TEACHING STRATEGIES

Physics should not be taken as a collection of facts, and teaching of physics should not emphasize memorization of formal statements by rote, mechanical solution of problems by formulae or carrying out measurements by following given detailed instructions.

The teachers should be well acquainted with the aims and objectives of the course. To present physics in a lively, exciting and intelligible way, emphasis should be placed on teaching for understanding by organized investigation, learning and discussion. A good demonstration can be used to stimulate learning. It is intended that consideration of everyday industrial and technological applications should pervade the course. Social, economic and environmental issues should also be considered where appropriate.

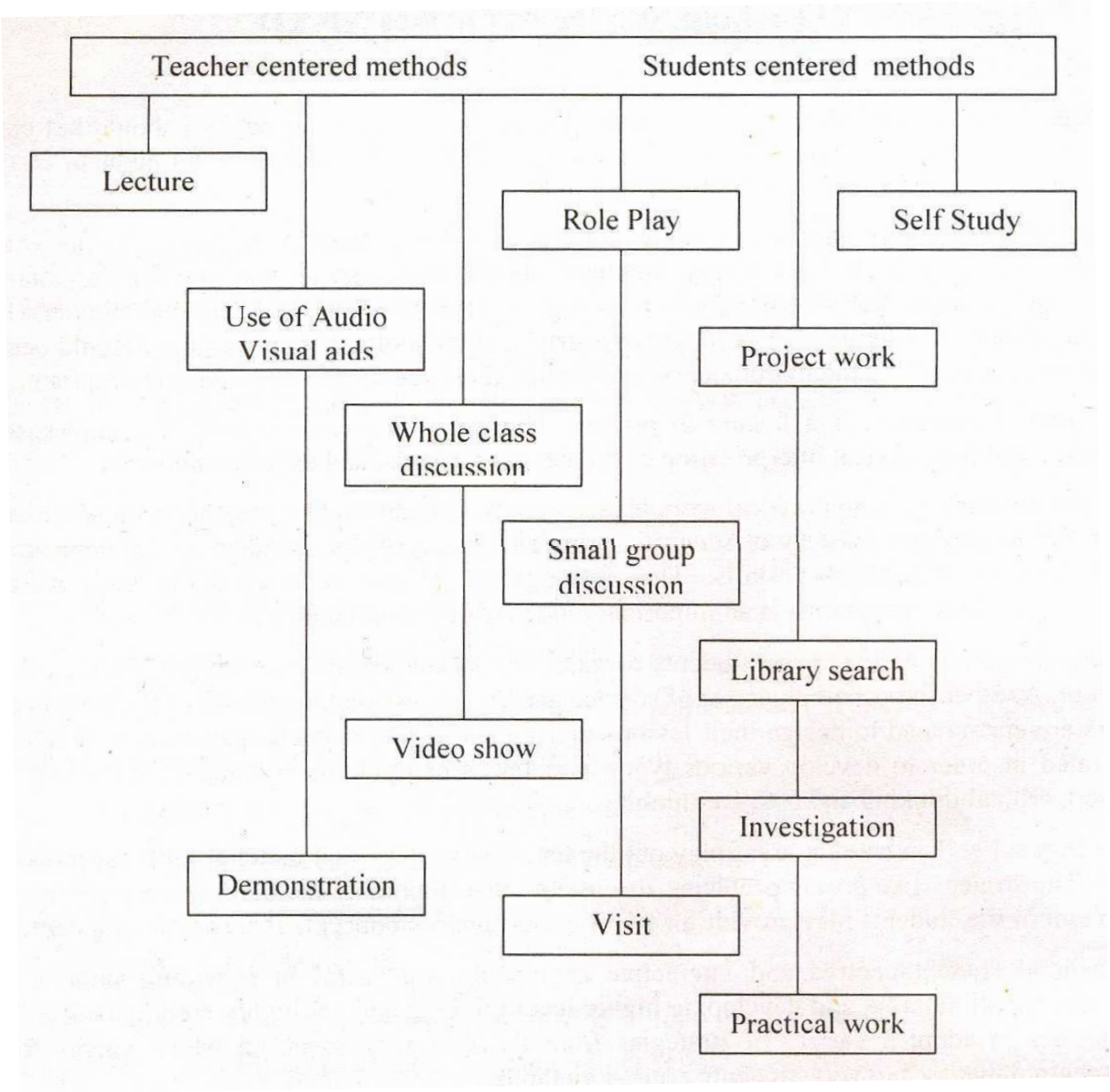
Quantitative treatment is a feature of physics. However, teacher must keep the emphasize on the understanding of the physical interpretation of theoretical formulae and experimental data.

An investigation approach to practical work is essential. Individual student project promote creativity and demonstrate the students mastery of scientific principles involved. Independent use of apparatus by the students develop manipulative skills. The development of psychomotor skills such as correctly manipulating various instruments is an important objective of physics course.

Practical work is essential for students to gain personal experience of physics through doing and finding out. Another important objective of science teaching is to develop attitude of thinking in students. Teachers are encouraged to design their lessons in such a way that suitable questions avid activities are incorporated in order to develop various types avid levels of thinking in students, including analysis, evaluation, critical thinking and creative thinking.

Teachers capable in content areas may opt the teaching strategy that matches with psychology of the students. The strategy like posing problems, discussion, investigations, and solving the problems with the involvement of the students may provide an ample opportunity in conceptual clearance of a content.

In general student centred and interactive approaches are useful in providing suitable learning experiences for stimulating and developing higher level thinking and are highly recommended. Teachers may consider to adopt a variety of strategies from the following spectrum which ranges from very teacher-centred methods to very-students centred methods.



SPECTRUM OF TEACHING METHODS

Teachers should choose appropriate teaching methods in accordance with the topic/skill to be taught as well as the interest and abilities of their students. The following are some factors to be considered when deciding on the teaching methods for a particular topic:

- Learning objectives to be achieved
- Ability of students
- Subject matter
- Availability of resources
- Amount of time available

ASSESSMENT AND EVALUATION

Assessment, appraisal, or evaluation is a means of determining how far the objectives of the curriculum have been realized. What really matters is the methodology employed for such determination. As is now recognized, performance on the basis of content-oriented tests alone does not provide an adequate measure of a student's knowledge and ability to use information in a purposeful or meaningful way; the implication, then, is that effective and rewarding techniques should be developed for evaluating the kind and content of teaching and learning that is taking place and for bringing about improvement in both. The following points, while developing the tests/questions may be kept in view:

1. Proper care should be taken to prepare the objective-type and constructed-response questions relating to knowledge, comprehension, application, analysis and synthesis, keeping in view the specific instructional objectives of the syllabus and the command words for the questions.

2. There should be at least two periodic/monthly tests in addition to routine class/tests. Teachers are expected to develop and employ assessment strategies which are dynamic in approach and diverse in design. When used in combination, they should properly accommodate every aspect of a student's learning.

3. In addition to the final public examination, two internal examinations should be arranged during the academic year for each class.

4. Classroom examinations offer the best and most reliable evaluation of how well students have mastered certain information and achieved the course objectives. Teachers should adopt innovative teaching and assessment methodologies to prepare the students for the revised pattern of examination. The model papers, instructional objectives, definitions of cognitive levels and command words and other guidelines included in this book must be kept in view during teaching and designing the test items for internal examination.

DEFINITION OF COGNITIVE LEVELS

Knowledge:

This requires knowing and remembering facts and figures, vocabulary and contexts, and the ability to recall key ideas, concepts, trends, sequences, categories, etc. It can be taught and evaluated through questions based on: who, when, where, what, list, define, describe, identify, label, tabulate, quote, name, state, etc.

Understanding:

This requires understanding information, grasping meaning, interpreting facts, comparing, contrasting, grouping, inferring causes/reasons, seeing patterns, organizing parts, making links, summarizing, solving, identifying motives, finding evidence, etc. It can be taught and evaluated through questions based on: why how, show, demonstrate, paraphrase, interpret, summarize, explain, prove, identify the main idea/theme, predict, compare, differentiate, discuss, chart the course/direction, report, solve, etc.

Application:

This requires using information or concepts in new situations, solving problems, organizing information and ideas, using old ideas to create new one and generalizing from given facts, analyzing relationships, relating knowledge from several areas, drawing conclusions, evaluating worth, etc. It can be taught and evaluated through questions based on: distinguish, analyze, show relationship, propose an alternative, prioritize, give reasons for, categorize, illustrate, corroborate, compare and contrast, create, design, formulate, integrate, rearrange, reconstruct/recreate, reorganize, predict consequences etc.

DEFINITION OF COMMAND WORDS

The purpose of command words given below is to direct the attention of the teachers as well as students to the specific tasks that students are expected to undertake in the course of their subject studies. Same command words will be used in the examination questions to assess the competence of the candidates through their responses. The definitions of command words have also been given to facilitate the teachers in planning their lessons and classroom assessments.

Analyse:	Describe with the use of graphs how information on two or more variables is related to other variables.
Apply:	Demonstrate the solution of problems by using the specified procedures.
Associate:	Show the inter connection of phenomena or facts.
Calculate:	Is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.
Define (the term or terms):	Only a formal statement or equivalent paraphrase is required. No examples need to be given.
Demonstrate:	Implies that the candidate is expected to show how one thing is related to another, usually it is a reference to theory but sometimes it is physical manipulation or experiment.
Derive:	Deduce stepwise of formula from a general from principle or rule.
Describe:	To state in words (using diagrams where appropriate) the main points of the topic. It is often used with reference either to particular phenomena or to particular experiments. In the former instance, the term usually implies that the answer should include reference to (visual) observations associated with the phenomena.
Determine:	Often implies that the quantity concerned cannot be measured directly but is obtained by calculation, substituting measured or known values of other quantities into a standard formula, e.g. relative molecular mass.
Differentiate:	Identify those characteristics which are the defining features of two concepts or phenomena.
Discuss:	To give a critical account of the points involved in the topic.
Draw/Sketch:	implies a simple freehand sketch or diagram. Care should be taken with proportions and clear labeling of parts.

Explain:	May imply reasoning or some reference to theory, depending on the context.
Give examples:	Name specific instances or cases to demonstrate the occurrence of an event or existence of a situation or phenomenon.
Identify:	Describe with specific examples how a given term or concept is applied in daily life.
List:	Requires a number of points, generally each of one word, with no elaboration. Where the number of points are specified, this should not be exceeded.
Name:	Mention the commonly used word for an object.
Prove:	Demonstrate by logical or numerical evidence.
Recognize:	Involves looking at a given example and stating what it most probably is.
Relate:	Describe how facts or phenomena depend upon, follow from or are part of another.
Represent:	Draw a graph to show the connection between two variables.
Show:	Demonstrate with evidence.
Solve:	Deduce in simple numerical terms.
State:	Implies a concise answer with little or no supporting argument, e.g. a numerical answer that can be obtained ‘by inspection’.
Use:	Apply the given information to solve a problem.