Q.1 Define teaching. Discuss in detail the components of teaching.

Teaching is a complex task. We need systematic planning to perform this task. Teaching has to be done in steps. The different steps constituting the process are called the **phases of teaching**. Each phase has some operations of teaching which create the situation for learning. Teaching process can be divided into three phases/stages.

1. Pre-active phase – refers to planning

2. Interactive phase – refers to the conduct and management

3. Post-active phase – refers to the follow-up and consolidation

Different phases involve different operations of teaching.

The pre-active phase of teaching:-

- It is the phase of planning for teaching.

- Good planning makes the task of teacher smooth, functional and successful.

- There one two major steps involved in this phase.

1. Establishment of some kind of goals or objectives.

2. Discovering ways and means to active these objectives.

Operation of teaching at pre-active phase:-

Before classroom teaching, a teacher has to perform many tasks. This phase includes all these activities which a teacher performs before entering the classroom. This stage involves the following activities.

(1) The formulation or fixing up of goal:-

- The teacher formulates in detail the instructional objectives in behavioral terms by using the taxonomy of educational objectives.

- Objectives one determined according to student's psychology and needs of the society and the school.

- Objectives are determined according to what changes teacher expects in students by achieving these objectives.

(2) Selection of content or subject matter to be taught:-

  - After fixation of teaching objectives teacher decides about the content to be presented before learners.

  - For content selection following points should be kept in mind.

1. The demand of syllabus/curriculum.

2. The entry behavior of the accepted learners.

3. Level of the motivation of learners.

4. Teacher's preference for assessment related to the content.

(3) The arrangement of ideas and style of teaching:-

After selecting the presentable content, the teacher arranges the elements of the content in a logical and psychological sequence. Sequencing should be able to assist in the transfer of learning.

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(4) Selecting Intuitional Methodology:-

The teacher has to select appropriate strategies and tactics of teaching, keeping in view, of the content and objectives of teaching. This operation is very important in teacher-education programme.

(5) Development of teaching strategies:-

The teacher should decide beforehand about strategies and tricks, which he has to use during the course of his classroom teaching. He should decide about

- When and what device of teaching should be used.
- When the teaching aids will be used.
- When recapitulation or evaluation etc. will be done.

Before selecting specific materials to teach evolution and the nature of science, it is important to identify criteria that can help evaluate school science programs and the design of instructional materials. Chapter seven in the National Science Education Standards, "Science Education Program Standards," describes the conditions needed for quality school science programs. These conditions focus on six areas:

- Consistency across all elements of the science program and across the K-12 continuum
- Quality in the program of studies
- Coordination with mathematics
- Quality resources
- Equitable opportunities for achievement
- Collaboration within the school community to support a quality program

Similarly, educators need to consider criteria against which to judge instructional materials. Teachers, curriculum designers, and other school personnel can use the following criteria to evaluate the design of a new curriculum, to select instructional materials, or to adapt instructional materials through professional development. No set of instructional materials will meet all the following criteria. You will have to make a judgment about the degree to which materials meet criteria and about acceptable and unacceptable omissions. These criteria are adapted from earlier discussions of standards-based curriculum.[1]

A Coherent, Consistent, and Coordinated Framework for Science Content . Science content should be consistent with national, state, and local standards and benchmarks. Whether for lessons, units, or a complete elementary, middle, or high school program, the content should be well-thought-out, coordinated, and conceptually, procedurally, and coherently organized. The roles of science concepts, inquiry, science in personal and social contexts, and the history and nature of science should be clear and explicit.

An Organized and Systematic Approach to Instruction. Most contemporary science curricula incorporate an instructional model. The instructional model should (1) provide for different forms of interaction among students and between the teachers and students, (2) incorporate a variety of teaching strategies, such as inquiry-

oriented investigations, cooperative groups, use of technology, and (3) allow adequate time and opportunities for students to acquire knowledge, skills, and attitudes.

Q.2 Explain the meaning and concept of teaching strategies. Discuss expository and enable strategy of teaching in detail.

Instructional objectives serve as goals that teachers have set in the achievement of a greater goal. They also tell students what is expected of them. Instructional objectives make definite the direction in which teaching leads and become the focus of instruction, not only for the teachers, but also for the students. Without instructional objectives teaching is comparable to a fallen leaf whose destination is dependent on the will of the wind. Without instructional objectives, teachers will have nothing to follow in order to achieve what it should achieve. Teaching is composed of certain elements in order to effect learning. These elements are interconnected and unified because they are all anchored on instructional objectives. The activities introduced by the teachers, the instructional media that teacher's use, and the assessment tools that they employ are connected to the instructional objectives. Instructional objectives serve as central unifying elements for instructional strategy, instructional media, and assessment. Assessment plays an indispensable role in the educative process. It determines whether the teacher has achieved the goals he set or not. The instructional objectives provide teachers the idea of what is the best assessment tool to be used in a given situation. Moreover, instructional objectives determine the behavior to be measured. Without instructional objectives, the teacher will have no indicator to measure achievement. What then is there to measure anyway with the absence of bases for assessment? Assessment, when carried out properly and used effectively, provides learning institutions and its stakeholders from the government and the school the data which reflect the achievement level of both the students and the teachers. Achievement levels can be easily determined and identified through the instructional objectives. These objectives, based from results, can be maintained, taken out, or modified depending on the role they play on the achievement of greater educational goals. The absence of instructional objectives can imperil the flow of the educational process because of the absence of feedback on the level of achievement, thus educational reforms, should there be any, cannot be initiated.

Teaching strategies refer to methods used to help students learn the desired course contents and be able to develop achievable goals in the future. Teaching strategies identify the different available learning methods to enable them to develop the right strategy to deal with the target group identified. Assessment of the learning capabilities of students provides a key pillar in development of a successful teaching strategy.

After analyzing the target learners, teachers can choose from the following teaching strategies to ensure maximum output is achieved with their class:

Strategy #1

Similarities and difference identification is a strategy used that enables learners to compare and contrast the different elements. This strategy helps in classification, enabling the learners to distinguish between various ideas.

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Strategy #2

Note taking and summarizing is a teaching strategy that enables the students to keep information for a long time while being able to use it for analysis and presentation purposes. This method of teaching encourages participation through questions and other forms of clarification.

Strategy #3

Provision of recognition and effort reinforcement is a strategy that enables students to understand the link between effort and the recognition they expect. Recognition provides the students with the motivation to continue adding efforts, ensuring that they are able to achieve their goals.

Strategy #4

Homework and practice is a teaching strategy that enables students to practice skills acquired from the previous lectures. This strategy enables the student and teacher to form a communication policy that underlines the time framework and the methods for carrying out the prescribed assignment.

Strategy #5

Nonlinguistic representation as a teaching strategy includes using the following methods to pass a message to the learners: mental images, physical models, pictorial representations, graphical organisers and flow charts.

Strategy #6

Objective setting and feedback provision is a strategy used when learners are expected to develop, personalise and communicate individual objectives. This method also stresses on the student performing a self-assessment to measure success achieved from the lecture.

Strategy #7

Generation and test hypotheses is a strategy that enables teachers to analyse systems while also solving identified problems. This strategy involves the following methods: problem solving, system analysis, decision-making, historical investigation, experimental inquiry and invention. This strategy helps in explaining the importance of coursework by describing the importance of each element. The analysis of this system helps the students in goal development and tackling of any barriers that they may face achievement of the stated goals. This strategy also involves testing the accuracy of the hypotheses and testing other elements to determine whether different solutions will be arrived at.

Strategy #8

Use of cues, organizer and questions is a teaching strategy that is used to ensure focus is maintained on the relevant important data while ensuring students are able to maintain deadlines by having advanced organisers. This strategy helps students compare different scenarios. It is really helpful in topic identification, addressing of available questions, generation of mental pictures by the student, prediction of the next occurrences and answering the asked questions. A summary is then developed for the information learned and the use of this information stated.

Strategy #9

Concept attainment process is a strategy that enables the teacher to develop examples for use in demonstration of available new concepts. Through use of examples and non –examples, the students are able to relate to the intended concept.

Strategy #10

Mental rehearsal is a strategy that focuses on variations and internalization enabling students to obtain ideas on ways of altering skills and procedures with response to different elements.

With the availability of so many different strategies, teachers can determine what best suites their intended learning concept and apply it to their classroom setting.

Q.3   Discuss in detail lecture method. Also explain types of lectures with their advantages and disadvantages.

Definition of Lecture Method of Teaching

Lecture method of teaching is the oldest teaching method applied in educational institution. This teaching method is one way channel of communication of information. Students' involvement in this teaching method is just to listen and sometimes pen down some notes if necessary during the **lecture**, combine the information and organized it.

One of the problems in this method is to grab the attention of students in class room. Another big problem is that many students in the class cannot follow the theme. Learning has a strong influence on method of teaching.

Advantages and Disadvantages of Lecture Method

Advantages of Lecture Method of Teaching

1.   In this teaching method a large amount the topics can be covered in a single class period.
2.   Using of this method exclude the using of any equipment or Lab.
3.   Learning material is not required.
4.   Student listening skills developed.
5.   Logical arrangement of the material in order to present it orally
6.   Help to learn languages

Disadvantages of Lecture Method of Teaching

1.   Psychologically this method is acceptable because individuals are not alike. Teacher delivers the same lecture to both students without recognizing the individual differences.
2.   Learning is an active process thus study should encourage to actively participate in the class room instead of just listening the teacher.
3.   Language using in the lecture is above the standard of the students. They are not able get full advantage of the lecture.
4.   Lecture are often forgotten by the students soon after while learning is retained if activities are experienced.
5.   Attention level is not the same while student listening the lecture.

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Learning is not a simple process. The pouring process is educationally not perfect or recommended for secondary level students. At this level it is difficult for student to pick new concepts using lecture method of teaching. They actually are meaningful, active and interesting experiences or activity in the class.

Advantages and Disadvantages of Traditional Lecturing

Lecturing, in the most traditional sense, holds more cons than pros.

Pros

Traditional lecturing offers a few distinct advantages that other teaching methods do not. Lectures are beneficial for these reasons.

- **Lectures are straightforward.** Lectures allow teachers to deliver information to students as planned. This gives great control over what is taught and lets teachers be the sole source of information to avoid confusion.

- **Lectures are efficient.** A well-rehearsed lecture can be presented quickly and planned ahead of time to fit into a certain schedule.

- **Lectures can be pre-recorded and recycled.** Many teachers record their lectures ahead of time and even show lectures given by others. Khan academy videos and TED talks are examples of common educational lectures available to the public

Cons

There are many drawbacks to lecturing that make it nonideal. The following list includes disadvantageous features of traditional lectures.

- **Lectures are very taxing for students.** In order for a student to get as much as possible from a lecture, they must take detailed notes. This skill must be taught and takes a lot of time to master. Most students don't know what they should take away from lectures and do not successfully learn material.

- **Lectures are not engaging.** Lectures are often long and monotonous, making it difficult for even the most dedicated students to engage. They cause students to quickly grow bored and tune out and they also don't leave room for questions, making confused students even more likely to shut down.

- **Lectures are teacher-centered.** They do not bring students into the conversation to ask questions, debate ideas, or share valuable personal experiences. Lectures are built on a teacher's agenda only with almost no student inquiry or contribution. In addition, a teacher has no way of telling whether students are learning.

- **Lectures do not accommodate individual needs.** Lectures allow for little to no differentiation. They follow a specific format of delivery that does not account for learning disabilities or other needs. Lectures leave many students feeling frustrated and confused.

- **Lectures cause students to rely on their teachers.** The one-sided format of lectures often leads students to develop a dependency on their teachers. Students accustomed to lectures lack self-directed

learning skills and are unable to teach themselves. This fails them because teaching students to learn is the very purpose of education in the first place.

Q.4 What is a project method of teaching? Discuss the steps and principles of project method of teaching .How it can be used at elementary level of education?

Meaning of Project Method of Teaching

Project method of teaching has evolved from the philosophy of programatists. It is experience-centered strategy related to life-situation. This teaching strategy focus on

1. To socialize a child
2. To achieve cognitive, affective and psychomotor objectives

This teaching strategy is based on the following principles

1. Principle of Utility. Choose those projects which are closer to the social life.
2. Principle of readiness. Involve the learners in finding the solution of the problem with their active participation.
3. Learning by Doing. Learner performs certain tasks and experiences new things. This adds to his knowledge and results in learning.
4. Socialization. It develops the feeling of cooperation and group work.
5. Inter-disciplinary Approach. To involve the knowledge of different subjects in solving the social problems.

Types of Project Method of Teaching

According to Kilpatric, "A project is a whole-hearted purposeful activity proceeding in a social environment. Kilpatric has classified the project method in four types.

1. **Constructive.** When learners have to construct some things related to social life. e.g. charts, models, maps, parcels etc.
2. **Artistic.** These projects are generally allotted in the aesthetic fields of life. e.g. in music, drawing, painting art and culture.
3. **Problem-Solving.** These projects are given to solve the problems related to any life-situation or related to any subject e.g. how to operate bank accounts? Or how to send an email or letter. These general problems if solved, will make a child efficient for social-life.
4. **Group-Work.** A team of students is assigned a work to be performed. e.g. to develop a garden in the school.

There are four basic elements of this teaching strategy which make it purposeful 1. Spontaneity, Purpose, Significance, and Interest or Motivation.

Advantages and Disadvantages of Project method of Teaching

Advantages

1. It helps in developing social norms and social values among the learners.

2. It provides invaluable opportunities for correlation of various elements of the subject matter and for transfer of training or learning.

3. It helps in growing knowledge very effectively as a results of their close cooperation on social participation in the spirit of democracy.

Disadvantages

1. The project cannot be planned for all subjects and whole subject matter cannot be taught by this strategy.

2. It is not economical from the point of view of time and cost.

3. It is very difficult for a teacher to plan or to execute the projects to the learners and supervise them.

Suggestions

1. This teaching strategy should not be used an independent teaching strategy but as a supplementary teaching technique.

2. Teacher should try to utilize the inexperience and waste projects to prepare models etc.

3. To avoid the problem of supervision, teacher may appoint a leader to each group of students.

4. Teacher should fix a time limit for each project.

Q.5 What is the difference between inquiry and investigation strategy? Discuss inquiry cycle and types of inquiry strategy.

When running workshops for experienced maths teachers, I hear the claim that Inquiry Maths is just another name for investigations. On one occasion, a teacher appeared exasperated as she accused me of "re-inventing the wheel" and declared that "we've come full circle in maths teaching." Evidently, I had failed to distinguish between investigations and inquiries, but, more importantly, I had also failed to understand that the colleague remembered a time when the investigation classroom was very different to what we know of it today.

The general conception of an investigation has undergone a change in the UK since the National Curriculum came into force over 20 years ago, and particularly since 2001 when the National Numeracy Strategy (NNS) became a statutory requirement in maths classrooms. If teachers used investigations in the NNS era, they were required to meet lesson objectives and fit them into three-part lessons. Investigations had to be structured and sequenced by the teacher to ensure the whole class reached the required outcome.

The reason the investigation survived at all during this period, it could be argued, was its inclusion in the GCSE specification as coursework. However, coursework investigations became so structured by the requirements of the exam board's mark scheme that they fell into disrepute. No longer was a piece of coursework a reflection of a student's independent thinking, but rather a reflection of how well the teacher knew the mark scheme. Coursework was scrapped in 2007.

Investigation classrooms were not always like this. During my PGCE year in the early 1990s, I visited a maths department that taught the whole curriculum through investigations. It was one of the last, if not the very last, school in the country to do so. It was like no other department I have visited or worked in since. Students were allowed to investigate or not, depending on whether the teacher's questions about a starting point had aroused

their curiosity. They investigated individually, occasionally having discussions with the teacher, until they discovered the mathematical concept for which the starting point had been designed. There was no whole-class instruction, which seems unbelievable today.

This is how I imagine the classroom Marion Bird describes in her **1983 booklet** on generating mathematical activity. Marion refers to the activities she uses as 'inquiries' and I would class some of them as inquiries in the sense I use the word today. Splitting decominoes, for example, starts with a diagram and, even though Marion sets an initial question, she allows the activity to develop into multiple pathways that encompass different forms of mathematical reasoning. However, another one of her activities - The greatest number of intersections - has become a classic investigation in which students have to draw more diagrams, tabulate results, identify a pattern and discover the generalisation. This is the inductive method of a science experiment in which more results confirm the hypothesis or lead to its revision.

The exclusively inductive approach is not consistent with the combination of induction and deduction that characterises mathematics, and certainly not with the deductive nature of mathematical proof. Polya explains in How to Solve It and Mathematics and Plausible Reasoning how "deduction completes induction." While the mathematician finds an interesting result through plausible, experimental, and provisional reasoning, the result of this creative work is established definitively with a rigorous proof. It is the certitude given by a proof that makes further results unnecessary.

	Investigation	Inquiry
Starting point	Teacher's questions to direct students from a starting point towards the target knowledge.	Students' questions, observations or conjectures about a prompt.
Regulation of thinking and activity	Individual; occasional discussion with teacher.	Social and justified publicly; evaluated by teacher.
Forms of thinking	Inductive (empirical): tabulate results, identify patterns, generalise from particular cases.	Inductive and deductive: exploration, plausible inference, proof.
Aim	Individual student's discovery of a mathematical concept.	Independent inquirers who can regulate the process by which maths is developed.
Teacher's role	Facilitate the discovery by using (leading) questions in discussions with individuals.	Give instruction on concepts and forms of reasoning when appropriate or requested to do so.