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CHAPTER II

REVIEW OF RELATED RESEARCHES

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2.1 Introduction

In this chapter an attempt is made to provide an overview of researches related to the present investigation and indicate the trend of research in this area as it emerges from these studies. As stated in earlier chapter the present investigation deals with the following two aspects.

(1) Relative effectiveness of different programme forms.

(2) Relationship between certain personality variables and achievement of the students.

Therefore, the review of researches has been confined to reviewing studies related to these aspects of programmed learning.

2.2 Relative effectiveness of different programme forms

The studies under relative effectiveness of different programme forms can be classified as follows.

(1) Studies on different response modes

(2) Studies on different styles.

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2.2.1 Studies on different response modes

Campbell (1961) studied the effectiveness of the programmed learning material under the following conditions: (i) subjects wrote the response only when sure of its correctness, (ii) subjects wrote answers in every blank, (iii) subjects didnot write answers, but mentally composed them, (iv) subjects read the same frames with no words omitted - no blanks to fill. On an immediate posttest there was no significant difference among the means of the four groups. Two weeks later however, condition four (iv) yielded a mean which was higher than those obtained under other conditions.

Goldbeck and Campbell (1962) conducted a study in which two experiments in junior high school classes compared overt covert and reading response modes. In experiment one, sixty-three subjects completed a programme of independent facts at one of three levels of difficulty. An analysis of covariance of test scores showed an interaction between response mode and difficulty, the overt group performing below the other groups, at the low difficulty level. In experiment two, sixty-two subjects completed a continuous discourse programme on light. The three response modes plus a fourth option mode were used in a simple randomized design. The reading groups surpassed the other groups on both immediate and ten week retention test. In both experiments the reading groups learned most pertime spent.

20 Cummings and Goldstein (1962) compared 'thinking' of an answer with written answer in a 119-item programme which contained some items with the usual verbal answers and other items which required drawing of examples of myocardiographic tracings. The posttest permitted separate measurement of the effects of these two types of items. Posttest performance was better for the overt responses than for the covert responses in the case of both types of material, but the overt-covert difference was especially striking for the items which demanded drawn answers. Though the group which wrote answers scored higher on both the verbal and pictorial materials and on both immediate and delayed tests, the covert responders took less time than the overt group.

Krumboltz and Weisman (1962) conducted a study to test the effect of overt versus covert responding in programmed instruction. Fifty-four undergraduates in educational psychology were randomly assigned to four groups: respondents of group I wrote down each response, those of group II mentally composed each response, those of group III read the programme in which the blanks were already filled whereas those in control group wrote their answers to a completely different programme about the same length. A fifty-item test was administered following the study period and an alternate form two weeks later. Groups with the three response modes did not differ significantly on the first test.

21 However, on the delayed test, the written response group scored significantly higher than the other two groups. The control group scored significantly lower on both tests. Thus, overt responding appears to increase delayed retention.

Tuel (1964) conducted a study aimed at determining the relative effectiveness of overt versus covert responding under varying conditions of IQ, sex, item, difficulty, retention interval, learning time, test time and response precision. No significant difference in general achievement or efficiency of retention was found. The overt response group did learn significantly more of the difficult material for brief retention and at moderate precision, than did the covert group but at high precision even this difference dropped below the level of significance.

Crist (1966) conducted a study on twenty four sixth grade students. They were randomly divided into two groups. Both groups read a programmed text, but one group responded overtly and the other covertly. Subjects were tested immediately upon completion of each programmed text, and also six weeks later. On the immediate posttests there were no differences between the overt and covert responding groups. On the delayed posttest also the overt and covert groups did not differ.

22 In a study by Lewis and Whitwell (1971), nine variations of a linear programme on addition and multiplication in binary arithmetic were formed by combining three levels of reinforcement namely reinforcement to all frames, reinforcement to key frames and no reinforcement - with three levels of response viz. overt response to all frames, overt response to key frames and covert response. These were worked by boys at two ability levels within each of two age groups (eleven and thirteen years). The learning was assessed by tests of retention, transfer and generalisation. The results showed (1) a different pattern of learning for the two age groups (2) that for the eleven year olds covert responses produced the most learning with subsequent reinforcement, an advantage only to those of high ability and (3) that for the thirteen year olds the combination of reinforcement and overt response to key frames only produced the most learning overall, although differences among the separate tests were also important.

Shah (1971) studied the effectiveness of four response modes using a programme on "Addition and Subtraction of Directed Numbers". The four response modes studied were (a) overt constructed response, (b) overt response prompt (writing the response already given), (c) covert response, and (d) covert response prompt (reading the response already given). A sample of one hundred and eighty eight students of standard eighth was taken from two secondary schools in

23 Baroda city. The investigator prepared four versions of the programme to suit the four treatments. The subjects were randomly assigned to the four treatment groups. These groups were comparable. It was found that the overall difference between the treatment means were significant at 0.01 level in both the schools. The mean scores of the four treatment groups in both the school showed perfect rank correlation. On comparing the four treatments on the retention scores, it was found that the overall differences between the treatment means were not significant at any level in both the schools. The response mode d where the pupils had to read the answer already given in the blank was the most effective as far as immediate scores were concerned.

2.2.2 Studies on different styles

Roe (1962) conducted a study in which a seventy one item autoinstructional programme on elementary probability was presented in scrambled and in properly ordered sequence, respectively to two groups, each of eighteen psychology students classified according to prior mathematical ability. Students proceeded once through linear programme at their own pace and were given a test immediately after this. The sequence of items had no significant effect on (a) time required for learning (b)

24 error score during learning (c) criterion test score (d) time required for criterion test.

Burton and Goldbeck (1962) studied the effect of several factors on learning. Their results with ninth graders who learned about animals did not support Skinner's idea that constructed response was superior to multiple choice response. However, they did find a significant interaction among leading methods, students aptitude, and the strength of the desired response in the student's repertoire. When easy multiple choice alternatives were used, they produced better learning of common responses by students who had high verbal reasoning aptitude. These data suggest that the difficulty of the material may be a determiner of the particular aptitude that comes into play.

Coulson and others (1962) conducted a study with the linear and branching forms. Out of a population of three hundred and forty-five items the branched group used an average of 213.5 items while the fixed sequence group used 233 item programme. Posttest scores were significantly higher for the branching group than for the fixed sequence group. Training times for the two groups did not differ significantly.

Glaser, Reynolds and Harakas (1962) developed a branching programme from a linear programme. They found

25 no posttest difference between a group using the branching form, and the one using small step linear form.

Beane's study (1962) used a control group for comparison purposes with all-branching, all-linear, half branching-half linear, and half linear-half branching groups. The instructor who normally taught the two experimental groups taught the control group. The control group had a higher mean score on posttest achievement than any of the four experimental groups, but the difference failed to reach statistical significance. There were significant differences between control groups and the four experimental groups on time spent on the programme.

Larkin and Leith (1963) conducted a study with junior school children of below ten years. The constructed response group fared better than the branching group on both kinds of tests (recall and recognition). In keeping with the view of conceptual structures' the linear was more effective for the low ability levels though the brightest children performed equally well with either programme. The linear group was better on a four months' retention test also. When Larkin (1964) repeated the experiment with fourteen year old secondary school pupils, there were no differences between linear or branching methods of programming on immediate test or a retention test, after four months.

26 Kulkarni and Yadav (1966) attempted to study the relative effectiveness of linear branching and simple programmes (i.e. without providing immediate knowledge of results) on the development of knowledge, comprehension and application objectives for 'Solving Simple Equations' of different levels of pupils. The sample consisted of sixth class 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 different styles of programme forms were then administered to these groups. It was found that treatment effects do not seem to be different. The investigators pointed out that from the given data this conclusion did not seem possible to be drawn because of the various reasons.

Krishnamurthy (1972) conducted a study in which he prepared seven forms of programme on 'thermometers'. They were (i) linear overt form, (ii) linear covert form, (iii) response prompt writing form, (iv) response prompt reading form, (v) branching form, (vi) skip programme form, and (vii) hybrid form. The purpose was to study the relative effectiveness of these forms. The sample consisted of three hundred and twenty-two pupils drawn from standard eighth of English medium secondary school of Baroda city. The results of the study revealed that response prompt reading form was better than all others, both on immediate posttest and

27 retention test. Branching form was least in efficiency in terms of both immediate posttest and retention test. The linear covert form and response prompt covert form were the groups with highest loss when retention was considered. Linear overt form, branching form and hybrid form facilitated better retention. The results implied that response prompt reading form can be said to be the most efficient form, if one considers both the criteria of immediate posttest and percentage of retention.

2.3 Relationship between certain personality variables and achievement of the students.

One of the agreed upon tenets of good educational practice is that of meeting individual differences of learners through instruction. It is this characteristic of programmed learning that attracts people from different fields. Some studies have taken into consideration the learner's characteristics and personality variables while studying the effectiveness of programmed learning materials. An overview of these studies are given below.

Dick and Seguin (1963) studied whether personality pairing of learners (pairs having similar or dissimilar dominant and submissive traits) contributes differentially to performance on a programmed course. Fifty six entering freshman were given the programme on English Grammar.

28 Besides other tests of English, ability etc. Bernreuter Personality Inventory was used as a measure of personality. It was found that the dominant similar group showed a more favourable attitude towards the programmed course than the submissive - similar group. Considering the contribution of the interaction between personality type and pairing procedure of the forty-eight possible comparisons, only two were significant.

Doty and Doty (1964) studied the effectiveness of programmed instruction in relation to five student characteristics (1) academic ability, (2) achievement motivation, (3) creativity, (4) social need, and (5) attitude towards the programmed instruction. The results revealed the following: achievement on instruction is found to be significantly related to creativity and attitude of female students towards programmed instruction. For female students there is a significant relationship between programmed instruction scores and attitude towards programmed instruction.

Fiks (1964) conducted a study in which the population dimensions of age, sex, residence, education, income, and occupation represented one set of independent variables. In addition, three experimental treatment factors of three levels each were considered. Confirmation consisted of : a 0% condition in which the subject was never explicitly

told whether his response was correct; a 50% (fixed ratio) condition where the subject was told only on alternate frames what the correct response was; and a 100% confirmation condition in which the subject was exposed to the correct response to every frame. A second treatment variable was response mode. The subjects were asked simply to 'read the material', or the subjects were instructed to 'mentally fill in the blanks' or think; or the subjects were required to 'write the responses'. Subject matter (confounded with difficulty) was a third treatment factor and consisted of three subject matters as described above. The major findings are as follows : (1) subjects in higher education and/or income classes and in the young adult age group showed learning superior to, but attitude less favourable than, subjects in lower classes and older age groups, (2) lowest education subjects liked programmed instruction increasingly, the more conformation they received, the tendency reversing for higher education subjects and (3) attitude was more favourable with complete rather than partial confirmation in the written response mode. Thus, systematic population variance and interaction effects exist in programmed instruction.

Stone (1965) studied the effects of study habits and student attitudes on the performance in programmed text and conventional text formats. Two sections of a lower

30 division educational psychology course taught by the author were as the two treatment groups. One section was termed the control section and consisted of an incidental sample of thirty-eight subjects. Student withdrawals reduced the N to twenty-eight in the experimental section and thirty-six in control section for the delayed retention phase. There was found to be no significant differences between the two sections in terms of predicted grade point average, sex, age, study habits, efficiency, and scores on a pretest of material to be covered in the experimental period. The experimental section was instructed through the use of skinnerian type of learning programme, while the control section studied the same subject matter using a conventional textbook and lecture approach. The results of the study may be summarized as (1) programmed instruction was found to be more efficient than conventional instruction when time was considered as one measure of efficiency, (2) study habits yielded no differential effects on performance under the two modes of instruction used in the study, (3) there was almost no significant relationship between student attitude toward concepts associated with programmed instruction of kind used in this study (linear) and student performance that cannot be accounted for by relationship between student ability and student attitudes, (4) there was significantly negative relationship between student attitudes and student ability,

31 (5) there was no significant change in student attitude as a result of experience with the learning programme used in the study.

In the study by Davis and Leith (1967) the experiment set out to evaluate effects on learning and attitude throughout a programmed learning task by manipulation in the controlled situation of four major determinants in learning, i.e. (i) pupils environment, (ii) social reinforcement, (iii) teacher interaction, (iv) personality variables. The following main conclusions were drawn (1) No difference in the achievement and attitude of the two environment groups was found. (2) The present study indicated that positive social reinforcement affects favourably both achievement and attitude in programmed learning, as compared to neutral and negative reinforcement. (3) No difference was found between the teacher supplying social reinforcement and the reinforcement being inherent within the programme. (4) The factor of extraversion showed a low negative correlation and anxiety gave low positive correlation with achievement and attitude. (5) A highly positive attitude in favour of programmed learning methods was noted.

Filep (1967) examined the relationship of learner characteristics viz. IQ, achievement, sex, ethnic classification, parents' occupational grouping and audio-visual stimuli presented in linear and branching sequences. The

32 experimental population consisted of 1222 eight grade students drawn from four junior high schools. The findings were as follows: (1) The learner characteristics did interact with media and programming modes to affect scores on the dependent variable. Total IQ scores provided the highest correlation with the dependent variable. (2) Exceptional children, identified as having low IQ, non-white, and representing the three lowest occupational groups, obtained higher scores after receiving the non-verbal, sound, branching treatments provided in this study. (3) Some indications were obtained that children in the exceptional category perform better on all branching treatments. (4) The results of comparisons of the linear and branching modes revealed different patterns for all three experiments (using subject content designated as non-concrete, concrete and action-process). In all three the score for students completing branching treatments were higher. An analysis of covariance indicated that this was significant, (.10) in experiment I (.05) in experiment II, and N.S.D. in experiment III.

Davis and Banning (1968) conducted a study on the role of personality and attitude variables in programmed instruction. Ninety seven tenth and eleventh grade mathematics students were individually given the Wechsler Adult Intelligence Scale. Before and after the experimental procedure, a programmed mathematics course, semantic

33 differential scales were administered to assess attitudes about school, learning, classes, teachers, programmed instruction, programmed texts basic maths course, programmed maths and regular maths. Factor analysis showed few relationships between attitudes and grades, or attitude and PAS variables. Multiple correlation analysis showed the differences between the variables which contribute to the two different criteria, the lack of correlation between the criteria and the overriding effects of attitudes.

Ripple et al. (1969) aimed at determining the interactions between each of four personality characteristics viz. anxiety, compulsivity, creativity and exhibitionism, sex, intelligence, and achievement based on combined test scores of recall, transfer, and generation of hypothesis from programmed instruction and conventional instruction. A year of extensive pilot studies, including reliability and validity checks, involved about five thousand grade eighth students. The experiment, also one year in duration involved 1100 students in grade eighth classes, from 22 schools which were equated on intelligence and sex assigned at random to either programmed or conventional instruction in vocabulary development - word meaning and usage. Pretests rated students on the four personality characteristics and intelligence. Four-way analysis of variance was performed to test all possible interactions, and the schools served as replicates

34 in the analysis. No interactions of personality traits, sex or intelligence with instructional mode were significant.

Conroy (1971) studied the effects of age and sex upon a comparison between achievement gains in programmed instruction and conventional instruction in remedial algebra I. An analysis of the equality of means of paired samples made by a t-test revealed that the variable of student age was significant since older students experienced greater achievement gains. The variable of sex was not found to be related to significant difference in achievement and analysis indicated that when pretest scores age and sex were held constant no significant differences in achievement resulted from the use of programmed instruction versus conventional instructional techniques.

Abramson et al. (1973) studied the effects on achievement from programmed instruction of experimentally induced familiarization of content and response modes. A study of programmed instruction sought to establish an attribute by treatment interaction (ATI) between prior familiarity of material and response mode. Two experimental variables (familiarization and response mode) and two subject attributes (sex and IQ) were employed. Junior high (JH) and graduate students (GS) were assigned to familiarization (F) or non-familiarization (NF) groups and to constructed response (CR) or reading (R) modes. The F-group received

35 advance familiarizing materials. Main effects for the college data were insignificant but sex and IQ were significant for JH students. There was ATI between familiarity and response mode F led to increased achievement for the CR-group. The familiarity by response mode interaction was complicated by interacting sex for G.S. and I.Q. for J.H. Delayed posttest interactions were more significant than immediate results. The negative effect of F on CR achievement was felt due to lower motivation for able students to attend to familiar material. Sex results were explained by the hypothesis that passive females attend to all tasks, impulsive males only to interesting ones, thus F led to reduced male achievement.

2.4 Conclusions

The relative effectiveness of overt, covert response modes; linear and branching forms; linear branching and simple programmes; and seven different programme forms were studied by different investigators. Krumboltz and Weisman (1962), Tuel (1964), and Crist (1966) found no significant difference between overt and covert response modes in immediate achievement. But Cummings and Goldstein (1962), Lewis and Whitwell (1971), and Shah (1971) found difference in immediate achievement between overt and covert response modes. Glaser, Reynolds, and Harakas (1962) Larkin (1964)

36 found no difference between linear and branching form. Coulson and others (1962) found that branching group was better in achievement than linear group. In Larkin and Leith's (1963) study linear group fared better than branching group. Kulkarni and Yadav (1966) found no significant difference in linear branching and simple programmes. In Krishnamurthy's (1972) study, where he used seven different forms, he found that response prompt reading form was the most efficient one. Findings of the studies reported about the relative effectiveness of different forms of programming are not conclusive. There is thus the need to undertake further investigations on this aspects to study most effective and efficient modes of presenting the programmed material.

As far as the studies on relationship between certain personality variables and achievement of students on the programme were considered, the personality variables and other variables studied were attitude, academic ability, achievement motivation, creativity, social need, age, education, income, occupation, sex, anxiety, compulsivity, creativity, exhibitionism, I.Q., and study habit. Majority of the studies showed some relationship between personality variables and achievement on the programme.

Different relationships studied in these investigations do not establish a definite trend of relationship

between modes of presentation of the programmed material, and various personality variables. There is thus need to undertake researches to study such relationships. These relationships are significant from the point of consideration about the learner. Learners with certain personality characteristics such as adjustment, dependency, attitude etc. are likely to have facility with material when it is presented in a particular mode. The present study thus has in its second part the major objective of identifying such relationships.

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