CHAPTER - I

INTRODUCTION

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1.1 Introduction

Science has made tremendous advancement during last few years. The progress of science has brought great blessings to mankind but also has posed major challenges which attract the professional eyes of the academicians. Situation demands attention of teachers, teacher educators and researchers towards problem of instructional methodologies and instructional media to make classroom instruction effective.

The decades of the fifties and sixties witnessed an unparallel growth, in the development of new curricula in science and mathematics, all over the world. In no other field of life has the impact of scientific and technological developments more noticeable than in media taxonomy. In this age a number of new methods and techniques, to educate more persons effectively and efficiently, are being developed in many countries including India. Equally the progress of educational technology has raised a series of fundamental issues among educators and the society as a whole. Some of such issues are:

(i) to what extent can present advancement in educational technology be used to rationalize and derive the best results?
(ii) to what extent can present advancement in educational technology be helpful to improve the process of learning in and outside classroom?

(iii) What pattern of human and material resources will produce a better, quicker and more economical teaching of more individuals?

(iv) How best could these new educational technological contributions be introduced into existing educational system?

Answer to all these questions require extensive research in the area of educational technology with major emphasis on instructional media.

The great varieties of teaching methods and media sometimes confuse teachers. Optimization of learning process by correctly choosing and implementing instructional media is one of the main tasks of the teacher. Teacher does not know which instructional media or method is better, from a pedagogical point of view. Choosing a particular media or method of instruction depends upon many factors and also it is up to a teacher to decide which media serves the best. This issue equally demands research.

The explosion of population and knowledge is of such a magnitude that the process of teaching and learning
can hardly cope up with it. The educational process becomes increasingly complex day by day. In country like India; with its size and diversity in number of aspects, these pressures are acutely felt. More exciting things are happening in education today than ever before. Alternative multimedia packages and models for teaching and learning are developed day by day. New methods and techniques have been tried out and innovations have been floated in the area of instructional media. Among the new approaches and innovations that have gained great acceptance in the last few years are; programmed learning material, visual materials like slides, flashcards, filmstrips etc. and audio materials like radio, tape, records and audio-visual materials like television, films and video. There has been mass production of teaching-learning materials, however, the efficacy of the same with different units of teaching remains still to be tested.

This is the era of expansion and explosion with existing inadequacies, limitations and short-comings. It is grave concern to meet the tide of explosion in knowledge. Efforts to improve methods by teacher training programmes are yet not to the satisfaction to bring about any tangible improvement. To assist in this complex process the teacher employs the instructional materials such as text books,
workbooks, instructional plans, home assignments, reference units, achievement tests, unit tests, diagnostic tests and other teaching aids, but still teacher does not find it appropriate in bringing out the desired behavioural changes in the learner. Here, assistance of radio, television, programmed learning material and other audio-visual devices have been necessitated. The efficacy of such media has to be tried out at different levels.

Teaching has become science due to impact of science and technology. There is imperative need to create efficient learning conditions and optimizing the learning outcomes by applying the concept of educational technology in teaching-learning process. It is necessary to employ new instructional media in classroom teaching such as programmed learning material, audio-visual aids like charts, slides, models, filmstrips, films, video, tapes etc. Considering the importance of these facts it is realized that the teacher can not and ought not to be left alone, to depend upon his own resources and talents, but he must be helped to acquire skills in utilizing the new techniques of teaching. Educational technology creates a favourable climate for making classroom teaching more purposeful by adopting new media in teaching-learning process. However, the efficacy of different instructional media remains still to be tested.
Generally speaking, teachers of mathematics in school adopt lecture method or so called traditional method in teaching. It has proved through researches that this method fails to achieve instructional objectives. Besides, it also does not suit the student population with individual differences in their learning capacities. Moreover, in the recent decades many new methods and techniques have been introduced in the field of education. Due to innovations and changes in the teaching-learning process, attention of the researchers in this field is much more needed to study contribution and impact of various instructional media in teaching-learning process. Teacher does not know which media will suit to a particular piece of content and which media is better from pedagogical point of view. So, it also requires research in this field.

As the past and the recent researches in the field of education reflect, most of the investigators have tried to compare any two methods of teaching, each having single component at a time. It is important to understand that the process of developing instructional media having different components is based on several criteria viz., instructional objectives, characteristics of the learner, subject matter, resource available, attributes of the media, cost and time involved etc. It is essential to study interrelationship of
these factors and determine their relationship with the variables so that the process of selection of instructional media would not remain subjective. This calls for the researches to empirically establish the relative effectiveness of one instructional media over the other alternative instructional media in a given context. Researches of this kind have not been undertaken in India, except for the comparative studies between programmed learning material and traditional method of teaching. The findings of researches, often undertaken in foreign countries, have a handicap in that, they can hardly be applied to Indian conditions, since, the very nature of Indian society is different from those of others, and India's problems and priorities are of a different dimension. This highlights the necessity of undertaking such researches in Indian conditions. In short, what is implied here is that, in this age of technology, when technology knocks the doors of education, it is expected that some scientific studies have to be undertaken to compare the efficacy of different instructional media that have been formulated with the consideration to their availability and feasibility to Indian classroom conditions.

Therefore, with a view to scientifically modernizing the teaching style, the present investigation not only aims at developing different instructional media, but also
investigating into efficacy of one instructional media over the other in teaching of mathematics.

1.2 Background

According to Eric Ashby (1972) mankind has already passed through three revolutions in education and now it is in the midst of the fourth revolution. The first revolution took place when the task of educating the child was shifted from parents to teachers and from home to school. The second revolution occurred when the written work was adopted as a tool of education. The third revolution came with the invention of printing and use of books in education. The fourth revolution was initiated with the developments in electronics, particularly invention and use of radio, television, tape recorder, computer and other communication media in education. Behavioural scientists have joined the fourth revolution and have pointed out the importance of learning and suggested ways in which natural learning process can be utilized in the presentation of subject matter by employing these communication media. In this context, learning is more emphasized in place of teaching and learner is given importance more than the teacher. Consequently, in the teaching of mathematics, the science of behaviour of pupils undergoing the process of learning gets priority over pedagogy.
This fourth revolution has equally influenced the teaching-learning process. As a result concept of educational technology has come up. Educational technology implies a behavioural science approach to teaching and learning, in which it makes use of pertinent scientific and technological methods and concepts developed in psychology, sociology, communications, linguistics and other related fields. Educational technology as a concept does not necessarily imply the use of machines and other items of hardware. In short, educational technology, in its wide sense as understood today, includes the development, application and evaluation of system, techniques and aids in the field of learning. The growing use of educational technology in today's school will help teachers to release the teacher from the routine role of information giving, so that he can devote his time and effort for planning, arranging and evaluating learning experiences.

Active employment of various instructional media will promote improvement of the instructional process. Visual aids have their existence for a long time but, educational technology has developed a point that instructional media can be used in many flexible individually challenging ways called instructional system. The teacher is the key component of an instructional system. Each pupil is a
system component too. Classroom use of the earliest technological material was called visual education. Advancing technology changed this in a few years to audio-visual education. Years ago educators changed visual to audio visual education and then removed the hyphen. Aids were called materials, sometimes multi-sensory materials, or teaching tools. Educators today often refer to educational technology, audio visual media, instructional media to describe the same field. Terminology has not been standardized and professionals may refer to any of these terms to mean the same thing. As a result of this, instructional media like programmed learning material and visual projection through projectors or overhead projector had received more significance. One of the latest changes in the instructional method that has caught the attention of educationist, psychologists and social workers in India, is programmed learning material. The potentiality of programmed learning material as a possible mechanism for change in educational practice is now widely recognised. The Centre for Advanced Study in Education (CASE) has taken up programmed learning as a major field of study. A number of universities and other institutions in India have also undertaken some research studies related to various aspects of this instructional media. It is the demand of the time to develop and
tryout programmes not only at University level but at school level also.

The study conducted by S. Ravishanker (1981) has proved that though many schools were equipped with audio and visual materials, full use of them is not made due to reasons like; heavy syllabus, heavy workload and lack of adequate maintenance facilities. The other difficulties expressed were lack of training in the operation of technological aids. Thus, it is felt that it is a need of time to for research in the field of instructional media and their comparison. The best media in terms of pupils' achievement should be developed and should be given due emphasis in schools. School teachers should be convinced with such research results so that they can make full use of best instructional media. In short, research results should be fully utilized in the field of learning and motivation.

1.3 The problem

All educational research should begin with a carefully formulated problem. The problem selected for the present investigation is:

"An investigation into efficacy of different instructional media in the teaching of mathematics to the pupils of class IX in relation to certain variables".
1.4 Definitions of the terms

For the purpose of present study the following workable definitions of the terms involved were accepted.

1. **Efficacy** : Efficacy is the amount of learning that is purported to have been produced in pupils by the implementation of the particular instructional media. Here, efficacy is measured in terms of pupils' achievement on criterion tests administered after implementing a particular instructional media.

2. **Instructional media** : There have been several definitions for the term 'media'. Media are printed and audio-visual forms of communication and their accompanying technology. According to Salomon (1970) media can be defined in terms of unique presentation modes which fulfils unique psychological functions. Hayman and Dawson (1968) concluded that instructional media can be defined only in terms of gestalts formed by combination of various elements which result in particular modes of communication. In short, instructional media are the aids like charts, models, slides, experiments and programmes used in the process of instruction. Educators often refer audio-visual media and instructional media to mean the same field.
In the present study three instructional media were employed viz., (i) Visual projection; (ii) Activities and experiment; (iii) Programmed learning material (PIM).

(i) Visual projection: For this instructional media figures and examples were noted in different frames with marking pencils on a transparent roll. This transparent roll was projected through overhead projector followed by discussion at each frame.

(ii) Activities and experiment: In this instructional media some charts and other materials were used to derive certain formula. Pupils were asked to draw figures and to get the required results by performing experiments and then to solve the problems themselves. This media was activity based, where pupils were actively engaged in drawing figures and solving problems.

(iii) Programmed learning material (PIM): A programme of instruction was arranged in linear style. The content is presented in small steps in the form of frames, each frame containing some information and mostly a blank or more. The pupils were to read the frame and decide the answer and to write the answer for each blank on a separate response
sheet given to them; and compare their answers for each blank on a given programme and then to proceed for the next frame and so on.

3. Certain variables: In the present study pupil's achievement was considered as a dependent variable which may be influenced by other independent variables. Instructional media was an independent variable considered as an experimental variable. Other independent variables controlled by the investigator are (i) reasoning ability, (ii) index of motivation towards school, (iii) content matter and (iv) the teacher.

1.5 Objectives of the study:

The study was undertaken with the following major objectives:

1. To investigate into the efficacy of the instructional media: I (Visual projection) over the instructional media: II (Activities and experiment) in terms of achievement.

2. To investigate into the efficacy of the instructional media: I (Visual projection) over the instructional media: III (Programmed learning material) in terms of achievement.
3. To investigate into the efficacy of the instructional media: II (Activities and experiment) over the instructional media: III (Programmed learning material) in terms of achievement.

4. To investigate into the efficacy of the instructional media: I (Visual projection) over the Traditional method of teaching in terms of achievement.

5. To investigate into the efficacy of the instructional media: II (Activities and experiment) over the Traditional method of teaching in terms of achievement.

6. To investigate into the efficacy of the instructional media: III (Programmed learning material) over the Traditional method of teaching in terms of achievement.

Besides these major objectives the following objectives were also laid down for the study.

1. To develop the programmed learning material for two units of Algebra for standard IX.

2. To find out the error rate of both the constructed programmes.

3. To develop other two instructional media, viz. (i) material for visual projection and (ii) material for activities and experiment.
1.6 Hypotheses of the study

Educational research, in order to be sound, must make use of carefully formulated hypotheses. There is no denying the fact that no scientific undertaking can proceed effectively without well conceived hypotheses. Without hypotheses, research is unfocused, haphazard, and accidental. Hypothesis is a tentative answer to the problem stated in the study. The present investigator had formulated the following hypotheses for the study.

$H_0_1$ : There will not be a significant difference between the mean scores for achievement of the pupils who studied through the instructional media : I (Visual projection) and the instructional media : II (Activities and experiment)

$H_0_2$ : There will not be a significant difference between the mean scores for achievement of the pupils who studied through the instructional media : I (Visual projection) and the instructional media : III (Programmed learning material).

$H_0_3$ : There will not be a significant difference between the mean scores for achievement of the pupils who studied through the instructional media : II (Activities and experiment) and the instructional media : III (Programmed learning material).
\( H_{o4} \) : There will not be a significant difference between mean scores for achievement of the pupils who studied through the instructional media: I (Visual projection) and the Traditional method of teaching.

\( H_{o5} \) : There will not be a significant difference between the mean scores for achievement of the pupils who studied through the instructional media: II (Activities and experiment) and the Traditional method of teaching.

\( H_{o6} \) : There will not be a significant difference between the mean scores for achievement of the pupils who studied through the instructional media: III (Programmed learning material) and the Traditional method of teaching.

1.7 **Limitations of the study**

The following are the limitations of the study.

1. The experiment was conducted over the pupils of standard IX of only two schools of Anand town.

2. The instructional media were developed with major emphasis on teaching of two units of Algebra.

3. Both the programmes were developed in linear style only.

4. Both the programmes were developed in Gujarati version only.
5. The other two instructional media, viz., (i) material for visual projection and (ii) material for activities and experiment were decided and prepared by the present investigator himself in consultation with his guide.

6. Criterion tests to decide the efficacy of the instructional media were prepared by the present investigator himself in consultation with his guide. They are the teacher made tests and were not standardized.

7. It was not possible to control all the independent variables affecting the dependent variable, (i.e. achievement in mathematics) however, efforts were made to control a few prominent independent variables like Reasoning ability and Index of motivation towards school.

1.8 Design of the study

Research is concerned with studying the relationship between the dependent and independent variables. Present investigator had decided experimental design to investigate into the efficacy of different instructional media. There are many good designs available to the investigator to choose for his experiment, such as; (i) a post test only control group design; (ii) a pre test-post test control group design; (iii) the solomon four group design; (iv) factorial design and (v) counter balanced designs. The first four designs
are often referred to as true experimental designs whereas the counter balanced design is referred to as a quasi-experimental design. The present investigator had decided a pre test - post test control group design. There were four homogeneous groups employed in the study; first three groups were experimental groups and fourth was a control group. Groups were matched on the basis of the scores obtained by administering two standardized tests viz., (i) Test of reasoning ability and (ii) Junior Index of motivation (JIM scale). Homogeneity of groups were tested using 'F' test. Variances of all groups were computed. Test of homogeneity of variance was applied and four homogeneous groups were obtained. The data obtained for the achievement of the pupils were analysed with the help of Analysis of Covariance taking pre test score as a covariate. The analysis of covariance is able to test the null hypotheses and to give a quantitative picture by making it possible to see at which level (.01 or .05) the difference exist. Adjusted mean scores were obtained to decide the superiority of particular media. The mean, SD and 't' test were calculated whenever necessary. Smoothed cumulative frequency curves (ogives) were drawn just to facilitate the comparison of the performance of pupils, on the post tests, of different groups.
1.9 Scheme of chapterization

The entire report is divided into the following seven chapters.

Chapter I: Introduction.
Chapter II: Review of the related studies.
Chapter III: Development of the instructional media.
Chapter IV: Planning of the experimental design.
Chapter V: Conduct of the experiment.
Chapter VI: Analysis and conclusions.
Chapter VII: Major observations, conclusions and suggestions.

Chapter II deals with review of related studies. It includes studies concerned with effectiveness of visual projection, effectiveness of audio and other instructional media and effectiveness of programmed learning material vs. traditional method of teaching.

Certain researches conducted in foreign countries and India are included in this chapter.

Chapter III deals with the development of the instructional media. Development procedure for programmed learning material and other two instructional media has been described in details in this chapter. The investigator had developed the programme learning material in algebra.
for Standard IX for two units and validated them following the procedure laid down for preparing the programme learning material. The chapter begins with some theoretical aspects on instructional media and its role in the process of instruction.

Chapter IV deals with the planning of the experimental design. This chapter includes some theoretical aspects on types of experimental design. It also includes the problems, objectives and hypotheses of the study, dependent variable; independent variables and controls, specification of research design and technique of analysis.

Chapter V deals with the conduct of the experiment. It includes sample, selection of teaching units, selection of the instructional media, development of the instructional media, administration and scoring of standardized tests, matching the groups, development, administration and scoring of criterion tests, conduct of the experiment and statistical analysis.

Chapter VI reveals the analysis and conclusions. It indicates the picture of complete analysis carried out keeping in view the objectives and hypotheses of the study.

Chapter VII deals with the major observations, conclusions and suggestions.
Besides these, the report contains tables and graphs whenever necessary. Bibliography and appendices are also presented at the end of the report.