

Methods of Teaching Physical Science

In a typical classroom, the composition of the students is heterogeneous in terms of their varying ability. Some are brilliant, some are interested in studies and a large number of students are of the average ability. Some are disinterested and a few are trouble makers. In such a situation, the teacher is in a dilemma in selecting an appropriate teaching strategy. The teaching strategies can be normally classified into two categories viz; ‘teacher – controlled’ instruction methods and ‘learner controlled’ instruction methods.

Teacher centered method

- I. Lecture method
- II. Demonstration method

Pupil centered method

- I. Heuristic method
- II. Project method
- III. Assignment method
- IV. Problem solving method
- V. Programmed Instruction
- VI. Computer Assisted Instruction
- VII. Active learning Method (ALM)
- VIII. Activity Based Learning (ABL)

LECTURE METHOD

This method is usually followed in colleges and in higher standards in schools. In this method, only the teacher talks, the students are passive listeners. They do not take any active part. Pupils listen, get bored, yawn and sometimes go to micro-sleep as well. The teacher acts as a chatter box, talking and talking all the time without considering whether the students are following or not. It does not stimulate the powers of observation and reasoning. This method originated in very ancient times, when printing press was not invented and handwritten manuscripts were very few, hardly for the use of teacher. Dr. Johnson stated “Lectures were once useful; but now when all can read and books are so numerous, lectures are unnecessary”.

Merits

1. **Attractive and Concise:** It is very attractive, concise and very easy to follow without much botheration on the part of the teacher and the taught. The teacher feels secure and satisfied.
2. **Economical:** It is economical because no laboratory is needed and one teacher can teach a large number of students at a time.
3. **Speedy:** Lengthy syllabi can be covered in a short time by this method.

- 4. Useful for Factual Information:** Factual information and historical anecdotes can be easily imparted by this method.
- 5. Useful for Logical Sequence:** The logical sequence of the subject can be easily maintained. Since the teacher has to plan the lectures in advance, there cannot be gaps or over-lapping in the development of the lesson.
- 6. Time Saving:** In this method there is no student activity. No project, no demonstration, therefore there is hardly any wastage of time and lesson can go at top speed.
- 7. Inspirational Value:** Good lectures have high inspirational value. Sometimes students pick up motivation, inspiration, ambitious ideas and something creative in life.

Limitations

- 1. Memory Based:** It lays too much stress on memory work. Experimental work is neglected and the power of observation of a child is seldom exercised.
- 2. Spoon feeding:** It does not encourage independent thinking, discovering, exploring and taking initiative. It is a type of spoon feeding and all the faculties of the child are not allowed to develop.
- 3. Teacher centered:** When the teacher lectures, there is no guarantee whether the pupils are concentrating and understanding all that the teacher is teaching.
- 4. Too Rapid:** The rate of imparting knowledge and information may be too rapid and the students may not get necessary connections of thought.
- 5. Unpsychological:** In this method the teacher is active participant while the students are passive listeners, which is opposed to the principles of psychology. The interests, aptitudes and capabilities of the pupils are ignored.
- 6. No inculcation of Scientific attitude:** It does not help to inculcate scientific attitudes and training in scientific method among the pupils.
- 7. No learning by Doing:** There is no place for learning by doing in this method. The very root of science is cut when practically nothing is done, for science is something which involves doing.
- 8. Authoritarian:** This method is undemocratic, the pupils are encouraged to depend upon one authority ie., the teacher. They cannot challenge or question his verdict.
- 9. No critical Thinking:** It fails to develop critical thinking and reasoning power, so essential for democratic living.

LECTURE CUM DEMONSTRATION METHOD

The main drawback of lecture method is that it is one-way process. The demonstration method takes note of this fact and thus while in a lecture method the teacher merely talks, in a demonstration method he really teaches. The teacher performs experiments before the class and meanwhile goes on asking questions from the class. The students are compelled to observe carefully and draw inferences. This method combines the merits of lecture method with that of demonstration method, it is also named as Lecture Demonstration method.

Principle

This method is based on principle. Truth is that which works. The teacher has to work out something and then only the student will believe.

Requisites for a Good Demonstration

1. **Appropriate Arrangements:** While performing an experiment the teacher must be sure that everything done on the demonstration table is clearly visible to the pupils.
2. **When there is no demonstration table:** The teacher may carry on the experiments on one of the student's table located in the front row and the class can view the demonstration by standing at some distance round the table. This method may prove very useful with small classes.
3. **Sufficient Light:** attention must be paid to adequate lighting of the demonstration table and the background.
4. **Demonstration Apparatus:** Demonstration apparatus should be as large as possible such as a big model of electric bell, vernier calipers etc. and the graduations on any instrument should be clearly visible.
5. **Arrangement of Apparatus:** Everything must be placed in order before the demonstration starts. The apparatus to be used should be placed on the left hand side of the table and the arranged in order in which it will be shown. After a particular thing or apparatus has been used, it should be transferred to the right hand side.
6. **Preparation by Teacher:** The teacher must be sure that the experiments will succeed and are strikingly clear. This demands adequate preparation on the part of the teacher.
7. **Securing attention:** Attention of the class is very important. The teacher should know various methods of arresting and creating interest.
8. **Effect of Season:** Proper account should be taken of time and season. Climate conditions sometimes affect the apparatus. For instance, frictional electricity experiment should not be done during rainy season. Hot season is best for experiments with ice.
9. **Teaching Aids:** Demonstration experiments should be supplemented with teaching aids like charts, pictures, diagrams, models, films strips etc.
10. **Use of Black board:** A large black-board behind the teacher's demonstration table is most essential. During the lesson the teacher can use it to great advantage. Tabular statements for entering data, principles arrived at, as a result of demonstration, can be written on the black board. Necessary simple diagrams can be drawn on it.

Conduct of a Demonstration Lesson

Some of the essential steps to be followed in a demonstration lesson.

1. Planning and Preparation

- Subject matter Knowledge
- Lesson notes including the type of questions to be asked

- Rehearsal of experiments
- Collection & arrangement of apparatus required

2. Introducing the Lesson

It is useless to start a lesson without properly motivating and preparing the minds of the students for it. E.g. Carbon di oxide: To start the topic carbon di oxide the teacher may open the soda water bottle in the class.

3. Presentation of the Subject matter

- Broader sense of Teaching: Lesson should not consist of dry bones of an academic course but a breadth of treatment is essential.
- Use fo Illustations: The teacher will draw illustrations from all branches of science.
- Judicious Questions: During demonstration, judicious questions should be so arranged that their answers form a complete teaching unit.

4. Performance of Experiments

- Clear Results: Experiment must work and their results should be clear.
- Simple Experiment: Experiments should be simple. Lengthy experiments like composition of air by rusting of iron, presence of carbon di oxide in air etc.,should be avoided.
- Appropriate time of Experiments: Experiment should be well spaced throughout the lesson. It is wrong demonstrating all the experiments at an early part of the lesson or rushed in at the end.
- Reserve Apparatus: Reserve apparatus should always be kept near the demonstration table so that much time is not wasted in collecting the apparatus in case of breakage.
- Arrangement of Apparatus: Apparatus should be arranged in an order in which the experiments are to be shown.
- Time saving: It is a wise policy to store the demonstration apparatus intact until it is to be used again. It results in much economy of time for the busy science teacher.

5. Blackboard Work

Chalk board is a very useful aid in a demonstration lesson. It is mainly used for two purposes.

- For tabulating data, important results and principles in summarized form.
- For drawing necessary sketches and diagrams.

6. Copying and supervision

The teacher should frequently go to the seats of the students and see if they are copying properly.

Common Errors in Demonstration Lesson

Some of the most common errors committed by the beginners in giving demonstration lesson are summarized below:

- The apparatus may not be ready for use.
- Blackboard may not be used properly.
- Right type of questions may not be asked.
- The teacher may fail to emphasize the generalization
- Sufficient time for recording data may not be given to the student

Merits

1. **Psychological Method:** Student need not imagine anything instead they are shown concrete things and living specimens.
2. **Sensitive Apparatus:** Demonstration is suitable when the apparatus is very costly.
3. **Useful in dangerous Experiments:** It is helpful in case of dangerous experiments like preparation of chlorine, burning of hydrogen etc.
4. **Economical:** when apparatus is not sufficient to do the practical individually, the teacher may perform the experiment before the whole class.
5. **Time saving:** It is a time saving method. If compared to Heuristic, Project or Experimental methods, it saves much time.
6. **Based on Activities:** Students are kept engaged in various activities like observing, taking notes, answering questions etc.
7. **Useful for Everyone:** It is suitable for all types of students i.e average, below average, and above average.

Limitations

1. **Not based on learning by Doing:** there is no scope for learning by doing which is an important principle of learning.
2. **Not child centered:** the teacher has the final responsibility to manipulate and perform the experiments.
3. **No scope for Individual Differences:** This method does not provide food for individual differences. Slow learners and genius are made to crawl at the same pace.
4. **Obstacle in Progress:** the desirable laboratory skills are not developed among the students.
5. **Not Based on Scientific Attitude:** It does not inculcate the most-needed scientific attitude and training in scientific method.