CHAPTER ONE

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There is no doubt that the world in which we live now a days urges us to act rapidly for the development of our educational system, in such a way that we may be enabled to face the challenges of scientific progress in the various fields of knowledge. The greater the pace of change in the world, the more urgent it becomes for us to develop efficiency in the way our young people learn. Seeing that the technology of education and training is still unable to keep pace with the technological progress itself, in our society, it becomes utmost important for us that we should turn our interest to the faith that the solution of problems created by technology lies in technology itself, and the extent of our success in its use in education.

* Educational technology is as wide as education itself; it is concerned with the design and evaluation of curriculum and learning experiences and with the problems of implementing and renovating them. Essentially it is a rational, problem solving approach to education, a way of thinking sceptically and systematically about learning and teaching*, Collier (1977). But as it exists today educational technology is comparatively a new idea, grown as a result of the integration of technological
devices in the use of practices with the newly explored psychological principles of learning, teaching behaviour modification, content analysis and evaluation etc. Therefore, it could be conceived as a science of techniques, methods and media by which educational goals could be realised.

The great demands of mass education cannot be meted out till our teaching is restricted to the use of a human being as a teacher without supplementing him with any other instructional devices. A teacher cannot be left alone to depend entirely upon his own resources and talents, he must be helped to acquire skills in utilizing the new techniques of learning and he should also be provided with reliable instructional material based upon the dependable findings of educational technology.

Programmed learning is one big step in this direction. It offers some hope to solve what otherwise appear to be insurmountable problems of education. It is only recently that it has attracted serious attention of the Indian scholar. But programmed learning has come to stay in India. It has immense possibilities in the direction of refining class-room instruction, encouraging self instruction and providing reliable basis for audio-visual instruction (V.S. Jha).

1.1 ORIGIN AND EVOLUTION OF PROGRAMMED INSTRUCTION

Program itself is an old word. It connotes a predetermined order, of sequence, and fixed relationships of inter dependent functions or actions
to be performed. After the world War II, the language of computers gave the word "program" added meaning and popularity. A program either represented or consisted of a set of controlled, sequenced actions. The basic idea was that decisions could be made in advance to determine what should happen; and, with the highly predictable and repetitive operation of equipment, one could be assured of the desired results. In short, programming was popularized as a process of determining empirically a sequence of actions or operations that follow a pre-set order to assure a dependable performance at an established standard.

It is not difficult to cite historical instances that illustrate that programmed instruction has been going on for a long time and has its roots in antiquity. Socrates in the Meno taught a slave boy the proof of the Pythagorean theorem by using simple diagrams leading the boy by small steps to generalizations of some significance. Its roots extend back to Comenius who wrote a text book for learning Latin and which was systematically arranged, the range of behavioural goals clearly discernible. Comenius recommended that the subject matter be systematically arranged according to types and stages in mental growth and adapted to the student's ability. When we look back at ancient India we find that our own scriptures are full of wisdom of the ancient saints who developed a full-fledged system
of education thousands of years back. The most sacred book of the Hindus, 'Gita' has all the ingredients of programming.

1.1.1

**PSYCHOLOGICAL ANTCEDELENTS**

Programmed instruction entered upon the educational scene by the side door—by way of psychology. There are theoretical and historical relationships between instructional programming and the early psychological works of Watson, Pavlov and Thorndike. However, the first use of the term programmed instruction is associated with B.F. Skinner (1954), a Harvard psychologist. The connection between Skinner's reinforcement principle of providing confirmation of responses in programmed materials and Thorndike's "law of effect" is probably the best known historical relationship. Pavlov's (1927) classical experiments which introduced the concept of "conditioning" are intimately associated with the basic principles of programmed instruction.

1.1.2

**EDUCATIONAL ANTCEDELENTS**

Dale (1967) has mentioned that much of the recommended systematized educational behaviour (highly detailed lessons, systematic arrangement of instruction, instructional materials designed to systematize activities for learning, developing the independent learner and recent analysis of instructional outcomes and sequenced behaviours) advocated and practiced earlier has elements in common with modern programmed instruction systems.
Programmed instruction as a somewhat self-conscious movement got underway quite precipitously shortly after B.F. Skinner read his 1954 paper entitled, "The science of learning and the art of teaching", which was subsequently reprinted in the Harvard Review and elsewhere. Pressey published his earliest papers on programmed learning in 1927. Pressey and several of his students were certainly the precursors of the programmed instruction and teaching machine movement, but they were probably not progenitors. In 1932, Pressey himself said that he regretfully was giving up his work on teaching machines because of his feeling that the time was not ripe.

Programmed learning as we come to know it in early sixties was largely the brainchild of B.F. Skinner. His programmes first developed to train his students in psychology, rely upon operant conditioning and reinforcement theory. Programmed learning grew out of experiments in operant conditioning mainly relating to the behaviour of laboratory animals. As a technique of learning, programmed instruction is of great interest to psychologists. In a short time this approach to teaching and learning became so much popular on the educational scene of the U.S.A. that it was considered as an expedient technique of imparting education by various scholars and educators in the field. Interest of the educators and psychologists towards programming has also been indicated by Schramm's (1964) who conducted a
research into various studies on programmed learning that had appeared before 1962 and found that 86 percent of these studies had appeared after 1959. Lumsdaine (1964) and Holland (1965) who also conducted research in the field of programmed instruction, supported Schramm's views.

Norman A. Crowder (1954), a psychologist with the United States Air Force introduced a kind of programming which adapts to the needs of the students without the medium of extrinsic device such as computer and termed it as Intrinsic or Branching style of programming. He called his device as automatic tutoring. According to Pife (1966) there are two major differences apparent between linear and branching programming. First, the branching of programme typically presents much more information at each step; whereas linear programme commonly gives a sentence or two at a time. Second, the method for student response is different; in the linear programme, the student often constructs a response whereas a branching programme usually employs a multiple-choice question at the end of each step (that is, the student chooses between given alternatives).

Mager (1958) and others conducted a survey of programming techniques described by Crowder and Skinner. It became clear to them that the sequencing of instructional events had upto that time not been based directly upon the student himself. He raised a basic question that why could not student himself be a source of significant input to the sequencing decisions?
Mager developed his own technique which was termed as "Learner Controlled Instruction". The main thesis of learner controlled instruction is that the object of instructional research is the student, who is the best source of information about himself.

Gilbert (1962) developed another kind of instructional programme called, Mathetics. He defined Mathetics as the systematic application of reinforcement theory to the analysis and construction of those complex repertoires which represent mastery of subject matter.

1.2

Programmed learning has attracted the attention of educationists and psychologists because it is a new strategy in teaching-learning which has outweighed the traditional teaching techniques that have become obsolete in the technologically developed society.

Though programming, in the final analysis, sets itself the same aims as a good living teacher, hoping to achieve these more quickly and in a more productive manner, its approach is usually a different one. Consequently, programming has introduced new features into teaching and has discovered new ways of applying these in practice (the individualization of the teaching process, self pacing, frequent application of the feedback, guiding the student according to the reactions he makes, and the like).
Gagne (1970) has been concerned with learning of several types, from motor skills to problem solving, and has established what he believes to be some necessary conditions for an effective programme. The first step is to analyse the material to be learned into number of tasks and sub-tasks. The next step is the drawing up of a hierarchy of tasks, so that at every stage the learner has already completed all necessary material for the new task. According to Gagne, "programmed learning consists of making teaching models which take into account the initial and terminal response of the student, are graded in accordance with a detailed schedule and permit intermediate assessment of the strategies employed".

Ake Bjerstedt (1972) has indicated that the term programmed learning is used in two ways. In a narrow sense it involves the composing of a series of tasks and their arrangement in what one believes to be an instructionally appropriate series following certain special principles. In the broad sense programming comprises, in addition to the above, comprehensive preparatory work aimed at, among other things, the analysis of goals, students and subject matter characteristic as well as comprehensive following up with successive testing and revision of the first version.

Susan Markle (1969) gave a wider definition of programmed instruction. She stated that it is a method of designing a reproducible sequence of
instructional events to produce a measurable and consistent effect on behaviour of each and every acceptable student.

Kulkarni (1967) defined the programmed instructional material as "a teaching material which leads a student by short, logically and psychologically related steps, resulting in a few errors so that he practises correct responses rather than errors and these are reinforced immediately by the knowledge of results so that he makes successively closer approximations to the responses leading to the desired goals".

Taber et al., (1965) stated, that the programmed instruction is "a process of constructing sequences of instructional material in a way that maximizes the rate and depth of learning, fosters understanding and ability to transfer knowledge to new situations, facilitates retention and enhances the motivation of the student. It is an explicit process, it is what an effective teacher does intuitively".

Espich and Williams (1967) defined programmed instruction as "a planned sequence of experiences leading to proficiency, in terms of stimulus-response relationship that has been proven to be effective".

The principles on which programmed learning is based were discovered and advanced by B.F. Skinner (1954) in his laboratory experiments. The basic principles were first identified with reference to the linear programme. In course of time, as various
techniques of programming have come to light, the principles of programming have been made broad based. According to Skinner's theory of linear programming, a programme must be split up into very short frames, each frame must meet with an active response, and knowledge of results must be immediately forthcoming.

Holland (1961) holds that programmed learning depended on three major principles—gradual progression, control of student's observing and mediating behaviour and variations in material.

Pipe (1966) asserts that programme instruction owes its potency to following four characteristics.

1. The material to be learned is presented in what have been called "optimally sized increments" (small steps).

2. The student continually is being made to interact with the programme (Active participation).

3. As soon as a student has made a response he discovers whether he was right or wrong (Immediate knowledge of results).

4. Each student's rate of progress is determined by the speed at which he works his way through the programme; he is not forced to wait for those slower than himself.
nor is he left standing by those more apt (Self-pacing).


De Cecco (1970) suggested the following characteristics of programmed learning:

- The material is broken down into small steps.
- Immediate response is required of the student.
- Immediate confirmation of right answers or correction of wrong answers for each response the student makes.

E.F. O'Day (1971) classified the principles of programmed learning into mandatory and optional principles. Following three are referred to as mandatory principles:

- The principle of objective specification.
- The principle of empirical testing.
- The principle of self-pacing.

In contrast the optional principles are:

- The principle of overt responding.
- The principle of immediate feedback.
- The principle of small step size.
Hartley (1972) discussed the features of programming along with its principles in the following manner:

- The student works with a machine or programmed text individually, and at his own rate.
- He works through a carefully ordered sequences of items (usually short) in which he is asked to respond in some way (by writing answer down, pressing appropriate button etc.).
- The material (Programme) is so designed that the student makes a few errors.
- At each stage the student is informed immediately whether or not his responses are correct.

1.3

**STYLE OF PROGRAMMING**

In the present study a linear programme was developed. This is a programme especially devised to advance the student step by step to his learning goal, and so organized that he will make minimal errors. B.F. Skinner, is the proponent of linear programming and the first to develop a linear programme. A linear programme was originally called Skinnerian programme also. Skinner has advocated the following principles.

1.3.1

**SMALL STEP**

Subject matter is broken down into very small steps and each step is presented in a
proper sequence. These small steps are called as frames. The student has to respond to each frame before he is given the next frame. In a linear programme the learner constructs his response.

Evans, Glaser and Homme (1959) found the effect of step size on the frequency of errors and upon immediate and delayed retention. The results revealed that smaller the step, the fewer the errors and greater the retention.

Coulson and Silverman (1960) concluded in their study that small step programme was significantly better as a learning device, although it took more time.

The studies are further strengthened by Blank et al., (1970) who found that small step size programme, produced higher post-test scores and had a lower error rate than large step programme.

Gosain (1975) in his study also concluded that the small step size programme had slightly low error rate than the large step programme.

1.3.2

**ACTIVE PARTICIPATION**

Linear programme involves active participation on the part of the learner. In each frame, a response is required of the learner; a student is made to interact with every bit of information and make a response.

Gilbert (1962) emphasized that learning takes place most rapidly if the student is
actively engaged with the subject matter.

According to Markel (1969) an active response to all the content in a frame is obtained when the student is required to process all of it in order to respond. There is considerable evidence that active responding aids learning.

1.3.3

IMMEDIATE KNOWLEDGE OF RESULTS

As soon as a learner responds, he is given the desired answer. Since the programme is carefully written at a level that holds student's errors to the minimum, the desired response is usually a confirmation of the student's response. When the learner finds that his response is correct, he obtains confirmation; when it is incorrect, he receives correction.

Studies have been conducted by Anderson (1967) and Annett (1969) on immediate knowledge of results. They found that immediate feedback is more helpful with the programmes with higher error rate.

Anderson (1972) conducted an experiment and found that the students who were prevented from seeing any correct response until they had made their own response did better than learners who were not prevented which means that it is not only the immediacy of feedback which affects the performance of the learner but the way the feedback is presented.
1.3.4

SELF-PACING

Every learner proceeds at his own speed through the programme without being forced to work with the speed of other learners.

Hartley (1968) conducted an experiment on the learners working through programmes at their own speed versus those who were working at a rate determined by some external agent. The results showed no significant differences between the groups on the test performance. It suggests that the principle of self-paced instruction is not essential in programmed learning in all situations.

Macoby and Sheffield (1968) found that for superior students a self-pacing procedure in which the student himself regulates the length of sequence before practice worked best.

Each of the principles discussed above was given due weightage while developing linear programme in the present investigation. More significant phases of research and experimentation in programmed instruction in relation to fundamental principles are underway, in order to determine their importance in the field of learning.

1.4

JUSTIFICATION OF THE PROBLEM

Programmed learning research, however, has largely ignored the effect of personality differences on the programmed learning material. The present investigation is an
attempt towards examining what, if any, influence the personality differences of learners have on their ability to learn through programmed instruction. Some personality factors that are supposed to effect achievement in programmed instructions have been studied by some researchers. Some of these are: creativity, intelligence, anxiety, introversion and extroversion etc. The studies related to these variables, however, have produced inconclusive and varying results.

The present study concerns itself with the performance on a linear programme in a segment of biology in relation to level of aspiration and socio-economic status. The effectiveness of programmed material in teaching biological concepts has been confirmed in the following studies, which justify the investigator's decision of selecting the content to be programmed, from biology.

Teather, Hardwick and Collins (1973) developed a linear programme on "Photosynthesis and water relations of plants" for undergraduate students and exhibited that the students who studied through the programmed text, scored significantly higher in post-test than did the students who chose to attend lectures.

Manwaring, developed an audio-visual self-instructional bridge course on development biology as part of the inter-university biology teaching
project and indicated that students like this type of instructions and would welcome more programmes on other topics.

Strickland and Randolph (1975) compared a programmed course and a traditional lecture course in general biology for junior college biology students and revealed that the subjects using a programmed instruction improved significantly on the biological achievement test.

From the above studies, programmed learning; self-paced and with an inbuilt facility for question asking and answering, would seem to be a teaching method more appropriate to science education.

In the present investigation, an attempt has been made to study the effect of two personality variables, namely, level of aspiration and socio-economic status on performance in the linear programme. The justification for the inclusion of these variables is given in the following pages.

1.5

LEVEL OF ASPIRATION

Dembo (1931), a student of Lewin, is normally credited with the formulation of the construct 'level of aspiration'. Frank (1935) was particularly concerned with quantification of level of aspiration behaviour and a behavioural definition of the concept. According to Frank, level of aspiration is the outcome of three needs of the individual:
1. A need to keep his self-regard (ego-level) very high. This makes the level of aspiration greater than the performance.

2. A need to avoid ridicule (fear of failure). This makes the level of aspiration lower than the performance.

3. A need to keep in touch with reality, an objective estimate of a future level of performance on the basis of past levels of performance. This makes the level of aspiration approximate the performance.

With these considerations in mind, Frank (1935) gave an operational definition of level of aspiration (LOA) as "The level of future performance in a familiar task which an individual, knowing his level of past performance in that task, explicitly undertakes to reach". This has remained a standard definition of the term and is also the one adopted by the investigators Lewin, Dembo, Festinger and Sears (1944) attributed level of aspiration behaviour to a resultant of three kinds of factors or influences:

1) The seeking of success i.e. a subject making an estimate of his/her future performance is influenced by the strength of his/her desire to have success at as high
a level as possible.

ii) The avoiding of failure i.e. the strength of his/her desire to avoid failure.

iii) The cognitive factor of probability judgement i.e. his/her expectancy or probability of making any given score.

In order to develop a level of aspiration a subject must have an idea of the difficulty of the task and of his own ability to learn or perform it. For most individuals the level of aspiration will represent a compromise between their own evaluation of their ability to perform or learn a task and their desire to achieve high level of performance.

In most typical experimental investigations of aspiration behaviour the subject is given a series of trials on a particular task, after each trial, a score is reported to him and he is asked to indicate his level of aspiration (LOA) for the following trial i.e. how well he expects or hopes to do on that trial. The discrepancy between the individual's expressed level of aspiration and his immediately preceding performance, averaged over all trials, has been the most commonly derived aspiration measure "the goal discrepancy score" (GDS). Therefore, in the present investigation GDS was used to measure the level of aspiration of the subjects under study.

The manner in which a person sets and adjusts his goals relative to his abilities and past experiences has attracted considerable attention
as an important aspect of behaviour. The purpose of the present investigation is to provide some indication as to the amount and kind of relationship between level of aspiration and achievement that exists with particular reference to achievement on a programmed text. Little work is reported in the literature that has attempted to study the variable of level of aspiration in relation to performance on a linear programme. One of the important advantages of programmed learning is in its use as a research tool affording some control over such important independent variables. In this direction a study by Davis, T.N. is of considerable importance.

Davis, T.N. (1971) developed five self-contained programmes (Mathematics, English, Art, Science & Geography) written in similar style and format, these programmes were tested on (i) three level of aspiration tests (ii) attitude to programmed learning at the completion of the first and last programmes (iii) achievement on each programme immediately after completion. In his study all three measures of LQA, significantly correlated with achievement.

Sufficient research studies that determine the relationship, if any, between academic achievement and aspiration level, however, are available.

Gould and Kaplan (1942) found no correlation between level of aspiration and scholastic achievement in their study on relationship of level of
aspiration to academic and personality factors.

Holt (1946) also established that there is no correlation between academic achievement and level of aspiration.

Schultz and Ricciuti (1954) in their study on level of aspiration measures and college achievement also hypothesized that the goal discrepancy score would have a negative or curvilinear correlation with the scholastic achievement. They reached a tentative conclusion as a result of this pilot study that little, if any, correlation exists between the goal discrepancy scores used and previous college achievement.

Red, McCary and Jhonsen (1962) in their study on relationship between aspiration level and academic achievement found that all correlation coefficients and comparisons between measures from the aspiration test and measures of academic achievement showed that little relationship is evident between the two.

Worell (1959) conducted a study on level of aspiration and academic success. The results of this study provide support for the fruitfulness of the level of aspiration method in predicting academic performance. Aspiration measures have been shown to be related to academic success.

Locke (1966) also attempted to see how the level of intended achievement is related to actual level of achievement. A significant linear relationship, was obtained in his experiments, concluding
that the higher level of intention, the higher the level of performance.

Dowd (1952) comparing 19 achievers and 16 non-achievers of high ability college freshmen, found no significant difference in respect of their level of aspiration.

Roberts (1962) in his study on factors affecting the academic under achievement of bright high school students did not support the positive relationship between LOA and academic achievement.

Pearce (1972) investigated, in the LOA procedure consisting of knowledge of results plus goal setting possesses a motivational property as reflected in performance on subject matter criterion instrument (Tolman's principles of biology test). He found no positive relationship between the amount of improvement over past performance for students exposed to LOA treatment.

Vasanth Ram Kumar (1972) studied self concept and level of aspiration as factors affecting academic achievement and found that there is high association between achievement and goal discrepancy. The coefficients show that the tendency to aspire for higher scores is more marked for high achievers than with low achievers.

Rai (1974, in a comparative study of a few differential personality correlates of low and high achievers found that LOA was not a significant correlate of achievement. The sample
consisted of 1000 Higher Secondary biology students. Tiwari and Rai (1976) in their study concluded (i) that the goal discrepancy and attainment discrepancy are not differential personality correlates of low and high achievers (ii) the low achievers and high achievers do not differ significantly in their goal discrepancies. (iii) there is negative relationship between goal discrepancy and achievement. (iv) the low and high achievers do not differ significantly in their attainment discrepancy. Therefore, it was concluded that LOA in itself is not a significant correlate of achievement.

Păcăoaru, Cornelia and Popescu-Neveanu, Paul (1977) studied the relationship between the individual's aspirations and his actual creative achievements. The results indicated a negative correlation ($p \leq 0.05$) between an individual's level of aspiration and the level of his actual creative performance.

Uniyal and Sah (1981) studied the LOA of teacher-trainees of rural and urban areas in relation to their achievement. Their main findings were: (i) there is statistically significant difference in the goal discrepancy scores of high achieving group and low achieving group on level of aspiration scale (ii) when achievement was controlled the goal discrepancy scores of high achieving rural and high achieving urban and similarly of low achieving group rural and low achieving group urban did not show any significant difference. (iii) there was statistically significant
difference between the attainment discrepancy scores of high achieving and low achieving groups.

Sharma (1981) studied self concept, level of aspiration and mental health as factors in academic achievement of students between the age group of 13\(^+\) and 18\(^+\) years drawn from X to XII classes and she found that level of aspiration did not influence academic achievement and established an inverse relationship between academic achievement and level of aspiration.

The findings of most of the studies conducted so far on level of aspiration seem to suggest that level of aspiration is one of the most effective motivational techniques and is intimately related to achievement. The outcomes of previous research work in the field, motivated the investigator to select level of aspiration as one of the variables in the present study. Secondly, to the investigator's knowledge no investigation utilizing linear programme technique and involving the measurement of aspiration level appear to have been undertaken in India to date.

1.6
SOCIO-ECONOMIC STATUS

A good amount of research has been conducted in discovering and attempting to measure the factors which contribute to scholastic achievement. Socio-economic status is considered to be one of the most important factors in this direction. It is supposed to influence student's attitudes, interests, values and motivation etc. and thereby, his academic achievement. Social class is so closely associated with cultural level and with attitude
toward education that it has a marked effect on educational progress.

Rosen (1956) also observes that middle class parents, in comparison with low class parents, are seen to place greater emphasis on mobility and success, and hence, their children are more likely to embrace achievement-oriented behaviours.

Among the different indices of socio-economic status, education of parents is expected to be more important than others, since educated parents are expected to place high value on education. In fact, numerous studies of the development of talent show that it most frequently appears in homes where parents themselves are well educated and emphasize the "Life of mind". Barbe (1956) has also established that underachievers tend to come from homes where parents have less education than the parents of achievers. Not only they are less educated, but their values also tend to be either neutral or negative with respect to education, while parents of achievers tend to value education positively.

Occupational status and economic background are other important indices of socio-economic status. It has been found that high achievers tend to come from top occupational groups of business and profession. Economic conditions of the family also play a major role in deciding educational attainments of the family. Smooth prosecution of study becomes
difficult under economic constraints and deprivations. Socio-economic status as one of the important learner characteristics has been included in a number of studies in the field of instructional technology.

Etter (1969) concentrated on individual differences of adult learners as they are related to achievement with prior knowledge of objectives. The learner characteristics included in the study were socio-economic status, age, sex, learner outcome preference, verbal ability and life goals. The instructional task was a 135 frame programmed text on the stock market. The students were assigned to a specific objective group, a general objective group and no objective group. It was concluded that high socio-economic status males in the specific objective group scored significantly higher than others with specific objectives.

Shushen (1971) designed a study to explore possible relationships between socio-economic status of learners and their achievement when programmed instructional and conventional classroom techniques are employed. The subjects were 105 biology students in grade IX. The results indicated that programmed instruction, as compared with conventional classroom teaching, is more effective for the students who belong to a lower socio-economic status than for other students.

The effectiveness of programmed instruction was investigated by Doty and Doty (1964) in relation to 5 students' characteristics; cumulative
GPA, creativity, achievement need, social need and attitude towards programmed learning. Significant correlations were obtained between scores on achievement test over the programmed unit and GPA, creativity and social need. When effects of GPA were partialled out, significant correlations were observed between achievement on programmed instruction and social need, suggesting that the latter may be an important variable in the programmed learning situation.

Beach (1960) studied the relationship between sociability and academic achievement in four different kinds of learning situations. He concluded that students with high sociability perform better in class situation in which interaction is at a minimum. Usually it is noticed that students belonging to low socio-economic status are less sociable than the students who belong to high socio-economic status.

Patel (1975) developed auto instructional programmes in Geometry to find out their effectiveness in relation to different variables. Kuppuswamy's SES, scale was used to measure socio-economic background of IX class subjects. He found that students from different strata of the society performed better with programmed learning material than with conventional teaching.

Dewal (1974) in a study of difficulties in teaching English and effectiveness of programmed teaching revealed that difficulties like,
shortage of trained teachers, dearth of good teaching-learning material, lack of individual attention and poor socio-economic background were overcome by programmed teaching.

A positive relationship between socio-economic status and academic achievement has been revealed in a number of studies undertaken by Barger, Ben & Hall, Everette (1965), Chopra (1968), Pathak (1972), Anand (1973), Venkataish (1980), and Raj and Krishnan (1980).

1.7 CONTENT OF BIOLOGY

The content to be programmed in the present study pertains to the process of vegetative reproduction in plants. In particular, the following topics have been included.

- Meaning of the terms 'reproduction' and 'vegetative reproduction'.
- Advantages and disadvantages of vegetative reproduction.
- Natural methods of vegetative propagation namely:
  - Vegetative propagation by underground stems.
  - Vegetative propagation by aerial and sub-aerial stems.
- Artificial methods of vegetative propagation:
  - Grafting
  - Cutting
  - Layering
  - Budding
1.8
THE PROBLEM OF THE PRESENT STUDY

Though much attention has been paid by theorists and researchers to the study of level of aspiration, we do not yet know the specific way in which level of aspiration relates to performance on a linear programme when the socio-economic status of the students is also taken into consideration. Both of these variables, no doubt, have proved their worth in affecting the academic achievement of the learners when studied independently in school situations. The focus of previous research, however, has also been on level of aspiration as it relates to socio-economic status of students and vice-versa, independent of learners' performance in relation to different instructional materials. The present investigation is an attempt in this direction, which aims at exploring the possible relationship between these two independent variables and performance on a linear programme.

Keeping in view the wide importance and implications of these two variables i.e. socio-economic status and level of aspiration, in determining the performance of a learner, a specific study of a linear programme in a segment of biology in relation to level of aspiration and socio-economic status was designed. Considering the vital role the individual differences play in the field of educational attainments, the investigator feels this study to be a subject of interesting experimentation and research.
The scope of the present study has been delimited with respect to the style of the programme, the experimental variables, the tools employed to measure the terminal performance, the content selected for the programme and the design of the experiment.

For the present investigation a linear programme was developed on a biological concept. The content was classified into four different units. The instructional objectives of all the four units were written in advance.

The main variables of the study are performance on a linear programme, level of aspiration and socio-economic status. The two independent variables were studied at three levels each. The effectiveness of a programme is evaluated by learner's performance on the criterion test. Therefore, a criterion test was prepared.

The programme was validated against usual 90/90 standard and other criteria. The results of the total performance on the post-test highlight the effectiveness of the programme. The criterion test was used as a pre-test and post-test measure.

A 3 x 3 factorial design was employed for conducting the experiment and the results have been statistically analyzed. The significance of the difference between the means has been found by using the usual F-test.
1.10

RATIONALE OF THE PRESENT STUDY

A review of literature on achievement and individual differences, particularly at the high school stage reveals that there is a widespread concern among educators for understanding the factors that affect the academic achievement of pupils, such as socio-economic background, intelligence, method of instructions etc. These factors are considered as important determinants of achievement. There are also instances in which emotional and motivational patterns of students were investigated, as correlates of their academic achievement. But, very few studies seem to have been conducted in which personality characteristics such as level of aspiration and concept of self of students were studied in relation to their performance on instructional media like programmed learning.

The rationale of introducing level of aspiration as a factor in the present study is based upon the assumption that an individual's level of aspiration has a motivational property due to which it is intimately linked with the process of learning, thereby, with the performance of learners. Keeping this assumption in view, the investigator introduced this factor in the present study which relates to performance on a linear programme.

The socio-economic status of the learners is another factor which contributes to a greater extent to academic achievement as shown in previous
researches. The rationale of introducing this factor into the present study is based on the assumptions, that, socio-economic conditions of family like, education of parents, occupation of parents, economic condition of the family, etc. play a major role in deciding the educational attainments of the children. Educational achievements of children are difficult under economic constraints and poor family conditions. Therefore, to study socio-economic status and level of aspiration together in relation to performance on a linear programme seems to be of special significance, so as to make learning successful in accordance with the needs of pupils with varied background.

1.11

OBJECTIVES OF THE STUDY

- The objectives of the present study are as follows:-
  To examine the performance of students, on a linear programme, in a segment of biology, in relation to their level of aspiration.

- To examine the performance of students, on a linear programme, in a segment of biology, in relation to their socio-economic status.

- To study the interaction between level of aspiration and socio-economic status.
1.12

HYPOTHESES

The following hypotheses were formulated and tested in the present experiment:

- Level of aspiration significantly affects performance in a linear programme.

- Socio-economic status significantly affects performance of subjects on the criterion test.

- There is significant difference in performance of subjects belonging to high, average and low level of aspiration groups on the criterion test.

- High, average and low socio-economic status groups differ significantly in performance as measured by the criterion test.

- The interaction between level of aspiration and socio-economic status is statistically significant

1.13

DELIMITATIONS OF THE PROBLEM

The present study has been delimited with respect to the variables, contents, sampling, tools and techniques at various stages. The main variables of the study are level of aspiration and socio-economic status. A linear programme on "vegetative reproduction in plants" was developed following the essential principles of programmed
learning. The content covered in the programme was classified into four different units.

A list of behavioural objectives was prepared keeping in view the various important concepts in the content.

The study has been delimited with regard to sampling also. The target population for which the study intends to make generalizations is the students of English medium schools and colleges of Chandigarh.

The sample consisted of 300 students of Higher Secondary Part II, Prep. Medical and Eleven Plus stage of 10+2+3 pattern. The sample has been further delimited to only biology students.

Finally, the study may also suffer from some of the unavoidable limitations pertaining to tools and techniques. It may, therefore, be observed that the important findings from the present research may be understood in the context of limitations outlined above.