexpensive.
- ❖ Once the audio tapes and equipment's have been purchased, there is no additional cost, because the tapes can be reused.
- ❖ Audio materials are readily available and very simple to use.
- ❖ They can be used for a group or an individual.
- ❖ Audio cassette recorders are portable and can be used outside the classroom because they can be run on battery.
- ❖ Cassette recorders are ideal for home study as students can afford to have their own cassette players.
- ❖ Audio tapes can be easily duplicated in required quantities.
- ❖ They can be used in all phases of teaching-learning from introduction of a topic to assessing students' learning.
- ❖ The audio media could be very well used for the purpose of self-paced learning.
- ❖ If required, learner can go back and repeat desired Pedagogy of Science: Physical Science ⇒ 316 segments of teaching-learning as often as necessary because the recorder/playback machine can serve as a very patient tutor.
- ❖ On the other hand, learners can skip ahead or increase the pace of their learning as and when desired.
- ❖ Pre-recorded audio media can be used as 'talking books' for the visually impaired students.
- ❖ Audio tapes can easily be prepared by teachers for students with special educational needs.

## Limitations

- ❖ The biggest drawback of the audio media is the lack of visual support.
- ❖ Moreover, audio media is not interactive.
- ❖ There is no possibility for any input from the listener, or of a hyperlink to any material elsewhere on the tape.
- ❖ The presentation can only be in a fixed predetermined sequence, though there is the possibility of rewinding the tape and hearing a recorded segment again or advancing the tape to an upcoming portion.
- ❖ As an example, suppose a student is listening to material on Kepler's laws where the examples being cited are of planets.
- ❖ If she gets curious to know whether artificial satellites also obey Kepler's laws, it will be difficult for her to jump to the material on artificial satellites. In short, there is no equivalent of a 'click' of a computer mouse on the audio tape.

## 2 Visual aids

- a) The primary function of a visual as a teaching-learning aid is to serve as a more concrete referent to the object being discussed in the class.
- b) When the object being discussed is not at hand, then the best referent is a visual representation of it.
- c) Even when it is at hand, visuals of its various aspects and its structure are useful referents. For example, when telescope or compound microscope is being discussed, visuals of its structure are extremely useful aids.
- d) Similarly, during the teaching learning of human eye, Van-De-Graff generator, nuclear reactor, electric generator and motor, etc., visuals of its appearance from various angles and its internal structure are very effective for learning.
- e) Obviously, for most effective communication, one must use the most realistic visuals available.
- f) Visuals are used very often as iconic representations of objects.
- g) Railway stations, roads, bus terminals and airports cater to people of all strata, from totally illiterate to highly literate people, and people of all nationalities.
- h) Universal icons representing various objects have been developed, so that no language is necessary to explain them.
- i) Similarly in science, we use various symbols of different electric and electronic devices and symbols for various elements in chemistry.

### Charts

- ✚ Charts of different types can be prepared by the learners with a little help from teacher depending on the teaching-learning objectives to be achieved and the need of the subject matter.
- ✚ Charts help in effective representation of the subject matter which is in the form of data, diagram, etc.
- ✚ Those charts which cannot be prepared locally may be procured from various educational centres.
- ✚ Charts depicting pictures of great scientists, instruments, equipment used in industry, industrial processes, etc. could be used as teaching aids.
- ✚ But the pictures used should be of reasonable size, so that it is visible to the whole class.
- ✚ They should not be overloaded with information to avoid distraction of the learners to unnecessary parts.
- ✚ Pictures or portraits of great scientists displayed in science laboratories not only give proper scientific atmosphere to laboratory, but also inspire learners.

### Posters

- ✚ Printed posters on various science concepts and life history of scientists are available from science publishers.
- ✚ These can be used as a resource in teaching scientific concepts covered in the school syllabus.
- ✚ If a Pedagogy of Science: Physical Science ⇒ 318 desired poster is not available, teacher should endeavour to make one for her with the help of students.
- ✚ For example, a good large-size poster of Periodic Table and Electromagnetic Spectrum will be of good help in teaching-learning of physical science.

### 3 Audio-visual aids

- a) Audio-visual aids are the most important teaching-learning aids as they involve both auditory and visual senses.
- b) They help in giving concrete and realistic experience.
- c) The various types of audio-visual aids are discussed below.

#### Educational television

- The television in the present day society can be used as one of the important teaching-learning aids.
- It combines the advantages of a radio (broadcast) and of a film, and could be used for mass education.
- Topics of discussion can be announced in advance and teacher can easily carry on teaching-learning process around the telecast time to incorporate them in the on-going lesson so that students can watch and discuss the concepts in the class.
- Such teaching-learning helps students to develop their interest in the subject.
- UGC programmes are telecast on Doordarshan.
- NCERT telecasts its educational programme on Gyan Darshan channel.

#### Disc records CDs

- The disc recording has a number of attributes that makes it an attractive medium of teaching-learning.
- It can reproduce the audio spectrum even beyond the limits of human hearing.
- A major advantage of audio CDs (and other optical discs) is that the user can quickly access any part of the disc.
- Data from the disc can be retrieved in any desired sequence.
- DVDs and Blu-ray Discs Similar to audio CDs these are the other forms of optical discs.
- DVDs and Blu-ray Discs offer all the advantages of audio CDs.
- These are used for video rather than audio due to their higher capacity.
- Blu-ray Discs supersedes the DVD formats and are used for High definition video and audio.
- Other storage devices USB (Universal Serial Bus) flash drives and external hard discs can also be used for carrying data and teaching-learning materials for students.
- Documents, pictures, audio and video can be carried in these devices.
- These are cheap, rewritable and removable devices.
- Very small in size pen drives can easily be carried in pockets and offer a huge storage capacity of data.

## Multimedia

- a) The Multimedia concept involves using multiple media for transaction of a concept. It involves integrating different media into a structured and systematic presentation.
- b) Each medium in a multimedia system is designed to complement the other, so that ideally the whole multimedia system becomes greater than the sum of its parts.
- c) Multimedia systems are multi-sensory and stimulate learning.
- d) The multimedia kit may include films, videos and audio tapes, records, still pictures, overhead transparencies, maps, worksheets, charts, graphs, booklets, real objects and models.
- e) Commercially multimedia kits are available for various subjects.
- f) Multimedia kits can even be prepared by teachers.
- g) It is important that the components of the kit be integrated, that is, each component contributes to the attainment of the lesson objective.
- h) Multimedia activities should also be correlated with other relevant learning activities in the classroom.
- i) Multimedia kits should be designed to transact particular topics and develop various skills.
- j) The teachers should involve students in handling and manipulating the materials in order to maximise their learning potential.
- k) Since they cater to many senses, multimedia kits make learning enjoyable.
- l) They are versatile in their content, range of media, and variety of applications, and thus contribute to learning for a wide variety of learners in many subject areas.
- m) In addition, multimedia kits provide scope for individualised attention to students.

## Uses of computer

- a) Today, everybody knows about computer.
- b) Computer is a power driven machine equipped with keyboard, electronic circuits, storage compartments and recording devices.
- c) It can perform mathematical operations at a high speed.
- d) It can store large amounts of data which can be retrieved on demand.
- e) A computer can do what a whole set of multimedia systems can do.
- f) So, whatever has been said above about audio, visual and audio-visual devices, computer alone can do all that.
- g) That is why, this single device has made all other devices obsolete.
- h) In fact, computer with an Internet connection is an all-in-one device for all kinds of educational aids.
- i) As we use computer in teaching-learning, an important factor to keep in mind is that large numbers of educational systems already use computers for a variety of administrative purposes, such as purchasing, ⇒ 321 Print and I C T Resources in Learning Physical Science managing payroll, inventory and personnel, and auditing.
- j) These include the processing of information for students' admissions, the continuous updating of students' records and evaluation report and the scheduling of classes, etc.
- k) There are a variety of legitimate teaching-learning uses of computers.

- l) Teacher can prepare, with the help of computer expert, self learning materials to transact various topics.
- m) For example, if teacher finds that there are certain topics where students need practice (for example, solving problems based on certain formulae), the material can be prepared by the teacher and later can be programmed with the help of a computer expert.
- n) Using such computer-developed materials, students can learn the various concepts of the topic taking their own time without much help from the teacher.
- o) Thus, different topics can be transacted by different ways. Computer systems can deliver instruction directly to students by allowing them to interact with lessons programmed into the system.
- p) This is referred to as Computer Assisted Instruction (CAI).
- q) CAI can also facilitate students with Special Educational Needs (SEN) in various ways.
- r) Computer can facilitate most effectively for simulation practices, tutorial, educational gaming, discovery and problem solving.

## Simulation

- ❖ A simulation is a simplified version of reality in which essential physical or social elements are represented without hazards, cost or time constraint normally associated with them.
- ❖ The purpose of simulations is to enable us to understand and function in real situation.
- ❖ Simulations are representation of real situations with the element of safety, because some real equipments cannot be used in the class as they may be too costly or too delicate or may be length of time involved in a real exercise would be too great.
- ❖ Simulation and games can give students practice in decision-making and allow them to test a hypothesis in abstract situations.
- ❖ One familiar example is the prediction of effect of increase in temperature on the pressure of a system.
- ❖ The variables can be manipulated on computers and it is possible for students to test out various hypothesis.
- ❖ One of the marked advantages of effective simulation is increase in students' motivation and participation.
- ❖ Students respond with unusual enthusiasm and interest to simulation/ gaming, because of its relevance to how things get done in real life.

## Internet

- ❖ It is a major tool for gathering, accessing, analysing, sharing and disseminating information.
- ❖ With the help of networking your computer Pedagogy of Science: Physical Science ⇒ 322 is connected with remote computers for accessing the information.
- ❖ This web of computers has certain specific locations called websites which store information on specified subjects.
- ❖ This information can be accessed by any internet user through the website's address.
- ❖ Alternately, one can also upload one's own information on the web to make it available to any user.
- ❖ The user depending on her/his requirement, then navigates through the web to access desired information.
- ❖ So versatile is the computer with internet, that it is now an essential part for all stages of education, from the lowest to the highest, and from sciences to social sciences, fine arts, languages and whatever else one can think of. It is an excellent resource for teaching-learning.

THANK YOU