CHAPTER-I

BACKGROUND OF THE STUDY

To be sure teaching like the practice of medicine is very much an art which is to say it calls for exercise of talent and creativity but like medicine it is also a science for it involves a repertoire of techniques procedures and skills that can be systematically studied and described and improved. A good teacher like a doctor is one who adds creativity and inspiration to the basic repertoire.”

- Silverman

I.1. INTRODUCTION:-

Modern education is based on science and technology with the introduction of educational technology in the discipline of education great changes have taken place in the process of teaching and training of teachers. In the last twenty five years, classroom teaching has been changed considerably with the application of technology of teaching. The emphasis is being given to evolve new practices in teaching in order to raise the academic performance and individual difference of the students be properly considered in teaching learning situations.

Educational efforts over the last fifty years or so has experienced several changes, particularly in the role and responsibility of the teacher vis-à-vis the learners. The shift in emphasis in the area from ‘teaching to learning’ has known varying shades of combinations of the two activities that go simultaneously to achieve the goals of this enterprise. It is now very

clear that neither one or the other by itself can achieve the ends nor hence a mix appears to be answer. The search is on for the mix. The growing concern for evolving appropriate strategies has become all the more in the light of the expanding frontiers of knowledge coupled with the changed needs and competencies of manpower the more ability to take in information will not get the citizens anywhere.

Joyce and Weil (1985) have defined teaching as "a process by which teacher and students create a shared environment including sets of values and beliefs (agreements about what is important) which in turn colour their view of reality." Students come to schools with different learning styles, requiring different approaches to be followed to make for effective learning. This definition introduces the concept of environment into the teaching process. Thus the teacher:

- Designs the course,
- Defines the requirements, and
- Assigns projects and learning materials.

Educational Technology has made an impact in almost all the aspects of human life and instructional strategies are the result of an application of instructional technology to the field of education. One notes worthily change observed in today’s classroom is the fine but significant difference in the classroom atmosphere. The studies have clearly revealed the intimate influence of Advance Organizer Model (AOM) and Biological Science Inquiry Model (BSIM) in the creation of fertile learning environment of pupils. William James observed long ago science never generate arts directly out of themselves an intermediary creative mind and make the application by use of its originality. The future of the education depends therefore directly

upon the quality of intermediates incentive mind of teachers therefore
directly upon the quality of intermediates incentive mind of teachers and
their ability to invent and innovate. It is in this area that the role of
Instructional Technology as regards its Advance Organizer Model (AOM)
and Biological Science Inquiry Model (BSIM) assumes vital importance.

I.2. GENESIS OF THE STUDY:-

Research innovations and inventions are the effective tools bring
desirables progress and improvement in all walks of human life. Research in
education serves the same purpose. However, carry out research as to invent
something new is not an essay-nut to crack. The rigorous and sophisticated
kind of research known as fundamental research neither serves useful
purpose nor it is feasible by the practioners like teachers and headmasters
within their meager resources and working conditions.

Schools and colleges all over the world are faced with the existing task
of optimizing pupil achievement. Educational Technology is no more new
fangled India computers have invaded marked and monitor our everyday
life. China is newly democratic country like India, the complexity of
teaching learning process coupled with the increases in number and diversity
of school going children as well as the expanding horizons of knowledge
have high lighted the need for proper planning of instructional strategies,
methods, devices and optimum are of instructional resources by the teachers
of today.

The new field of Teaching Technology is concerned with meeting this
problem. Many recent teaching technologies claim be panacea for
educational problems mention may be made of programmed learning.
Magnetic tape demonstration, discussion, book-cum-discussion, lecture-
cum-demonstration, discovery learning team teaching etc..
Among the accepted criteria to ascertain the student’s attainment are those connected with Educational Technology, educational system and application by higher learning technology, the lab to land networks and management of research and development?

A vital component of the entire educational scenario is the irritating of technological advancement to enhancement of teaching methodologies and strategies at different levels of intelligence.

Keeping in view the above points related to its importance, it is clear that the present study was a humble attempt to ascertain the effectiveness of Advanced Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM) in teaching Biology with regards to their Intelligence and Socio-Economic Status.

I.3. JUSTIFICATION OF THE RESEARCH:

Days in and days out we read in news-papers, journals and educational magazines etc. about the views of educationist and journalist regarding the Instructional Technology for effective teaching learning process. Whatever are the arguments whether for or against the quality of teaching largely depends upon the quality of teaching or instruction?

It has been accepted by the public in general and educationist in particular that effective teaching rests on the building of the nation. If the nation building is be excellent the quality of teaching necessarily has to be made excellent. It is probably in this context the often quoted statement of the Education Commission (1966) that destiny of nation is shaped in its class-rooms needs to understand and scrutinized.

By enlarge it is proved through research findings that quality of teaching depends upon teachers ability and knowledge the teacher’s success is assessed by growth of his school towards academic excellence,
development of desired psycho-motive abilities, social and emotional maturity etc. The more a teacher succeeds in making his students to group in their direction. The more he is able to fill the gap between nation’s aspirations and their actual achievements. Many research studied have been conducted on effective syntax of Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) separately but no any study has been conducted with a view to ascertain the effeteness of Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM) in teaching Biology with regards to their Intelligence and Socio-Economic Status.

The researcher felt that before choosing any strategy and method in teaching one should be fully aware of the consequence of such choice after testing a teaching learning situation. Thus, the researcher selected the performance of students in Biology with regard to their Intelligence and Socio Economic Status.

I.4. SIGNIFICANCE OF THE PROBLEM:-

Education is a process takes into account both the science of education and art of education. The science of education comprises the corpus of knowledge which is largely responsible for making the art of education more effective. The art of education has relevance to classroom practices and for effective dialog between the teacher and pupil.

Advance Organizer Model (AOM) may be used effectively to reduce the burden of teacher’s again the immense use in our school where teachers are required to handle those disciplines or concepts in which they have not specialization at all. Advance Organizer Model (AOM) for the purposed instruction can be utilized effectively in the field of all type of education.
Biological Science Inquiry Model (BSIM) is one of the learners centered approaches propounded by J. Schwab (1965) to teach scientific knowledge and to develop interest in scientific inquiry. Not only can the nature of science put process of research in Biology, but also be introduced to students. They can also learn planning and execution of projects and self-learning involving acquisition of knowledge through observation of phenomena creative thinking and activities.

The importance of the present study is to put the hands of the teachers and effective and efficient time saving and labour saving devices for removing the weakness in Biology teaching. It should contribute to the development of existing knowledge in science education. It should be specified the specialization group when a candidate has offered this strategies.

The present study in future intended to give better appropriate equipment to the teacher to teach by effective strategy. This study is also intended to serve for teachers with more time to plan and prepare curriculum because teachers are the right people who know the needs and requirements of pupil as well as nation.

The present study is further intended to give emphasis to Advance Organizer Model (AOM) and Biological Science Inquiry Models (BSIM) movement in this country. It represents a motivating force to deep into contents of the present problem and undertaking comprehensive study of the subject.

I.5. **STATEMENT OF THE PROBLEM:-**

The technological revolution has been responsible for the acute needs for better achievement of the students. Man has always desired for excellence. This desire has given birth to new inventions and innovations in
all walks of life. Science and technology has always been instrumental in bringing efficiency and improvement in the processes and products of the human work. The world of education has also been influenced by the increased use of technology. It has provided valuable help in improving the task of the teacher smoothing the process of teaching learning and enriching the goals of education.

Many researchers have been conducted on effective instructional strategies, but no study has been conducted in a view to ascertain interaction effect of student’s performance with regards to their Intelligence and Socio Economic Status through different methods of instruction. Hence, it is very essential that some research work should be done in this direction. In the context of the above said need, the present study precisely be stated as –

“A Comparative Study of Effectiveness of Advance Organizer Model and Biological Science Inquiry Model and Traditional Method in Biology Teaching at Secondary Level”

I.6. DEFINING THE TERMS:-

I.6 (A) EFFECTIVENESS:-

According to International Dictionary of Education- “Effectiveness is defined as the amount of information learned by the students in a given length of time”.  

In the present study effectiveness of Advance Organizer Model (AOM) Biological Science Inquiry Model (BSIM) & Traditional Teaching Method, in bringing up achievement in Biological Science has been studied. Here effectiveness refers to what extend Advance Organizer Model (AOM) & Biological Science Inquiry Model (BSIM) could support learning in

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Biological Science and there by faster attainment in the subject among the secondary level students.

I.6 (B) **ADVANCE ORGANIZER MODEL (AOM):**

According to Ausubel whether or not material is meaningful depends more on the preparation of the learner and on the organization of the material than it does on the methods of presentation. If the learner beings with the right ‘set’ and if the material is solidly organized, then meaningful learning can occur.

According to Mayer (2003) – “Advance Organizers Information that is presented prior to learning and that can be used by the learner to organize and interpret new incoming information”

Advanced Organizers are the primary means of strengthening cognitive structure and enhancing retention of new information. Ausubel describes Advance organizers as introductory material presented ahead of the learning task and at a higher level of abstraction and inclusiveness than the learning task itself. Their purpose is to explain, integrate and interrelate the material in the learning task with the previously learned material (and also to help the learner discriminate the new material from previously learned material)

**According to Ausubel** - The Advance Organizer Model (AOM) presented at a higher level of abstraction generality and inclusiveness; and since the substantive content of a given organizers or series of organizers is selected on the basis of its suitability for explaining, integrating and interrelating the material they precede this strategy. Simultaneously satisfies

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the substantive as well as the programming criteria for enhancing the organization strength of cognitive structure.

Ausubel contends that these organizing ideas which may be single concepts or statements of relationship are themselves important content and should be taught because they serve to organize everything that follows. Advance organizers are based on major concepts, generalizations, principles and levels of academic disciplines.

I.6 (C) BIOLOGICAL SCIENCE INQUIRY MODEL (BSIM):

Biological Science Inquiry Model (BSIM) is an inductive and learner centred approaches of teaching based on Biological science propounded by J. Schwab (1965) to teach scientific knowledge and to develop interest in scientific inquiry\(^5\). Not only can the nature of science but process of research in Biology also be introduced to students. They can also learn planning and execution of projects and self learning involving acquisition of knowledge through observation of phenomena, creative thinking and activities.

I.6 (D) TRADITIONAL METHODS (TM):

All instructional Methods are originated from the teacher. Students are the recipient in the process; they are led by the teacher through the process in the pre-decided route designed by teacher. Though both students and the teacher are activity engaged in the process the focus is on the presentation of LEs by teacher and so there are called ‘Teacher Centered’ or ‘Traditional’ methods of teaching. The Traditional Methods are content centered and teacher remains more active and students are less active or passive listeners. The Traditional Methods of teaching realize cognitive objective. There are

high subjective and conventional styles of teaching methods. The main Traditional Methods are the following:

1. Lecture Method
2. Demonstration Method

DEFINITIONS:

According to international dictionary of Education - “Traditional procedure used in the presentation of instructional material and the content of activities”.

According to Banthiya - “Traditional arrangement of learning events adopted by the teacher of facilitate learning to accrue in the students or trainees.”

According to the view of Researcher - “Traditional technique of the presenting any contents in classroom is called Traditional Method”.

I.6 (E) BIOLOGY:-

In order to define Biology, the meaning of Science will have to be understood because Biology is also a Science.

Meaning of Science:-

Science is an organized body of knowledge and opinion which is supported by formal proofs or by observational evidence through systematic attempts.

The Columbia Encyclopedia (1963) defines science as an accumulated and systematized learning in general usage, restricted to natural phenomenon. The progress of science is marked not only by an accumulation effect, but by the emergency of science method and scientific attitude.

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According to Gagne (1965) “Science is what the Scientist does” – It is a process by which we increase and refine understanding of ourselves and of the universe through continuous observation, experimentation, application and verification.

Natural in these definitions is the implication that science is at the same time a body of knowledge and an ongoing self testing process of inquiry. Thus, it may be stated that “science is both a product and a process.” This view is supported by the defamations of science given by Fitzpatrick (1960) UNESCO (1971).

Science as Product:-

Although the importance of science both as a product and a process is undisputedly accepted, but in actual classroom practices today the emphasis is still on ‘acquisition of knowledge’ which forms the product side of science. Science is being taught in Public School as well as other schools as a body of established facts obtained by individuals using reliable methods.

The reality of scientific knowledge includes not only facts which are truth and therefore indisputable but also generalization and theories that are subject to error and prone to change.

Scientific method is the procedure followed by Scientists to conduct scientific investigations, as to find solutions to the problems.

Ritchie (1980) remarks that scientific methods basically involves confronting ideas with experience i.e. designing experiments to test ideas or hypothesis and predictions based upon them.

Science as Process:-

The most distinguishing characteristic of science is its method. It is an activity that takes place in the minds of individuals which is the result of certain intellectual processes that made discovery possible.
The processes of science are the means by which one can examine explore and investigate the unknown. They are the procedures researchers use to investigate the natural world.

‘Acquiring processes of science’ implies that students are expected to possess the abilities such as – to observe, to classify, to assume, to make and test hypothesis and to conduct experiments about the natural phenomena.

The following were identified ‘as processes in science’ by the American Association for Advancement of Science (AAAS)

a. Observation
b. Classification
c. Number relations
d. Measurement
e. Space/time relations
f. Communication
g. Prediction
h. Inference
i. Making operational definitions
j. Formulating hypothesis
k. Interpreting data
l. Identifying and Controlling Variables

m. Experimenting

American Association of the Advancement of Science (AAAS) used a process skill approach to teach science. Further it defines these skills as a set of broadly transferable abilities appropriate to many science disciplines and reflective of their true behavior of scientists. It divides process skills into two types basic and integrated. The basic science processes are observing
classifying, communicating, measuring, using space/time relations, using number, inferring and predicting. These skills provide a foundation for learning the more complex integrated skills. The integrated science process skills are –controlling variables interpreting data, formulating hypothesis, defining operationally and experimenting.

**Place of Science in Secondary Education:-**

In the past, science was an ornament of casual wear and it was pursued on a routine basis. As a time changed, science has evolved and occupied a prominent place is just in the curriculum but in the practical of life as such. The very existence of Nation further depends on the very foundation of Science Nation’s power and productivity, no doubt, depends on the progress made in scientific inquiry.

The problem faced by a student, a teacher in a classroom as well as a citizen of a country can no more is restricted to once own boundaries. They have to be solved by consisted Inquiry proceeding by innovations. These novel innovations are possible only when “Science is taught as Science” in Schools. This requires a virtual revolution in the teaching learning processes of science. In order to effect that change we will need nothing less than a radical shift in every one’s perception of what science as “Curiosity” - the heart of science education.

Emphasizing the importance of science, the Secondary Education Commission (1954) recommended that science teaching at the secondary stage should initiate the student into the use and appreciation of scientific method by which facts are discovered, relationships established and sound conclusions reached. Pupils should be encouraged to explore every opportunity to develop the attitude of critical inquiry. This clearly indicates what the expected outcomes of science are at the Secondary level.
The objectives of science teaching for the Secondary classes as enumerated by the new pattern of education 10+2+3 in India can sum up the place of science as “The objective of science teaching is to develop an attitude of open mindedness, spirit of inquiry and training in scientific method. What is considered essential for every citizen of India is that, they become helpful and not impediments in the process of any change considered good for the Individual, social and national advancement”

**Meaning of Biological Science:**

Lamark and Treviranus were two scientists of 1802 AD, who had given the name ‘Biology’ to the systematic study about the creatures/living things.

Biology is formed by the synthesis of two Greek words ‘Bios’ and ‘Logos’. ‘Bios’, means ‘Life’ and ‘Logos’ means ‘Discourse’ or ‘study’. Thus, Biology is also known as science of life today.

On the basis of knowledge of Biology, the study of Biology has been divided under two heads:

(i). **Zoology:**

Zoology is formed by the synthesis of two Greek words- ‘Zoo’ and ‘Logos’, ‘Zoo’ means animals or fauna and ‘Logos’ means study. Thus ‘Zoology’ is that branch of Biology under which the study of animals or fauna is done.

(ii). **Botany:**

The second branch of Biology is Botany which is formed by the synthesis of two Greek words- ‘Botane’ and ‘Logos’, ‘Botane’ means plants or flora and ‘Logos’ means study. Thus, Botany is that branch of Biology under which the study of plants or flora is conducted.
I.7. OBJECTIVES OF THE STUDY:

The present study is based on the following objectives:

1. To develop and validate model lesson plans of the Advance Organizer Model (AOM) and Biological Science Inquiry Model (BSIM) on the topic “Cell and Tissues” in Biology.

2. To develop and standardize an achievement test on the topic “Cell and Tissues” in Biology.

3. To investigate the related effectiveness of instructions through Advance Organizer Model (AOM) and Biological Science Inquiry Model (BSIM) and Traditional Method (TM) of High and Low Intelligent students for High Socio-Economic Status students.

4. To investigate the related effectiveness of instructions through Advance Organizer Model (AOM) and Biological Science Inquiry Model (BSIM) and Traditional Method (TM) of High and Low Intelligent students for Low Socio-Economic Status students.

5. To study the interactional effect of Intelligence (High & Low), Socio-Economic Status (High & Low), Teaching Methods (AOM, BSIM & TM) on scholastic achievement scores in Biology.

In this study Intelligence, Socio-Economic Status, Teaching Methods have been taken as independent variables and scholastic achievement scores has been taken as dependent variable or criterion variable.
I.8. HYPOTHESES:-

Taking into account the objectives of the present study, the following hypotheses have been formulated –

1. Significant difference would not be observed in the scholastic achievement of students of High and Low Intelligence taught through Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM) for High Socio-Economic Status.

2. Significant difference would not be observed in the scholastic achievements of students of High and Low Intelligence taught through Advance Organizer Model (AOM) and Biological Science Inquiry Model (BSIM), and Traditional Method (TM) for Low Socio-Economic Status student.

3. The treatment of independent variables namely Intelligence (High & Low), Socio-Economic Status (High & Low) and Teaching Methods (AOM, BSIM & TM) will not have direct effect on dependent variables or criterion variables namely scholastic achievement in Biology. There is no significant interactional effect between various independent variables.

(A) MAIN HYPOTHESES:-

i. Significant difference would not be observed on the scholastic achievement scores for three Methods of Teaching i.e. Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM).
ii. Significant difference would not be observed on the scholastic achievement scores obtained from students of two Intelligence groups (High & Low) taught through different Methods of Teaching i.e. Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM).

iii. Significant difference would not be observed between the achievements of High and Low Socio-Economic Status students taught through different Teaching Methods i.e. Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM).

(B) HYPOTHESIS RELATED TO INTERACTIONAL EFFECT:-

1. There would not be significant effect of interaction between two levels of Intelligence (High & Low) and different Teaching Methods i.e. Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM) on the scholastic achievement.

2. There would not be significant effect of interaction between two levels of Socio-Economic Status (High & Low) and different Teaching Methods i.e. Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM) on the scholastic achievement.

3. There would not be significant effect of interaction between two levels of Intelligence (High & Low), two levels of Socio-Economic Status (High and Low) and different Teaching Methods i.e. Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM) on the scholastic achievement.
I.9. THEORETICAL BACKGROUND OF TEACHING METHODS:-

I.9 (A) TEACHING MODELS:-

The word ‘Model’ is used by people in different ways in different contexts. Engineers and architects used the word ‘Model’ for dams, projects, building, and machines etc. They also carry out the construct work according to the plan or pattern envisaged in the model. Thus, a model of a bridge does not guide an engineer to construct a building. It is meant for a particular purpose. In the teaching-learning process, models have the same interpretation as they have in the case of construction of dams, buildings, etc. Thus, models of teaching, like plans, patterns or blueprints, present the steps necessary to bring about desired outcomes. According to Joyce and Weil (1972), a teaching model is a pattern or plan which can be used to shape curriculum or course to design instructional materials and to guide a teacher’s actions. Thus, a model of teaching can be used to design face-to-face teaching in class-rooms of tutorial settings to shape instructional materials, including books, films, tapes, computer-mediated programmes, and curricula and long-term courses of study (Joyce, Weil and Showers, 1992). Apart from the above uses it creates the necessary environment which facilitates the teaching-learning process. The core of the process of teaching is the arrangement of environment within which the student can interact (Dewey, 1916). Thus, a model of teaching consists of guidelines for designing educational activities and environments. It specifies ways of teaching and learning that are intended to achieve certain kinds of goals (Joyce and Weil, 1978).\(^7\) It is a step-by-step procedure that leads to specific learning outcomes (Gunter, Estes and Schwab, 1990). Models are prescriptive teaching strategies, designed to accomplish particular

instructional goals (Eggen Paul, D et.al., 1979). Thus, a model of teaching is designed to achieve a particular set of objectives. It is not a substitute to any teaching skills. Rather, it creates the conductive teaching-learning environment in which teachers teach more effectively, by making the teaching act more systematic and efficient. The characteristics of the models of teaching is given below –

(i). Models of teaching are some sort of plans or guidelines or patterns of strategies of teaching.

(ii). Models of teaching are not a haphazard combination of facts but are, on the other hand, systematic procedures to modify the behavior of the learners.

(iii). Models of teaching specify the learning outcomes or instructional objectives in terms of observable and measurable performance of students.

(iv). Models of teaching specify in definite terms the environmental conditions under which a student’s response should be observed.

(v). Models of teaching specify the criteria of acceptable performance expected from the students.

Models of teaching are actually models of learning. *Models of teaching have been developed to help a teacher improve his or her capacity to reach out to more children and create a richer and more diverse environment for them.*

A comprehensive definition of model of teaching is "*An instructional design which describes the process of specifying and producing particular environmental situations which cause the students to interact in such a way that a specific change occurs in their behaviour.*"
1. **Assumptions of Teaching Models –**

   a) The teaching is the creation of appropriate environment. There are various component of the teaching environment, which is interdependent.

   b) The second assumption is that content, skill, instructional roles, social relationships, types of activities, physical facilities and their use, all forms of an environmental systems whose parts interact with each other to restrict the behavior of all participants, teachers as well as students.

   c) The third assumption is that different combinations of these elements create different types of environments and obtain different outcomes.

   d) The fourth and the last assumption is that models of teaching create suitable environment for teaching in classroom.

   Models of teaching have three major functions in the teaching-learning or instructional process. These are –

   a) Designing of curriculum or courses of study;

   b) Development and selection of instructional materials; and

   c) Guiding the teacher’s activities in the teaching-learning situation.

   The functions of models of teaching can be explained with the help of a diagram given on the next page -.
2. **Elements of Models**

*A focus of a system* refers to the frame of reference around which the model is developed. It is the main theme which determines combinations and relationship of various processes, conditions and factors built into the model. Objectives of teaching and aspects of the environment generally constitute the focus of the model. What is aimed to be achieved is found to be the focus of most of the models. Focus is the central aspect of a teaching model.

According to Joyce and Weil (1985), the four concepts for describing the model are:

- A syntax
- A social system
- Principles of reaction
- A support system

**Syntax**

*The syntax or phasing of the model* refers to the description of the model in action, i.e. the kinds of activities which are organised at well-defined stages of the whole programme characterize the educational
environment belonging to each model. It is the sequence of steps involved in the organisation of the complete programme of teaching. Table No.-T.I.1 illustrates how two models can result in different sets of phases even though the same type of concept may be under consideration. The objectives of the two models may be different.

**Table No. – T.I.1:- Illustration of Phasing in Two Models**

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Phase One</th>
<th>Phase Two</th>
<th>Phase Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>Presentation of concept</td>
<td>Presentation of data</td>
<td>Relating data to concept</td>
</tr>
<tr>
<td>Model 1</td>
<td>Presentation of data</td>
<td>Development of categories by students</td>
<td>Identification and naming of concepts</td>
</tr>
</tbody>
</table>

**Social System**

The next element is the social system, which refers to two elements: *students* and *teacher* roles, and norms or the student behaviour which is rewarded. In some models, the teacher is the reflective facilitator of the group work. In other situations, the teacher may be a leader, an dependable figure. Social system is an important element of every model. Specific learning is very much controlled by the kinds of relationship that are structured during the process of teaching. Models of teaching prescribe system for teaching of attitudes, skills and understanding.

From following figure, it can be seen that as roles, relationships, norms and activities become less externally imposed and more within the students’ control, the social system becomes less structured. Some models where the teacher is the taskmaster are often more structured than other models. However, the structure of all the models can be varied greatly to adapt to the nature of the students.
**Principles of Reaction**

This aspect tells the teacher as to how to deal with the learner. For instance, teachers can shape behaviour of the students by rewarding desirable behaviour and maintaining a neutral stance towards undesirable behaviour. In some models designed to develop creativity, teachers may maintain a neutral stance to give room for students to become self-directed.

Principles of reaction provide the teacher with rules of thumb by which to tune in to the student and select model appropriate responses to what the student does.

**Support System**

The aspect of a model is the support system, which means to provide facilities to teacher and the students, to successfully implement the strategy of teaching. For example, if we want to implement individualization, we have to provide a number of audio visual aids, programmed text, laboratory work, quizzes and so on to cater to the needs of individual learner.

**3. Instructional and Nurturant Effect**

The effects of a learning effect can either be direct or indirect. Effect can be considered direct if the effect comes from the content and skills on which the activities are based. However, latent or implicit effects are often observed which can also be attributed to a learning environment. Hence, the description of the effects of models can be validly categorized as the direct or *instructional* effects and the indirect or *nurturant* effects. The
Instructional effects are those directly achieved by leading the learner in certain directions. The nurturant effects come from experiencing the environment created by the model. In choosing a suitable model for teaching, a teacher must select a model that balances the instructional efficiency or directs with the predictable nurturant effect in the following figure.

![Diagram of Instructional and Nurturing Effects](Fig.-3:-Instructional-and-Nurturing-Effects)

Obtaining good scores in the three crucial subjects (Physics, Chemistry and Biology) from Class IX to XII examinations may be the goal for students aspiring to enter medical college. High competition towards the attainment of this goal may be the direct effect—A in above Figure. However, the effect of reaching the goal may also trigger feelings of inferiority, which in this case is the nurturant effect—B. Similarly the effect of reaching the goal may also develop team spirit—C as a nurturant effect. The teacher will then have to balance A the direct effect, with the relative effects of B and C. If we have three models whose instructional effects are appropriate for our goal of securing good marks in Physics – Chemistry – Biology, we may choose one over the other two because its nurturant affects further other goals or because they reinforce the direct instructional effect.
If we have three models whose instructional effects are appropriate for our goal of teaching the basic concepts of electrostatics, we may choose one over the other two because its nurturant affects further other goals or because they reinforce the direct instructional effects. Following figure illustrates these instructional and nurturant effects.

![Diagram of Instructional and Nurturant Effects](image)

(Fig.-4 :- Instructional and Nurturant effects – Sample model in Science)

4. **TRAINING STRATEGY FOR MODELS OF TEACHING:**

Joyce and Weil (1985) have suggested four components of training teachers. They are:

- Presentation of theoretical bases
- Demonstration of correct performance.
- Planning and executing peer teaching and provision of feedback
- Transfer of training that is adapting of teaching behaviour in the classroom.
The three phases in the teaching strategy is shown in the following figure –

![Diagram](Fig.-5 :- Phases in Training Strategy)

Each component has specific objectives and these objectives are attained through a series of sub-steps involved in each component. Models most suitable for effective science teaching are listed in following table-

**Table No.-T.I.2:- Models Most Suitable for Science Teaching**

<table>
<thead>
<tr>
<th>Concept Attainment</th>
<th>Information Processing Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Inquiry</td>
<td>Behavioural Model</td>
</tr>
<tr>
<td>Direct Training</td>
<td>Social Interaction Model</td>
</tr>
<tr>
<td>Laboratory Method</td>
<td>Personal Models</td>
</tr>
<tr>
<td>Synectics Model</td>
<td></td>
</tr>
</tbody>
</table>

During the last two decades a lot of attention has been given to improving the process of teaching, resulting in the development of a number of models of teaching by various researchers (Decceco, 1968; Haddan, 1970; Joyce and Weil, 1972; Brady, 1980). All these models are based on empirical researches, theories, hunches, postulates, hypothetical propositions, etc. Among them, the monumental work of Joyce and Weil (2003) classified 24 teaching models into four families, as follows:

i. Information processing models,

ii. Social interaction models,

iii. Personal models,

iv. Behavior modification models.
**Information Processing Model** –

This model share an orientation towards information processing capability of students and the ways they can improve their ability to master information. Information processing refers to the way people handle stimuli from the environment, organize data, sense problems, generate concepts and solutions to problem and employ verbal and non-verbal symbols. The models that are under umbrella of this family are Inductive Thinking Inquiry Model, Scientific Inquiry Model, Inquiry Training Model, Concept Attainment Model, Biological Science Inquiry Training Model, Cognitive Growth Model and Advance Organizer Model.

**Social Interaction Model** –

This model emphasizes the relationships of the individual to society and to other persons. They focus on the process by which reality is socially negotiated. Consequently, with respect to goals, models from this orientation give priority to the improvement of the individual’s ability to relate others to engage in democratic processes and work productively in the society. Social Interaction Models include ‘Group Investigation Model, Social Inquiry Model, Laboratory Model, Juries Prudential Inquiry Model, Role Play Model, Value Discussion Model and Social Simulation Model.’

**Personal Model** –

This type of the teaching model shares an orientation towards the individual and the development of selfhood. The models emphasize the processes by which individuals construct and organize their unique reality. Frequently, they focus on the emotional life of the individuals. It’s expected that the focus on helping individuals to develop a productive relationship which the environment and to vie themselves as capable persons will produce richer interpersonal relations.’ The models’ belonging to this family are Non-directive Teaching Models, Awareness Model, Synectics Model,
Conceptual System Model and Classroom Meeting Model (Social Problem Solving Model).

**Behaviour Modification Model** –

These types of the model were evolved from attempts to develop efficient systems for sequencing learning tasks and shaping Behaviour by manipulating reinforcement. The models in this family are Programmed Instruction, Managing Behaviour Model, Anxiety Reduction Model, Assertive Training Model, Simulation Model and Direct Training Model.

**I.9 A-1. ADVANCE ORGANIZER MODEL:**

In the present research the Instructional Method i.e. Advance Organizer Model (AOM), Biological Science Inquiry Model (BSIM) and Traditional Method (TM) have included primary variable in the factorial design. Advance Organizers Model and Biological Science Inquiry Model have a tremendous promise in changing the role of the class teacher. It may be attributed to an explosion in the knowledge which has added a new dimension to already complex problem of education.

Hence, the present study included (AOM) and (BSIM) as primary variable in the factorial design. The researcher has developed a Model lesson plan on the topic “Cell and Tissues” in the subject of Biological at secondary level. The syntax has been planned and evaluated empirically.

The decent is using an Advance Organizer in this case a powerful concept used by art Historians. This Organizer contains many subordinate ideas that can be linked to the particular characteristics of the art object being viewed in this scenario the teacher has thus provided students with what David Ausubel calls an “Intellectual-Scaffolding” to structure the ideas and facts they encounter during their lesson.
David Ausubel is an unusual educational theorist; first he directly addresses the goal of learning subject matter. Second he advocates the improvement of presentational methods of teaching (lectures and reading) at a time when other educational theorist and social critics are challenging the validity of these of these methods and finding fault with the “passiveness” of expository learning. In contrast to those who advocate discovery methods of teaching, “open education”, and experience based learning, Ausubel stands imabashedly for the mastery of academic material through presentation.

Ausubel is also one of the few educational psychologists to address learning teaching and curriculum simultaneously. His theory of meaningful verbal learning deals with three concerns: (1) How knowledge (curriculum content) is organized, (2) How the mind works to process new information (learning), and (3) How teachers can apply these ideas about curriculum and learning when they present new material to students (instruction).

**IMPLICATIONS FOR CURRICULUM**

Ausubel’s ideas about subject matter and cognitive structure have important and direct implications for the organization of curriculum and for instructional procedures. He uses two principles progressive differentiation and integrative reconciliation to guide the organization of content in the subject fields in such a way that the concepts become a stable part of a student’s cognitive structure and to describe the student’s intellectual role. Progressive differentiation means that the most general ideas of the discipline are presented first, followed by a gradual increase in detail and specify.

Integrative re-conciliation simply means that new ideas should be consciously related to previously learned content. If the entire body of material has been conceptualized and presented according to progressive differentiation, integrative reconciliation follows naturally, through it
requires the learner’s active cooperation. Gradually as a result of both principles the discipline is built into the mind of the learner.

**IMPLICATIONS FOR TEACHING**

Advance Organizers are the primary means of strengthening cognitive structure and enhancing retention of new information. Ausubel describes Advance Organizers as introductory material presented ahead of the learning and at a higher level of abstraction and inclusiveness than the learning task itself.

Their purpose is to explain integrate and interrelate the material in the learning task with previously learned material. The most effective organizers are those that are concepts, terms and propositions that are already familiar to the learners, as well as appropriate illustrations and analogies.

![Advance Organizers Model](Fig.- 6 :- Instructional and Nurturant Effects : Advanced Organizer Model)
Instructional and Nurturant Effects :- Advance Organizers Model-

Syntex-

Phase One : Presentation of Advance Organizer

(a) Clarify aims of the lesson.
(b) Present Organizer.
(c) Identify defining attributes.
(d) Give examples.
(e) Provide context.
(f) Repeat.
(g) Prompt awareness and of learner’s.
(h) Relevant knowledge and experience.

Phase Two : Presentation of learning task or material –

(a) Present material
(b) Maintain attention
(c) Make organization explicit
(d) Make logical order of learning

Phase Three : Strengthening Cognitive Organization –

(a) Use principles of integrative
(b) Reconciliation
(c) Promote active reception learning.
(d) Elicit critical approach to subject matter.
(e) Clarify.

I.9 A-2. BIOLOGICAL SCIENCE INQUIRY MODEL (BSIM):-

Biological Science Inquiry Model (BSIM) in an inductive and learner centered approaches of teaching based on Biological Science propounded by J. Schwab (1965) to teach scientific knowledge and to develop interest in scientific inquiry. Not only can the nature of science but process of research in Biology also be introduced to students. They can also learn planning and
execution of projects and self learning involving acquisition of knowledge through observation of phenomena creative thinking and activities.

The Biological Science Inquiry Model is designed to teach the processes of research Biology to affect the ways students’ process information and to nature a commitment to scientific inquiry. It probably also nurtures open mindedness and an ability to suspend judgment and balance alternatives. Through its emphasis on the community of scholars, it also nurtures a spirit of cooperation and an ability to work with others.

Scientific Inquiry Models have been developed for use with students of all ages from preschool through college (1995). The core purpose is to teach the essential process of science and concurrently major concepts from the disciplines along with the information which these have been developed.

Research on there models has usually focused on entire curricula that have been implemented for one or more years, using the models consistently.

(Fig.-7 :- Instructional and Nurturant Effects⁸)

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Biological Science Inquiry Model with appropriate materials of instruction two types of findings are of particular interest to us. The first is that teachers. Who would use them need to engage in intensive study both of the academic substance and of there models of teaching. Otherwise they tend to with draw from inquiry based instruction.

The second is that where these models have been well implemented with adequate attention to teacher’s study of academic content and teaching process, the result has been impressive.

**Syntax:**

Phase One : Pore area of investigation to students.
Phase Two : Students structure the problem.
Phase Three : Students identify the problem in the investigation.
Phase Four : Students speculate on ways to clear up the difficulty.

**Social System -**

The model has moderate structure and cooperative, rigorously intellectual climate.

**Principles of Reaction -**

Teacher nourishes inquiry turning students toward inquiry process rather than identification efforts.

**Support System -**

The model requires a flexible instructor skilled in the process of inquiry and a supply of problem areas of investigation.

**Implication for Teaching -**

The BSIM used several techniques to teach science as inquiry. First, it uses many statements that express the tentative nature of Science, such as,
“We do not know” we have been unable to discover how this happens and “The evidence about this is contradictory”.

BSIM uses what is called a narrative of inquiry in which the history of mazor ides in Biology is described and the course of inquiry in that area is followed. This model is designed to bring students directly into the scientific process through exercise that compress the scientific process into small periods of time. Its increased understanding of science, productivity in creative thinking and skills for obtaining and analyzing information.

This model originated in a belief in the development of independent learners its method requires active participation in scientific inquiry. The general goal of inquiry training is to help students develop the intellectual discipline and skills necessary to raise questions and search out helping students’ inquiry independently but in a disciplined way.

Although inquiry Model was originally developed for the natural sciences, its procedures are usable in all subject areas. Any topic that can be formulated as a puzzling situation is a candidate for inquiry training.

This model has been designed to teach inquiry skills, autonomous leaning, creativity spirit etc. It also promotes proficiency in verbal expressions, tolerance of ambiguity, persistence, logical thinking and the like. It helps in learning observing, collecting and organizing data, formulating explanations and drawing inferences. Student can even become proficient in listening to others and remembering what has been said.

I.9 A-3. TRADITIONAL METHOD:--

The content treatment helps in formulating relevant IO’s. In technical terms these two go in hand and provide direction as to what needs to be done. Therefore, the term ‘Task Analysis’ is also used to refer to these. Having carried out task analysis, the next task in instructional designing is
the selection of LE’s (Learning Experiences). It is pertinent to recall the examples of teacher reactions. Several LEs that different teachers provide could be similar. Effective teachers seem to know ‘how’ to carry out the LEs for greater impact. That is, selected LEs provided in some organized manner tend to have greater effectiveness. If every teacher knows it, LEs could be more effectively selected and executed in all classrooms. In fact, this need was one of the earliest to be explored into. Attempts were a foot as early as the first half of the twentieth century to understand what goes to make effective teaching. The underlying assumptions pertained to the possibility of discerning a systematic scheme for teaching-learning process. Through continuous efforts, it has been possible to identify certain ways in which LEs can be implemented effectively. At present, we know these identified ways as “Methods of Teaching”. The term ‘method’ suggests a few defined steps to be followed in carrying out a task. It implies certain given conditions within which these steps can be applied or followed systematically and will lead to achievement of the purpose or objectives set for the task. That is, systematic application of the prescribed steps will ensure realization of objectives efficiently. In the same line ‘teaching method’ pertains to the systematic application of steps during teaching-learning process under certain given conditions, for the purpose of pupil learning. It is necessary to recognize that such a view is not in line with the meaning or the main characterization of teaching as a creative and dynamic process. So that is to say that, instructional methods are nothing but identified distinct way of organizing and carrying out instructional interactions. A teacher with an understanding of these instructional methods is better equipped to create effective instructional situations.9

According to R.A. Sharma - “Traditional style of the presentation in classroom is called Traditional Method.”

According to Banthiya - “The traditional arrangement of learning events adopted by the teacher to facilitate learning to occur in the students or trainees.”

All instructional methods are originated from the teacher. Students are the recipient in the process; they are led by the teacher through the process in the pre-decided route designed by the teacher. Though both students and the teacher are actively engaged in the process, the focus is on the presentation of LEs by the teacher, and so these are called ‘Teacher Centered’ or ‘Autocratic’ or ‘Traditional’ methods of teaching. The Traditional Methods are content centered and teacher remains more active and students are less active or passive listeners. The Traditional Methods of teaching realize cognitive objective. These are high subjective and conventional style of teaching methods.

**TYPES OF TRADITIONAL METHOD :-** The main Traditional Methods are the following-

i. **LECTURE METHOD**

ii. **DEMONSTRATION METHOD**

Significant features of traditional instructional methods are stated below which help the teacher might understand instructional methods in proper perspective. A brief description of the commonly known instructional methods including the Meaning, Component, Steps, Potential and Limitations for each in following paragraphs-

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(i). **LECTURE METHOD:**

**Meaning** -
Continuous oral, systematic, verbal articulation by teacher involving narration, description as well as explanation as required, providing meaningful auditory experience to pupils is called lecture. This has been one of the oldest Traditional Methods in which teaching as “Transmission of Knowledge” has been carried on. Sometimes learners may find it difficult to understand that knowledge on their own, or that knowledge may not be within the reach of pupils—as during ancient times. Learners essentially ‘receive’ during lecture. That is, their participation is mainly non-verbal as they remain attentive mentally and grasp the essence of what teacher presents. It is useful:-

- For introducing a theme.
- For providing basic knowledge.
- For simplifying complex concepts, theory or phenomenon.
- For a meaningful consolidation of various ideas dealt with.

At school level, teacher explication is useful for the first two and the last of the above.

**Steps** -
- Introductory remarks.
- Presentation of the explication.
- Concluding remarks.

**Components** -
- Clear statement of each point.
- Logical links between points.
- Relevant illustrations.
- Narration of any sequential presentation.
- Description of any detail.
• Explanation of cause-effect relationships.
• Simple and clear sentences to the level of audience.

**Teacher Student Organization**

In case of one way lecture method teacher student ration may range from (1:50 to 1:100). The teacher usually uses a public address system to amplify his/her voice. Chalk board is used as a banner to write the title of the talk in large size letters. Basically only speech is used for communication by the teacher.

**Potential**

• Economical; needs no apparatus or laboratory.
• Effective for giving factual information.
• Develops effective audience habit.
• Develops basic concepts.
• Saving time and covers syllabus in limited time.

**Limitation**

• Little scope for pupil activity other than listening.
• Does not consider individual variations.
• Can become monotonous after a while.

(ii). **DEMONSTRATION METHOD**:-

**Meaning**

Demonstration can be defined as a combination of verbal explanation coupled with a live display using apparatus for presenting important facts, ideas, or process. It can be considered to be an audio-visual explanation. Demonstration may be given to a whole class, a small group or to an individual student.

Demonstration is a teaching method that normally combines oral explanation with the handling or operation of equipment or materials (aids).
In this method you will be showing to the students what to do and how to do by actually performing an operation or doing a job. It is a method having tremendous potential to trained students in manipulative skills.

**According to Banthiya** - “Demonstration is a useful method for developing skills both psychomotor as well as cognitive.”

**Steps** -

- Preparatory period.
- Process of demonstration – sequential or orderly.
- Follow up period.

**Components** -

- Full information.
- Attention catching, proper placement of apparatus or articles.
- Good posture of demonstrator.
- Speech modulation.

**Teacher Student Organization** -

The strength of group of observer students should ideally be 6 to 12 students. However if the model (OHP- Model) and its moving parts are visible from a distance of 10 meters are so than demonstration can also be organized in normal classroom having students up to 40 or 80. Visibility and audibility should be the criteria for deciding the place and group size of students.

**Potential** -

- Makes hard to describe terms and processes concrete.
- Develops interest in students.
- Develops keen observation.
- Gives a scope for critical analysis.
**Limitations** -

- Selective items can be demonstrated and not all abstract or difficult things.
- Require a proper arrangement for it without which it is ineffective.
- Every teacher may not be competent to effectively demonstrate.
- Need more time?

**RELEVANCE OF TEACHING METHODS**:-

Search for effective methods of teaching became a major concern during the past century and a half since school as it is known as today became a specialized agency for educating individuals. Despite the widely prevalent view that teachers are born not made, the need for enlisting more teachers also brought to light that their effectiveness varied. During the post industrial revolution period a need arose for enlisting services of a large number of teachers in the newly established schools. Further in the emerging social order, the concept of common curriculum for all learners of a particular stage came into vogue. The necessitated some common level of quality among all teachers. All such development to emerge of teaching as a new organized occupation with the larger group of teachers, variations suggested the need for identifying what and how effective teachers do during instructional process. Large scale observations of a variety of teachers enabled identification of clusters of behaviors of teacher and student during the instructional process that could fairly seem distinct. There behaviors or interactions could be recognized in some sequence and a logical explanation provided. Teachers seem to have a purpose or a why for the sequence. Explanation such as, ‘I wanted to … so I did could be discerned. Several such clusters of sequential behavior of teachers and students for an explicit purpose came to be termed “teaching methods”. Thus, teacher’s verbal explication become lecture Method teachers recreating any process by
operating in it front of learner group came to be named as demonstration and so an. Every instructional method in differentiated in respect of the kind of instructions it can generate the role of teachers and learners the potential it has for activating specific learners behaviors. Several such instructional methods have been identified and propagated for classroom use. Knowledge of there and competence to utilize them appropriately (select and implement), it is surmised, will enhance change of teacher effectiveness. For, teacher gains a repertoire of “tools” to select from in the light of the objectives for which they are needed.

**I.10. DELIMITATION OF THE STUDY:**

Though it is necessary to study on large sample but due to limitation of time and number of students the present study has been delimited as follows:-

1. The study has been completed in English medium schools affiliated to C.B.S.E. Board situated in Bhiwani district of Haryana State.

2. The sample has been drawn from IX class students of Science stream from the Institution of urban population and the students were taught according to their school time table.

3. Researcher has been completed her studies by taking the Topic “Cells and Tissues” in Biology subject for IX class students of C.B.S.E. Board.

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