

CHAPTER V

ACHIEVEMENT THROUGH PROGRAMMED LEARNING AND STUDENT CHARACTERISTICS

Study of individual differences in achievement has, since long, attracted the attention of numerous researchers. Concern of researchers to explore this area has been due to the challenges it has thrown to the educationists in properly organising the instructional programmes. However, inspite of all researches, instructional programmes well adjusted to individual differences among the students still represents only the wishful thinking of the educationists rather than a situation achievable in any instructional system. In the field of programmed learning also, several researches have been conducted to study the relationship between student characteristics and achievement through programmed learning with a view to determining the influence of these characteristics on achievement.

Studies of individual differences in achievement carry special significance when the method of instruction happens to be programmed learning. Programmed learning being a self-instructional method, wherein the student learns without much of group influence and teacher influence,

allows the researcher to study differences in achievement with greater precision and under better controlled conditions.' On the other hand, conventionally adopted methods of group instruction involve several socio-psychological variables intervening in the process of learning, in addition to the ability variables related to teacher and other group members which may, perhaps, be controlled considerably. Apart from this, there is another point which makes a study of individual differences in achievement through programmed learning interesting.

'Unlike the educationists, in general, who have remained highly conscious of the effects of varying student characteristics on achievement, the exponents of programmed learning have made unusually tall claims in this regard. It is argued that all students learn equally well through programmed learning irrespective of differences in their characteristics such as intelligence and other personality factors, as though the technique in its operation totally wipes out the differences among the students. It should, therefore, be interesting as well as useful to determine the worth of such claims made in favour of programmed learning. These studies would, apparently, seem to be of only theoretical interest. However, in actuality, the findings of these studies would be of vital importance for decision-making regarding the implementation of programmed

learning technique and integrating it with the regular instructional work.

A few researchers, in the country, have attempted to study achievement through programmed learning in relation to student characteristics. Student characteristics that have been generally considered in this context are intelligence, anxiety, persistence, attitude towards programmed learning, self-sufficiency, introversion extroversion, and achievement motivation (Bhushan, 1973; Pandya, 1973; Gangopadhyay, 1974; Kapadia, 1974). Some studies (Singh, 1972; Hussain, 1974) have also considered certain demographic variables such as age, sex, location (urban-rural), and socio-economic status in order to determine their influence on achievement. The present investigation includes a study of achievement through programmed learning in relation to four student characteristics, viz., attitude towards programmed learning, intelligence, academic motivation, and English language reading comprehension. An attempt has also been made, separately, to study the attitude of students towards programmed learning in relation to intelligence and academic motivation.

Sample

Sample for this aspect of the study consisted of the 35 B.Ed. students of the M.S. University of Baroda who formed the experimental group of the validation experiment described in Chapter III of the thesis.

Before giving the findings of the study, operational definitions of the variables considered in the study have been presented alongwith details regarding the tools used to measure those variables. Also, specific hypotheses to be tested have been stated after briefly discussing the trends indicated by earlier researches.

Achievement through Programmed Learning

The combined criterion test scores were taken to represent students' achievement through programmed learning. It might be recalled that a combined criterion test score is derived using the scores obtained by the student on the six criterion tests of the Programmed Text. For clarity, the procedure of obtaining the combined criterion test score would be specified, here : Convert the score obtained on each criterion test into percentage. Find the mean of these percentages over the six criterion tests. This mean is the combined criterion test score for the student.

Attitude towards Programmed Learning

Attitude of students towards programmed learning as a method of instruction was measured using the attitude scale prepared by the investigator. The attitude scale has been developed following the method of equal appearing intervals evolved by Thurstone and Chave (1929). Details about this scale have already been presented in the previous chapter and the actual scale is given in Appendix B. Attitude scores obtained by the students through the first administration of the scale (vide Chapter IV) were taken to represent their attitude towards programmed learning as a method of instruction.

Intelligence

Intelligence score obtained by the students on the Raven's Standard Progressive Matrices tests was taken to indicate their intelligence level.

These tests represent an attempt to measure intellectual functioning within the context of Spearman's concept of 'g' (Bortner, 1965). The tasks or matrices consist of designs which require completion. The testee chooses from multiple choice options, the design or design part which best fits. An answer which fits may :

(a) complete a pattern, (b) complete an analogy, (c) systematically alter a pattern, (d) introduce systematic permutations, or (e) systematically resolve figures into parts. The number of items correctly solved is the score which is then translated into a percentile rank.

The Progressive Matrices tests have been subjected to extensive research in several countries and with a wide variety of groups. Numerous reliability coefficients quoted by Raven vary from 0.80 to 0.90. Reliability reported by other investigators using the split-half method ranged from 0.70 to 0.90. With older children and adults test-retest reliability varied within approximately the same range as those found by the split-half method. Validity of the Progressive Matrices tests has been studied in the usual ways. When the Stanford-Binet Test of Intelligence was used as the criterion, correlations varied from 0.50 to 0.86.

Academic Motivation

Academic motivation of the students was measured using the Junior Index of Motivation (JIM scale) developed by Jack Frymier. Scores obtained by the students on the JIM scale were taken to represent their academic motivation.

The complete scale has been reproduced in Appendix C.

The characteristic being measured through the JIM scale has also been referred to by the scale constructor, sometimes, as 'motivation to learn' or 'motivation towards school' (Frymier, 1970). The latter type of reference has been made mainly because of the fact that the scale was originally developed and standardised for school children. However, it is important to note that what is being measured through the scale is the basic level of internal motivation in the student to learn; it is internal in the sense that it represents a need in the student due to his own internal state and not developed due to the influence of another person or a competitive environ. The following two excerpts from Frymier's writing (1970) should further clarify the actual nature of the psychological construct being measured through the scale.

"Throughout this research, motivation was assumed to be something which came from within rather than something which came from without. That is, motivation toward school was assumed to represent an internalized state of being which manifested itself outwardly in particular ways of behaving. In other words, motivation was conceived of as that which student had or was rather than that which a teacher or other person did to him." (p. 56)

"...it can be pointed out that the research reported here assumed that whatever causes one to try to do good work in school comes primarily from within rather than from without, and that whatever this motivation or force is, it is probably rooted in one's personality structure, his value structure, and his curiosity. In the development of items to be included in a motivation index these assumptions were employed." (p.57)

The scale consists of 80 items in the form of statements. Although there are 80 items, only 50 items are to be scored. The others are filler items, but should be included. For each statement the student responds by marking one of A, B, C, D which represent, agreement, strong agreement, disagreement, strong disagreement with the content of the statement, respectively. Although the questionnaire is not timed, it takes about 30 minutes for students to complete the items.

For scoring, responses A, B, C, and D are taken to represent 1, 2, -1, and -2 respectively. Student's score for the 50 items are added algebraically. This sum with sign reversed is the raw score value. This raw score value is then added to +100 algebraically. This score is the student's converted motivation score. Higher scores indicate higher motivational level. Low scores indicate low motivation level.

Frymier(1970) has reported a split-half reliability coefficient of 0.67 for college students. However, the reliability of the scale for B.Ed. students was checked by the investigator, by administering the scale to 61 B.Ed. students of the M.S. University of Baroda. Split-half reliability coefficient was found to be 0.89. As has been pointed out earlier, the scale has been originally standardised for use with school children. However, in answer to the question, whether the scale be valid for use with college students, Frymier (1970) writes, based on the validity studies conducted by him, that the evidences seem to suggest that the scale may have validity for use with groups older than secondary school age. The validity of the scale for use with B.Ed. students was studied under the present investigation by adopting extreme groups difference technique. Ratings were obtained from the Faculty members regarding the academic motivation for those students who were considered to have either very high academic motivation or very low academic motivation. Only students belonging to extreme categories were chosen on the assumption that these students are more easily identifiable and the ratings for them would be more accurate than for others. Based on these ratings two criterion groups, with 12 students in each group, were set up. The criterion groups

represented the two extreme groups of students, namely, those with very low academic motivation and those with very high academic motivation. JIM scale scores were obtained for the students of the two criterion groups. Difference in the mean scores of the two groups was tested for significance using t-test. The difference was found to be significant at 0.01 level testifying to the validity of the scale for use with B.Ed. students.

English Language Reading Comprehension

A test of English language reading comprehension developed by the investigator was used to measure the ability of the students to comprehend English language through reading. Scores obtained by the students on this test were taken to indicate their English language reading comprehension ability.

This test of English language reading comprehension was prepared on the basis of the Michigan Test of English Language Proficiency developed by John Upshur and others at the English Language Society of the University of Michigan. The reading comprehension test used in the study consists in its final form of four passages in English. Each passage is followed by five multiple choice questions, each carrying one credit. Thus, the maximum score a

student can get on the test is twenty. The test in its final form is given in Appendix D.

Split-half reliability and reliability by K-R formula (20) were determined by administering the test to a sample of 95 B.Ed. students studying at the M.S. University of Baroda. The split-half reliability was found to be 0.65, while the reliability by K-R (20) was found to be 0.66. In the absence of a more sound criterion measure for validating the test, validity of the test was studied by correlating the scores obtained on the test by a sample of 48 B.Ed. students with the marks obtained by them in compulsory English at their graduation level examination. The product/moment coefficient of correlation was found to be 0.53.

Achievement and Attitude

Different methods of providing instruction require the students to perform different sets of tasks. However, a student performs the set of tasks involved in a particular method, whether it is listening to lectures and reading textbooks, or it is seeing a film and reading a textbook, or it is merely reading a programmed text, with a specific objective, namely, to learn. Thus, learning on the part of the student represents the product

of the tasks he performs as required by an instructional method. It is expected that different students may possess different attitudes towards the different sets of tasks involved in various methods of instruction. It would be ideal if a student can learn through a particular method whichever he desires to. But, in reality all students would be required to learn uniformly through a particular method of instruction which the authorities would adopt considering its administrative feasibility in addition to academic suitability. An obvious question pertinent in this context would be whether differences in attitudes of students towards the specific set of tasks involved in the particular method of instruction influences the product also. In other words, it is to see whether the amount a student learns through a specific method of instruction is related to his attitude towards that method. Obtaining an answer to this question becomes more relevant when the introduction of a new method of instruction is being advocated. This question has been tackled by a few researchers in the context of programmed learning as method of instruction.

Doty and Doty (1964) conducted a study with 100 undergraduate college students enrolled in an introductory psychology course. Students were to complete a programmed unit on physiological psychology after which they were

administered an achievement test. Along with this a brief attitude test consisting of ten 5-point rating scales was also administered to determine favourableness of attitudes towards the programmed instruction; ratings were summated to yield a single index of attitude. Product-moment correlation between programmed instruction achievement and attitude towards programmed instruction was found to be 0.10 which was not statistically significant. This finding was in consonance with the earlier findings of Eigen (1963), and Eigen and Feldhusen (1963). Eigen (1963) studied the attitude of high school students towards programmed instruction. He found that attitudes vastly differed from student to student. However, he concluded that students' attitude towards programmed instruction did not bear any relationship with the amounts they learnt through the programme. Eigen and Feldhusen (1963) studied the relationship between achievement and several student characteristics including attitude towards programmed learning. They also concluded that attitudes of students towards programmed learning were not consistently related to the students' levels or amounts of learning.

Stone (1965), also, in his study of student attitude towards programmed learning technique and its effect on performance found that there was no significant

relationship between student attitude towards concepts associated with programmed instruction of the kind used in the study (linear) and student performance.

Brinkmann (1966) administered a questionnaire designed to reflect the attitude of the individual towards programmed instruction just experienced, in order to check the possibility that a relationship might exist between the effectiveness of this particular technique of learning and the students' attitude. Analysis of the attitude survey revealed that students who preferred programmed instruction to instruction by the teacher scored higher on the post-test. Those students who felt that teachers could teach much better than the programme had consistently scored below the median on the post-test. Also, the majority of those students who indicated preference for only occasional utilisation of programmed learning were found to have scored below the median.

Singh (1972) administered a programme on 'Fraction' for students of class VI in his study of the relationship between programme effectiveness and certain student characteristics. He found that, in terms of criterion test scores, the programme was more effective on students having a favourable attitude towards programmed

learning than for those who did not.

Bhushan (1973) administered a Likert type scale of attitude towards programmed instruction, prepared by himself, to 42 B.Ed. students who had completed a programme on Educational Statistics. Product moment coefficient of correlation between post-test scores and attitude scores was found to be significant at 0.01 level of confidence, which indicated the existence of a positive relationship between achievement through the programme and attitude towards programmed learning as a method of instruction.

It may be noted that the findings of the studies reported above are equivocal. They do not allow for any definite conclusion to be drawn regarding the specific nature of relationship between students' achievement through the use of programmed learning material and their attitude towards programmed learning as a method of instruction. An attempt has been made in the present study to collect further evidence about the relationship between achievement of students through programmed learning and their attitude towards programmed learning. In this connection, the following hypothesis has been tested.

There is no relationship between students' achievement through programmed learning and attitude towards programmed learning as a method of instruction.

Achievement and Intelligence

Intelligence has been the most extensively explored area of the psychology of individual differences. It may be recalled that measurement of intelligence originally began as an attempt to provide a scientific basis for developing improved grouping strategies at schools. Tests of intelligence have claimed that they provide reliable indices of general ability to learn which can directly help the schools to adjust their programmes of instruction to suit the varying needs of the learners. Although the relevance of what is measured through the tests of intelligence to the factor of ability to learn has been doubted (Jensen, 1964), intelligence has been traditionally accepted as a fundamental factor influencing academic achievement. This traditional acceptance, however, is based more on an unclenching faith of the teachers in the superiority of 'mother's wit' over 'effects of schooling' than on any scientific evidence. At the same time, one cannot fail to notice that, inspite of vast amount of

research efforts invested in the area, psychologists have been unable to bring a meaningful rapprochement between the concepts of intelligence and academic achievement. Intelligence as a concept has defied a universally acceptable definition; and, as a measure it, perhaps, overlaps with academic achievement.

In this context of orthodox faith among the teachers as to the role of intelligence in academic achievement and, of a state of confusion among psychologists as to its very nature and definition, some educationists heralded programmed learning as the great solution for all the gnawing problems of individual differences in achievement. It was argued that the improvement in instruction contributed by programming techniques enabled the student of limited ability to reach levels of achievement seldom reached with conventional instruction. Although the initial claims sounded promising, a closer inspection of the programmes showed them to be rather more innocuous than what the extravagant claims indicated (DeCecco, 1964). Researches soon revealed that the claims were only the prophecies made by some enthusiasts rather than conclusions based on scientific observations.

Research results in this regard are not conclusive. They do not help one to draw any definite conclusion as to the relationship between intelligence and achievement through programmed learning. Some researchers (Porter, 1959; Pandya, 1973) have reported negative relationship between intelligence and achievement through programmed learning; some (Porter, 1961; Stolurow, 1964; Reynolds and Glaser, 1964; Eigen and Feldhusen, 1964) have found low or zero correlation between the two variables; and, some others (Alter, 1962; Lambert, 1962; Goel, 1970; Bhushan, 1973; Kapadia, 1974) have reported a positive relationship between the two variables.

Porter (1959) made an intensive study of the effects of year long instruction through teaching machines. He found a slightly negative correlation between intelligence and post-test achievement, although it was not statistically significant.

In a study by Pandya (1973), twenty students of high I.Q. of the experimental group were compared with twenty students of low I.Q. regarding their gains in the criterion test scores. It was found that students of high as well as low I.Q. gained in learning but students of low

I.Q. gained more than the students with high I.Q. The difference was significant at 0.01 level.

Porter (1961) compared the relationship between intelligence and achievement in spelling for a group of children taught through programmed learning and that for a group taught through traditional methods. He found the correlation to be lower for the group taught through programmed learning than for the group taught by traditional methods.

Stolurrow (1964) conducted a study on twenty gifted students who participated in a problem solving institute. Their learning experience consisted of studying self-instructional programmed materials over a six-week period. He found that Mental Age of students did not correlate significantly with the post-programme achievement scores.

A total of 96 ninth, tenth and eleventh grade students served as subjects in two studies (Eigen and Feldhusen, 1964) of learner variables in programmed learning. They concluded that in neither study I.Q. per se was found to be the fundamental learner variable in programmed instruction.

Reynolds and Glaser (1964), in their experiment with seventh graders to compare three methods including that of learning through a programme, correlated intelligence scores and scores of criterion tests administered after the completion of the programme. Based on their findings, they concluded that intelligence scores can not be taken as predictive of the amount of achievement that results from linear programmed instruction.

Alter (1962) studied the relationship between intelligence and retention of material learnt through programmed instruction. He found that more intelligent students performed better on the retention test than less intelligent students.

Lambert (1962), in his study with school children found that intelligence was the most significant variable in immediate subject matter acquisition through programmed instruction.

Goel (1970) undertook an investigation to study the differences in the error rate on the programme and criterion scores for students at different intelligence levels. She found that students of above average intelligence made significantly fewer errors on the

programme and attained significantly higher scores on the criterion test than those belonging to average and below average intelligence levels.

Kapadia (1974) studied the relationship between the immediate achievement and the retention scores on linear and branching programmes and some personality variables including intelligence. The sample for the study included 525 students of standard VIII from eleven schools of the city of Baroda. Criterion tests of the linear and the branching programmes, which were on different topics, were administered once immediately after the completion of the programme and again after an interval of two months. The results indicated that intelligence was positively related to immediate achievement scores as well as retention scores on both types of programmes. The relationships were found to be significant at 0.05 level.

Bhushan (1973) administered Jalota's Intelligence Scale along with a programme on Educational Statistics to 42 B.Ed. students. Product-moment coefficient of correlation between post-test and intelligence scores was found to be significant at 0.01 level indicating that higher the intellect of the student better the chances of his benefitting by the programme.

As it was noted earlier, findings of the above studies are equivocal and do not lead to any conclusive answer to the question of relationship between intelligence and achievement through programmed learning. However, in view of the crucial role traditionally calimed for intelligence in school learning and also the tall claims made by some exponents of programmed learning it becomes important to collect more research evidence regarding the role of intelligence in achievement through programmed learning so that a conclusive answer be given in this regard. With this purpose in mind an attempt is made in the present study to test the following two hypotheses.

- (1) There is no relationship between intelligence and achievement through programmed learning.
- (2) There is no difference in the achievement of students belonging to high intelligence group and low intelligence group.

Achievement and Academic Motivation

Study of relationship between academic motivation and achievement is, perhaps, more of theoretical interest than practical. Academic motivation has been differently referred to in the literature as 'motivation to learn' or

'intent to learn' (Gagne and Bolles, 1959) or 'resolve to learn' (Gagne, 1965). It may be hypothesised that the product of a task performed in any situation is dependent on the individual's basic motivation to perform the task. In other words, the amount a student learns in a particular instructional situation is related to his motivation to learn. The motivation of the student, here, does not refer to a mental state induced in him due to the conditions of learning such as the nature of instructional procedure, content of the learning material or other environmental conditions; it refers to an internal mental state in the individual which preps him to embark on a task or tasks which would result in learning.

However, research evidences are not all that supportive of a hypothesis of positive relationship between motivation to learn and amount learned. Walker (1969) considering the findings of animal learning experiments studying the effects of drive level on learning has stated that the most frequent conclusion is that drive level affects performance but does not affect the amount learned. Studies of human learning also, in this regard, seem to support the above conclusion. McGeoch and Irion (1952) present a review of previous studies on motivation to learn. Based on research findings, particularly those of Postman (1955,

1956a, and 1956b), Gagne and Bolles (1959) conclude that intent to learn has not been shown to be a factor worthy of much concern in considering manipulable variables in a training situation. Gagne (1965) has expressed the same view more emphatically in the following : "some discussions of the problem of motivation speak of 'motivation to learn' as if this were a specific kind of resolve by means of which the student could say to himself, "I must learn this" and learning would then follow. But if there is this kind of specific motivation, it does not appear to be effective. A number of studies have shown that under many circumstances learning occurs about as well when such a resolve is absent as when it is present."

In spite of Gagne's (1965) categorical remarks regarding the utility of studying it as a variable influencing achievement, testing a hypothesis of relationship between academic motivation and achievement seem to have a special significance when programmed learning is the method of instruction employed which has been claimed to be based on operant conditioning principles. In learning through a programme, the programme frames form basic stimulus-response (S-R) behaviour units along with the correct responses acting as reinforcers. Here, the learner responds to a question (stimulus) in a frame

essentially because of his motivation or 'intent' to learn, as he is told that that is the way to learn using a programme; it is, perhaps, misleading to think that a learner responds solely because of the prospect of getting the reinforcement in the form of knowledge of the correct response. Further, each of these S-R units constitutes an essential component of the terminal behaviour repertoire to be acquired by the learner. These points indicate to a possibility that a positive relationship exists between the learner's level of motivation and his achievement through the programme which, is dependent on the individual S-R bonds established while the learner reads the programme frames. An examination of the details of an operant conditioning experiment of animal learning would, perhaps, bring the point under consideration, viz., relationship between motivation to learn and achievement through programmed learning, into clearer focus. Analogous to 'motivational level' one comes across the concept of 'drive level' of the organism to be trained in animal learning experiments. In a typical operant conditioning experiment, the drive level of the organism is manipulated in terms of deprivation of food and water, electrical brain stimulations, etc. Initially, the organism is maintained at a minimum drive level which prods it to embark on the learning task; and, throughout the

learning process, it is the manipulation of this drive level, by adopting differential drive reduction through suitable reinforcers, which facilitates learning. In this situation, the organism acts or responds not with any intent to learn the task but solely because of the prospect of drive reduction. On the other hand, for the animal trainer drive reduction is not the purpose; it is only a mediational technique employed for facilitating learning. But such a dichotomy of purposes of the organism and the trainer, eventually, vanishes in a situation of human learning wherein the student learns through a programme. Here, reinforcement provided in the form of knowledge of correct responses in a programme does not involve any mediational technique extraneous to the process of learning. Intent of the learner as well as the programmer coincides when the learner responds to the individual frames on the programme. This brings into fore the importance of studying motivation to learn or academic motivation as a variable influencing achievement through programmed learning. In this context, an attempt is made in the present study to test the following hypotheses.

- (1) There is no relationship between academic motivation and achievement through programmed learning.

- (2) There is no difference in the achievement of students belonging to high academic motivation group and low academic motivation group.

Achievement and Reading Comprehension

Programmed learning material whether presented through teaching machine or in a textbook format, consists of verbal material presented through visual medium. Presentation of programmed material through other media is, atleast, not as common as through the visual medium. Because of this one may be tempted to conclude that learning through programmed material relies heavily upon the ability of the students to comprehend verbal material through reading. In order to avoid such a situation of heavy reliance on the ability of the students, presumably, the narrative content of linear programmes is written at a sufficiently low reading level to fall below the lowest level of reading ability of the group for which the programme is written. Thus, reading ability should not be a variable in such a programme. However, whether it is possible to really develop programmes which suit students of variability to comprehend verbal material through reading is a pertinent question. And, a negative answer

to this question regarding a programme tells upon its suitability for the target population. Thus, it should be worth trying to find out with respect to each programme, whether achievement through its use is influenced by the reading comprehension ability of the students.

With this objective in view the following hypotheses have been tested in respect of the Programmed Text developed under the present study. It may be recalled that the Programmed Text has been written in English language.

- (1) There is no relationship between reading comprehension ability of the student and achievement through programmed learning.
- (2) There is no difference in the achievement of students belonging to high reading comprehension ability group and to low reading comprehension ability group.

Attitude, Intelligence and Academic Motivation

There is a widespread notion that programmed learning is suitable for students of average and low intelligence, but not for those with high intelligence.

The argument runs that the learning task presented to the students in the form of programmed material is too simple and not challenging enough that intelligent students would find the task boring and uninteresting. This tentamounts to saying that students with high intelligence may not be favourably disposed, in their attitude, towards programmed learning as a method of instruction. However, Bhushan (1973) has reported results which are quite contrary to the popular notion. He studied the relationship between intelligence and attitude towards programmed learning of a group of 42 B.Ed. students who had taken a programme on Educational Statistics. He found that the coefficient of correlation between intelligence score and attitude score was significant. From this, he concluded that students having higher intelligence were liable to form more favourable attitude towards programmed learning as a method of instruction. Thus, it would be necessary to obtain more research evidences before one can conclusively answer the question regarding the relationship between intelligence of students and their attitude towards programmed learning as a method of instruction.

A question very similar to the above may be posed regarding the relationship between academic motivation of students and their attitude towards programmed learning

as a method of instruction. It is claimed that a programme has an inbuilt motivational mechanism in terms of providing immediate knowledge of correct response which is adequate to maintain and even increase the motivation of the student to learn. However, it is also counterargued that for students who are already motivated to learn, knowledge of correct response is only informational and has no motivational value. These arguments, although neither of them has been conclusively answered by research, point to the possibility that since the programme frames would have differential motivational effects on students according to their academic motivation (motivation to learn), the students differing in their academic motivation may react differently towards programmed learning as a method of instruction. This again amounts to answering the question whether there is any relationship between academic motivation of students and their attitude towards programmed learning as a method of instruction.

In the present study an attempt is made to obtain an answer to the aforementioned questions of relationship between intelligence and attitude towards programmed learning and that between academic motivation and attitude towards programmed learning. The following two hypotheses have been tested in this regard.

- (1) There is no relationship between intelligence of students and their attitude towards programmed learning as a method of instruction.
- (2) There is no relationship between academic motivation of students and their attitude towards programmed learning as a method of instruction.

Results and Discussion

Product-moment coefficients of correlation have been obtained between achievement through programmed learning and the four student characteristics, namely, attitude towards programmed learning as a method of instruction, intelligence, academic motivation, and English language reading comprehension. These coefficients have been presented in Table 5.1.

Table 5.1

Correlation between Achievement and
Student Characteristics (N=35)

	Attitude	Intelligence	Academic Motivation	Reading Comprehension
Achievement	0.43**	0.45**	0.33*	0.59**

* Significant at 0.05 level

** Significant at 0.01 level

Achievement of students belonging to high intelligence and low intelligence groups, to high academic motivation and low academic motivation groups, and to high reading comprehension and low reading comprehension groups was compared by computing the mean achievement scores for the different groups and testing the differences in means for the two groups, in respect of each characteristic for significance using 't' test. Mean achievement scores for the different groups are presented in Table 5.2. The high and low groups have been formed in each case by taking, the corresponding median score as the point for classification.

Table 5.2
Mean Achievement Scores for the Different Groups

	Mean	S.D.	t-value
High Intelligence	76.15	8.92	1.41
Low Intelligence	71.41	10.02	
High Motivation	76.06	9.89	1.21
Low Motivation	71.85	10.62	
High Reading Comprehension	79.03	9.92	3.19**
Low Reading Comprehension	69.44	7.83	

** Indicates significance at .01 level

Product moment coefficients of correlation were computed between attitude of students towards programmed learning as a method of instruction and their intelligence, and academic motivation. These coefficients of correlation are presented in Table 5.3

Table 5.3
Correlation between Attitude and Intelligence,
and Academic Motivation (N=35)

	Intelligence	Academic Motivation
Attitude	0.07	0.10

It may be observed from Table 5.1 that the product moment coefficient of correlation between achievement and attitude is 0.43 which is significant at 0.01 level. This indicates that students with more favourable attitude towards programmed learning as a method of instruction have achieved higher through programmed learning. Thus, the hypothesis of no relationship between attitude towards programmed learning and achievement stands rejected. But, it would need many more research studies before a definite answer be given to the question of relationship between

achievement and attitude towards programmed learning, as results of previous studies in this regard are equivocal. However, it is interesting to note that in both the Indian studies reported earlier (Singh, 1972; Bhushan, 1973) findings have been similar to those of the present study.

Table 5.1 shows that the product moment coefficient of correlation between intelligence and achievement through programmed learning is 0.45 which is significant at 0.01 level. Therefore, the hypothesis of no relationship between intelligence and achievement has to be rejected. This points to the possibility that intelligence may be a factor influencing the achievement of students through programmed learning. Somewhat contrary to this, results presented in Table 5.2 indicate that there is no difference between the mean achievement scores of students belonging to low intelligence group and of students belonging to high intelligence group. Thus, here, the hypothesis of no difference in the achievement of students belonging to the two groups is not rejected. From these findings it may be concluded that, although there is a significant relationship between intelligence and achievement, intelligence may not be considered as a factor causing differences in achievement of students through programmed learning. This again, however, can not be taken as the final answer to the

question of role of intelligence in achievement of students through programmed learning, as the findings of earlier researches have not been conclusive; rather, it further adds to the controversy that already exists in this regard. But, the findings of the present study clearly shows that product moment coefficient of correlation between the two variables may not be taken independently as an indicator of the role of intelligence in the achievement of students through programmed learning.

It may be noted from Table 5.1 that the product moment coefficient of correlation between academic motivation and achievement is 0.33 which is just significant at 0.05 level. Thus, at 0.05 level of confidence, the hypothesis of no relationship between academic motivation and achievement stands rejected. However, again, results presented in Table 5.2 indicate that there is no difference in the mean achievement scores of students belonging to low academic motivation group and of those belonging to high academic motivation group. Therefore, the hypothesis of no difference in achievement of students belonging to the two groups is not rejected. From these findings, it may be, again, concluded that although there seems to be a significant relationship between academic motivation and achievement through programmed learning, academic motivation

may not be considered as a causal factor in the achievement of students through programmed learning. It may be noted that this finding is in concordance with Gagne's (1965) conclusion that motivation to learn is not a fundamental factor influencing achievement.

Again, Table 5.1 shows that the product moment coefficient of correlation between reading comprehension and achievement is 0.59 which is significant at 0.01 level. Thus, the hypothesis of no relationship between reading comprehension ability of students and their achievement is rejected. However, it may be noted that this coefficient of correlation comes down to 0.41 which is significant only at 0.05 level, when the effects of the other three variables, namely, attitude, intelligence and academic motivation have been partialled out. Results presented in Table 5.2 show that there is significant difference between the mean achievement scores of students belonging to low reading comprehension group and of those belonging to high reading comprehension group. This implies that the hypothesis of no difference in the achievement of students belonging to the two groups is also rejected. These findings suggest that reading comprehension ability acts as a factor influencing the achievement of students through programmed learning. Although, it may not be correct to draw such

a generalisation regarding the influence of reading comprehension ability on achievement through programmed learning, it may atleast be concluded that ability of students to comprehend English language through reading has influenced their achievement through the Programmed Text used in the present study. It suggests that either the language of the Programmed Text has to be further simplified or that instead of merely assuming, as it was done in the present study, about the students' comprehension ability based on their qualifications, scientific methods of measurements be employed to ensure that students possess the required English language reading comprehension ability for using the Programmed Text.

Results presented in Table 5.3 show that there is no significant relationship between attitude of students towards programmed learning as a method of instruction and their intelligence. Thus, the hypothesis of no relationship, stated earlier in this regard, is not rejected. It may be noted that this finding is contrary to that of Bhushan (1973) who reported a positive and significant relationship between intelligence of students and their attitude towards programmed learning. It is further interesting to note that the present finding is also contrary to the popular notion in this regard which implies a negative relationship

between the two variables. /It may be concluded from the finding of the present study that intelligence and attitude towards programmed learning as a method of instruction are two independent student characteristics./

Again, from Table 5.3 it may be observed that there is no significant relationship between attitude of students towards programmed learning as a method of instruction and their academic motivation. Thus, the hypothesis of no relationship, stated earlier in this connection, is not rejected. The finding of the present study, therefore, (indicates that the attitude of students towards programmed learning as a method of instruction is independent of their academic motivation.

An important point should be noted while considering the findings and conclusions reported under the present chapter. Programmed learning as a method of instruction refers to the use of any programmed learning material in regular instructional work. These programmed material can be of different formats and styles although they would have several commonalities. Achievement through programmed learning material differing in their main features would amount to achievement under different learning conditions, which may, in turn, have differential

relationships with various student characteristics. Thus, the conclusions drawn in the present study regarding the relationship between achievement and student characteristics may be taken as generalisations over situations involving the use of programmed material which are similar in format and style to the Programmed Text used in the present study.

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