CHAPTER - I

INTRODUCTION

CHAPTER - I

INTRODUCTION

1.0.0 INTRODUCTION

Knowledge is power. Educating people is to empower them. Empowerment is an indicator of development and education is required for all. Knowledge of the society and culture is essential to interact with others and also to bring changes in social structure and culture. Education begins at home and continues in various places and school is the important place, where child takes part in the learning-process. Teaching -learning process in school education was in traditional methods and teacher centered. Here teacher seems to be active and the students are passive learners. Thus learning is not interesting, students' participation is less. The quality of education has become the need to be improved at present in middle school level. Therefore, educators, administers, planners thought of making school education interesting and child centered and quality of education to be maintained. Different subjects are dealt in the class rooms. Due to the lack of proper teaching-learning materials, the learning becomes futile. Therefore, it is required to make the classrooms interesting by using different teaching-learning materials for teaching the different subjects.

1.1.0 CHEMISTRY AS A SUBJECT

Chemistry is an essential basis for many facets of our everyday lives. An understanding of chemistry allows us the opportunity to make sense of, and explain the world around us.

Learning in chemistry allows for the development of a lot of general skills, e.g. problem solving, being sensitive to and aware of dangers and hazards, for environmental protection, or understanding how science contributes to society's sustainable development.

Chemistry also offers many career opportunities. Chemistry education should give students guidance regarding potential future employment in chemistry related

jobs. Since chemistry is related to other works also, so a good grounding in chemistry can provide many opportunities in not just chemical industry. Understanding chemistry is necessary for working in almost all the other sciences such as biology, archaeology, geology, material sciences, engineering, environmental sciences, and medicine.

Finally, chemistry as a science offers unique opportunities for learning about how science works and about the interaction of science, life and society. In this way chemistry has the potential to contribute to developing general educational skills. Some of these skills do overlap with the other sciences, some are even beyond all the sciences, but some of them are also unique to chemistry. From all these reasons, it is asserted that chemistry is a subject that should be taught in the best way possible to all students. It should not be limited or solely oriented towards those few students intending to embark in the future on an academic career in chemistry. Chemistry is essential for allowing all students a thorough understanding the world around them, to enable them to contribute in societal debate about science and technology related issues, but also possible. Unfortunately, throughout the history of chemistry education many chemistry education programs failed to achieve many of these rather demanding goals.

1.2.0 INSTRUCTIONAL STRATEGY

The term strategy has been popularly used in the case of battle or war but during the recent past social scientists has also started using it. There is no doubt that the use of right strategy in teaching as in any other endeavor smoothens the process of teaching and quickens learning.

Dick and Carey use the term *Instructional Strategy* to describe the process of sequencing and organizing content, specifying learning activities, and deciding how to deliver the content and activities.

1.2.1 Elements of an Instructional Strategy

Creating an instructional strategy involves taking all of the information that has been accumulated to this point and generating an effective plan for presenting the instructions to the learners. The knowledge of learning and design theory must be combined with the experience of learners and objectives. Creating a strategy is

not the same as actually developing instructional materials. The purpose of creating the strategy before developing the materials themselves is to outline how the instructional activities will relate to the accomplishment of the objectives. This provides with a clear plan for subsequent development. There are four elements of an instructional strategy:

Content Sequence and Clustering

Learning Components

Student Groupings

Selection of Media and Delivery Systems

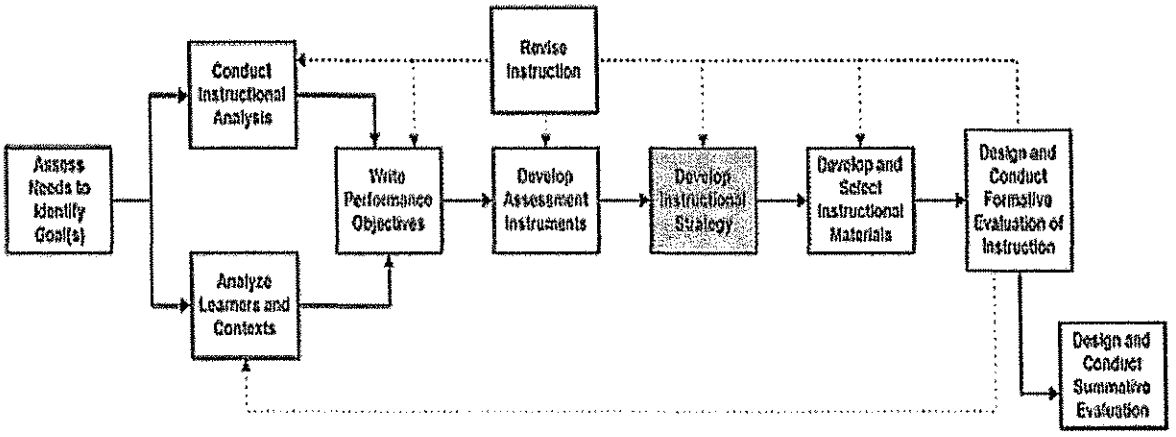

Fig. 1.1: Content Sequencing and Clustering

- **Element 1 - Content Sequencing and Clustering**

Content Sequencing

The first step in developing an instructional strategy is deciding on a teaching sequence and groupings of content. Whether developing a lesson, a course, or an entire curriculum, decisions must be made regarding the sequencing of objectives. The best way to determine the sequence is to refer to instructional analysis. Beginning with the lower level subordinate skills on the left and work up through the hierarchy until the main goal step is reached. Then instruction is provided on integrating all of the steps in the instructional goal (attainment of the terminal objective).

Clustering Instruction

The next important consideration is how to group instructional activities.

Information may be presented with one objective at a time, or cluster several related objectives. The following factors should be taken into consideration when determining how much or how little instruction to present at any given time:

1. The age level of the learners
2. The complexity of the material
3. The type of learning taking place
4. Whether the activity can be varied, thereby focusing attention on the task
5. The amount of time required to include all the events in the instructional strategy for each cluster of content presented.

- **Element 2 - Learning Components**

The next element in an instructional strategy is a description of the learning components for a set of instructional materials. Here, a mention of Gagne's *Nine Events of Instruction*, is required.

Gagne's events of instruction are designed to help learners get from where they are to where the instructor wants them to be. It is a set of external teaching activities that support the internal processes of learning. Following is a list of the events, in the order they are typically employed:

1. Gaining attention
2. Informing learner of objectives
3. Stimulating recall of prior learning
4. Presenting the stimulus material
5. Providing learning guidance
6. Eliciting the performance
7. Providing feedback about performance correctness
8. Assessing the performance
9. Enhancing retention and transfer

Each of these events may not be provided for every lesson. Also, one or more of the events may be provided by the learners themselves, particularly experienced self-learners.

- **Element 3 - Student Groupings**

The next element of an instructional strategy is a description of how students will be grouped during instruction. It is important to consider whether there are any requirements for social interaction explicit in the statement of your objectives, in the performance environment, in the specific learning component being planned, or in the own personal views of the instructor. Student groupings can hinder individual learning, but at the same time they can motivate students and keep them interested. Also, the delivery system can affect the amount of social interaction possible. Example, a distance-delivered course makes it hard to promote social interaction between students. Similarly, computer-based instruction can be hard to do with groups of students.

- **Element 4 - Selection of Media and Delivery Systems**

This is the fourth and final element of an instructional strategy. Once decisions have been made about content sequencing and clustering, and the learning components have been planned, time attention should be paid to selecting a delivery system for the overall instructional system, along with the media to be used to present the information in the instruction. The selection of a delivery system indicates a general preference for emphasizing certain instruments to accomplish instructional events. Within this general preference, specific agents or media can be assigned, event-by-event, objective-by-objective to accomplish the intended goal.

The overall delivery system includes everything necessary to allow a particular instructional system to operate as it was intended and where it was intended. Some examples of delivery systems include:

- Classroom delivery
- Lecture
- Correspondence
- Videotape
- Videoconference
- Computer-based
- Web-based

Once the delivery system has been chosen, various media can then be chosen to deliver the information and events of instruction. Media constitutes the physical elements in the learning environment with which learners interact in order to learn something. The choice of media is done as part of the instructional strategy.

The choice of a delivery system is generally made at the course or curriculum level. The ideal way is to base the decision on the goal, learner characteristics, learner and performance contexts, objectives, and assessment requirements. Different instructional media have different capabilities for providing the various events of instruction. For example, teachers are great for providing learning guidance and feedback; however, videotape can be used effectively to present stimulus situations that would be hard for a teacher to present in any other way (for example, a tour of Taj Mahal).

1.2.2 Need for a new strategy for teaching chemistry

In recent years, there has been a wide spread support around the world for reforming science education in general and chemistry teaching in particular. Many researches in Europe and US suggest that many chemistry programmes all over the world and their related pedagogies are inadequate for sufficiently meeting the challenges.

Over the past twenty years, research in chemistry teaching has revealed that a vast majority of chemistry students at all levels learn chemistry by rote memorization. Although many students perform satisfactorily on exams, it has been found on

interviewing students can reveal gross misconceptions regarding chemical phenomenon.

Hence, there is a need for instructors to rethink on the instructional strategy so that they can teach for meaning and not simple playback of chemical concepts.

One suggestion that Herron has offered is that we can help students acquire surrogate concepts that can substitute for the real thing by providing extensive experience with concrete props that model the abstract concept. Here integration of new technology into teaching is essential. The hope is that the transition from the surrogate to the real will become increasingly easy as the student matures. Thus many areas of chemistry can be better taught using technology.

In this study, the instructional strategy consists of Concept Attainment Model (CAM) with multimedia instructions.

1.2.3 Concept Attainment Model (CAM)

This model of teaching was developed by Jerome Bruner and his associates Jacqueline Goodrow and George Austin.

Concepts are the building blocks of knowledge. Concept Attainment is "the search for and listing of attributes that can be used to distinguish exemplars from non- exemplars of various categories."(Bruner, Goodrow and Austin, 1967).

1.3.0 ELEMENTS OF A CONCEPT

There are six elements in a concept

- Name
- Essential attributes
- Non essential attributes
- Positive examples and negative examples
- Rule

1.3.1 Name

Each and every concept is related to a particular term called name. Fruit, pen, pencil, books are all names given to objects. Although the items or data present in

each category differ slightly from other items common, features cause these different objects to be referred as the same general term.

1.3.2 Essential Attributes.

The similar features or characteristics that help one to place similar items under the same category are called essential attributes. If one takes the examples of a living animal or plant. This concept has 1) Reproductive 2) Respiration 3) Growth and development 4) Metabolism as essential attributes.

1.3.3 Non-essential Attributes.

The attributes which do not help in identifying the concepts are called non essential attributes. Shape, weight they are non essential attributes of a flower. These character/attributes which interfere in identifying concept are called non essential attributes. The task of learning a new concept is made more difficult by the presence of many non essential attributes. It is difficult for a student to focus on the essential features.

1.3.4 Positive examples and negative examples

"Bruner" uses the term "exemplar" to refer to instance of the concept. Those instances that contain all the characteristic attributes are called positive exemplars. The absence of one or more characteristic attributes makes an instance a negative exemplar.

1.3.5 Rule

A rule statement evolves at the end of the concept attainment model. The teacher often uses for summarizing the findings of their search for attributes. Rule statement just reflects successful utilization of the other elements of concept i.e. negative and positive exemplars and nonessentials and essential attributes

1.4.0 TYPES OF CONCEPTS

There are three types of concepts as identified by Bruner. It is important to recognize and distinguish among them, because the type of concept affects the

1.6.1 Selection Strategy

This strategy is used when the teacher is free to choose concept instance (exemplars and non-exemplars) in order to best hypothesise about concepts. Here, the labelling and sequencing of example are different. In this case, the example is not labeled until students ask whether yes or no. Also the students can ask about their own examples in order to attain the concept. Much freedom in this case is in the hands of the students.

Syntax

Phase - I: Presentation of data and identification of concept/ attributes:

1. Teacher present unlabelled examples.
2. Students enquire which examples including their own are positive ones.
3. Students generate and test hypothesis
4. Name the concept
5. State its essential attributes.

Phase - II: Testing attainment of the concept

1. Students identify additional unlabelled examples
2. Students generate examples
3. Teacher confirms hypothesis names concepts, restates definition according to essential attributes.

Phase - III: Analysis of thinking strategy

1. Students describe thoughts
2. Students discuss role of hypothesis and attributes.
3. Students discuss type and number of hypothesis
4. Evaluate strategies.

1.6.2 Reception Strategy

In this strategy, negative and positive examples are presented in a sequence before the students. The students identify the common characteristics (attributes) of those examples and hypothesise the concept.

Syntax

Phase - I: Presentation of data and identification concept/ attributes:

1. Teacher presents unlabelled examples
2. Students compare attributes in positive and negative examples
3. Students generate and test hypothesis
4. Students state a definition according to the essential attributes.

Phase - II: Testing attainment of the concept

Students identify additional unlabelled examples as 'yes' or 'no'.

Phase - III: Analysis of thinking Strategy.

1. Students describe thoughts
2. Students discuss role of hypothesis and attributes
3. Students discuss type and number of hypothesis

1.6.3 Unorganized Material Model

Here, the material is unorganized when present to students. This procedure involves:-

- Locating the concept.
- Identifying attributes
- Discussing adequacy and appropriateness of the attributes
- Comparing the examples to other passages using the same concept.

Generally, progression to analyse the concept in unorganized material strategy is part of a sequence of instruction in concept analysis activity. This is much more than group discussion than an instructional exercise, such as the reception and selection discussion and to ensure that it focus on the development of a concept in the material.

Syntax

Phase - I :- Description of concept as it is used

1. Locate and label concept

2. Identify attributes being used

Phase - II: Evaluation of concept

1. Discuss adequacy and appropriateness of concept being used.
2. Compare example to other data using same concept.

Phase III: Analysis of thinking strategy.

1.7.0 MULTIMEDIA/ INTEGRATION OF TECHNOLOGY IN EDUCATION

Multimedia (Latin Multum + medium) is the media that uses multiple forms of information content and information processing (example: text, audio, graphics, animation, video interactivity) to inform or entertain the audience(user). Multimedia also refers to electronic media. To store content multimedia is similar to traditional mixed media in the fine art craft, puppets, role play but with a broader scope. The term rich media is synonymous for inter active multimedia.

1.8.0 TYPES OF MULTIMEDIA

Multimedia has been broadly classified into two types-

1) Linear 2) Non – Linear

Linear active consent progress without any navigation control for the viewer such as cinema presentation, nonlinear content is also known as hypermedia content. Multimedia presentations can be live or recorded presentations may allow interactivity via a navigation system. Multimedia presentations may allow interactivity via interaction with the presenter performer.

1.9.0 CLASSIFICATION OF EDUCATIONAL MULTIMEDIA

The educational multimedia is classified as:

- Theoretical part- Subject matter related to the topic and this matter process through activity example matter based activity, animation in AV- form.
- Animation parts in multimedia include all activities in movable form.
- Graphical representation includes all diagrammatic part in graphical form to develop specific creativity among students.
- Activity related to subject matter.
- Quizzes dealing with exercise.
- Model question papers.

1.10.0 ADVANTAGES OF EDUCATIONAL MULTIMEDIA

- Qualitative response to the sensory perception of the pupil by fully or partially substituting the traditional practice of verbal teaching.
- Liberation of pupils from the compulsion of utilizing maximum time for curricular activities.
- Elimination of psychological alienation of pupils from the subject matters of the school curriculum because of bearing pedagogy like verbal teaching.
- Minimization of difference among high and low achievers in particular class.
- It provides the teacher with the means of extending the horizon of experience.
- It helps the teacher provide meaningful sources of information.
- It assists the teacher in overcoming physical difficulties of presenting subject matter.
- A-V technologies provide the teacher with rich sources of pupil purpose when communicative materials are produced jointly by pupils and teachers.
- A-V technologies provide the teacher with a kit of tools to carryout diagnostic research and remedial work demanded by up-to-date instructional purposes.

1.11.0 NEED AND JUSTIFICATION OF THE STUDY/ SIGNIFICANCE OF THE PROBLEM

Over the years, research and curriculum development have shown that effective instruction is much more than the presentation of a concept, process, or skills. Learning is the process whereby knowledge is created through transformation of experience (Kolb, 1984). This definition implies that the curricula of school science subjects must be structured and sequenced, in particular how a session or a whole course may be taught to improve student learning. Gibbs (1988) noted that individuals differ in their preferred learning styles and recognizing this is the first stage in raising students' awareness of the alternative approaches possible and helping them to become more flexible in meeting the varied demands of learning situations. Teachers also need to recognize their own learning styles as a basis for the development of effective teaching and learning strategies (Healey & Jenkins,2000). Learning may suffer where there is marked mismatch between the style of the learner and the approach of the teacher (Fielding, 1994).With the

expansion of higher education in many countries and the increasing emphasis on access, diversity, retention rates and life-long learning, there is a good reason to explore the nature of different learning styles (Healey & Jenkins, 2000).

The conceptual aspects of chemistry in middle and higher education are generally presented to the students so as not to establish relationships with their scientific origins nor with the social or technological, in most schools. Thus, several authors reported obstacles in Chemistry Teaching, highlighting the fact that there is a separation between the scientific and academic communities, and this does not contribute to the understanding of knowledge and the processes of teaching and learning. On other hand, there are successful attempts to bring scientific concepts to "Chemistry" classroom, through analogies, contextualization, and experimentation and use everyday for the teaching of science in high school.

Chemical educators have long recognized that students have difficulty learning chemistry concepts (Some of the reasons put forth to explain this difficulty include the ideas that: (a) Chemistry involves very abstract ideas that are not easily seen or understood (b) Solving chemical problems often require students to access and process many different concepts and data at the same time (c) In order to be successful at understanding chemistry concepts, students must be able to think and convert between the macroscopic, particulate (sometimes called the microscopic, molecular, or submicroscopic),and symbolic levels of representation and (d) Students learning chemistry often have strongly-held preexisting conceptions that are inconsistent with scientifically-accepted theories and can interfere with subsequent learning.

Most visualization designed for chemistry instruction involves depictions either as static images or as dynamic visuals including both animations and simulations. Therefore, these visuals help make the abstract concepts more concrete and can lower the cognitive load placed on the chemistry student. With proper instruction, these visuals can help students make connections between the macroscopic, particulate, and symbolic representations which can lead to more scientific conceptions on the part of the chemistry student. Since many chemistry concepts

require students to understand how the chemical systems change overtime, showing dynamic visuals can be especially helpful for students. Rieber noted that dynamic computer animations were generally useful to students studying science, but can be distracting (and diminish learning) if the lesson does not involve visualization, motion, or trajectory. Both animations and simulations can be viewed as student-centered forms of instruction, which can support student learning as they develop a conceptual understanding of chemistry topics. Therefore, the design and use of dynamic visualizations should take into account the chemical education, psychology/cognitive and multimedia theories.

Hence, this study may help teachers and educational planners in making chemistry more meaningful and fun for learners.

1.12.0 STATEMENT OF THE PROBLEM

The problem of the proposed study may be worded as:

"Effectiveness of Instructional Strategy for Teaching Chemistry to VII Standard"

1.13.0 OPERATIONAL DEFINITIONS OF KEY TERMS USED

- **Instructional Strategy**

  These are methods that are used in the lesson that the sequence or delivery of instructions helps students become independent strategic learners. In this study, the instructional strategy consists of Concept Attainment Model (CAM) with multimedia instructions.

- **Effectiveness**

  It refers to the improvement in student performance when the instructional strategies are used.

1.14.0 OBJECTIVES OF THE STUDY

1. To study the effectiveness of instructional strategy in terms of:
   (a) Achievement of students in chemistry, and
   (b) Reaction of students towards the strategy.

2. To study the effect of treatment, gender and their interaction on the achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.
3. To study the effect of treatment, style of learning and thinking and their interaction on achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.
4. To study the effect of treatment, parental profession and their interaction on achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.
5. To study the effect of gender, parental profession and their interaction on achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.

1.15.0 HYPOTHESES

Following hypotheses were formed for the study:

1. There is no significant effect of treatment on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
2. There is no significant effect of gender on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
3. There is no significant interaction of treatment and gender on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
4. There is no significant effect of style of learning and thinking on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
5. There is no significant interaction of treatment and style of learning and thinking on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
6. There is no significant effect of parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.

7. There is no significant interaction of treatment and parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
8. There is no significant interaction of gender and parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.

1.16.0 DELIMITATIONS OF THE STUDY

The study was conducted under the following constraints:

- The study is delimited to an English Medium, co-ed school of Bhopal only.
- The study is delimited to the subject of chemistry of class VII, only.
- The study is delimited to students of VII standard studying in ICSE Board.