

## CHAPTER 13

### Teaching Aids and Instructional Materials for Teaching and Learning Science

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#### Introduction

The effectiveness of teaching and learning depends upon the use of different type of equipments available in the classroom. According to Badaka and Benedicto (2019), there are many Traditional and Modern teaching and learning materials available these days, they are of much importance in TLP (Teaching Learning Process). The resources a teacher uses while teaching plays a vital role in how students learn. Motivation, stimulation, retention, interest, actionable learning, etc., can vary per resource. First, why do Teaching aids and Instructional materials help in education? The short answer is – fun, engagement, curiosity, and sensory interactions improve learning, memory, and understanding. Teaching aids are also called audio-visual aids. Contemporary teaching aids that are in use provide stimulation to ears and eyes together compared to the traditionally used teaching aids that stimulated only one sense organ. The emerging teaching aids involve other sense organs (Đurđanović, 2015). These teaching aids are visual aids (illustrations, textbooks, magazines), auditory aids (sound recordings from CDs), audio-visual aids (combination of audio and video materials, DVDs). Uchechi (2021) defines teaching aids as devices (computer, DVD), instructional aids (book, chalk board, picture), or objects (specimen, map, globe) that help the teacher to effortlessly carry out the teaching-learning process. Teaching aids are the tools that are used by teachers in classrooms which helps in explaining a concept effectively to students (Bhuyan, 2022). Broadly speaking, any device, method, or system that helps to teach can be called a teaching aid.

Teaching aids are the strategies and techniques used to make learning more interesting for students in various ways. Teachers use different teaching aids to make their students listen attentively. Teaching aids facilitate the learning of students in various ways. Teachers use different teaching aids to make their students listen attentively and interestingly. Teaching aids are intended to impart knowledge to the students through the senses to ensure quick and effective learning. However, the teaching aids should be used as aids to teaching and should not replace the teacher but revolutionize the other methods of teaching. The traditional teaching aids involve the usage of blackboards, posters, globes, charts, textbooks, etc. However, as technology grows, teaching aids have also improved a lot, and today's teaching aids are classified into audio aids, visual aids, mechanical teaching aids, audio-visual aids, and more. Science teacher is expected to use the different types of teaching aid to achieve the aims and objectives of his/her lesson.

The science teacher must have the desire to teach his/her subject as effectively as possible for realizing the stipulated objectives of teaching science. Effectiveness of communication with the students holds the root of success in realization of objectives. The effectiveness of communication demands that what the teacher wants to convey should be conveyed by him in the most desirable and effective way benefiting the students to the maximum extent. Teaching aids offer the scope of meeting with such requirements of an effective communication in the field of teaching - learning process.

### **Classification of Teaching Aids**

Teaching aids may be classified as-audio aids, visual aids, audio-visual aids and activity aids.

1. Audio Aids: Those are like radio, tape recorder, etc.; represent that aid material which helps the learner to acquire the knowledge through his auditory senses.

2. Visual Aids: Those are like charts, pictures, models, epidiascope, micro-projector, filmstrips, etc.; represent that aid material which helps the learner in acquiring the learning experiences through his visual senses.

3. Audio-Visual Aids: Those are like television, motion pictures, video-films, living objects, etc., represent all those equipment and aid material in which the learner gets opportunity to utilize both his auditory and visual senses for gaining the desired learning experiences.

4. Activity Aids: Activity aids are those aids in which the students learn by engaging in some useful activities. Activity aids are the natural medium of instruction suitable for developmental education. These include field trips and excursions, exhibition, demonstration, dramatization, museum, planetarium, aquarium, terrarium, vivarium etc. These aids facilitate learning through sight and sound as well as through doing.

#### **1. Field trips and excursions**

Excursion usually involves a tour by a person or a group of persons to some selected place. Excursions are mostly undertaken for recreation and pleasure. When an excursion is undertaken for gathering objective- based learning experiences it becomes a study tour. The tour made by a group is often known as field trip too. This provides direct experience leading to effective understanding.

#### **2. Exhibition**

Exhibitions are effective modes of mass communication and instruction. If it is organized by the pupils themselves, they get opportunity for self- activity. Special talents of the pupils get revealed and creativity can be fostered. The exhibitions arranged in schools are usually planned to communicate novel ideas to children, their parents, and the general public alike.

Mathematics exhibition, science exhibition, etc. are at present organized effectively. Observing excursions organized elsewhere also is of educational value.

### 3. Demonstration

It is a technique which is often used by all teachers. Ideas, skills attitudes and processes can be demonstrated. When the spoken word is supplemented with demonstration using various aids, the learners get audio – visual experiences. Demonstration must be purposeful, simple, specific and effective. Any demonstration should be planned and rehearsed well in advance. It should be designed by the co-operative activity of pupils and teachers.

### 4. Dramatization

Dramatization gives reality and concreteness to learning situations. It also gives opportunities for self-expression. Dramatization can be successfully utilized for the learning of various subjects, especially social sciences and languages. It gives new life to the dead facts deposited in the text books. Because of active involvement of pupils, dramatization helps easy memorization of learning materials.

### 5. Museum

Museum is a wonderful medium for public education. It is an institution that collects and preserves original objects and specimens and uses them for research and educational displays. Museums are repositories with an array of educative materials including rare specimens on a variety of subjects arranged in a logical order.

### 6. Planetarium

A planetarium consists of a dome usually mounted on the ceiling of a hall to represent the sky. A special projector is used to display images of the celestial bodies on the dome. The viewers who are seated below can see the projected images that will appear to be very realistic. The projector consists of various individual's units for projecting the sun, the moon, the planets and the stars. Taped narration and sound effects add to the effectiveness of the presentation.

### 7. Aquarium

Aquarium consists of glass tanks filled with water in which aquatic creatures are kept in naturally simulated habitats. Her pupils can observe the natural behavior of these creatures. If a school aquarium is constructed and maintained by pupils, they get very valuable learning experiences related to various aspects of life science.

## 8. Terrarium

It is an enclosure, usually a tank, used for rearing plants or animals under natural condition. This enables pupils to closely observe the specimens and to draw meaningful conclusions by themselves.

## 9. Vivarium

It is live corner arranged in school or at home where creature living in the air are grown and reared. It provides opportunity for an unlimited amount of spontaneous, undirected, observation and enjoyment.

In addition, there is another way of classifying the teaching aids and equipment which is quite technical and technological. According to this approach, these can be classified as-hardware and software.

- The equipment and machines like epidiascope, different types of projectors, radio, television, tape recorder, video, teaching machines and computers, etc, are named as hardware.

- On the other hand, in the category of software, we include the aid materials like pictures and other printed material, graphics like charts, maps, diagrams, three dimensional objects like models, specimens and actual objects, and other specially prepared material like slides, film strips, audio and visual tapes.

- The material included in this category makes an essential part of the equipment and machines mentioned as hardware. The hardware can serve as a teaching aid only when it is fed or supplied with some or other types of software.

- Therefore, hardware is quite dependent upon software for their services. On the other hand, many of the software may serve well without the help of hardware. The graphics, three dimensional objects, pictures and printed material, etc, can function quite independently as a useful aid for the teaching of science.

### **Need and Importance of Teaching Aids**

Good teaching aims at effective communication and appropriate learning outcomes. Teaching aids are intended to impart knowledge to the pupils through the senses to ensure quick and effective learning. However, the teaching aids should be used as aids to teaching and should not replace the teacher but revolutionize the other methods of teaching. The importance of teaching aids includes but not limited to the following:

### 1. Clear understanding:

With the help of teaching aids teacher can provide clear understanding of the subject matter to the students. Various concepts of mathematics and phenomena of science can be clarified for the students.

### 2. Make teaching learning process interesting:

Teaching aids make the teaching learning process more interesting. Students become curious about learning new things through teaching aids. Teacher can use pictures, graphs, charts, models, posters and projectors to make the teaching learning process more interesting.

### 3. Expand teaching skills:

Teaching aids help to enhance the teaching skills of the teacher. With the help of these aids, teacher can provide the information in an exciting and interesting way. Thus, teachers can make their teaching more enjoyable.

### 4. Habit of study:

Teaching aids help the students to take more interest in studies. Students can set specific goals for themselves and can make improvements in their academic performance. Thus, teaching aids help to develop study habits in students.

### 5. Save time:

With the help of teaching aids teacher can provide the information in a easy and more convenient way and thus help to save teacher's time and energy. Many complex topics can be easily presented to the students with the help of these aids.

### 6. Provide experience:

Teaching aids give direct experience to students and provide complete practical picture of the concept to the students. Thus, students grasp the concepts easily when they are taught with specific teaching aids.

### 7. Develop motor skills:

Teaching aids help to develop motor skills in the students as they actively participate in classroom activities. They come to know how to use and maintain different types of teaching aids.

### 8. Increase attention span:

Teaching aids help to increase the attention span of the child. Students pay more attention in the classroom activities and they can retain the concepts for longer period of time.

## 9. Scientific attitude:

Teaching aids help to develop scientific attitude among the students. Students become more open-minded, rational, responsible, and curious. Students get to know the actual concept behind the phenomena.

### **Instructional Aids**

Instructional aides are materials like charts, maps, models, concrete objects, films strips, projector, radio, television etc. which helps a teacher for effective teaching. To Eniayeju (2005) in Odeniyi and Saladin (2018), Instructional aids is defined as any object or device used by physics teacher to enhance or enliven the classroom. According to Duret (2024), “It is easier to believe what you see than what you hear; but if you both see and hear, then you can understand more readily and retain more lastingly”. Studies have identified various ways through which excellence in physics could be achieved to include improved teachers’ strategies and application of appropriate Instructional aids, (Askhia, 2010). This implies that excellence in every other science subject could be achieved if science teachers use appropriate strategies and applications of instructional aids in teaching and learning process. Therefore, if we are to encourage more students to study Chemistry, physics, Biology, Mathematics, Integrated Science, Health Education, we need to identify with instructional aid as an influential factor which causes students to be interested in the study of the aforementioned subjects. According to Lukman (2021), the use of instructional aids and teaching methods among many factors affect students’ performance the most. Instructional aides are essential and significant tools needed for teaching and learning of school subjects to promote teachers’ efficiency and improve students’ performance. Instructional aids make learning more interesting, practical, realistic and appealing. They also enable teachers and students to participate actively and effectively in lessons. They give room for acquisition of skills and knowledge and development of self-confidence and self-actualization. However, Lukman (2024) outline some types of instructional aids as Graphic materials, still pictures, still projected pictures, motion pictures and Audio material.

1. **Graphic Materials:** This represent these charts, graphic, posters and diagrams, cartoons, comics, maps and globes which we draw on a cardboard paper or on a piece of cloth and present to our learners to help them visualize what we have been laboring so hard to explain verbally. Graphic materials belong to the family of two-dimensional material and proportionate relationships that may exist among variables in a phenomenon. Graphic materials are used to compress information to focus and captivate attention, to vary stimuli presented and as an aid to recall. Graphic materials when properly produced can help in attaining all processes in the information processing model of learning as well as serve as avenue for applying principles from other learning theories.
2. **Three-Dimensional Materials:** These are different from charts and graphs which are illustration of two-dimensional materials because of the incorporation of a third element-department. Thus, whereas graphs and charts embrace the width and height of a visualized

object, a three dimensional embraces this third element department, a feature that makes the three-dimensional material a replica of the real thing. Different types of three-dimensional material exist, namely: models and mock-ups, specimen, kits and dioramas- which is the creation of a scene in an event.

### 3. Still pictures

## **Major differences between Teaching Aids (TA) and Instructional materials (IMs)**

The main difference between TA and IMs is: A TA is used as a delivery method that can be applied to any context. An IM is subject-specific and contains information within itself.

**Example 1:** A teacher is using a book in the class; each student has a copy.

If a book is used as a course-prescribed resource, it is an instructional material. If the book is a student engagement activity (reading and discussing a story to build vocabulary) and isn't a part of the syllabus, it would function as a teaching aid.

**Example 2:** You are studying algae under a microscope.

A microscope would be an instructional material if a course-based learning goal is 'using a microscope to study microscopic entities.' However, a microscope would be a teaching aid for a theory class on algae. A teacher could use one to show students what it looks like in order to engage the class in learning about algae.

Traditionally speaking, teaching aids have been thought of as devices that can be used – white and blackboards, computers, calculators, projectors, slideshows, tape recordings, television, etc. Teaching aids are tools that help the delivery of information. A TA isn't information, or to put it in a different way, information is not directly embedded in a TA. But IMs *often* have information embedded in them. Resource books, worksheets, graphs, etc., are all IMs because of this embedding. However, tools such as microscopes are IMs if students are learning what microscopes are.

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