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CHAPTER II

REVIEW OF RELATED STUDIES

2.1 Introduction

The review of related studies is a very significant aspect of research process. It helps the researcher by providing some information about the status quo of knowledge in the area intended to study. It provides the researcher with information related to the type of study and type of design that may be eventually used in conducting research. Research work done in past serves as a solid foundation on which any new investigation firmly rests. Hence, planning for a new research work presupposes consideration of good work done in the past.

Accepting the importance of review of the past work, the present investigator tried to go through available literature and the research reports. The description of which is provided in the pages to follow.

2.2 Comparison of different instructional media

A number of studies have been conducted especially, in the United States to compare the effectiveness of one media over the other. But, some of them are done without having carefully defined what is being compared, as Levie and Dickie (1973) put it. What is called for is not
comparison of media attributes and matching media attributes to task learner situation characteristics. Tosti and Ball (1969) identified six dimensions of media attributes, viz., (i) encoding form, (pictorial, symbolic, verbal or environmental structure) (ii) duration, (transience or permanence of presentation) (iii) response demand characteristics, (the type of learner response required) (iv) respond demand frequency, (v) presentational management frequency and (vi) management purpose. But most of the researches that were conducted were concentrated upon the first dimension, which comprises of comparison between pictorial stimuli and verbal stimuli; visual stimuli and auditory stimuli. The major findings of such researches are discussed here under the following heads.

2.2.1 Pictorial stimuli Vs. Verbal stimuli

Rohwer, Lynch, Lavin and Suzuki (1967) and Jenkins (1968) found pictures superior to words as stimulus items in paired associate learning. Nickerson (1965), Shepard (1967), Jenkins, Neale and Deno (1967) and Haber (1970) found greater recognition for pictures than corresponding nouns. These findings led to a hypothesis that pictures provide more cues for recall and recognition. Wicker (1970) compared simple line drawing and colour photographs with corresponding nouns as stimulus items in paired associate
learning. While recall was greater for pictorial stimuli, there was no difference found between colour photographs and line drawing, suggesting that richness in cues is not an adequate explanation for word-picture differences with older learners. Allen (1967) found that pictorial illustrations increased learning from printed programmed sequences only when subject matter consisted of material having concrete references. Baker and Popham (1965) found that adding pictorial embellishment to verbal material did not increase learning, but resulted in high rating for interest and enjoyment. Gropper (1966) concluded that a visual order of presentation is appropriate for concept learning tasks and that the addition of words to pictures facilitates the formation of longer verbal chains and the use of more sophisticated technical language.

2.2.2 **Auditory stimuli Vs. Visual stimuli**

Harwood (1951) found reading superior to listening with respect to learning. Haugh (1952) concluded similarly with regard to the 11th grade students when tested for immediate recall. James (1962), Cody (1962) and Thalberg (1964) with regard to the college students arrived at the same results. Gulo and Baron (1965) found print superior to lecture, T.V. lecture and radio on multiple choice retention test. These
results show a clear tilt towards reading. Shultz (1969) found no significant difference between reading and listening in verbal learning. Shultz and Kasschau (1966) found visual stimuli superior to auditory stimuli for words of low meaningfulness while auditory stimuli superior to visual stimuli for words of medium and high meaningfulness. Shultz and Hopkins (1968) arrived at the same results in verbal discrimination task. Cooper and Gaeth (1967) found that for high grade level students, auditory stimuli was superior to visual stimuli, but for low grade level students, visual stimuli was superior to auditory stimuli in learning meaningful words. These studies do not clearly conclude in favour of either auditory or visual stimuli.

2.2.3 Audio plus Visual Vs. Audio or Visual

Van Mondfrans and Travers (1965) found no additional advantage for audio plus visual presentation when simple pictorial stimuli were presented on visual and their names on audio. However, they found the simultaneous presentation of audio and visual stimuli better than their sequential presentation. Severin (1967) when testing for recognition on the channel or channels in which the information was presented, found that a word as the audio and a related picture as the visual was
superior to either alone, but a combination of an unrelated word and picture was inferior to either alone. Some studies point out the play of individual differences influencing the media effectiveness. Kay (1958), Westover (1958) and Klemmer (1958) found totally different results in different individuals.

2.3 The studies concerned with effectiveness of visual projection

If the history of any innovation in the area of teaching is examined, it can be easily noticed that researches have been conducted comparing the effectiveness of the innovative methods with conventional teaching. This position has been summed up by Allen (1971). Allen clarified that the educational establishments demanded proof of the effectiveness of innovative technique and the base line for comparison was clearly the teaching practices. This happened with educational radio, television method of instruction, tape-slide based instruction; radio vision, programmed instruction, peer tutoring and others.

Saetter (1968) observes that during the period 1918-1945 media development in U.S.A. was influenced most critically by research under taken in the use of radio and film for instructional purposes. The period 1945-65
produced more intensive media research, stimulated by a growing concern with education as a response to the forces of technological change. Major change during this period was towards curriculum innovations with increasing desire to improve teaching and teacher training. The question arose as what to teach, whom to teach and how to teach. New media formats were being introduced and there was a demand for evaluation of these new approaches.

In many such comparative media studies, the important factor is found to be not only the type of pictorial presentation used, but also the verbal accompaniment. If one is attempting to replace film by pictorial media, the limitations of the visual display can not be overcome by more realistic presentations. What ultimately contracts the degree of understanding and the learning outcomes is the verbal exposition accompanying the pictures. Duyer (1972) concluded from his study of the three media: television, slides and programme booklets, and varying types of pictorial details that the effectiveness of these forms of visualized instruction depends on a complex interaction of treatment, presentation mode and educational objectives. Schupham (1970) summarized research which assessed the comparative effectiveness of matched communications through print, radio and television when used to teach adults
and concluded that on the whole there was little difference between the learning gains achieved by three teaching methods.

On the basis of available research it can be said that the effectiveness of a particular instructional media is more dependent upon the nature and quality than upon the characteristics of the channel of communication. This assumption contradicts sharply with the common practice of improving communications by the addition of visual aids. Klapper, Carpenter and others (1958), found that decreased learning may occur when televised courses are enriched through the addition of visual materials. Twyford and other (1964) demonstrated that some instruction utilizing visual materials are more effective than other classroom activities. Sound films were found more effective than filmstrips in providing learning in general science course.

Slides or filmstrips linked with sound are increasingly popular presentation devices. The studies reviewed under this section are concerned with the effectiveness of tape-slide media of instruction. The effectiveness of tape-slide material has been investigated in two ways. One way has been to compare the effectiveness of these materials with other media or with conventional method of teaching. Besides this a few attempts have also been made to develop some tape-slide programme. The studies reviewed under
this section have been categorised in two sections viz.,
(i) developmental studies and (ii) comparative studies.

2.3.1 Developmental studies

Here, an attempt has been made to present a review of some important developmental studies on tape-slide sequence.

Bharat and Mellandar (1969) developed tape-slide materials and other materials to teach physical geography. They set up an audio-visual tutorial (A.V.T.) equipped with tape, slide projector and other teaching-learning material. No sophisticated research study was conducted but primary findings were so encouraging that it was decided to use A.V.T. approach for entire introductory course in physical geography.

Maccini (1969) carried out an investigation to develop an audio-visual tutorial programme consisting of tape-slide and other materials in introductory geology course. Audio-visual tutorial laboratory was equipped with a film-loop projector, a slide projector, a desk lamp and appropriate teaching-learning materials. He divided 135 students into three groups of 45 each. The first 45 students completed both the pre and post tests. The second 45 students completed pre and post tests for the units. The third
45 students completed the unit media assessment questionnaire. All post-tests scores were significantly higher.

Brown (1971) developed two multimedia presentations to teach subjects to identify various musical textures. The two presentations consisting of 35 mm slides and a series of tape-recording were identical except that one used popular music as example and the other used serious music. One group of 29 subjects heard serious music. The test was tape recorded. It consisted of 40 musical experts using both serious and popular music. Both groups made significant gains from pre-test to post-test at the 0.07 level.

Smith (1979) studied to determine if certain instructional materials produced to utilize an audio-visual mode of presentation, in a structured concrete and applied manner, affects the students conceptualization of basic mathematics as they relate to measurement in carpentry. An analysis of covariance was used to test the differences in treatment and control groups, between the mean scores on the functions and the carpentry post-test. A significant differences was found between the mean scores of treatment and the control groups on the carpentry post-test. It was concluded that this mode of presentation was feasible and recommended for other technical programmes.
2.3.2 Comparative studies

The researches, the review of which is given in the following lines were conducted to compare the effectiveness of tape-slide material with conventional method of teaching.

Jenkins (1969) conducted an experiment which included four slide presentation on graphic art. Two groups of junior high school students were taken into experiment for evaluation on the terminology and procedural tests. The control group was found to be significantly superior to the experimental group at 0.01 level on learning terminology. But, no significant difference was found between the two groups on the procedural tests.

Butts and Prickett (1969) reported the comparison of relative effectiveness of teaching tape-slide materials in audio-tutorial laboratories and the conventional teaching done in traditional laboratories based on student achievement in accounting principles. The experimental group received traditional instruction and audio tutorial laboratory materials including tape-slide materials and assignment exercises. The control group was given a traditional instruction as given in laboratories without using any tape-slide materials. There was no significant difference between
the performance on achievement test of the experimental and control group.

Mcvey (1970) compared the effectiveness of tape-slide materials, in teaching four programmes, with conventional teaching. The programmes included the study of animal health, commercial fertilizers, small gasoline engines and farm credit. The instruction method with tape slide materials was found as effective as conventional teaching for three out of four programmes.

Davis (1975) compared the effectiveness of tape-slide unit on the radio telephone and broadcast endorsement against the conventional approach which involved lecture and demonstration. The experimental group consisted of 18 students and the control group consisted of 14 students of radio production. The pre and post test scores were analysed and the tape-slide method produced a significant gain over the conventional method of teaching.

Jones (1975) investigated the comparative effectiveness of video-cassette and slide-tape presentations for self instruction of paraprofessionals. Based on single classification analysis of covariance, controlling pre test performance, no significant difference was found at 0.05 level between the group of instructional aids taught by the
video cassette presentation and the group taught by slide-tape presentation on six week retention test performance. The post test performance of slide-tape group was significantly better than that of video cassette group. One way analysis of variance of the total population under study showed that both the self instructional presentations resulted in highly significant improvements in post test and retention test when compared to pre test performance. It was concluded that both self instructional presentations were effective. However, the study was not designed to measure the degree of effectiveness.

2.4 Effectiveness of different instructional media.

This section deals with studies concerned with the effectiveness of different instructional media. An attempt has been made here to present some of the researches related to this area.

William Charles (1972) studied the relative effectiveness of video tapes with the conventional teacher presentation method in teaching typewriting to intermediate students. 60 experimental and 60 control students were involved in the study. Students in the experimental group received all their instructions through prepared video tapes while the control group received all their instructions in
conventional teacher presentation. The test scores were analysed with analysis of covariance technique. The experimental group achieved higher than the control group. The students in the experimental group answering an evaluation form pertaining to video instruction gave high approval to the prepared video tapes as a medium of instruction.

Carl Allen (1973) investigated the effectiveness of instructional aids in teaching vocational agriculture classes. Data for the study were collected from eight vocational agriculture teachers. Each teacher taught a unit of their choice with special emphasis on use of instructional aids. Other units were taught without instructional aids. The data was analysed by analysis of variance method. Comparisons were made between the experimental group and the control group. The results showed no significant difference between the experimental group and the control group.

Machula (1976) carried out an experiment to determine if different affective responses would result from exposure to three different forms of media presenting the same content. The media involved in this experiment were video tape, audio tape and print. Out of three groups, one group viewed the video tape, another heard the audio tape and a third group read the printed transcript. A semantic
differential consisting of fifteen scales on seven concepts was used to measure differences in effective response and an objective test was administered to measure cognitive learning. An analysis of covariance between pre-test and post-test scores of the cognitive learning showed that the subjects receiving the audio-tape version had learn significantly less than those receiving the other treatments.

Francis (1976) analysed achievement in a college biology audio-tutorial programmes for non-science majors. In first phase achievement was compared between a group of students receiving audio-tutorial instruction and a group of students receiving lecture laboratory instruction. The second phase compared achievement among high, medium and low science ability sub-groups in audio-tutorial group. Analysis of variance and analysis of covariance techniques were used to analyse the data. The results indicated that the audio-tutorial group achieved significantly higher than lecture laboratory group in the area of knowledge but not in areas of comprehension and application or in overall achievement.

Anthony (1977) studied the comparison between an audio-tutorial and lecture method of instruction in biological science courses. Sample consisted of first term college freshmen enrolled in two sections. One class from the audio-tutorial section was selected as the experimental group.
One class from the conventionally taught section was selected as the controlled group. Both the groups were further divided into three ability level sub groups. The Nelson Biology test and Watson, Glaser critical thinking appraisal was administered as pre and post test. The results showed that, (i) no statistically significant differences were observed in achievement when audio-tutorial and the conventional lecture method of instruction were compared, and (ii) no statistically significant difference was observed in the post test adjusted mean on the dependent variable critical thinking ability when the audio-tutorial and conventional lecture method of instruction were compared.

Davis (1977) studied the interaction occurred between the instructional methods and pupils, pupils' grade and sex with respect to science achievement, attitudes and understanding. The treatments were the lecture discussion method, the verification laboratory method and the inductive laboratory method. Results of the study indicated that the method of instruction did not significantly affect the science achievement.

Stanton (1979) attempted to investigate comparative effectiveness of two messages (simple and complex) and three media conditions (audio, written, video) for facilitating information gain in learning. 90 undergraduates were
randomly assigned to six conditions. Each treatment group received a complex or simple message transmitted by audio-cassettes, audio-visual cassette or written study sheet. A two factor analysis of variance indicated a significant effect for media and not for the messages. Scheffe tests were performed to compare audio and video, video and written and written and audio media for both simple and complex messages. It was found that video is more effective than audio in the retention of simple information. No difference was found between the complex audio message and the complex video message. The simple video message was not found more effective than the simple written message. Written is more effective than audio in the retention of simple information. No difference was found between the complex written message and the complex audio message.

Villamil (1980) studied the relative effectiveness of two different methods of teaching. The two teaching methods involved in the study were lecture discussion and modular instruction. Two groups each of 150 students comprising of 75 tenth grade vocational agriculture students and 75 adult farmers were formed. The result of the study demonstrated that there was no significant difference in terms of achievement of knowledge between combined group of tenth grade vocational agriculture students and adult farmers taught through modular instruction method and the
combined group of tenth grade vocational agriculture and adult farmers taught by Lecture discussion method.

Merritt, Robert L. (1983) studied differences in students receiving computer assisted instruction in an experimental group from those receiving departmentalized instruction in a control group. The subjects of study were sixth and seventh grade students. Experimental group achieved significantly higher gains in reading and mathematics than did control groups.

Burg, Kathleen Ellen (1983) studied the effectiveness of two teaching methods, a directed question format and a tape-response format on the visual aesthetic preference and language use of first and third grade students. The sample consisted of 158 students randomly selected. A pre-test - post test design without a control group was used. The only significant change across time occurred with gender in the first grade. Males at both the first and third grade tended to have a different visual aesthetic preference level than females at those grade levels. By the end of experiment, males and females disliked art expert slides.

In the following lines a few studies concerned with effectiveness of various instructional media, carried out in India, has been reviewed.
Ashokkumar (1979) studied the relative effectiveness of three methods of instruction in teaching of science. These methods were, (i) Exposition method, (ii) Programmed learning method, and (iii) Multi-media method. The pre-test - post test experimental method was used. In this experiment 3 x 2 factorial design was employed for studying the relative effectiveness and interaction effect between methods and two levels of intelligence. The sample of study consisted of all the male biology students of class IX and X of all the intermediate colleges of Saharanpur city. It was observed from analysis that F-ratio for methods was significant while for intelligence and interaction not significant. This indicates that three methods differ significantly in their effectiveness. The multi-media method was more effective than either the programmed learning or the expository method. The programmed learning method was better than expository method on gain achievement scores. There was no significant interaction between methods and intelligence. The multimedia method was more effective on retention than either the programmed learning or the expository method.

Mullick (1980) studied the relative effectiveness for a book format programme and a multi-media programme. The multi media programme consisted of 46 slides, tape script
and a work book. The book format programme consisted of 53 frames. The study was conducted on 204 pupils of class V and 240 pupils of class VI. Results showed that multi-media programme was found to be superior to the book format programme.

Ankleshwaria (1980) studied the relative effectiveness of three instructional media, viz., (i) programmed learning material, (ii) structured lectures, (iii) the taped teaching material with charts and worksheets in teaching nutrition to home science students. Latin square design was adopted for the study. Findings showed, (a) a significant difference between programmed learning material and structured lectures, (b) no significant difference between media, (ii) and (iii) in their effectiveness in terms of achievement of instructional objectives, (c) no significant difference between media (i) and (ii) in their effectiveness in terms of achievement of instructional objectives, (d) media (ii) was more effective only with the high intelligence group, with other two media level of intelligence played no significant role.

Tripathi (1982) studied the relationship between selected instructional methods, viz., (i) audio-vision, (ii) programmed learning, (iii) peer tutoring. 160 students of VIII and IX classes were divided into four equated
groups. Three groups were randomly assigned to be taught through selected instructional methods. Last group was taught through traditional teaching. t test and F test were used for testing the significance of the mean difference. Major findings of the study were: (a) audio-vision group, when compared with traditional instructional group performed significantly better on criterion test, (b) the difference between audio-vision group and programmed learning group was not significant, (c) the difference between audio-vision group and the peer tutoring group was not significant, (d) the difference between programmed learning material group and the peer tutoring group was found not significant, (e) the difference between programmed learning group and the traditional instructional group was significant, (f) the difference between peer tutoring group and the traditional instructional group was not significant.

Ummad Singh (1983) studied the effectiveness of three instructional media, viz., (i) programmed learning material (PIM) in book format, (ii) tape slide programme, (iii) audio-tape programme. Eight groups were formed; each having 30 students from secondary schools. Analysis of variance with a derived technique of least significant difference was used to test the significance of difference among the mean gain scores. When relative effectiveness of
the four media and replicates were compared in terms of gain scores based on pre and post criterion test, the obtained value of 'F' were found to be 5.52 for experiment I and 8.08 for replication. These values were greater than the table value of 'F' with degrees of freedom 3 and 116. It indicates that there were significant differences at 0.01 level. Further, no significant difference was found between the gain scores of traditional and tape-slide treatment. Similarly there was no significant difference between the results obtained by PIM book format and audio-tape treatment. However, both traditional and tape-slide treatments were found significantly better than the PIM book format or the audio-tape treatment.

2.5 Effectiveness of programmed learning material (PIM) and the traditional method of teaching

The programmed learning material is a recent development in the field of class room teaching. The chief credit of its practical use in classroom and different situation of instruction goes to Skinner who defined programming as a process of arranging materials to be learnt in a series of small steps designed to lead a learner through self instruction from what he knows to what he is expected to know.
Science and technology have touched almost all the aspects of human life and programmed learning is an application of behavioural science and technology in the field of education. Keeping in view the large quantum of knowledge to be imparted to larger population with minimum resources within a limited time, programmed learning has shown a new path towards automation and individualization of instruction.

An attempt has been made here to review some of the available Indian researches as well as researches conducted in the foreign countries, related to programme learning material.

2.5.1. Research work done in India

Desai (1966) studied the effectiveness of programmed learning material in the teaching of Gujarati in Standard IX. A sample consisted of two sections of class IX of a secondary school. Each section had forty students. The two sections, experimental and control, were comparable on intelligence and academic achievement in Gujarati. The findings of the study revealed that, (i) the difference between the two means of the experimental and the control group was found to be significant at 0.01 level, (ii) the programmed learning approach was more effective than the
conventional teaching approach for students ranging from high IQs to low IQs.

Dewan (1966) investigated the effect of two different modes of presenting the learning material, viz., (i) with the knowledge of immediate results and (ii) in the question answer format, implying active responding in the context of televised instruction. Students from grade X from three Delhi schools were selected for this purpose. Three groups were randomly assigned to the three treatment groups. Under treatment I, called conventional television lesson, treatment II which may be called experimental treatment A, third treatment called experimental treatment B. The findings of the study revealed that, (i) the experimental group A was clearly superior to the conventional TV lesson group and (ii) the scores obtained on delayed post-test could not be attributed to the learning through the TV lesson.

Sharma (1966) compared the programmed method of teaching algebra with the conventional classroom lecture method, with a delayed post tests, to study the relative retention under the two methods. The sample of study consisted of eighty students of class IX who were first
divided into upper, middle and lower groups on the basis of marks in the terminal examinations and then they were randomly assigned to experimental and control groups. Besides the usual pre test and post test, a delayed post test was also administered to study the effectiveness of two methods in terms of retention. Major findings were, (i) the mean achievement of the experimental group was higher than that of the control group, (ii) the obtained mean gain was significant at 0.01 level, (iii) sixty per cent of the experimental group secured cent per cent on the test, whereas, only twenty per cent of the control group could reach that high standard, (iv) the experimental group had a minimum score of four whereas, control group showed a minimum of zero and (v) the delayed post test also showed better retention by the experimental group.

Kulkarni and Yadav (1966) attempted to know which method of programming could have better impact on instruction. Branching, linear and simple programmes were tried out on below average, average and above average students to study the relative effects of different types of programmes on the development of knowledge, comprehension and application objectives for "solving simple equations". The sample consisted of class VI students of an English medium school in Delhi. Three matched groups were formed on the basis of
marks obtained by students in mathematics in their last examination. The main findings were, (i) F values for the treatments were 3.15 and 5.14 respectively, which obviously showed that the treatment effects did not seem to be significantly different, (ii) with so many missing cases, with school marks not very much dependable as criterion variable and the sample size being also quite small, no sound conclusions could be drawn, (iii) to arrive at certain conclusions replications with better control were needed.

Shah (1969) developed the auto instructional programmes covering the whole syllabus of Algebra of Std. VIII. In this experimental type of study, the control group was taught by conventional method and the experimental group was allowed to learn by auto instructional method. The self-test, which could give the idea of achievement to the students as well as the teacher, was prepared and given to both the groups at the end of each unit. The total mean score as well as the test-wise mean scores of both the groups were computed to find out the effectiveness of auto instructional programmes. The investigator also studied the relationship between the achievement scores on auto instructional programmes and variables. The results of the study were, (i) the total mean score achieved
by the experimental group was higher than the total mean score achieved by the control group, (ii) the average time taken by the experimental group was less than the average time allotted to the control group, (iii) the order of difference between mean achievements for the two methods changed with the achievements levels and (iv) with some explanation of a few technical terms, the standard V students could learn through the programme easily and could answer the self tests given at the end of each unit quite satisfactorily, but taking almost double the time to go through the same content learnt by the students of standard VIII.

Kulkarni (1969) developed programmed learning material containing new curriculum in Algebra and studied effects of student variables and method variables. Two divisions each of grades V, VI, VII and VIII were selected from a centrally located high school in Poona. Three experimental treatments were set up for this study. Treatment group I was asked to revise by going through the same programmed learning material. Treatment group II utilized summary review pamphlets, which were not programmed for revision. Treatment group III did not utilise any sort of review material. The major findings of the study were, (i) on an immediate post test the mean score of students having pre defined entering behaviours was significantly
higher than the mean score of students not having the necessary entering behaviour, (ii) students using programmed learning material for revision were significantly better in achievement than that of the students using summary review pamphlets. The control group lagged significantly behind the above two groups, (iii) students not having knowledge of subjects did significantly better after completing one revision only if they used programmed material for revision.

S.I.E. Gujarat (1970) studied the effectiveness of programmed instruction as revisional lessons. Sixteen classes of eight schools were taken-up for the purpose of the study. Eight experimental groups were given the revision work through programmed learning method and the other eight control groups did the revision through conventional method. The whole course of Algebra of standard VIII was programmed. For interpretation, percentages and averages were found out. The findings revealed that the mean achievement of the experimental groups was higher than the mean achievement of the control groups.

S.I.E. Gujarat (1970) studied the effectiveness of programmed learning material. Two comparable groups of eight schools were selected. Programmes were developed in different subjects and were administered to the groups.
't' test was used to study the effectiveness. The findings were, (i) programmed learning worked better than the conventional method and could save time, (ii) ninety per cent students like to work by this method and (iii) teachers were benefitted by the programmes, because they could get a picture of micro analysis of the subject.

Kapadia (1972) studied the relationship between the immediate achievement and the retention scores on linear and branching programmes and some selected personality variables. A sample of 525 students of standard VIII was taken from eleven gujarati medium schools from Baroda. One linear programme in science and branching programme in geography were prepared by the investigator. These programmes were given to the students along with psychological tests such as, Bernreuter's Personality Inventory, IPAT Anxiety scale and Intelligence test. The achievement on programmed learning material was judged in terms of the scores obtained by the students on the criterion tests given immediately after completing the programmes and after an interval of two months. Partial correlations between programme types and selected personality variables were computed. The major findings of the study were, (i) relationship between both types of programmes and intelligence was found to be significant, (ii) anxiety correlated negatively with the achievement on the linear programme, (iii) self-sufficiency and introversion-
extraversion did not influence the achievement on any of the two types of programmes. It was concluded that personality variables have a little effect on learning in a programmed way.

Mehta (1975) conducted an investigation involving 252 students of grade V belonging to six schools in the city of Baroda. The experimental group was administered the programmed reading material prepared by the investigator whereas the control group was taught through the conventional teaching method. Results showed that students in the experimental group were significantly better than their counterparts in the control group. It was further revealed that students with higher IQ were superior in attaining and retaining to those whose average IQ was below 100.

Pandya (1974) developed programmes in 'Light' which were tried out in class X of different schools. The criterion tests were developed. A sample of class X students of six schools in rural area of the four districts of Gujarat state was selected. Out of these three classes of three schools were treated as experimental group which was taught through the programme learning material and three classes of other three schools as the control group which was taught through the conventional teaching method.
Data about achievement motivation, SES and IQ were also collected. Analysis of variance and covariance technique were employed to compare the achievements of the experimental and control groups. The major findings of the study were, (i) the experimental group achieved more in all the four tests, (ii) the gain of the students of the experimental group at the post test was significantly greater than the pre-test scores, (iii) learning through programmed learning material benefitted the students with high, middle and low IQ, (iv) when the effect of the variables of motivation was partialled out, the adjusted mean scores showed that the experimental group achieved higher than the control group, (v) the developed programme gave enough challenge to lowly motivated pupils than to highly motivated pupils.

Dewal (1974) studied the difficulties in teaching English and effectiveness of programmed teaching. Ninety three English teachers of Udaipur constituted the sample for the first part of the study. A total of 150 students of class VIII of four government schools of Udaipur city formed the sample for the second part of the study. The study revealed that, (i) the difficulties hampering effective teaching and learning of English were due to the shortage of trained teachers, lack of subject competence in teachers, dearth of good teaching-learning material, lack of
individual attention and poor socio-economic background, (ii) programmed teaching overcame some of the felt difficulties of the teachers and helped students to perform significantly better than those who were taught by conventional method, and (iii) the strategy proved useful in a situation where teachers were under-qualified and untrained.

Patel C.B. (1975) attempted to develop programmed learning material in geometry for standard IX and studied its effectiveness in the context of different variables. Fourteen classes of fourteen rural and urban high schools formed the sample of the study. The tools used in the study were, (i) the Desai's intelligence test, (ii) the Kuppuswamy's socio-economic status scale, (iii) test on entering behaviour, (iv) test on terminal behaviour, (v) Opinionnaire for the students, (vi) interview schedule for teachers. The findings of the study were, (i) the programmed learning material proved to be more effective than conventional method, (ii) high and low IQ groups of students performed better with PIM than with conventional teaching, (iii) average time taken by the group learning through PIM was less than that of group taught by conventional method, and (iv) students from different strata of the society performed better with PIM than with conventional teaching.
Reddy (1975) studied effectiveness of programmed learning material over conventional learning in the instruction of language. The sample for study was drawn from grade VI. The study followed simple match group design. The experimental group was exposed to programmed learning material and the control group was exposed to conventional learning. Mean, S.D., and critical ratio were used to compare the two groups. The findings revealed that, (i) mean performance score of the experimental group was higher than that of controlled group, (ii) there were some definite advantages found in the programmed learning method over the conventional method.

Chandrakala (1976) studied relative effectiveness of (i) programmed instruction (PI), (ii) lecture method (IM) and (iii) traditional method (TM) at three levels of achievement. A sample of 172 students of standard IX was formed. Factorial design of 3 x 3 was applied. The findings of the study were, (i) the three treatments were equally effective in terms of students' performance, (ii) high and low achievers learnt equally well through PI, (iii) average achievers learnt better than high through PI, and (iv) high achievers learnt better than average and low achievers through IM and TM.
and step size and three levels of taxonomic categories.
The main findings of the study were, (i) small step programme was more effective with regard to achievement, (ii) there was no relation between sex and attainment through programme instruction, (iii) small step programme was more effective for knowledge and comprehension categories, whereas they were equally effective for application category, (iv) boys performed better in comprehension category and (v) small step programme was significantly more effective than large step programme for both boys and girls with respect to knowledge and comprehension categories.

Patel A.D. (1977) developed programmed learning material in geometry for standard VIII and studied its effectiveness with traditional method of teaching, in relation to certain variables. The sample consisted of 810 students of class VIII studying in 14 schools of Kheda district. It was found that, (i) the auto-instructional material did not work well with pupils having low n-Ach, (ii) in case of highly motivated students the material was found to be working well, (iii) the PIM was found to be effective for the pupils who had good study habits as well as those who had poor study habits when compared to traditional way of teaching, (iv) learning through auto-
instructional programme in case of students having poor reading ability was not more effective than the traditional method of teaching; but it was superior in case of students who had good reading ability, (v) the more anxious students could learn better through PIM than either counter parts.

Sodhi (1977) studied the effectiveness of programmed learning material in chemistry in relation to certain variables. The sample consisted of 135 students from grade IX. The PIM and criterion tests were developed for the study. The major findings were, (i) the PIM with linear style was superior to lecture method in terms of total achievement, (ii) PIM with branching style was superior to lecture method in respect of overall achievement, (iii) branching programme was superior to linear programme in case of total achievement.

Suthar (1980) studied the performance on programmed learning material in relation to some psychological characteristics. Programmed learning material in algebra for standard VIII was developed. 500 students studying in standard VIII were selected, from Kheda district for this study. Major findings were, (i) the students who had poor study habits were more benefitted by programmed learning method, (ii) programmed learning method was more suitable to students with negative attitude towards mathematics,
(iii) programmed learning method was more suitable to students with poor reasoning ability, (iv) the students with high motivation towards school were far better in programmed learning method than those with low motivation towards school, (v) programmed learning is more suitable to the students with low entering behaviour, (vi) students who learnt algebra through programmed learning method were found to be superior than the students who learnt through conventional method of teaching.

Nirmal Singh (1981) developed programmes in physical geography for high school learners in English medium school. The experimental data supports that 95 per cent of the students were able to respond 95 per cent of the frames correctly. On the tests of terminal performance the percentage of success achieved by the learners ranged between 85 to 91 per cent. Students' reactions were analysed through the students' reaction checklist and it was found that 97 per cent of the students felt that learning through programmes is an easy affair.

Pandey I.D. (1982) conducted an investigation involving 60 students of class IV studying in Central School of Samchi (Bhutan). This 60 students were divided into three homogeneous groups, each group was assigned randomly
to one of the three treatments, viz. (i) control group following traditional method without home assignment, (ii) experimental group I following programmed text, (iii) experimental group II following traditional method with home assignments and grading. Programmed text was developed in the subject of mathematics. Results revealed that experimental group I was significantly superior to other two groups in respect of immediate achievement. However, the control group and experimental group II showed no significant difference in their immediate achievement.

2.5.2 Research work done in other countries

Austiric Kenneth (1965) compared programmed Vs. conventional instruction in algebra. In this study the experimental group was taught by simple programme and the conventional group by conventional class-room method. The experimental group scored high and retained more on questions actually covered in the programme, but did less well in applying learning to new questions not covered in the programme.

Bartz, Wayne and others (1965) compared the programme instruction with formal instruction. The results indicated that the non supervised completion of programmed texts was less efficient in terms of achievement than
supervised instruction or formal instruction. From this study it was concluded that programmed texts were effective in the instruction of algebra provided the student's study was supervised.

Carpenter C.R. and others (1965) studied the effectiveness of programmed course presented by (1) teaching machine, (2) programmed text books, (3) film strip compared to conventional classroom teaching. There was no significant difference found in learning outcomes except that on the unit tests, the programmed treatment gave higher scores and lower variance.

Hughes J.L. and McNamara. W.J. (1970) compared programmed and conventional teaching. Programmed book classes took less time to complete the book than the conventional classes. Programmed text book classes scored higher than the conventional ones. Difference was significant, even after the effect of difference in reasoning ability was partialled out. The students were favourable to programmed texts.

Peter H.J. Murdoch (1970) found that programmed text compared to the conventional text, was more liked, more preferred to lecture text and general text. Also the students preferred it for learning with a time limit
and at leisure, and they also considered it better preparation for the examination.

Caldwell (1974) attempted to compare the two media for individualizing a programme of reading instruction for semi literate adolescents. Findings indicated that neither medium had a significantly greater effect on achievement than the other. Comparison of post treatment attitudes found that the mean attitude of learners using the computer based display unit was significantly more positive at the 0.05 level than the mean attitude of those subjects using the programmed text.

Eshiwani, George Sammy (1975) tried to determine the comparative effectiveness of programmed instruction, conventional classroom approach and integrated programmed instruction in the teaching of probability to high school students. No significant difference was found between the means of the treatment on the first achievement test for girls, but a significant difference was found at the 0.05 level between the treatment on the second achievement test for girls and on both achievement tests for boys. The results of the study showed a definite superiority in time taken to complete the probability unit for the programmed learning methods compared to conventional classroom approach. Programmed instruction resulted into
a saving of nearly fifty per cent of instruction time, while the integrated programmed instruction resulted into a saving of 20% of instruction time.

Flowers (1977) compared the effectiveness of individualized instruction based on programmed material to teacher centred instruction. Results supported the hypothesized superiority of experimental group over the control groups but not exceeding the 0.05 level of significance. Overall results suggest that instruction based either mode – experimental or traditional increased pupils skills.

Glavach (1977) reported that the use of programmed instruction is an effective learning mode. From the results of the study, it was concluded that the experimental group made significantly greater gains as compared to the control group.

Chen-Linc Kulik, Barbara J. Schwalb and James A. Kulik (1982) studied the effectiveness of programmed instruction in secondary schools. The analysis showed that results from programmed instruction were on the average very similar to those from conventional teaching. Programmed instruction did not typically raise student's achievement on final examinations, nor did it make students
feel more positively about the subjects they were studying or about the quality of the teaching at their schools.

2.6 Conclusion

Reviewing the researches in the field of education in India and elsewhere, seems quite clear that use of educational technology is gathering momentum and the various teaching techniques at almost all the levels of education are undergoing a radical change. Obviously, higher or university education too, is trying to make a head way towards a variety of methods and materials for teaching different subjects.

Educational practitioners have turned their faces towards teaching technology, where researches show encouraging findings. Developing different instructional media is one such finding which when used for different age groups, subjects and situations, ensures better learning. Probing deep into such attempts the impression one carries is that the researches have most of the time tried to compare the different kinds of teaching techniques to establish the effectiveness of one over the other in the given context.

The developmental studies concerned with visual projection for instruction are found optimally effective
with inconsistent results in almost all the cases. Hence, it is imperative that in order to reach some sort of generalization some more studies need to be conducted. The studies conducted are related to physical geography, geology, music and mathematics. So, it is again necessary that studies be conducted in other school subjects also.

The comparative studies concerned with visual projection for instruction end with no significant differences. In one case, tape-slide method produces significant gain over conventional method of teaching. In other case tape-slide method of instruction found more effective as compared to video-cassette presentation. This suggests that there is a need for further exploration in this area of research.

Comparative studies concerned with different instructional media have proved that audio-vision and other instructional media are more effective than the traditional method of teaching in the teaching of biology, science and nutrition. This suggests that there is a need for further exploration in this area of research, especially, for the teaching of mathematics. Some more studies are required to provide useful data to classroom teacher with emphasis on teaching to specific units of mathematics.
Comparative studies, especially concerned with programmed learning method and the traditional method of teaching, in India and foreign countries are in favour of programmed learning method, but the results are not consistent. This indicates that programmed learning method has come out as an effective media for the teaching of different subjects. Therefore, there is a need for further exploration in this area with special emphasis on mathematics.

Considering these, the present investigator decided to investigate the effectiveness of different instructional media and developed three instructional media to teach two units of algebra for standard IX. The next chapter deals with details regarding the main features of the development process.