MODULE 2 PRINCIPLES OF DESIGNING INSTRUCTIONAL MATERIALS

UNIT 1 DESIGNING INSTRUCTIONAL MATERIALS

CONTENTS

1.0 INTRODUCTION

This unit introduces you to some aspects of the design of instructional materials. You need to know the functions of instructional materials and advantages and limitations of selected instructional materials. The Gerlach/Ely Instructional Design Model is to introduce you to the basic ideas and components involved in the instructional design process. The example of the communication process and model presented here will help you to know the importance of effective communication in the instructional process and how the media assist classroom communication.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- list the functions of instructional materials
- outline the advantages and limitations of selected instructional materials

- explain the Gerlach/Ely instructional design model in relation to the design of instructional materials
- explain the importance of the communication process and model in the instructional process.

HOW TO STUDY THIS UNIT

Read through this unit care. Study the unit step by step as the points are well arranged.

NOTE: All Answers to Activities and Assignment are at the of end this Book.

3.0 WORD STUDY

Sender: This can be the messenger or the teacher that possesses the knowledge, values, skills, ideas or information to be transmitted to the learners, audience or receiver.

Encoder: This is the mental processing of the message by the sender which translates the message into a simple, understandable and transmitting form.

Channels: This represents the means that the information or message is transmitted through to the learner. It can be audio, audio-visual, visual etc.

Decoder: This refers to the receiver or learners engagement of mental process to download the message into an understandable form. The message is interpreted and received.

4.0 MAIN CONTENT

4.1 Functions of Instructional Materials

Instructional materials are necessary in the learning process. They assist both the teacher and the learner to have meaningful and effective teaching and learning. At the primary school level in particular, pupils need to be able to relate what they are taught to their environment and nature. The following are the functions of instructional materials in the primary school.

1. They allow the pupils to relate what is taught to their environment, experiences and nature as young learners.
2. Instructional materials help to gain and sustain the attention and interest of the pupils.
3. They emphasis areas of interest and importance in the learning process.
4. They facilitate the understanding of abstract concepts.

5. They help pupils to be active and ensure active participation.
6. They provide equal opportunity or a common framework of learning experiences to a large number of learners.
7. They stimulate reality.
8. They provide opportunity for pupils to manipulate objects in their environment, thereby making learning more concrete.
9. Instructional materials create lasting impact in learners.
10. They employ all the senses of the pupils in the learning process thereby promoting mental activity.
11. They increase the vocabulary level of the pupils.
12. Instructional materials simplify and condense difficult and large quality of instructional information into understandable format.

4.2 Advantages and Limitations of Selected Instructional Materials

1. Pictures (still pictures)

Advantages:
a. good representative of the real thing (realia)
b. easy to prepare
c. easy to store
d. easy to use
e. able to stimulate interest and create correct impressions; they can be locally produced

Limitations:
a. may require artistic skills
b. pictures may fade or tear with time
c. pictures traced, lifted or copied can be distorted
d. details of the object represented are often omitted

2. Charts (flip charts, diagrams, flash cards, cartoons, graphs, posters, etc)

Advantages:
a. They are visual summaries.
b. They can pinpoint events in story form.
c. They are good in showing condensed information e.g. graph or quantity symbols.

Limitations:
a. They require a lot of money.
b. They can be very complicated if details are necessary.
c. They present storage problems especially with large charts.

3. Flannel graphs – (felt boards, magnetic boards)

Advantages:

a. They can present a story in sequential order as the pictures used are mounted one after the other and as desired.
b. The pictures used can easily be removed or stored as the need arises.
c. Attention and interest of students can easily be aroused.
d. They can be locally produced.
e. The materials are cheap and easily accessible.

Limitations:

a. The pictures are not permanent and thus can easily fall off, especially in The case of flat boards or magnetic board.
b. They may be bulky and may pose storage problems.

4. Maps/atlases/globes

Advantages:

a. They are excellent in showing condensed information.
b. They can show a very large area (even the whole world) at a glance.
c. Details are not normally confusing or boring.
d. The instructor can face the class when using it, thus allowing direct eye contact with the learners.
e. They are very useful and adequate for large groups or classes.
f. They do not require any special skills in production.
g. Little or no planning or preparation is required.
h. They do not require a completely dark room.

Limitations:

a. They require special and professional skills.
b. All maps or globes tell lies as most information is exaggerated.
c. Inaccuracies in directions, distances, shapes etc. can occur if care is not taken.
d. They are highly conventionalised and capable of creating misconceptions.

5. Modules, modes and specimens

Advantages:

a. They have a distinct appeal to young learners and attract them better than pictures, maps, etc.
b. Their 3–dimensional character gives a better conception of reality than pictures.
c. Specimens can represent the real things themselves.
d. Learners learn by the collection, modeling and care of materials.
e. They can be produced by the learners with local materials.

Limitations:

a. A lot of time may be wasted in collecting specimens.
b. Modeling is messy.
c. They require storage space.

6. Blackboards or chalkboards as a unique medium

Each type of educational medium should be chosen for what it can do best or for what it can do that no other medium can. As you begin to accumulate ideas for teaching with media, consider the important characteristics of the chalkboard, such as the following.

- Materials can be big, bold and colourful.
- Unplanned information can be listed as needed during the class.
- ‘‘Down time’’ is no worry. It requires little maintenance, no electricity or operating instructions, and cost for materials is very low.
- Availability is nearly universal; you can count on always having one in a classroom (portable boards are also available for use in unusual locations. You can even make your own chalkboard by using special paint on Masonite hardboard or plywood).

Long term notices and an announcement can be recorded on the board and kept there, since the board is permanently located in the classroom. There is no doubt that the use of the chalkboard creates a much richer instructional setting than does a presentation that is strictly verbal. You might be tempted to place the chalkboard in the category of “instructional aid” because of its necessary role in teaching.

Because of the high esteem that live teaching enjoys, it is natural to assume that machines or devices are merely aids. However, when any device is used, even a simple one such as the chalkboard, a new form of teaching results. The chalkboard can be regarded as a visual aid because of the already mentioned advantages generally and the following specific advantages and limitations.

Advantages:

a. They are the most accessible aid.
b. They are the easiest form of teaching aid.
c. They do not require any elaborate preparation.
d. They are excellent for summary notes and illustrations.
e. They can be used for practice by learners themselves.

Limitations:

a. Writing may be poor and illegible for those who are not properly oriented.
b. Partially blind or blind learners may not benefit from them.
c. They are large and immovable.

7. **Textbooks**

Advantages:

a. They contain more permanent sources of information.
b. They can be used over and over again.
c. They may provide self study guide for individualised learning especially where workbook is included.
d. They are hidden treasures for the serious learner.
e. They can be an effective guide for the trainers and teachers.

Limitations:

a. Storage facilities may not be adequate.
b. They may be expensive to purchase.
c. They may be outdated and circumstances may hinder their use.
d. They can pose the danger of being copied by both the learners and the teachers.

8. **Realia**

Advantages:

a. It shows the real situation of events, experiences or true and life–like presentations and sometimes the real object itself is used.
b. It may be easy to get.
c. It is cheap as you don't have to spend to get most realia objects.
d. It does not distort or exaggerate facts.

Limitations:

a. Itcan be dangerous and unrealistic to show or go through real events or things e.g. snakes, war situations, seas, hills or mountains.
b. Itmay be too far, too big, or too small to be taken to the learning environment, classroom or venue.

4.3 The Gerlach –Ely Model of Instructional Design

The Instructional Design Model (ISD) is necessary for the teacher who designs instructional materials because it helps in the application and integration of the instructional materials into the instruction or classroom use. There are many instructional design models but we will only use the Gerlach-Ely model for our illustration here. There are ten items in this model which will be itemised in a diagrammatic form as follows.

Instructional Design Model

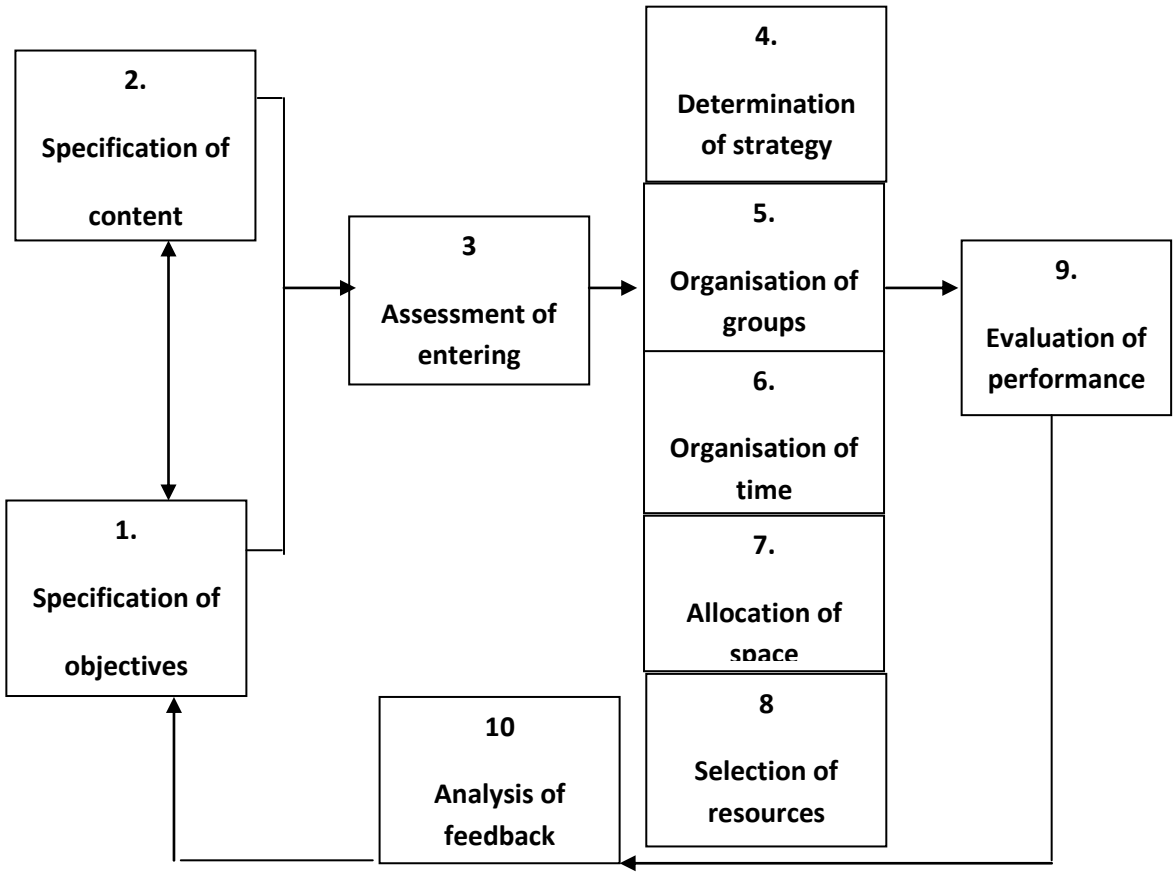


Figure 1.1
Source: Gerlach, V. S. & Ely, D.P. (1971, pp.8-11)

Instructional Design Model

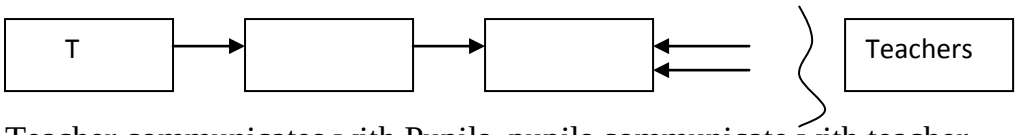
The instructional design model was developed by Gerlach and Ely (1971) which presents the procedure for instructional system design graphically as shown in the diagram. It is appropriate as a guideline for instructional design. It contains ten guidelines or principles or elements which are closely related to other models on instructional systems design. The components of the Gerlach/Ely (1971), instructional systems design are as follows.

- Element 1. Specification of Objectives- the teacher is expected to state in measurable terms the outcome of the lesson after the learners have been taught; the attainment of the specified objectives depends largely on the proper implementation of the other elements.
- Element 2. Specification of content- this will depend on the objective, the curriculum or societal/community needs and the needs of the learners.
- Element 3. Assessment of learners' entry behaviour- this relates to the previous knowledge or the pupils previous knowledge or experience he has gathered which is relevant to the topic. The teacher is expected to build on the previous knowledge of the pupils to make learning process effective.

- Element 4. Determination of Strategy –this is when the teacher determines what strategy or method will help him and the learners achieve the specified objectives. The strategy should be learner centred, participatory, interactive, provocative, collaborative and fun based especially for primary school pupils.
- Element 5. Organisation of learners into groups- collaborative work will require the pupils to work in groups. Also if the instructional materials needed are not adequate, the pupils can be grouped into a number of pupils reasonable for such materials. The number of pupils for discussions or verbal activities that require only activities such as listing, explaining, discussing etc may have more pupils in a group.
- Element 6. Allocation of time- this will depend on the strategy, subject matter, objectives, availability of space (e.g. the laboratory or library), school administration etc. The teacher should utilise whatever time he allocates to each subject meaningfully and responsibly.
- Element 7. Allocation of learning space- this can be for the laboratories, library, small or large group work, individual study carrels, etc. The use of large classrooms, auditorium, halls, lecture theatres, collapsible classrooms etc can be reserved for general courses or special programmes.
- Element 8. Selection of appropriate instructional materials- this is a very significant aspect of the model. The teacher can select relevant / appropriate instructional materials from existing ones from the school library, media / material stores etc. You can also adopt some materials if the existing ones do not suit your objectives by adding or subtracting from the details of the available ones. You also decide to design new instructional materials if the available ones are not suitable.
- Element 9. Evaluation of performance- this is an appropriate or assessment of the learners' achievement, the teacher's strategy, the instructional material used, the environment where the learning is done and the objective- whether it has been achieved or not.
- Element 10. Analysis of feedback –if the feedback is to be useful/ effective, objectives must be clearly stated and must include the conditions under which the bahaviour should occur and a criterion level of acceptable performance. Immediate Knowledge of Result (IKR) is good and motivating especially for the primary school pupils.

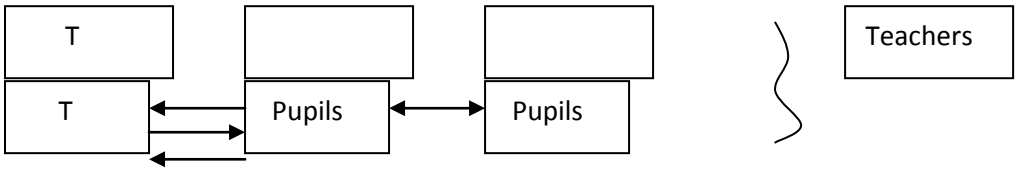
4.4 The Communication Process and Models: the Importance of Effective Communication in Instruction

You may want to know what communication is. All disciplines define communication based on its use or in relation to their peculiar practice and needs. Communication in education is simply the interactions among members in the education system. Specifically, communication in the classroom is the transfer of a message from the teacher (sender) to the learner (receiver) and vice versa. Effective classroom communication is not a one-way affair, all the elements in the teaching –learning process, i.e. the teacher, learner, media etc interact or communicate for the system to work as illustrated below.



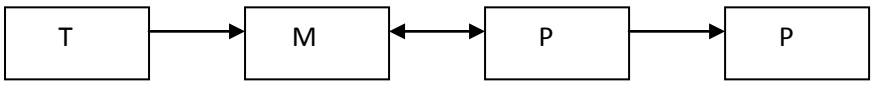
Teacher communicates with Pupils, pupils communicate with teacher.

Figure 1 (a) Classroom Communication Process



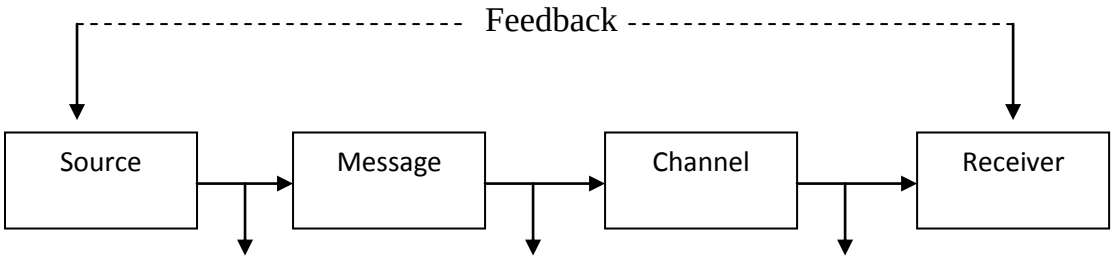
Pupils communicate with each other and the teacher.

Figure 1.1: (b) Classroom Communication Process



Teacher with media communicates with pupils who interact with media and teacher. In order to achieve the interaction media or instructional materials and the content, there should be a free flow of transfer of information between the teacher, pupils and media.

David Berlo's Model (1960).
This is one of the most popular models known as the S-M-C-R model. It was developed by a psychologist known as David Berlo in the 1960s. The model is popularly used by psychologists and educators.



Encoder Decoder

S - Teacher	M- Knowledge	C - Instructional	R- Teacher
- Learner	- Attitude	materials	- Pupil
- Resource person	- Values	- Media	- Skills

Figure 1.3: David Berlo's Model

4.4.1 Components of the Communication Model and their Application in Instruction

The following components of the communication model are directly or indirectly reflected in most of the communication models. They are as follows.

- **Sender**: this can be the messenger or the teacher that possesses the knowledge, values, skills, ideas or information to be transmitted to the learners, audience or receiver. In the transactional model, the receiver at a point of providing responses to the message received becomes the sender.
- **Encoder:** this is the mental processing of the message by the sender which translates the message into a simple, understandable and transmittable form.
- **Message**:this represents the information, knowledge, ideas, values, skills or attitudes that are transmitted to the learner for the change in behaviour in the three domains of learning.
- **Channel**: it is the means through which the message is transmitted or disseminated such as any instructional materials –audio, audio-visual, visual and other resources the teacher uses to make the teaching and learning processes more interactive, participatory and interesting.
- **Decoder**: the receiver or learner engages in a mental process to download the message into an understandable form. The message is interpreted and received.
- **Receiver:** this is the audience or learner. It is easy at this level after decoding to receive and respond to the message which places the learner in the sending position.
- **Noise**: this relates to any distraction or misunderstanding during the communication process. Noise can present itself in different ways such as physical, emotional, psychological, linguistic etc. This should be prevented by the teacher as much as possible.

5.0 Activity

1. List five (5) functions of instructional materials.
2. Outline five (5) advantages and limitations of selected instructional materials.

6.0 Assignment

1. Identify the components of the communication model and their application in instruction.

7.0 SUMMARY

In this unit, you have learnt the following:

- functions of instructional materials
- advantages and limitations of selected instructional materials
- the instructional design model of Gerlach /Ely as an example of the design of instructional materials
- communication model and its importance in the instructional process

8.0 REFERENCES

Adegbija, M.V. (2000). *Instructional Media: A Basic Handbook.* Lagos: INDEMAC Communication.

Bertalanffy, L. (1968). *General System Theory*. New York: Braziller.

Okwo, F.A. (1995). "Instructional Communication".In Okwo, F.A. and Ike, G.A. (Eds).*Educational Technology: Basic Concepts and Issues.*Nsukka: University Trust Publishers.

Onuebunwa, S.E. &Awotua-Efebo, E.B. (1999)."The Communication Process".In Onuebunwa, S.E. (Ed.). Onitsha: Cape Publishers International Limited.

Thompson, J.J. (1979). *Instructional Communication*. New York: University of Alabama Press

UNIT 2 CONCEPT AND CHARACTERISTICS OF LEARNING MATERIALS

CONTENTS

1.0 INTRODUCTION

In this unit, you will be exposed more to learning materials, the rationale for the use of learning materials, variety/sources of learning materials and the classification and characteristics of learning materials. Learning materials can be regarded as the teacher's companion because they assist him to provide all that is needed to make his lesson concrete, productive, effective and individualised. Learning about the various instructional materials and their characteristics will help the teacher to produce the appropriate materials that will help him achieve the stated objectives for the lesson.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- define learning materials
- explain the rationale for using learning materials
- list the sources of learning materials
- classify the various learning materials

HOW TO STUDY THIS UNIT

Read through this unit carefully. Study the unit step by step as the points are well arranged.

NOTE: All Answers to Activities and Assignment are at the of end this Book.

3.0 WORD STUDY

Learning Materials: This refers to instructional material from the simplest counting sticks to the most complex materials that the teacher employs in the instructional process to enrich, aid, and ensure effective, efficient, interactive and participatory learning.

4.0 MAIN CONTENT

4.1 The Definition of Learning Materials

What are learning materials? Most teachers often think of only complex materials whenever this question is asked. But learning materials refer to anything the teacher employs to make the instructional process more active, interesting, interactive and scientifically based. Learning materials should be based on the objective of the content and should appeal to more than one sense (seeing, hearing, touching, smelling, tasting) employed in the teaching – learning process. Learning materials can be audio, visual (projected and non- projected) or audio–visual (to be discussed in detail later). They range from the simplest material to the most complex materials at the teacher's disposal. Learning materials are those resources that help learners gain knowledge through participation and reinforcement.

4.2 Rationale for the Use of Learning Materials

Now that we have defined what learning materials are, what is the rationale for employing materials in learning? According to Onasanya and Adegbija (2006), learners, especially primary school children, are acutely aware of their senses which they use continuously to acquire new skills and ideas. Learning materials or instructional media sharpen the senses for this purpose. Other reasons for learning materials /media include the followings.

- They develop a continuity of thought in learning through the use of pictures, slides, films, and especially motion pictures.
- They supply a concrete basis for conceptual thinking and hence reduce meaningless word responses of students.
- They supply the necessary basis for developmental learning and hence make learning more permanent.
- They offer a reality of experience that simulates self-activity on the part of the learners.
- They contribute to the growth of meaning and hence, to vocabulary development.
- They arouse and maintain the interest and attention of learners.
- Learning materials contribute to the efficiency, depth and variety of learning.
- They are unbiased in dealing with and effecting desirable change in learners.
- They are accepted by and appealing to all categories of learners.

- Learning materials provide experiences not easily secured from other sources.
- They make learning participatory and scientifically based.
- They provide equal access to education and contribute to the individualization of instruction.

4.3 Classification and Characteristics of Learning Materials

This unit gives a breakdown of the different learning materials and their characteristics in a tabular form. There are various ways of categorising media but we will just focus on the following.

Table 2.1

S/N	Type of learning Materials	Sources/Examples	Characteristics
1	Audio Media	Radio, tapes, cassettes, amplifiers, ear phones, telephones, gramophones, loud speakers, microphones, records, language laboratories	Appeal to the sense of hearing only; very cheap and easily accessible
2	Visual (Projected)	Televisions, films, film-strips, videos, slides, computers, opaque, over head projector, power point	Electronic materials that need to be projected / need projectors and electricity
3.	Visual (non-projected)	Educational boards- magnetic, flannel, felt boards, chalkboards, adhesives, bulletin boards, pictorial 2 –D objects – flip charts, posters, sketches, still pictures, wall charts, 3-D objects-demonstrations, exhibits, field trips, modules, simulators/games, printed texts-books, charts, brochures. Course materials, handouts, leaflets	Most easily accessible, cheap, commonest, appeal to the sense of seeing only
4	Audio –visual	Drama, demonstrations, films (88mm, 16mm, 32mm) television, videos, slides with sound, computers	Appeal to all the senses in learning
5	Realia	Real objects, tools, animals, artifact, demonstrations, mock–ups, dramas, exhibits, field trips.	All real objects used for teaching are cheap, and available in the community
6	Human and non - human resources /resource persons	Professionals / specialists e.g. doctor, lawyers, teachers, community resource persons e.g. chiefs /obas, community leaders, police, politicians, industrialists, military	These are persons with adequate knowledge in their various fields and ready to enrich the learners' knowledge.
7.	Community resources	Airports, art galleries, banks, historical monuments, parks, industries, markets, palaces, museums, police station, post office, rivers, dams, zoological gardens	Our community is endowed with various resources
8.	Resource centers	Libraries, workshops, educational resource centers	Centers where learning materials are provided en masse / stored and distributed for

			teaching and learning
9.	Educational games	Puzzles, mock ups, plays/ costumes, games (ludo, ayo , chess.)	Provide fun as students learn. They stimulate participation and reinforcement

4.4 Sourcing for Instructional Materials for Teaching Basic Technology

Table 2.2

Topic	**Instructional Materials**	**Where to Source for Materials**
Workshop safety	Fire extinguishers, improvised sand bucket, pictures and chart showing safe work habits	Fire extinguishers should be sourced commercially, while others should be improvised by the teacher utilising simple production techniques learnt in module 1
Properties of materials	Specimen of wood, metals, various types of ceramic and glass products plastics and rubbers	Outdoor laboratory, ceramic /glass industries or wood and metal workshops
Drawing instruments and materials	HB pencils, T-square, set squares, part of compasses, French curve	Commercially bought .some could be improvised with the help of a computer like the French curve and the pair of compasses
Energy and power	Fan, battery, regulators. Electric bulb, bicycles	These could be sourced from a roadside mechanic workshop
Building and materials	Charts, posters on various buildings, models and various types of houses, building plans, cement, sand, gravel, ceramics, wood, plastics, metals, grass etc	Students could improvise models of houses and building. Charts and posters of various buildings could be improvised by the teacher while others could be sourced from the community.
First aid and first aid materials	First aid box and materials, cartons could be used to improvise first aid box after which colour is added	First aid box could be sourced from the carpenter's shop or improvised by the teachers and learner. Materials are to be bought from pharmaceutical stores.
Geometrical construction	Constructs of various types of angles, triangles, circle and plane figures. Models of quadrilaterals and polygons. Flip charts display geometrical constructions of various types. Drawing instruments.	Constructions could be provided by carpenters. Students could use locally sourced materials to produce some of these materials in the basic technology.
Metalwork hand tools	Measuring tools like protractors, steel rules, driving tools like pinches, screw driver, spanner. Marking out tools like surface plate, scribers, odd-leg clippers, cutting tools, like chisels, files etc. Posters charts on various methods of steel production, furnace, limestone, coke tungsten	Sourced commercially or from the introductory technology workshop.
Mechanical energy transmission system		Outdoor laboratory i.e. road
Frictions	Lubricants, different metal or wood surfaces students palms, rugs etc	Side mechanic workshop or teacher / learners home and school based introductory technology workshop
Bell drivers	Motor driven pepper grinder, motor fan belt, sewing machine etc. bicycle / motor cycle chain drivers. Pictures	Outdoor laboratory

	displaying chain and belts drivers machine	
Gear	Cardboard wood, improvised clock, driving systems of machines in school workshops, e.g. gear box	
Linear motion	Scrap engines, levers, linkages slides and slots, charts displaying these materials films containing use of levers, linkages slides and slots in the production of their motion	Teacher production educational resource centres
Rotary motion	Old shafts of cars, brake pads and clutches. Flip charts, pictures and films displaying crank shafts, connecting rods and pistons and sleeves of cars, kites, farm plate, paper scissors, pins	Pick materials among junks from the mechanic's workshop- teacher production. Improvised kits made by learners. Commercially bought and teacher made
Airflow	Models of hydraulic and pneumatic devices hydraulic jack, charts displaying pneumatics films containing demonstrations using real components of pneumatics	Commercially bought and teacher made
Pneumatics	Pressing iron, electric kettle, generators cooker and water heater, gas lamps, gas and kerosene cookers, charcoal pressing iron, boiling ring, refrigerator, improvised auto generator, alcohol methylated spirit	Home economics laboratory improvisation by the teacher from an artisan.

Source: National Teachers' Institute (2010, p.47)

5.0 ACTIVITY

1. What are learning materials?
2. Explain at least five reasons/rationale for learning materials

6.0 ASSIGNMENT

1. List the different categories of learning materials, giving examples and characteristics of each.

7.0 SUMMARY

In summary, learning materials/media have been simply defined as instructional materials, from the simplest counting sticks to the most complex machines, that the teacher employs in the instructional process to enrich, aid and ensure effective, efficient, interactive and participatory learning.

The reasons for learning materials include making learning concrete and permanent, There is also the continuity of thought, especially through motion films, providing reality of experience that stimulates self–activity, equal access to education and the ability to secure and maintain the interest and attention of learners, etc. The unit also presented to you, the classification of learning materials, the examples of materials for each category and their characteristics – audio, visual (projected and non-projected), audio–visual, realia, resource persons, community resources, resource centers, simulators and games.

8.0 REFERENCES

Adedoyin, J.A. (1991). *Introduction to Educational Technology*. Lagos: Johns – Lad Publishers.

Ajelabi, A. (2000). *Essentials of Educational Technology*. Lagos: Raytel Communications Ltd.

Dale, E. (1969). *Audio-Visual Methods in Teaching.* New York: Holt, Rinehart and Winston, Inc.

Dick, W. Carey, L. & Carey, J.O. (2005).*The Systematic Design ofInstruction*. Boston: Allyn and Bacon.

Gerlach, V.S. & Ely, D.P. (1971).*Teaching and Media: A SystematicApproach*. New Jersey: Prentice Hall Incorporation.

Heinich, R.O., Molenda, M.M. & Russell J.D. (1982).*Instructional Media andthe Nw Technologies of Instruction*. New York: John Wiley & Sons.

National Teachers' Institute (2010).*An NTI-TESSA Integrated Manual for theRe-training of Primary School Teachers*. Kaduna: NTI Press.

Onasanya, S.A. &Adegbija, M.V. (2005).*Practical Handbook onInstructional Media*. Ilorin: Graphcom Publishers.

Romiszowski, A.J. (1987). *Designing Instructional Systems*. London: Kogan Page.

UNIT 3 PRODUCING INSTRUCTIONAL MATERIALS

CONTENTS

1.0 INTRODUCTION

This unit will cover two main sub-topics, that is, the role of learning materials in relation to other elements and the selection criteria. In the previous unit, you have considered the specific reasons/ rationale for learning materials. In this unit, you are going to learn the over-all role of learning materials based on Dale's cone of experience. You will also learn about designing new instructional materials and how to produce your own instructional materials.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- explain the role of learning materials as itemised in Dale's cone of experience
- list sources of instructional materials
- describe how to produce your own instructional materials.

- HOW TO STUDY THIS UNIT

Read through this unit carefully.

Study the unit step by step as the points are well arranged.

NOTE: All Answers to Activities and Assignment are at the of end this Book.

3.0 WORD STUDY

ERCs: - Education Resource Centers.

PTA: - Parent Teachers Association.

Tracing: - This is a technique that involves the use of tracing paper to trace visual objects.

Lamination: - This is the use of cellophane or polythene bag to cover materials for protection from damage.

4.0 MAIN CONTENT

4.1 Role of Learning Materials in Relation to other Elements of the Instructional Process

Dale's cone of experience cited in Heinich (2002), presents options of instructional materials in terms of their concreteness and learners' readiness to profit from more and less concrete experiences. At the bottom of the cone are direct, participative activities, involving Brunner's concept of enactive learning. Learning materials/audio–visual materials are regarded as iconic. Verbal symbols are shown on the cone to be the most abstract.

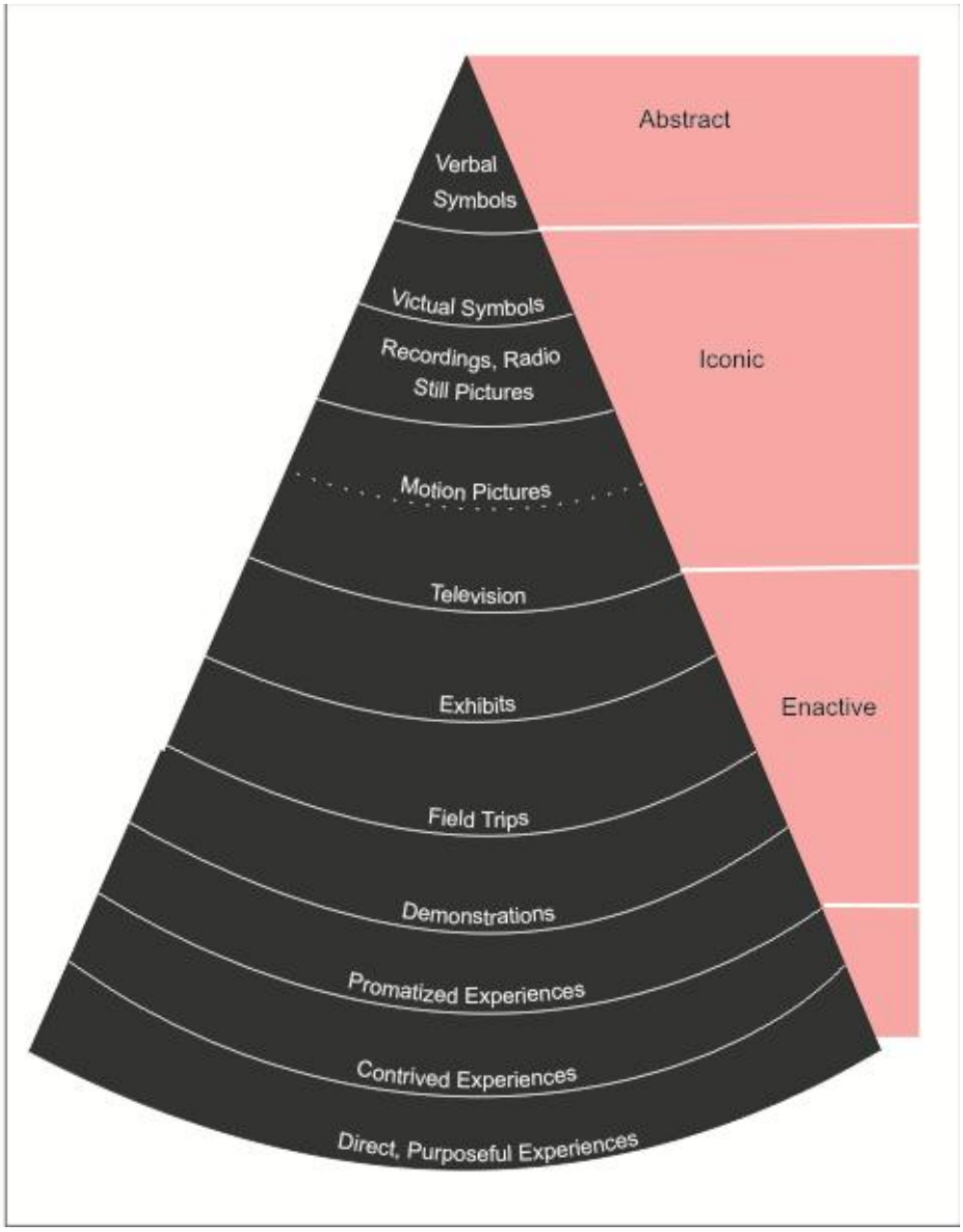


Figure 3.1: Dale's Cone of Experience
Source: Heinich, Molenda& Russell (2002, p.11). Instructional Media and New Technologies of Learning

Designing New Instructional Materials
Designing new instructional materialsis difficult and challenging. However, it is more creative, manipulative and satisfying especially for the provider or the teacher. Designing new materials can also be more time consuming, expensive and involving. You should consider the following factors when designing your own materials.

- Objectives of the instruction
- Audience
- Cost

- Technical expertise
- Equipment to be used
- Facilities
- Time

Before you produce instructional materials for classroom presentation, you should consider some factors enumerated by Ajelabi (2000), as follows.

- Instructional objectives. What learning goal is each student expected to reach or what new capability should the learner possess at the completion of instruction? An objective is a target that helps the teacher to hit/achieve his goal/aim. All objectives (instructional or behavioural) must be started in performance or observable terms.
- Suitability. You need to consider the appropriateness to the learner's age, ability, interest etc
- Content accuracy. You need to consider the authenticity, accuracy and appropriateness of the learning materials.
- Availability. Are the learning materials available and accessible? If not, what options are available– selecting, modifying or designing?
- Size of class. Another thing to consider is the size of the class which determines which media to use, that is, whether to use mass/multimedia for large groups / class or media for small group/individualised learning materials.
- Cost. Is the cost of especially designing new learning materials worth it? Are there materials that can be improvised, realia or community resources? The teacher should know that cheap materials can as well be used as long as they meet the desired goal.
- Teacher's capability. You should select learning materials you are able to handle, manipulate and operate.
- Operating facilities. You should also consider the fact that the facilities for operating the selected learning materials are available. You can also consider the involvement of an expert or technical support.

4.3 Sources of Instructional Materials

Detailed studies have shown that instructional materials may be acquired by schools through the following ways.

a. The collection of items from the immediate locality of the schools.
b. The production process by teachers and learners.

The distribution to schools by government and non –government organisations of posters, charts, textbooks, computers and science equipment

- Donations from several sources such as PTA, community, corporate bodies, philanthropist, alumni etc.

- The distribution of productions by pupils in tertiary institutions
- Education Resource Centres (ERCs).
- Direct purchase by the school authority.

Collecting items from the immediate locality. Based on the advice of the teacher, learners could collect the following items from their homes or elsewhere in the locality: milk and beverage containers, discarded plastic containers, bottle tops, old magazines, calendars etc.

Production process by teachers and learners. The teachers and learners should produce some cheap materials such as maps, charts and models from locally available materials.

Governmental organisations. Occasionally, government acquires and distributes to schools, items ranging from inexpensive material such as charts, maps, globes, textbooks, to more sophisticated material / equipment like computers, projectors and laboratory equipment. Nongovernmental organisations such as UNESCO, UNDP, UNICEF, USAID, etc, also donate instructional materials to schools.
Donations from several sources. Philanthropists and other public –spirited people within the school community, town, unions, old pupils association, Parent Teacher Associations, Board of Governors and others similar bodies can also donate instructional materials to schools.

Distribution of productions by pupils in tertiary institutions. Institutional materials produced by pupils in tertiary institutions as part of their projects are subsequently distributed to neighbouring schools after being graded. These materials are then used in schools for the promotion of the teaching –learning process.

Education Resources Centres (ERC). A resource centre is a place where varieties of teaching –learning materials exist for use by teachers, learners and other interested persons within a school or an area. ERCs can be established by institutions, a local or state government, and an individual or non-governmental organisations. Virtually all the states in the country have ERCs. These centres, not only store, sell and distribute teaching–learning materials, they also run short courses on how to use these materials.

Direct purchase by school authority. The school authority should make funds available for the purchase of instructional materials directly from producers.
(NTI, 2009, pp.130-131)

4.4 How to produce your own Instructional Materials

The following techniques could be employed in the production of instructional materials by the teacher.

i. Drawing. Examples of these are maps, charts, diagrams, etc.
ii. Lettering. Examples of this are labeling of materials such as charts, drawings and diagrams.
iii. Tracing. This is a technique that involves the use of tracing paper to trace visual objects.
iv. Modeling. You can use papier–mache/ pulp, clay, plasticine, etc.
v. Copying. This is copying original material to a card board sheet
vi. Lamination. This is the use of cellophane or polythene bag to cover materials for protection from damage.
vii. Photograph. The real object can be brought to the classroom situations through pictures from the photographs
viii. Mounting. Cut out materials from calendar and newspaper could be mounted on a board or plywood for classroom presentation.

Use of discarded items

Here are some discarded materials that you can look for and possibly modify for use:

a. cartons
b. spoons
c. news magazine
d. cans
e. forks
f. calendars
g. bottles
h. bottle tops
i. plates
j. pots
k. match boxes
l. biros
m. glass frames
n. boxes
o. markers
p. jugs
q. motor parts
r. paper
s. bicycle parts etc.

Production of Materials from Low Cost Items
Instructional materials can also be produced from many items that are commonly available. These items can be easily used to improve instructional materials with minimal supervision.

List of some common instructional materials for primary school that you can produce:

i. pamphlets
ii. posters
iii. pictures
iv. mock up
v. graphs
vi. drawings
vii. models
viii. charts
ix. cartoons
x. puppets

General Guidelines on Lettering
Lettering is a major part of design. Thus, simple and basic ideas and knowledge will be very valuable at this point. There are four basic methods of lettering. They include:

- stencil lettering guide
- freehand lettering
- letraset lettering
- econasign lettering

In all types of lettering, the following instructions should be followed.
Use the same size as much as possible

- Use guidelines
- Space well
- Shapes well
- Slant letters well

You will now be exposed to the basic methods of lettering. This will help you in the production of media.

Stencil lettering guide. This is of different styles and sizes. It is very good in writing captions, labeling and transparencies. It is like ready made lettering. Practise and get used to the styles before the final work is done

Freehand lettering. This is cheap and it can be done quickly and will also be attractive as long as it is legible, clear, and neat if the general instructions are followed. Lower case letters are easier to read than capital letters especially in writing many words. The capital letters should be used for main titles and short captions. All the general

instructions should be applied to the free hand lettering also. Practise a couple of times before the final work. Use the following examples to practice.

Letraset instant lettering. These are usually commercially prepared letters and numbers that can be carefully transferred to a design. The letraset lettering is easy to use. Each sheet is transparent and has a backing sheet for preventing the letters from abrasion from handling and storage. Select the required letter or number along the pre-drawn guidelines, rub across the letter or number with a hard object such as a pencil or ball pen and carefully pull away the sheet after the transfer has been completed.

Econasign lettering stencil. This is simple to transfer or design, only that some letters such as A B D must be printed in two operations of the brush in order to get a complete letter. Note from the example given below that the portions are always next to each other. The second portion is transferred on the first one until it overlaps and forms the complete letter which can be as good as a printed letter. You should damp and not wet the brush and hold the brush up-right and use lightly to avoid messing up the design.

Grid/graph method

a. Use tracing paper (or any paper soaked in kerosene) to copy or trace out illustration from the original copy.
b. Draw grid lines over the assigned numbers to vertical and horizontal lines.
c. Draw a similar but bigger grid of desired proportion to the first grid say 3:1, 4:1 with corresponding numbers on the location of cardboard or other surface you wish to do the enlarged illustration.
d. Transfer small portion of lines and curves on illustration on tracing paper to the cardboard or surface until whole illustration is drawn.

Projection method
If you have access to slides, few frames of strip of filmstrip and readymade transparencies that are suitable for enlarging and copying on to poster or chart, they can easily be reproduced in the same way. Illustration for enlargement is put directly under opaque projector. When it is switched on, cardboard is positioned in front of the projector.

The size of the projected image can be determined by the distance between the projector and the screen on which the cardboard is placed.

Designing some instructional materials through improvisation
You can improvise a completely different instructional material from these items using various methods and techniques. The methods of improvisation include the followings:

- cutting and pasting
- dry mounting

- wet mounting
- creation of flannel board
- paper pulp making
- tie and dye
- clay moldings
- manipulation of figure and shapes
- photocopy
- scanning

5.0 ACTIVITY

1. List eight important factors you will consider when producing instructional materials.
2. Mention seven sources of instructional material.

6.0 ASSIGNMENT

1. Describe how to produce your own instructional materials.

7.0 SUMMARY

In this unit, you have learnt the following.

- The role of instructional materials based on Dale's Cone of Experience
- Designing new instructional materials
- Sources of instructional materials
- Producing your own instructional materials

8.0 REFERENCES

Adedoyin, J.A. (1991). *Introduction to Educational Technology*. Lagos: Johns – Lad Publishers.

Ajelabi, A. (2000*). Essentials of Educational Technology*. Lagos: Raytel Communications Ltd.

Dale, E. (1969). *Audio-Visual Methods in Teaching*. New York: Holt, Rinehart and Winston, Inc.

Dick, W., Carey, L. & Carey, J.O. (2005).*The Systematic Design ofInstruction.* Boston: Allyn and Bacon.

Gerlach, V.S. & Ely, D.P. (1971).*Teaching and Media: A SystematicApproach.* New Jersey: Prentice Hall Incorporation.

Heinich, R.O., Molenda, M.M. & Russell J.D. (1982).*Instructional Media* and the New Technologies of Instruction. New York: John Wiley & Sons.

National Teachers' Institute (2009).*Manual for the Re-training of PrimarySchool Teachers*. Kaduna: NTI Press.

Onasanya, S.A. &Adegbija, M.V. (2005).*Practical Handbook onInstructional Media*. Ilorin: Graphcom Publishers.

Romiszowski, A.J. (1987). *Designing Instructional Systems.*London: Kogan Page.

UNIT 4 THEORIES RELEVANT TO THE DESIGN AND PRODUCTION OF LEARNING

CONTENTS

1.0 INTRODUCTION

This last unit of module two presents the theories relevant to the design and production of learning materials. You shall be considering the importance of relevant theories such as behavioural theory, constructive theory and conditions of learning.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- explain theories that are relevant to instructional design and production
- describe the importance of theories
- list three theories relevant to learning materials.

HOW TO STUDY THIS UNIT

Read through this unit carefully. Study the unit step by step as the points are well arranged.

NOTE: All Answers to Activities and Assignment are at the of end this Book.

3.0 WORD STUDY

Theory: This refers to a set of ideas, opinions that has been tested and confirmed. It is used to explain facts that describe certain phenomenon.

4.0 MAIN CONTENT

4.1 Importance of Learning Theories/Psychological Conditions and Principles

What are learning theories? Learning theories can be defined from different perspectives. However, we will want to say that learning theories are a set of ideas, which help to explain learning concepts, principles or laws on which learning or instruction is based. Learning of course is not only the knowledge gained through study but all the experiences to which the learner is exposed which may result in a positive change in behaviour or human performance as a result of the learner's experience and interaction with the world (Driscoll, 2005).

- Learning theories are important for the following reasons.
- They help provide adequate guide within which learning can operate.
- They help the achievement of learning aims and objectives and help learners to acquire new knowledge and capabilities.
- They help /guide the planning, organizing/implementing and evaluating instructional processes as a whole.
- They attempt to describe how humans learn.
- They attempt to prescribe teaching methods and instructional materials.

4.2 Relevant Learning Theories

Let's now consider some relevant learning theories based on the major classification presented by Kemp and Dayton (1985). These are as follows.

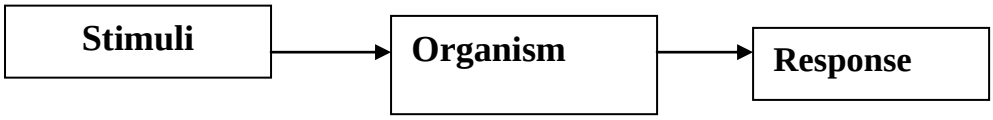
- Behaviourism
- Cognitivism
- Connectivism

We shall now explain these one by one.

4.2.1 Behavioural Theory

How has behaviourism contributed to facilitating learning? Behaviourism (also referred to as connectionism), interprets human behaviour as the Stimulus – Response (S-R) type of learning. This theory was formulated by a psychologist called B.F. Skinner in the 1950s. The message or content of the subject, the instructional materials and all other elements that elicit response or reaction from the learner can be referred to as the stimulus. The response is the new performance the learner is

expected to acquire. The learners' responses are rewarded or reinforced with perhaps a word of praise from the teacher or other tangible reinforcers. B.F Skinner discovered from laboratory animals that by manipulating the stimuli response and reinforcement, he could elicit complex new behaviours from laboratory animals. Other researchers found that humans, too, responded in similar ways to certain types of consequences or reinforcers (Robinson, Molenda and Rezabek, 2008). B.F. Skinner also made the stimulus – response learning clearer in the introduction of the ''programmed instruction'' in which each sequence of learning is broken down into smaller bits called frames, requiring an appropriate response to each item followed by immediate knowledge of results known as feedback and every correct response attracts reinforcement.



Sources: Ajelabi, 2000.

Figure 4.1: Stimulus-Response Learning

4.2.2 Cognitive Theory

What is cognitivism and how is it different from behaviourism? We shall get to know of what cognitivism is and be able to compare it with behaviourism in this unit.

According to Robinson, Molenda and Rezabek (2008), cognitivismis diverse theories in psychology that endeavor to explain internal functions through scientific methods. Learners use their memory and mental or thought processes to generate strategies as well as store and manipulate mental representations and ideas. Cognitive theories were developed by Jean Piaget in the 1920s and 1930s.

Piaget discovered that there were periods called:

- assimilation dominated: where young children build up classification systems and try to fit object and events of their everyday experiences into the existing framework and
- accommodation dominated: where the learners modify their mental structures when they encounter contractions or experiences that cannot just fit.

Cognitive theory can also be referred to as Gestalts theory in which the theorists believe that transfer of learning involves both generalisation and identical elements fused together (Ajelabi, 2000). The theorists recommended that in order to ensure transfer of learning, there should be adequate practice on the significant elements that can be generalised.

4.2.3 Constructive Theory

There are many views of constructive theory. It is also referred to as social constructivism because of the social and cultural influences in the theory. It is a socio cultural approach to learning. There were several authors holding divergent and sometimes conflicting views such as Philips (1995); Bednar, Cunningham, Dufty and Perry (1991); Dufty and Cunningham (1996); Dufty and Jonassen, 1992; etc. However, Driscoll (2005) seems to conclude that knowledge is constructed by learners as they attempt to make sense of their experiences.

Tehart (2003) suggested two solutions to the problem of constructivism as follows.

- Moderate constructivism to refer to constructivist theories that accept the assumption of cognitivists
- Radical constructivist as constructivist theories and strategies that depend on the subjectivist epistemology of Von Glasersfeld

4.3 Conditions of Effective Learning

Ajelabi (2000) suggests that for learning to effectively take place, the following conditions should be considered.

a. Readiness. The learner must have the necessary pre-requisite that is to make him to be physically and mentally ready for the experiences he is being taken through.
b. Motivation. The learner needs to be stimulated to learn.
c. Practice. When trials are repeated, they enhanced discovery, mastery and integration. Practice, according to popular saying, makes perfect.
d. Provision for transfer of knowledge by giving the learner alternative situation or elements common to two or more experiences in learning can be perceived for better association.
e. Creating convenient learning environment by providing appropriate learning materials suitable for the age, class, interest, readiness or maturity of the learners.
f. Organisation of content. A logical, sequential and orderly organisation of learning materials will enhance effective learning.
g. Participation. Learning is more effective when the learner is fully active or when he is involved in the learning process.
h. Individual differences. The learners' general and specific characteristics must be considered and involved for effective learning.
i. Learning objectives must be clearly stated in measurable and performance terms.

5.0 ACTIVITY

1. Describe the importance of learning of theories.

2. What do you understand by constructive theory?

6.0 ASSIGNMENT

1. List at least seven conditions you will consider for learning to effectively take place.

7.0 SUMMARY

This unit has exposed you to the following points.

- The importance of theories to instructional materials and learning as a whole.
- Relevant learning theories such as behaviourism, cognitivism and connectivism
- Conditions of effective learning such as readiness, motivation, practice, provision for transfer of knowledge by giving the learner alternative situation, a logical, sequential and orderly organisation of learning materials, etc.

8.0 REFERENCES

Ajelabi, Ayo. (2000). *Essentials of Educational Technology*. Lagos: Raytel Communications Ltd.

Balogun, T.A. (1972). A System Approach to Education in Nigeria in *West African Journal of Education*. XVL, (2), 205 – 219.

Dale, Edgar. (1969). *Audio-Visual Methods in Teaching*. New York: Holt, Rinehart and Winston, Inc.

Dick, W., Carey, L. & Carey, J.O. (2005).*The Systematic Design ofInstruction.* Boston: Allyn and Bacon.

Gerlach, V.S. & Ely, D.P. (1971).*Teaching and Media: a SystematicApproach*. New Jersey: Prentice Hall Incorporation.

Heinich, R.O., Molenda, M.M. & Russell J.D. (1982).*Instructional Media andthe New Technologies of Instruction*. New York: John Wiley & Sons.

Romiszowski, A.J. (1987). *Designing Instructional Systems London*: Kogan Page.