Unit 2: Teaching and Learning of Physics

Introduction

In this unit teaching and learning will be defined. The psychological theories of learning studied in general psychology will be related to the teaching of learners, the sequence and strategies of learning will be described. The various teaching methods and the situation in which they are used to enhance effective teaching will be discussed at length. Lastly, class organization will be analysed. The activity is organized as follows:

- Learning Theories and Theorists
- Sequence of Learning and Strategies of Learning
- Teaching approaches and Methods
- Classroom Organization

Learning Outcome of Study Unit 2;

At the end of the unit you should be able to:

1. Explain how the psychological theories of learning are applied to learning and teaching
2. Describe the sequence of learning and the criteria of selecting strategies of learning
3. Describe the different methods of teaching and explain how each teaching method can be used in order to enhance effective teaching and learning.
4. Analyze the different aspects of classroom organization.

2.1 Learning theories and theorists

As you read through this section pay attention to the traditional and the progressive points of view. Traditional education, as Dewey states, is primarily concerned with teaching students' information and skills that have already been worked out in the past. They assume that the future will be just like the past; therefore, the skills and knowledge that were of useful in the past will help students succeed in the future. He identifies this assumption as a major flaw in traditional education. Dewey believes the world is constantly changing, and students need to learn critical thinking skills and problem solving skills in order to deal with these changes. Traditional education treats students as docile, non-active receptive entities that learn only from books and teachers. Knowledge is taught as a finished product.

Students cannot learn essential problem solving skills if they are taught that all problems and answers to these problems have already been worked out (Dewey, 1952). "If we teach today as we taught yesterday, we rob out children of tomorrow" (Dewey, 1944, p. 167).

Dewey stressed the importance of active learning; students must be engaged in the learning process. Traditional education, in which conduct is strictly enforced, automatic drills are used to transfer knowledge and students' power of judgment and intelligence are impeded, created the wrong kind of experiences to promote learning. Progress Education Theory main tenet is that education is based on personal experiences of the learner. Teachers are the mature person who provides guidance to

the students to facilitate learning. The instructor's main function is to arrange for the kind of experiences that engage students and promote further experiences. Dewy states that quality experiences are necessary. Quality experiences are experiences that lead to more experiences; Dewey refers to these types of experiences as the experiential continuum. Quality experiences must also lead to intellectual growth, which arouses curiosity and strengthens initiative. Again, Dewey criticized traditional education practices because the type of experiences promoted did not lead to the continuity of new experiences or aroused curiosity or initiative (Dewey, 1952).

Students should understand why they are learning. Instrumentality of learning is paramount in progressive education. Students should not learn in isolation. Dewey stresses that education is a social process that everyone should participate in. Schools should be involved in their local community so that students learn how to participate in the community.

Teachers are also required to know the students in order to identify their needs and capacities so that they can arrange classroom experiences that will help the students cope with real life situation. Teachers must recognize what surroundings are conductive to promote quality experiences. Traditional Education did not allow teachers to affect the learning environment. Desks were arranged in rows and students were to sit still and sit up straight. This arrangement encourages passivity in students. Progressive education requires the teacher to arrange the learning environment to promote active student learning. Students may move around the room from work station to station, actively working on and solving problems. The classroom setting is arranged so that students have freedom of movement. Physical freedom of movement lends itself to freedom of intelligence. This requires lesson planning and arranging the learning environment teachers to put more thought into (Dewy, 1952).

CONSTRUCTIVISM (Learning Theorist)
Constructivism is a theory of learning where humans construct meaning from current knowledge structures.

Class Activity
Read about Constructivism learning theory and answer the following questions regarding its contents.
   1. Describe the constructivist learning theory in 100-120words.
   2. Describe the nature of the learner from a constructivist point of view 100-150 words.
   3. Explain the role of the learner from a constructivist point of view 50-60 words.
   4. What pedagogies are based on constructivism, explain in 50-60 words.
   5. Explain in 100-120 words why the constructivist theory of learning is criticized.

Summary of Constructivist Theory of Learning

According to the constructivist individuals construct new knowledge from their experiences. Learning is therefore an active social process. There is dynamic interaction between the task (learning), the teacher and the learner. The teachers are facilitators. It emphasizes on hands-on approaches, so the" learning is by doing".

Learning Tips

In a changing world teachers must choose methods that enhance the learner's critical thinking skills and problem solving skills in order to deal with these changes. Learning by doing pedagogy is today's teacher's choice of the teaching. The learner-centered paradigm must therefore be emphasized.

2.2 Application of Learning Theories

You have already studied the views of the different learning theorists in your psychology Module you will apply these theories in this module as you prepare to teach. Read through this passage carefully and note down the different theories and theorists and how their ideas can be applied during teaching. Pay special attention to reinforcement, conditioning, cognitive and insight. It will be worthwhile to refer to your module in psychology too. In each of the learning theories you come across the term stimulus and response are usually mentioned so I will start by defining them. A Stimulus was defined as a physical or chemical agent, it acts upon a sensor. In common terms, stimuli can be called signals, cues or signs.

A stimulus may be simple or relatively complex, and can be external or internal. A Response is behaviour which can be sensed. Responses may be simple or complex; for example, eye movement when reading. Responses can be measured by the number of times the response is made (frequency), time from stimulus appearance to when the response gets underway (latency) and speed of response from start to finish or response (response time). Stimuli and response are linked continually in student behaviour.

To provide a satisfying state of affairs for your student you have to reinforce them. One type of reinforcement is termed primarily **reinforcement**, that is, it is a positive rein forcer that fills a physiological need, such as hunger or thirst. This process he called primary reinforcement, and the food a primary rein forcer. The second type of reinforcement is called secondary reinforcement. This is a consequence that serves to increase the frequency of behaviour without fulfilling the needs of hunger, thirst, warmth or simply the primary gratification. An example of secondary reinforcement is the association of the rattling of dishes and the mother's voice with a primary rein forcer: food following immediately. When a teacher prepares lessons that are motivating, learners look forward to those lessons. Teachers are continuously looking for ways of reinforcing their learners with a good, well done, try again, a pat on the back to material rewards. These are positive rein forcers in humans, each individual

expects the consequence of his behaviour to be consistent with past experience; hence it is sound to conclude that reinforcing properties do not lay in a stimulus but in its effect on behaviour. A satisfying state of affairs can be approached from two directions: by reducing or adding stimulation. Whether the stimulus is a positive or negative rein forcer depends on the resulting change.

B.F. Stinker experimented on animals and came up the concept of '**operant conditioning'**. Operant is an example of behaviour which increase the frequency or rate of a particular operant called positive rein forcers.

At times your student cannot achieve the target behaviour well enough receive positive reinforcement. In circumstances like these, what you have to do is to reward successive approximation to the desired behaviour. This is a use of the process called shaping. At first you reinforce any approximation to the desired behaviour. Then, on subsequent trials you reinforce any approximation to the desired behaviour. These on subsequent trials you reinforce only that behaviour which shows improvement in the direction of the target behaviour. Besides shaping, you can also apply continuous reinforcement, which means reinforcing the behaviour until the target response is achieved. Here the number and timing of reinforcements are very important, particularly when you consider the resulting activity and permanence of response. Besides continuous reinforcement, you can also use intermittent or partial reinforcement. This means that instead or reinforcing every single response, you reward the student only after every 10 to 15 instances of completion of the task. Another method of increasing reinforcement is by keeping a cumulative record, in which you keep track of the record of behaviour on successive particular days.

Cognitive psychological theorists view learning as a change in knowledge, and infer mental processes such as purpose, insight and understanding. They believe successful performance to be more closely related to an understanding of relationships in the present situation than to past experiences, which are more important to the stimulus-response (S-R) psychologists.

This theorist introduced the term **'insight'**. This concept of insight has been described as getting the point, grasping the idea, or catching on. With insight the student grasps the essential relationships in a situation. She/he then knows what leads to what and how to reach the goal. The process of insight is regarded as an essential component of learning, which proceeds better when the components of a problem are so laid out that their relations are evident and a sensible solution is possible. The student considers this to be equivalent to learning with understanding. When teachers have taught the lesson they want the learners to be able to retain what has been learnt in a way that they can apply the concepts to their daily life. Teaching Methodologies chosen must meet these demands of learning for them to be effective and efficient.

To summarize behavioural theories explain why learning has or has not taken place. Cognitive theories explain the role of logic and the learner's cognitive (knowledge) structure in learning. The language based theories explain the role of communication in teaching and learning (Young, 1995).

Learning Tips
Psychologists have developed a number of theories and concepts that tell us what happens in classrooms and offer guidance for assisting learning. As a teacher you will make reference to them as you plan for teaching in order to optimize on the learning process.

2.2 Sequence of Learning
In the light of the psychological theories of learning we might say that any form of learning involves these five stages discussed below:

Attention: Attention is considered a necessary preparatory set. Your students have to pay attention in order to follow and understand the content you are teaching them. Attention prepares your students for the next stage in learning, which is called perception.

Perception: At this stage of learning, there is an input to the senses that gets registered so that its meaning is established. The result, namely what is perceived, depends partly on the students' prior learning and partly on what stimuli or parts of stimulus situations your students attend to. Perception involves a complex interrelating of information from the environment and information retained from prior learning.

Acquisition: This is the phase of learning in which a student acquires a new capability or new skills in operating something. Acquisition involves identifying how ways and means are mastered and learning how to respond to a situation.

Retention: What your students have learned is retained until the time it will be used. Psychologists believe that there are two types of retention: short-term and long-term retention. Short-term retention is demonstrated when your students hold information long enough for immediate use. For instance remembering a telephone number until a call is made, a hotel waiter memorizing details of your order before serving you waiter memorizing details of your order before serving you with the food you ordered. When the outcomes of learning last in your student's mind beyond the immediate occasion for their use, say from a few minutes right up to a lifetime, long-term retention is observed. Long-term retention of behaviour is required in education for learning purposes. In learning, the best way of improving retention is to give attention to what is learned initially and how this learning is organized, and to relate this to the kind of problem you are faced with.

Transfer: This is sometimes called application and is the highest and most psychologically complex level of learning. It occurs when you require your students to apply, or put to use motor skills they are able to recall. You should now be aware that objectives that require your student to apply their knowledge in a real world setting are the most complex psychologically and require more instruction than the other phases of learning we have described.

Learning Tip
The sequence of learning involves five stages namely attention, perception, acquisition, retention and transfer

Strategies for Learning
In activity one you learnt how to write objectives in measurable terms and you were also exposed to the meaning and categories of learning domains. A statement of objectives, it was stressed, was the first step in determining learning arrangements. The next step after stating your objective(s) has to do with the means of learning the target performance of the objective and it is called a strategy of learning. Knowledge about objectives is going to help you to learn how to select and use strategies for learning purposes. The strategy you select belongs either to the expository or the inquiry general method of learning. When you are selecting a strategy for learning, you must be sure that it is both effective and efficient. The meaning of these terms will now be explained for you.

Effective
Effective learning strategies are those that are powerful in bringing about expected results in a given situation. One way of testing for effectiveness is by trying to find out whether principles a student has acquired can be transferred and used in a new setting. Suppose, your students have been taught about the Pythagoras principle of determining the height of an unknown side during a math lesson. You then ask them to apply this knowledge to determine the height of a tree or a wall. If your students can determine the height of the given tree or wall then the principles they learned

Efficiency
Efficiency refers to those learning strategies that bring about learning quickly and adequately within a specified time. As a teacher you will notice that certain objectives can be accomplished in less time with one method of teaching than with other methods. These methods could be described as being efficient.

Efficiency and effectiveness are usually considered together. If the retention or transfer of information or skill learned is greater for one method than another, and also takes a shorter time, then that method is more effective and efficient for teaching a specific objective than other ways of teaching. As you examine the strategies for learning it would be helpful to study and apply them in the light of their efficiency, as well as their effectiveness.

Learning Domains

COGNITIVE (KNOWLEDGE)	AFFECTIVE (ATTITUDE)	PSYCHOMOTOR (SKILLS)
1. Recall; do an activity to recall a process, rule, quote a law or procedure.	1. Receive (awareness)	1 . Imitation (copy)
2. Understand	2. Respond (react)	2. Manipulation (follow instructions)
3. Apply (use	3. Value (understand and act	3 . Develop Precision
4.Analyze (structure/elements)	4. Articulation (combine, integrate related skills)	4 . Organize personal value system
5. Synthesize (create/build	5.Naturalization (automates, become expert)	5. Internalize value system (adopt behavior)
6. Evaluate (assess, judge in relational terms		

The table above is a really simple adapted 'at-a-glance' representation of Bloom's Taxonomy. The definitions are intended to be simple for modern day language use, to assist you in explanation and understanding. This simple overview can help you to understand and explain the taxonomy. Refer back to it when considering the tasks ahead, getting to grips with the detailed structures – this overview helps to clarify and distinguish the levels.

You actually have a choice as to how to use Bloom's Taxonomy. It's a tool – or more aptly – a toolbox. Tools are most useful when the user controls them; not vice-versa (Bloom et al). From the summary you have made the domains provide points for learning design and evaluation, whether for a single lesson, session or activity, or training need, or for an entire course, program or syllabus, across a large group of trainees or students, or a whole organization.

Teaching Approaches and Methods

Approaches
An educational approach can be defined as a way of dealing with an education issue. A teaching approach may be defined as a combination of ways that a teacher uses when presenting the content of a lesson. The different approaches to teaching will be discussed below note them down as you read through.

Didactic Approach
In the early days, teaching was didactic, i.e. lecture method. Students were given rigidly formulated statements, which they had to memorize and regurgitate when required to do so by teachers. Little or no emphasize was placed on understanding; learners were simply made to cram things. It was believed that the human brain is a blank store where knowledge can be pumped and stored.

Expository Approach

This involves the kind of teaching that is characterized by predominance of teacher talk with little or no involvement of students on practical activities. It is a teacher-centered approach. The teacher gives facts, explains concepts, and gives illustrations. Anything that needs to be taught practically is done through teacher demonstrations. Student participation is limited to listening and asking questions and writing notes as the lesson progresses. This approach is not considered very effective in the teaching. However, it is alleged that there are some topics in science/mathematics that can only be approached satisfactorily by exposition because their very nature they are difficult to teach practically.

Empiricist Approach

Emphasis was on the need to acquire scientific knowledge through observations. Laws were reached by induction. The learner was now given opportunity to at least handle apparatus and make observations thus developing interest and manipulate skills.

Heuristic Approach

At the turn of 20th century advocates of the Heuristic approach of teaching believed that learners could be trained to discover scientific ideas by using faculties of observation, reasoning and memory. Learners were involved in observation, recording, analyzing data and drawing conclusions on their own. This was a better approach since it involved real inquiry, which would lead to understanding of the theory however, this approach tends to consume more time, hence delay in syllabus coverage.

The Inquiry/Discovery Approach

This is a learner-centered approach with a high degree of involvement of all who participate. It is systematic in that a set of activities is used, yet highly flexible in that the sequence of the activities can be changed and others can be substituted at any time. The teacher involves students in activities that help in the development of scientific skills such as the ability to make observations, perform experiments, collect data make deductions and present results.

A Chinese proverb says, 'I hear I forget, I see and I remember, I do and I understand.' The learners would carry out experiments then create concepts at first hand in the laboratory, as a means of awakening original thought. With passage of time, it was realized that despite the many practical activities may of the learners still face problems understanding science, hence the slogan 'I do and I am even more confused'. The teacher's role is to guide students by clarifying instructions where necessary and being available to answer any questions that may arise in the course of the activities.

Constructivist approach

The constructivists approach takes cognizance of the fact that by the time a learner enters formal education he/she has already interacted with former environment and

has developed ideas and concepts in relation to what he has experienced? As a child grows up, it continuously encounters new horizons in terms of knowledge gained, which require explanations either from its parents, family members, or peers. The entire encounter is digested and stored in their memory and becomes knowledge. Learning therefore should be built on the learner's practical experience while at the same time correcting any misconceptions or learner's alternative frameworks. According to Piaget, an individual interprets reality via intellectual structures characterized by acting schemes that change as one grows. An individual therefore tries to attain structures to make it consistent with the new experience.

The role of the teacher is to provide guidance as a facilitator by giving students challenges that will help to correct their misconceptions and enable them to draw correct concepts. The teacher can do this through:

- ✓ Class discussions (peer group learning)
- ✓ Students' experiments and demonstrations
- ✓ Use of audio visual aids, charts, diagrams models etc.

In relation to the inquiry approach, this involves a wider range of activities centered on helping students to learn by:

- ➢ Gaining new insight from the outcome of their investigations
- ➢ Modifying their pre-existing ideas in the light of the new insights
- ➢ Constructing their understanding of a scientific concept.

The basic assumption is that students have their own explanations of the phenomena encountered in their everyday life. This approach helps them to test their understanding using the scientific approach.

Learning Tip

There are various approaches to teaching and they could be teacher or learner-centered. These are didactic, expository, empirical, heuristic, inquiry and constructive approaches.

In view of the above teaching approaches teachers therefore have various methods of teaching as you read through these methods answer the short questions that you come across.

Teaching Methods

Teaching methods may be defined simply as a way of carrying out actual teaching in the 'classroom'. They are the means by which the teacher attempts to impart the desired learning or experience. The concern is with the way the teacher organizes and uses teaching techniques or skills, subject matter, teaching aids or resources to meet teaching objectives. The particular method that a teacher uses is determined by a number of factors. These include:

1. The content to be taught
2. The objectives which the teacher plans to achieve

3. Availability of teaching and learning resources and the ability and willingness of the teacher to improvise if convectional teaching aids are not available.
4. Evaluation and follow-up activities.
5. Individual learner differences.
6. Size of the class

Lecture (Chalk and Talk) Method

This involves giving factual information with very little or no participation by the learners. This method is obsolete and not advised to be used regularly due to a number or reasons:

It does not offer training for the attainment of scientific skills

Content taught in a lecture method is quickly forgotten

Lectures can be boring especially if they are lengthy and if the teacher lacks appropriate communication skills.

It is teachers centered.

However, this method is most effective for transmission of large amounts of matter. In spite of this criticism this method is still very useful an instructional technique as long as it is used appropriately.

Demonstration Method

The purpose of a demonstration is to provide a means by which the teacher can explain or clarify certain parts of the context quickly and economically e.g. it can be demonstrated that metals expand when heated; or that seedlings exposed to a unilateral source of light bend towards the light. It is essential that the students should be involved actively. One way in which this can be achieved is through questioning as the demonstration progresses. Whenever possible the teacher should also give students an opportunity to set up the apparatus required for carrying out a certain procedure. The students should be organized in such a way that every student is able to observe the demonstration. Demonstration can also be used to explain an experimental set up before the students begin to set up their own apparatus and/or materials to be used are not enough for the whole class; or when the materials are too dangerous or equipment too delicate to be entrusted to the students e.g. use of high voltage capacitors; experiments involving a mixture of hydrogen and air.

Activity
Which sub-topics in your elective teaching subjects can benefit from this teaching method? Enumerate at least 4 ideas.

Practical Work /Experiment Method

This involves teaching/learning activities conducted by the students under the guidance/supervision of the teacher. The teacher provides the students, either singly or in groups, with the materials and apparatus well as the instructions to be followed in performing the activities. Deliberate effort should be made to enhance group work

although individual participation must be assured. The ability to follow instructions and the use of scientific methods and skills to solve problems with little help from the teacher is an important aspect of learning science. Lack of laboratory facilities or equipment should not be taken as an excuse to limit practical work. The teacher (and the students) should collect materials and improvise as much as possible. Where improvisation is not possible, small-scale experimentation should be encouraged.

There are certain basic skills that are essential in order for learners to carry out practical work safely and successfully. Examples of such skills include:

Ability to read instruments (Vernier calipers, meter rule, measuring cylinders,) accurately.

Correct use of equipment and apparatus (magnifying glass,).

Successful practical work depends on a number of factors that include the following:

1. Preparation before the practical period.
2. Trying out of activities to make sure that the materials used will give the expected results.
3. Clarity of the instructions-language should neither be ambiguous nor include terms that are unfamiliar to the students. If such terms must be used, they should be clearly defined.
4. Effective guidance and supervision by the teacher.
5. Group size and composition.
6. The ability of the teacher to establish a link between the practical work and the concept to be learnt (bridge).
7. Briefing on any precautions to be taken to ensure the safety of the students and the equipment.

Project Work

The value of project work in the learning of science or humanities cannot be overemphasized. Project work enables learners to actually engage in investigation in an area of their own interest. The students learn to appreciate the basic steps in the scientific method. It combines the following skills:

- ✓ Observation
- ✓ Identification of a problem
- ✓ Discussion
- ✓ Formulation of a hypothesis
- ✓ Design and investigation
- ✓ Data gathering
- ✓ Data analysis
- ✓ Making deductions
- ✓ Report writing and presentation

Contrary to popular belief project work need not consume a lot of the time and resources allocated to the subject. There are many opportunities for students to learn through individual or group project work. The problems to be investigated may are arising from the students' own interest but they may also be suggested by the teacher.

Whatever the case, the teacher should make sure that students have sufficient background information before they embark on project work. Teacher supervision and guidance are important pre-requisites for successful project work.

Suggest 6 possible problems from your subject area that you can assign your students to research on in a project.

Field Work/Excursions
Fieldwork method needs to illustrate the natural development or technological application of certain topics dealt with in the classroom. It provides students with first-hand evidence of scientific phenomena and how they impact on everyday life. Students learn to appreciate the sciences and arts not only as subjects in the curriculum but also as part of the real world. Students may also get an opportunity to interact with experts in particular fields of study.

What are some of the possible places that students can be taken for field trips or excursions?

Fieldwork is difficult to organize, but if well planned, it can be an effective method of teaching and learning some aspects of science as well as art subjects. It need not be conducted in a place that is far from the school. The immediate environment of the school may offer unique opportunities for students to conduct field work which may help to reinforce what is learned in the classroom. To avoid a situation where students reduce a field trip to sightseeing, the teachers must plan as thoroughly as they plan any other lesson. Specify the objectives, learning activities, evaluation and follow-up activities. Prepare a detailed work sheet or questionnaire and give clear instructions to students beforehand to focus them on key areas of study. Form the working groups in advance.
Suggest aspects of your teaching subject that can be taught using field work as a method of teaching?

Discussion Method
Discussion is an important component any teaching /learning situation. It allows students to share their ideas. It can be used at the beginning of a topic to ascertain students' pre conceived notions of the subject matter or towards the end of a topic by presenting students with a new situation and asking them to explain it in terms of what they have just learned. However, discussion in groups might not have much value unless it is followed by presentation of reports.

Other Teaching Methods
There are other methods such as simulation, games, skits, and others. These may be effective in teaching if understood and well used.

1. Simulation – This is an imitation of the appearance or character of the real situation e.g. a car, plane an actor, a shop. It is the use of models to represent the real situation.
2. Role play- acting out characters so that learners can understand the situation.
3. Skit – This method involves role-play but it is a short play.
4. Games and puzzles to answer questions
5. E-learning – Use of computers to explain processes or concepts.
6. Broadcasting Method – Use of radio and television to deliver lessons.

Self-instructions method
It is also called Programmed Instructions learning. Here the learner proceeds to learn materials at his own pace it is individualized learning done through a programmed text book or a take or CD. The learning takes place in small steps ranging from very simple facts to very complex ones. Reinforcement is immediate and at the learners pace. The teacher gives guidance on the use of materials or instruction and how to assess learning.

Assignment
  Do you recognize the self-instructions method as your own type of learning technique? What challenges are you facing? Explain in 100-150 words.

  i) Review each of the teaching methods and indicate which category they fall into according to this classification. Which are the teachers or learner centred ones?

LEARNER - CENTERED	TEACHER-CENTERED

  ii) Africa is behind the rest of the world technologically which teaching methods can be used to enhance the students' technological capabilities. Explain in 100-150 words

Questioning techniques
Questions play an important role in teaching and learning they are applicable in all teaching approaches and methods discussed above. It is one of the basic and successful ways of stimulating student's thinking and learning
Teachers must ask many questions during a lesson. It is important therefore to develop the skill or technique of questioning. The goal is to be fluent in asking questions.
The types of questions asked and those used in testing are based on the Bloom's Taxonomy
1. knowledge
2. comprehension   Low order cognitive questions}
3. application
4. analysis
5. synthesis   High order cognitive questions}
6. evaluation

Knowledge

i. Recalling facts, i.e. what is the function rheostat? ii. Recalling observations, i.e. what type of motion is motion of a butterfly?

iii. Recalling definitions, i.e. What is motion? What is force?

These questions usually have a single correct answer. They ask who? What? Where? When? Recall questions are answered accurately and specifically.

The number knowledge questions asked must be limited to a desirable proportion.

Comprehension Questions

These are designed to make students organize facts they have learned in various ways.i.e.

- Describe what happened in the experiment.
- Compare the results in experiment A and B
- How do speed different from velocity

Comprehension questions do not call for information outside the lesson being taught. They test the understanding of the current lesson. Comprehension questions are important because the learners are required to organize and select facts in order to give and answer.

Application Questions

These questions require the pupils to apply the knowledge acquired. They are required to apply rules, principles, methods, laws and theories. This is a common way of questioning in science and mathematics i.e. Explain why refraction occur at the interface of two media?

Application questions require a high level of understanding and teachers should help the learners to apply technical terms, concepts, rules and formulas in new situations.

Analysis Questions

The questions will require the student to breakdown into its components like,

- Identification of parts
- Analysis of relationship between parts

The question here requires understanding of the content and structural form of the material. Analysis questions have no single correct answer

The "stem" of an analysis question is recognized by terms such as

- Why
- Now that we have studied this, what can we conclude about…?
- What does this tell us about…?
- What evidence can you find to support…

Analysis questions are very important in experimentation and data interpretation.

Synthesis Questions

Synthesis is the ability to put parts together to form a new whole. Synthesis answers will require classification of things, learners are encouraged to give answers from a personal approach and it introduces creativity in essay writing and research reports. Synthesis questions do not have a single correct answer.

The "stem" of a synthesis question would be.

- How can you solve…
- How can you improve no this experiment…
- What will happen if the?
- What do you predict would happen if pollution occurs in the Nile river?

Evaluation Questions

These types of questions Judge the value of materials. They require the opinion of the learner

I.e. do you agree with the Darwin theory of Evolution? Discuss.

The "stem" usually begins with

- Do you agree…?
- Do you believe…?
- What is your opinion…?
- Would it be better…?
- Which do you like…?

This category of questions can be used all the time during a lesson and also in the testing. All levels of questioning should well have distributed at any one time during the lesson. Teacher should increase their frequency of the use of higher order questions in order to improve the student's learning. Fluency in asking questions. This includes:

- Clarity and coherence
- Pausing and pacing
- Directing and distributing
- Prompting and probing

Clarity and coherence

Questions need to be planned. They should be included in the lesson plan and the expected answers should be written too in the learner's activity column. Use simple language. Ask one question at a time.

Pausing and pacing

Teachers have a tendency of asking more questions than receive answers. This is due to lack of pausing between questions. Pausing (3 seconds) gives the learners an opportunity to think. One should look for non-verbal clues which tell you whether pupils have an answer i.e. hands are put up, facial expression. Pacing is determining how often to ask the questions.

Directing and distributing

Some pupils are more willing to answer than others therefore the teachers must learn their learners by name so that all the learners are involved during the lesson. Question

answering is a time to build self-esteem. Questions could be answered by a group if the learners are doing group work, the 'Heads Together' method results in more student –on- task behavior, better test performance and greater satisfaction with instruction.

Directing a question to a learner who is not attentive is a way maintaining class control and disciplining. Redirecting questions helps keep students alert and attentive.

Prompting and probing

This involves building up questions from low level to a higher level order questions. Prompting involves giving hints to help the learners gain confidence in replying. Probing helps the pupils to think deeply and express themselves clearly.

Other things to consider during questions:

- Put the questions to the whole class then pause, and then name the learner to answer thus allowing the whole class to think about the question.
- Avoid asking questions where the answer is merely YES or NO where there is only one alternative.
- Make sure the question is clearly understood by rephrasing it or taking a different approach.
- Do not ignore learner' answers because they are wrong. One can use them to develop further questioning, probing.
- Insist the learner' answers are loud enough so that every member in the class can hear.
- Distribute the questions around the class.

When you learner ask and answer questions

- Create an atmosphere that encourages learners to ask questions
- Repeat the question asked by the learner
- If you think other learner know the answer, use them to answer.
- If the question is irrelevant but asked sincerely, give a short answer or if possible, see the learner afterwards but do not ignore the question
- If you do not have the answer, admit it but give a suggestion of where to find the answer.
- Praise stimulates future effort.
- If the answer is correct use it as the basis of another question to move on to the next step.
- If the answer is not correct, ask the pupils why it's wrong and how it might be improved guide them to answering correctly.
- Do not accept chorus answers.
- Remember long pauses make a long boring lesson ensure the pace is just right.

Classroom Organization

Managing the learning environment is both a major responsibility and an on-going concern for every teacher, even those with years of experience. There are several reasons. In the first place, a lot goes on in classrooms simultaneously, even when students seem to be doing only "one" task together. At any one moment each student needs something different—different information, different hints and different kinds of encouragement. The diversity increases even more if the teacher deliberately assigns multiple activities to different groups or individuals. Another reason that managing the environment is challenging is because a teacher can never predict everything that will happen in a class. A well-planned lesson may fall flat on its face, or take less time or even a longer time than you expect, and you find yourself improvising to adjust to the class time.

The teacher's responsibility of preparing a room full of children for a bright and successful future is faced with the burden of preparing lessons and tests, satisfying curriculum requirements, marking papers, planning field trips, meeting with parents, and preparing for standardized student testing which could ultimately impact school funding and accreditation, if private. The teacher must ensure that after organizing all this work it is not undone at the delivery level.

Teachers have come up with some ways of preventing management problems in the classroom by increasing students' focus on learning. The methods include the arrangement of classroom space, the establishment of procedures, routines, and rules, and communicating the importance of learning both to students and to parents

> **Learning Tip**
> Classroom organization entails arrangement of the classroom space, the establishment of procedures, routines, and rules, and communicating the importance of learning to learners. Preventing management problems largely depends on the preparedness of the teacher.

THE CLASSROOM ENVIRONMENT

This part of the unit focuses on techniques you can use to arrange the environment so that your learners can act appropriately. These techniques are called: stimulus control, modeling and rules. For each of the three techniques, you will learn what the technique is and when and how to use it. Note these aspects down as you read through the article.

Stimulus Control

This refers to arranging the learning environment so that the group behaves as the teacher intends. One of the techniques of stimulus control is called prompting. Prompting means providing extra cues or instructions so that your students know what behaviour they are asked for. For example, you might use handouts on performing a practical skill when you are demonstrating it in front of your class or a chart or model to explain concepts. The long-run purpose of stimulus control is to get your students to be able to control themselves and make rational decisions.

Modeling

Modeling means acting or being the same as someone else, following the example of someone. Modeling produces effects, for example showing and appropriate response for situation or producing complicated behavior quickly. The characteristics of appropriate models are: the model should be someone important to your students and secondly the model should have some type of rein forcers for your students, for instance, the model's similarity to the subject. When your student models an example of behaviour, praise him or her for the behaviour. One could ask the student to act like a certain judge, policeman, doctor, politician or comedian and so on. When modeling a kind of behaviour keep in mind the following points: tell your students what to look for, label the demonstration as you model it, and once the behaviour model has been completed ask the students to analyze what they have seen, debrief them.

Rules

One way to stop unwanted behaviour is to state rules that your students should follow. Here are some characteristics of good rules. They should be:

- Stated to the students in behavioural terms with objective criteria.
- Reasonable, thus the student could do what is asked if given the opportunity.
- Enforceable, that is, the teacher has control over the consequences and observation of the act. When students follow the rule they are reinforced positively.
- A rule is enforced by having the student repeating the rule; the student may acquire the habit of following it.
- After following rules and seeing their functions, students learn very fast to make rules of their own and to participate in rule making.

The other aspects of the classroom environment fall under two categories; the Physical Environment and the Psychological Environment

Physical environment comprises of the buildings, indoor facilities, the resources and the people. This physical environment includes:

- Neat and Clean classrooms
- Arrangement of desks must suit the lesson being taught
- Consider learners of various handicaps
- Learners must be neat and tidy
- Classes must get free flow of fresh air/ well ventilated classes.
- Controlled room temperatures.
- Good lighting. Avoid glare on the chalkboards
- Classrooms should have informative bulletin boards

Psychological environment ensures that the teacher creates a relaxed atmosphere in the class by:

- Encouraging freedom of expression and independence of choice.
- Encouraging individual participation.
- Choosing learner-centred learning techniques
- Motivating learners by reinforcing learners' response and performance during lessons
- Catering for individual differences

Learning Tip

The classroom environment could be:

1. Physical: appropriate buildings, facilities and resources.
2. Psychological: where the teacher creates a relaxing learning environment.
3. Technique: the teacher chooses to arrange the learners so that they can act appropriately using stimulus control, modeling and rules

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CLASSROOM COMMUNICATION

Classrooms are different from many other group situations such that classroom communication serves a unique combination of three purposes at once: content, procedures, or behavior control. Content talk focuses on what is being learned; it happens when a teacher or student states or asks about an idea or concept or when someone explains or elaborates on some bit of new knowledge. Usually content talk relates in some obvious way to the curriculum or to current learning objectives, as when a teacher teaches secondary school content in a history or biology class. Content talk can also digress from the current learning objectives. A student might unexpectedly bring in new ideas from their own experiences.

Procedural talk, as its name implies, is about administrative rules or routines needed to accomplish tasks in a classroom. Procedural talk provides information that students need to coordinate their activities in what can be a relatively crowded space—the classroom, in a laboratory—and under conditions in which time may be relatively short or tightly scheduled. It generally keeps activities organized and flowing smoothly. Procedural talk is not primarily about removing or correcting unwanted behavior, even though certain administrative procedures might sometimes annoy a particular student, or even though students might sometimes forget to follow a procedure. Instead it is intended to provide the guidance that students need to coordinate with each other and with the teacher.

Control talk is about preventing or correcting misbehaviors when they occur, particularly when the misbehaviors are not because of ignorance of procedures. Control talk is obviously important for managing class effectively.

Another way to understand classroom communication is to distinguish verbal from nonverbal communication, and intended both unintended forms of communication. As the name suggests, verbal communication is a message or information expressed in words, either orally or in writing. Classrooms obviously have lots of verbal

communication; it happens every time a teacher explains a bit of content, asks a question, or writes information or instructions on the chalkboard.

Non-verbal communication is any gesture or behavior that conveys information, often simultaneously with spoken words. It happens, for example, when a teacher looks directly at students to emphasize a point or to assert her/his authority, or when the teacher raises her/his eyebrows to convey disapproval or disagreement. Non-verbal communications are just as plentiful as verbal communications, and while they usually add to a current verbal message, they sometimes can also contradict it.

CLASSROOM DISCIPLINE

Discipline refers to controlled behaviour. It is the ability to get attention when you need it. There is often quiet and purposeful talking in a well-disciplined classroom. Dealing with disruptive behavior is one of the most stressful aspects of teaching. The disciplinary tone you set in your classroom over the first couple of weeks may determine how your room operates or fails to operate for the rest of the year. Your handling of discipline is noted not only by the student in question, but an audience of peers, who may gauge how far you can be pushed based on your handling of an incident. You should strive to have a very even-tempered, firm delivery of your requests, and proceed with ordered steps of increasing consequence for continued non-compliance.

However, even if the responsibility of redirecting students and giving them consequences lies at your feet, while the job of finding out the underlying causes go to someone else, it is urgent that the process return back to you in a complete circle.

Activities

- Find out from two neighboring schools the following issues about indiscipline.

- Identify the indiscipline problems that occur in their classrooms by interviewing a teacher/s from the school and student/s by asking them what they are usually punished for. During the interview ask them to suggest ways of curbing indiscipline. Describe these findings in 250-300 words.

- Do the indiscipline problems arise from the pupils, teachers, parents, administration or the community? Categorize them and explain why you chose those categories. Peer review your findings with colleagues to get a wide scope of disciplinary problems and the approaches used to curb indiscipline.

- Do the schools have similar indiscipline problems? Comment in 100-150 words.

- As teachers you have noted what can contribute to disruptive behaviour in classrooms. The secret of discipline control is learning how to prevent discipline problems in the first place. Suggest twelve ways of preventing indiscipline in the classroom in 200-250 words.

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