CHAPTER I

INTRODUCTION
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1.1 ACADEMIC PERFORMANCE

Academic performance is often referred to as the degree or level of success or proficiency attained in some academic work. According to Christian (1980), the word performance indicates the learning outcome of students. As a result of learning different subjects, the behaviour pattern of the students changes. Learning affects three major areas of behaviour of students: (i) Cognitive (ii) affective and (iii) Psychomotor. Christian (1980) is of the view that all these three levels are not affected in equal measure at a time, a student may be at a higher level in one domain and lower in another.

Cognitive area is primarily concerned with intellectual growth of the individual. It involves acquisition of basic intellectual skills, such as reading, ability to add and subtract, learning of facts, etc.

Bloom (1956) contends that cognitive domain includes all those objectives which deal with recall or recognition of knowledge and development of intellectual abilities and skills.

Broverman (1960) conceptualizes cognitive style as expression of different response probabilities or response strengths in certain types or classes of behaviour.
Sharma and Aggarwal (1980) conceive 'cognitive style' as a term that refers to stable individual performance in a mode of perceptual categorisation of external environment.

Affective area deals with the self-concept, personal growth and emotional development of the students.

The psychomotor domain is primarily concerned with the development of muscular skills and co-ordination.

Good (1959) refers to academic achievement as "the knowledge attained or skills developed in the school subjects, usually designated by test scores or marks assigned by the teacher".

Trow (1956) defines academic achievement as "the attained ability or degree of competence in school tasks, usually measured by standardised tests and expressed in grades or units based on norms, derived from a wide sampling of pupils' performance".

Mehta (1969) expressed the view that the word 'performance' is a wider term which includes both the academic and co-curricular performance of an individual. Achievement is the learning outcome of a student. A level of achievement in the academic field of a student is included in the performance of the individual.

The present study concerns itself with only the academic performance of the students. It is known through experience and experiments that academic performance is affected by different variables. Fig. 1,1 gives an illustration of the correlates of academic performance.
Fig. 1.1

Correlates of Academic Performance
Attempts have been made to review variables on which relatively more emphasis has been laid down by the research workers in this field. Out of the above correlates, only those variables are discussed here which have been included in the present study.

1.2 **INSTRUCTIONAL DESIGN**

The need of right instructional design cannot be underestimated in an ideal system of education. Ever since the inception of formal education there has been a constant search for different technologies of instruction to realise different teaching aims. Research of the past has pointed out to the fact that individuals have varying personality traits, consequently they differ in their learning styles. As they differ in their learning styles, they need to be taught by different instructional designs to get maximum out of them.

The external conditions of learning can be controlled by the procedures of instruction. According to Gagne (1965), instruction may be thought of as the sequence and arrangement of the external conditions of learning in ways which will optimally interact with the internal capabilities of the learners so as to bring about a change in those capabilities. According to Good (1945) instruction is an act of providing situations, conditions or activities...
designed to facilitate learning on the part of those, who are engaged in learning. Design of instruction, primarily pertains to ensure such like controls of external conditions.

An instructional design is a physical layout which prescribes the manner in which a student should proceed to learn or a teacher to teach or a combination of both. Instructional design is concerned with the application of modern skills and techniques for the requirement of education and training. This includes facilitation of learning by making best use of media, methods and the control of environment. According to Glasser (1965) an instructional design should have the following components:

- analyzing the characteristics of the subject-matter competence;
- diagnosing pre-instructional behaviour;
- carrying out the instructional process; and
- measuring learning outcomes.

Hence, a good instructional design should not concern itself only with the imparting of knowledge to the students, which is only one aspect of this many faceted process. On the other hand, an instructional designer should analyze the content judiciously and critically, break it into simple sub-concepts, grade it properly, arrange it in ascending order of difficulty, present it in such a way that it forms
both easy and interesting reading. At the same time, there should be provision for testing knowledge of the students before and after they are taught.

Instructional designs differ in their lay out that prescribes the manner in which learners proceed to learn and teachers proceed to teach.

Educators of different times have employed different designs. The instructional designs have an ancient heritage. The early educators called sophists, taught by delivering lectures to the public, which resulted into mass-instruction. With the passage of time they started teaching into groups which evolved era of tutorial system.

The 'Socratic method of instruction', aimed at teaching by inquiry into knowledge. This method was based on the assumption that knowledge is inborn and it can be withdrawn by means of right type of questions.

In twelfth and thirteenth centuries scholastic method came into existence in Europe. According to Sattler (1968), Abelard (1108) gave the basics of this technique. He was of the view that all the aspects of a problem should be presented to the learner but the final formulation of the conclusions should be left to him.

Comenius (1633) gave following principles of his instructional technique:

- subject-matter should be organised according to its difficulty;
- a graduated series of text-books and illustrative materials should be correlated with instruction; and
- general principles should be explained and examples given before rules are learned. Content, should first be understood and then memorized.

Comenius (1633) laid the foundation of a systematic understanding of the teaching-learning process by using Bacon’s inductive method.

Lancaster (1806) gave the idea of ‘monitorial instruction’. In such a system, one teacher taught a group of fifty bright pupils or monitors. These monitors, in turn, taught ten students each. Thus one teacher was able to take charge of five hundred students at a time.

 Pestalozzi (1874) psychologized the instructional techniques. He believed it necessary that instruction proceeds with increasing sensitivity to knowledge of how children develop. His object was to analyze content into simple elements and to develop graded exercises based on the study of objects.

Froebel (1826) started a new system of early education in kindergarten. It consisted of three aspects: (1) Games and Songs; (2) Construction; and (3) Gifts and Occupations.

Herbert (1835) formulated a systematic method with four logical steps: clearness, association, system and method.
Ne believed that object to be studied has to be broken up into small details which could be associated with already known related facts. These facts when get arranged into unity are ready to be put to a test.

Thus, from the pre-Socratic era to the end of nineteenth century we came a long way in the field of instruction, starting from mass-instruction and reaching a well organized Herbartian method of instruction. However, the beginning of the twentieth century saw the emergence of science and technology of instruction with the contributions of various educators like James (1901), Dewey (1910) and Thorndike (1913).

Thorndike (1913) formulated laws of learning which provided a base to the technology of instruction. These laws are:

- The law of exercise.
- The law of effect.
- The law of readiness.

According to Thorndike (1913) a teacher should be guided by the two broad rules (a) to put together, what should go together and (b) to reward desirable connections and make undesirable connections produce discomfort.

Dewey’s (1910) approach to instruction resembled that of a scientific investigation, where hypotheses are formulated and tested.
Kilpatrick (1918) developed the project-method. He reorganized the curriculum as a succession of projects, suitable to the age and interests of the learners.

Montessori (1912) initiated a 'Montessori method' of instruction for the small children. She emphasized the various senses, individually and in combination with each other.

Before 1800, teaching was mostly individual. However, the invention of black-boards, slates, pens etc. and increased number of pupils resulted into the evolution of graded schools with systematized group instruction, by the middle of the nineteenth century. The latter part of this century, however, noticed an important shift towards individualization of instruction.

According to Sattler (1968), Burk (1912) developed one of the first systems of individual instruction. He permitted his students to progress at their own rate of progress with very little directions from the teacher.

Washburne and Marland (1963) developed a plan called Winnekta Plan. This plan made sure that different learners proceeded at different rates and a learner proceeded at different rates in different subjects.

Parkhurst (1922) evolved Dalton plan. The main characteristics of this plan were; differentiation of
Morrison (1931) gave another instructional proposal. He viewed class-room as a laboratory and differentiated assignments for learners of varying abilities. His formula for teaching something to mastery was: "Pre-test, teach, test the result, adapt procedure, teach and test again."

Individualization of instruction reached its glory in the time of Skinner (1954), who introduced programmed instruction and teaching machines into the world of education. Joyce and Weil (1972) in their book 'Models of Teaching' talk of various models of teaching; main ones being Inductive teaching model, Inquiry training model, Biological Science Inquiry model, Jurisprudential Teaching, Concept Attainment, Laboratory Method, Group Investigation, Social Inquiry model, Developmental model, Non-directive Teaching, Classroom Meeting, Synectics, Awareness Teaching, Operant Conditioning etc.

'Group Investigation' model is based upon theories propagated by Dewey (1916) and Thelen (1960). Dewey (1916) was of the view that the whole school should function as a democracy in which, all the students could participate in the development of the system. By thus, participating, the...
students would learn how to apply scientific method for the betterment of society. Thelen (1960) argued that education had to originate from a conception of social man, otherwise his interests and efforts may conflict with those of other men.

Laboratory Method model was introduced by National Training Laboratory, Bathal, Maine in 1947. At that time, quick changes were taking place both in personal lives and social interactions which called forth for the improved methods of facilitating humane responses. The new method developed concerned itself with individual rehabilitation and social reconstruction.

Based upon the works of Rogers (1951, 1969) is another teaching model known as 'Non-Directive Teaching'. Learning, according to this model refers to growth which involves changes in the self. It is a process in which a 'new or revised configuration of self is being constructed'. This model, basically is student centered.

Developmental Model is derived from massive work of Piaget (1952) on intellectual development. Intelligence, according to this model is the process of adaptation and Organization. A child's intellectual capacities grow i.e., he develops more complex schemes through the environment. Piaget (1952) argued that intellectual development takes place in a predetermined sequence at a pre-determined rate.
This theory of cognitive development of Piaget provided a base for the 'Development Model' of teaching.

'Synectics', developed from the theory of Gordon (1961), aims at developing creativity. Gordon (1961) assumed that creativity could be developed and increased by training. He believed that it could be done by metaphoric activities. This technique applied to classroom teaching aims at "increasing the depth of students' understanding, using metaphors to link areas of substantive knowledge and at teaching a method of hypothesis".

Suchman (1962) developed a model known as 'Inquiry Training' to train children to improve their strategies for scientific inquiry and theory building. Suchman (1962) was of the view that children could be trained to do so by letting them form theories and collect data to test them in classroom environment.

Based upon the theory of Ausubel (1963), "Advanced Organizer", model of teaching emerged. According to Ausubel (1963), the main knowledge within different school disciplines is to be transmitted in such a way that it gets incorporated into the learners' system.

Schwab (1965) gave 'Biological Science Inquiry' model. It was designed to teach students to conceptualize problems and to follow a particular method to find their
solution. This model aimed at teaching science as inquiry. The essence of the model was to bring the student face to face with an area of investigation and to identify a problem within that area. Then the student is encouraged to find a way to solve that problem.

Derived from Glaser's (1965) theory of neurosis, is a model known as "Classroom Meeting". Glaser (1965) believed that love and self-worth were responsible for success of an individual. His theory lays the blame of failure in academics on the school system, a system where, if students feel lonely or isolated cannot develop their abilities. 'Classroom Meeting' model aims at developing warm and loving environment in a classroom, which is so very essential for the success of student in academics.

Massialas and Cox (1966) are the proponents of 'Social Inquiry' model. Massialas and Cox were of the view that school had to be an active participant in the creative reconstruction of the culture. They maintained that school had the responsibilities towards pluralistic democratic society, for which school must teach citizens how to participate with each other in the creative restriction of the society.

'Jurisprudential Teaching' model was given by Oliver and Shaver (1966). It was developed to teach the
students to analyze and take positions on public issues in American society.

'Concept Attainment' model is the result of work by Bruner, Goodnow and Austin (1967). It was developed primarily to develop inductive reasoning.

'Awareness Training' model is based upon the work of Schutz (1967). Here, the teacher creates an environment to help students to be aware of themselves. There is no rigid environment to train and shape the student, rather he actualizes himself/herself.

'Operant Conditioning' model is derived from Behaviour modification theory of Skinner (1954). Skinner is of the view that behaviour is subject to changes as a result of changes in external conditions. Hence, behaviour is something that can be manipulated by bringing a change in the external conditions. Thus, in a classroom situation, learning behaviour is controlled by different factors. The teaching model drawn from this theory is widely known as 'Programmed instruction'.

Programmed instruction has been widely discussed and empirically tested. It has made a prestigious place for itself in the field of instructional technology because of its innate quality by virtue of which it takes care of individual differences.
For the present investigation, programmed instruction has been chosen as one level of instructional design. Programmed instruction combined with textbook material is studied as another level of instructional design under study.

1.2.1 Programmed Instruction - A Historical Perspective:

Programmed learning is an exciting and new method of teaching which, in fact, is a product of modern technology. It came into being as a result of psychologists' concern with instructional technology. Psychology of learning, till the beginning of twentieth century had not been very helpful in education. The principle of individual differences had been used with little understanding. Students with different learning abilities, capacities and interests were and are still, often taught together. In trying to teach more than one student at a time, the whole educational system suffers and the worst affected are the learners. The effect of pressure to move beyond one's speed is often disastrous. A student, who has not mastered the first step, is less able to master the second. A little difference in speed may result in immense difference in comprehension. Thorndike and Gates (1929) in their book, "Elementary Principles of Education", discussed the possibility of a book, so arranged
that only to him, who had done what was directed at page one, would page two become visible and so on. Programmed Text is such a book and Programmed Instruction is an answer to the problem of individualization of instruction. Burns (1971) explains that, "individualizing instruction is nothing more than applying logic to the learning act and then by careful planning and organisation, providing an efficient method, whereby learners have the opportunity to acquire behaviours in their own way at their own rate". Programmed Instruction, as one of the significant trends in the field of education, takes care of all these psychological and philosophical principles.

In 1955, an American Dr. Alvin C. Enrich introduced mass production technology in instructional process, which included massed file systems. In contrast to this trend of mass-instruction was the beginning of development of individualized instruction. The most dramatic development was individual instruction through the teaching machines, computers, etc.

Dalton plan tried to devise methods, which could take care of individual differences. Many educationists, psychologists, educational psychologists conducted experiments to study the learning processes and unanimously felt that behaviours which were rewarded were more likely to recur and the reward or the reinforcement to be most
effective had to follow immediately after the desired behaviour, which led to the conception of Programmed Learning.

Programmed learning, as it is viewed in the present context is the brain child of an American psychologist, B.F. Skinner, who introduced it first of all in 1954 through his research paper, "The Science of Learning And the Art of Teaching". It was the beginning of new technology of educational instruction, which employed the simplest techniques of controlling the human behaviour. Pressey (1920) and several of his students like Angel, Little, Peterson and Stephens were the precursors of the programmed instruction and the teaching machine. But the teaching machine of Skinner (1954) was free of the faults of Pressey's. The successful teaching machine of Skinner provides immediate knowledge of results which acts as reinforcement for the correct answer and the students while working on it, invariably emit appropriate behaviour. Programmed work book of Homme and Glaser (1958) also conforms to this type of behaviour technology. Schramm's (1964) summary of research in programmed learning annotated about 200 original studies. He believed that, "no method of instruction has come into use, surrounded by so much of later activity."

According to Simon (1957), "in the high schools of the future, there will still be teachers and classroom sessions but
each student will spend a large proportion of each day interacting with computer controlled teaching machines.

1.2.1.1 Concept of Programmed Instruction

The word 'programme' means a predetermined order, logic and fixed relationship of independent functions or actions to be performed. According to Klaus (1962), "Programmed Instruction deals with orderly and controlled development of an individual's skills in much the same way as the good tutor might do. By presenting lessons in small, carefully sequenced steps, complicated skills can be developed by gradually progressing from the very simple to the very complex level of performance. Since the subject must perform actively at each step during training it is possible to guide the development according to the correctness of each response." It is a fair summary of Linear programming.

Leith (1966), describes Programmed Instruction as, "systematic application of principles of teaching which were already applied in the classroom."

Kulkarni (1967), defines the programmed instruction 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 re-infused immediately by the
knowledge of results so that he makes successively closer approximations to the responses leading to the desired goals."

According to Lasdham (1968) programmed instruction is a type of instruction, "which deals with presentation of organised learning situation by graphic or audio-visual methods to individuals or to groups. The learner actively responds to a feedback chain.

Thus, programmed instruction is a special type of teaching technique, which brings out desired behavioural changes in the learner, with the help of physical environment.

1.2.1.2 Characteristics of a Programme

Skinner (1954) gave the following characteristics of programming:

- It is an individualized instruction.
- The learner learns at his own speed i.e. it is individually paced.
- Steps are carefully sequenced.
- There is an interaction between the learner and the information.
- It requires active responding.
- There is an immediate knowledge of results.

These characteristics of programmed learning are based on the principles of learning given by Gilbert (1958),
which are as follows:

- Learning takes place most rapidly when the student is actively engaged with the subject matter.
- Student must learn to construct correct answers to questions, rather than merely recognise them.
- Subject matter ought to be arranged in hierarchic order.
- Learning is most effective, when immediate knowledge of results is available.
- Since learning takes place in individuals, the learning situation should be designed to allow each learner to proceed at his own pace.

Holland (1961) suggested that programmed learning depends upon three principles:

- Gradual progression.
- Control of students' observation.
- Mediating behaviour and variations in materials.

Markle (1969) gave the following principles for programming:

- Active responding.
- Minimal errors.
- Knowledge of results.
Hartley (1974) in his article 'Programmed Instruction, 1954-1974 - A Review' gave the following characteristics of programmed instruction:

- The learner works individually at his own pace.
- He works through carefully sequenced steps and responds overtly.
- Programme is so designed that the learners make very few errors.
- It provides immediate knowledge of results.

Fundamentals of Programmed Instruction according to Johnson and Ruskin (1975) are:

- Specifying course objectives.
- Active involvement of the student in the learning process.
- Managing contingencies to ensure a positive environment.
- Frequent assessment and immediate student knowledge of performance.
- Small sequential material presentation.
- Mastery of each unit before further progression.
- Written materials.
- Student control over the speed of progression through course content.
Hence, we can say that the main ingredients of programmed instruction are as follows:

- Individualized instruction.
- Self-pacing.
- Carefully sequenced small steps.
- Active responding.
- Immediate knowledge of results
- Empirical testing.

1.2.1.2.1 Individualized Instruction

It has been realized by many educators and psychologists that the teacher is handicapped in the present classroom situation, where he has to teach thirty or more children, with different learning abilities, simultaneously. The teacher, however, efficient he may be, finds it difficult to work effectively with more than a few students, at a time. Skinner (1954) and Gilbert (1958) highlighted the fact that some students learn faster than others and therefore it is not easy to teach them in groups. However, Hartley (1968) concluded as a result of his own experiment that learners working alone, in pairs of their own choice or in small groups, show no significant differences. Hoole (1973) pointed out that programmed instruction is not completely individualized instruction as the content of what he learns is usually pre-determined though the learner works at his own speed.
According to Hartley (1974), these researches, however, do not underrate the importance of individualized programmed instruction. They merely point out the need for exploration of some other method as individualized programmed learning is not always the best.

1.2.1.2.2 Self-Pacing

Programmed instruction makes sure that the learners are not forced to move beyond their natural speed. Skinner (1954) and Gilbert (1958) emphasised that programmed instruction is self-paced. However, Grepper and Kress (1965) found as a result of their experiment that learners worked at approximately the same speed despite the varying difficulty of the programme, with which they were working. Hartley (1968) experimented on learners working through programmes at their own rate and those who were working at a pre-determined rate and found no significant difference on the test performance of two groups. These studies make it obvious that self-pacing is not an essential feature of programmed learning in all situations.

1.2.1.2.3 Carefully Sequenced Small Steps

A programme is composed of small steps leading logically through the subject matter. The subject matter presented at a time is called a frame or a step. Skinner originally took the view that smaller the frame, the better
it is. The results of studies of Hamme and Glasser (1959) and Larkin and Leith (1964) supported the notion that smaller the step size, the fewer the errors and greater scores on post-test. Silberman (1961), conducted an experiment on the step-size. Out of five studies, four favoured small step programme with respect to the learning score on the post-test. But Smith and Moore (1960) and Fry (1963) could not find any significant difference in the effect of small and large step size on the amount of learning. Holland (1965), Leith (1966) and Markle (1969) concluded as a result of separate studies that step-size is a matter of experimental determination. It is the function of ability of learners, who are using the programme.

Skinner (1954) considered proper sequencing of steps to be one of the important features of a good programme. But Hartley (1974) was of the view that there was no single simple logical sequence for teaching different subject matter, McEachie (1974) did not believe in very small steps and logical sequence as he thought that learners working through such a programme will know exactly what was coming next. Of three studies conducted by Silberman (1961), for comparing logically sequenced with randomly sequenced programmes, two showed no difference between them in amount of learning or in time taken to complete the
programme and the third favoured an ordered sequence. Thus, the characteristic of small step with logical sequence, is not a necessary condition of programmed text. It depends upon the learners and the learning situations.

1.2.1.2.4 Active Responding:

Learning from reading is facilitated more by time spent on recalling or responding, what has been read than re-reading. If the learners actually write the answers down, rather than just think them out for themselves, learning and retention is better. Skinner (1954) and Gilbert (1958) were of the view that learners should actively interact with the subject matter and should overtly respond. If the subject is not made to respond actively his thoughts are liable to wander somewhere else. Active responding results in concentrated learning. Briggs et al (1961), Eigen and Morgulis (1963), Holland (1965), Leith (1966) and Anderson (1967) indicated that overt responding was superior to covert responding. Feldhausen and Birt (1962), Koremody and Van Atta (1962) found no significant difference between overt and covert responding groups.

1.2.1.2.5 Immediate knowledge of Results:

Sheer repetition without indication of improvement or any kind of feedback is a poor way to learn. Many psychologists are of the view that reinforcement, to be
most effective, must follow immediately after the desired 
behaviour. Skinner (1954) emphasized the use of immediate 
feed back. Holland (1965) found the immediate feed back 
be better than delayed feed back. Anderson (1967), 
Annett (1969) and James (1978) found that learning occurs 
best when response is immediately reinforced. James (1978) 
was of the view that reinforcement should follow the 
response which should recur and not follow inappropriate 
responses. Anderson (1972) showed that method of 
presentation of feedback is more important than immediacy 
of the feedback. Mckeachie (1974), found that feedback 
was effective, when the learner knew what to do to correct 
his error. Shah (1970), in his paper 'Programmed Learning 
and Classroom Teacher', says that "There is virtually 
unanimous agreement that immediate knowledge of results is 
superior to delayed or no knowledge of results."

1.2.1.2.6 Empirical Testing:
The main feature of a programme is that it is an 
empirically tested material. It is tested at three levels: 
- Individual level, 
- Small Group level, 
- Field level.

By the end of field testing, all the flaws and 
drawbacks of the programme are removed and the programme is 
now in the final improved state.
1.2.1.3 Types of Programmed Instruction

The programme developed and used by Skinner (1954) was a straight line programme, which came to be known as 'Linear Programme'. This type of programme is composed of small steps leading logically through the subject matter. It is a single track programme and the information is provided to the learner at a time in small bits, so that errors are as few as possible.

Crowder (1955) suggested another model of programming, called intrinsic programme. This is a multitrack or branched programme, where the track followed by different students may be different. Here the frames are bigger than the frames of linear programme and unlike the linear programme, learner can learn by committing errors.

Mager and McCann (1961) devised, "Learner Controlled Instruction". It is a kind of Socratic dialogue in reverse, where the learner leads the instructor. The task of the teacher is to respond rather than direct. The learner stimulates the teacher with the questions.

Gilbert (1962) developed a programme known as 'mathetics', in which the mastery step is taught first of all. The chains are retrogressive in nature.

Pressey's (1963) programme is known as 'Adjunct auto-instruction'. Pressey's machine could teach as well
as test. After teaching the subject matter, this self-testing machine could be conveniently used for a diagnostic test.

Lysaught and Williams (1963) showed that a linear programme can be changed into a multiseriate programme.

Markle (1969) developed a programme which was essentially linear in character but had longer frames or frames in form of paragraphs.

For the present study, linear format has been taken up in view of its greater amenability to the nature of the content under study which is highly structured.

1.2.2 Adjunct-Programmed Texts:

According to the Concise Oxford Dictionary (1964) the word 'Adjunct' means 'something added to another'. In other words two types of materials combined together will result into adjunct material.

Pressey (1963) argues, "In a well organised text book, written at a level suitable for its users, elucidative auto instruction might well be most effective and integrative if placed at the end of each chapter or there might be clusters of auto-instructional items at whatever places in the chapter they seem to be needed. Experienced teachers will know fairly well when and where such material is needed. Points, where it is needed can be located with
greater precision in such subjects as arithmetic and science."

Adjunct Programming is said to fix the programmed material in a textbook. In Pressey's (1963) opinion, conventional material should form the main part of instruction but difficult and confusing materials should be given in the form of programmed materials. By combining teaching styles adjunct programming provides, a way for the teacher to shift from stimulus oriented to response-oriented method of instruction.

Yassin (1980), found that Programmed instruction supplemented by Traditional instruction proves to be more effective as compared to both Programmed instruction and Traditional instruction followed individually.

Mayer (1981) as a result of her experimental study, where she tried to evaluate the effectiveness of Programmed Instruction and Traditional Instruction, concluded that both types of instructions had benefits to offer. She stressed the need for both types of instructions in a proper mix.

As a consequence of the results of the above studies it was decided to combine linear programmes with text book format to form adjunct-programmed text in the present investigation. It served as one level of instructional design along with linear programmed text which formed the other level.
1.3 INTELLIGENCE

Voluminous research in the field of education and psychology has led us to the belief that intellectual superiority of an individual is the most important determinant factor in the field of academic performance. Intelligence paves a way for brilliance in academics. The concept of intelligence has been defined in various ways. Earlier definitions were intuitive and asserted that intelligence is the ability to learn or solve problems. Later, more logical and philosophical attempts were made to define this term. Thorndike (1913) defined intelligence as "the power to make good responses from the point of view of truth or fact." An intelligent person, in his view, is the one who is able to come up with the right answers to difficult problems.

According to Thorndike (1913), there are three kinds of intelligence: the abstract, the mechanical and the social. These three types were neither absolutely independent nor necessarily correlated mutually in a person. It is quite possible to find some people who are very adept at dealing with abstract ideas and others who are social experts and still others who are good at handling mechanical ideas and yet there are some, who are good at either two or all these three abilities. He believed that the level of intelligence
in a person depended upon the number of bonds or nerve connections that have been set up. He thought that learning new material was facilitated by being able to use connections that had already been made.

Terman (1916), defined intelligence as the ability to think in abstract terms. The importance of ability to think in abstract terms is paramount in Terman's view on intelligence. Burt (1921) gave the idea of "general intelligence" or "g". He formulated his notion of innate, general cognitive efficiency.

Spearman (1927) developed a two factor theory. He concluded that all intellectual operations were composed of a 'g' factor (general intellectual ability) and a large number of 's' factors (specific intellectual ability). Later, he included group factors as well which resulted from overlapping of the specific factors. He developed a tetrad equation. He expressed that inter-correlations, which, when equal to zero indicate that these inter-correlations are due to a common factor. Low inter-correlations are supposed to be there because of specific and sampling errors. This principle, if carried to a school situation, would mean that a student who is good at one subject is good at all the subjects and vice-versa. According to Spearman (1927), a bright person would be generally
bright in all directions and vice-versa. To him, 'g' appeared to be the most important part of the intelligence. However, there were areas, where his observations did not hold good but Spearman considered these variations relatively unimportant.

Henman and Nelson (1931) wrote that intelligence involves two factors; the capacity for knowledge and knowledge possessed.

Opposed to Spearman's two factor approach is that of Thorndike's (1927) multifactor theory of intelligence. According to him, there is no such thing as 'general intelligence'. He believed that there were only highly specific acts. Thorndike divided an intelligent activity into three parts: (i) Special intelligence or ability to understand and deal with persons, (ii) Concrete intelligence or ability to understand and deal with things and (iii) Abstract intelligence or ability to deal with verbal inductive reasoning.

Stoddard (1943) states that intelligence is the ability to undertake activities that are characterised by difficulty, complexity, abstractness, economy, speed, adaptiveness to a goal, social value and the emergence of originals and to maintain these activities under conditions that ask for a concentration of energy and resistance to
emotional forces. The idea is that an intelligent person, when compared to a less intelligent one is able to do difficult mental tasks which are both complex and abstract. He does more work with less effort and in less time than his less intelligent counterpart. The ability to be inventive and creative is a widely accepted facet of intelligence. Bright children tend to have greater capacity to concentrate than their dull mates.

According to Wachsl (1943) intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment. Hebb (1949) distinguished between what he termed intelligence 'A' which is innate potential and intelligence 'B', which is the functioning of a brain in which development has gone on. He argued that intelligence 'A' cannot be measured directly, its evidence comes through intelligence 'B'.

Ryle (1949) is of the view that intelligence is not an entity, but something overall. When we say that an individual is intelligent, we mean that he characteristically acts in an intelligent way in all or many of the things he does.

Stephen (1952) holds that, "intelligence is whatever intelligence tests measure".
Freeman (1962) gave three definitions of intelligence:

- Intelligence is the adaptation or adjustment of the individual to his environment.
- Intelligence is the ability to learn.
- Intelligence is the ability to carry on abstract thinking.

Cattell (1963) suggested that a distinction should be made between fluid (Qf) and crystallized ability (QC) i.e. potentiality for intellectual achievement from associational ability (Level-I) and reasoning ability (Level-II).

Guilford (1967) provided a complete factorial picture of the intelligence. He organized all factors that had been discovered up until 1954, about 40 in number into categories like 'Contents', 'Operations' and 'Products' of thought. He argued that there are 120 mental factors that are responsible for someone being intelligent. The breakdown of these 120 factors is as such: 4 in content domain, 5 in the 'operational' dimension and 6 factors belonging to 'products' of the operations on the contents of thought (4x5x6 = 120).

The factors of the Guilford's model can be explained in terms of the learning-motivation model. This model of learning-motivation is concerned with the process of learning.

In the structure of intellect, the stress is on what has been
learnt. The teacher should be able to know the strengths and weaknesses of the different patterns of thinking and should be in a position to make use of these strengths.

Butcher (1968) expressed his views that like all descriptive systems there is no 'true' scheme, which must prevail but different schemes may serve different purposes. Hence, for the present investigation 'intelligence is what intelligence tests measure' may serve the purpose.

It is quite important to know if there are any interactions between intellectual and non-intellectual phenomena, whether intelligence alone or in collaboration with non-cognitive factors, affects an individual's performance. Non-intellectual or non-cognitive phenomena include primarily motivational and personality variables. It is a known fact that performance is influenced by n-Achievement and some personality characteristics. There is a wide variety of personality traits affecting academic performance. From such deep seated aspects, self-concept and n-Achievement have served as the basis of present investigation.

1.4 SELF-CONCEPT

In recent years, an idea that has received importance is modern psychology, but whose significance has not been fully recognised and appreciated until very recently is that of the self-concept. At one time, this was not considered a problem
worth investigating. Hume (1940) was of the view that self was a complete illusion. He considered 'self' to be different from reality. As a result, for a very long while, psychologists did not admit self to psychology. During recent decades, however, it has received great emphasis. Originally purposed by Lacky (1945) this concept is of tremendous implication in the area of education, more so in personal aspects such as motivation, purposes, goals and adjustments, which are pillars upon which success of an individual in the school and outside the school, primarily rests.

The self-concept may best be considered as a person's ideas, feelings and attitudes about oneself, i.e. how one perceives oneself.

Mead (1934) set forth an idea of self— which had a strong impact upon psychological thinking. Mead's 'self' is an object of awareness rather than a system of processes. It is a socially formed self, it can arise only in social setting, where, there is a social communication.

Murphy's (1947) 'self is used in two contrasting senses. The self as a thing conceived and as a thing perceived. Hilgard (1949) means by self - one's image of himself. He infers the self-image from the introspective material. For Allport (1961), self is something which we are immediately aware of. It is some kind of core of our being.
According to James (1950), a man's self is the sum total of all that he can call his: his body, his clothes, his house, his wife, his children, his ancestors and friends, his reputation and works, his lands and houses and yacht and bank-accounts.

Smith (1961) thinks that self is a person, as perceived, felt and thought of by himself. According to Sartain et al. (1958), individual's beliefs about the kind of person he is and he is not, may be called his self-picture. As he can perceive others, so he can perceive himself. As his perceptions of others are never entirely accurate, so his perceptions of himself are also neither accurate nor complete.

Jourard (1963) feels that self-concept comprises all the beliefs that an individual holds, concerning what kind of person he is. Coopersmith (1967) defines 'self' as an abstraction which an individual develops about attributes, capacities, objects and activities which he possesses and pursues.

According to Sherif (1968), self is a developmental form of the individual consisting of interrelated attitudes that the individual has acquired in relation to his own body and his parts, to his capacities and to objects, persons, family groups, social values, goals and institutions, which
define and regulate his relatedness to them in concrete activities.

LaBanna and Greene (1969) are of the view that self-concept is person's total appraisal of his appearance, background and origins, abilities and resources, attitudes and feelings which culminate as a directing force in behaviour.

Sarbin (1952) looks upon self as a cognitive structure which consists of one's ideas about various aspects of his being, conception of his body of his sense organs and musculature and of his social behaviour.

Thus 'self' is the sum total of person's ideas about who and what he is, what he appears to be, what he thinks of himself to be and what others judge him to be.

Rogers (1951) put forward a self-theory. According to Hall and Lindzey (1957), the principal conceptual ingredients of this theory are:

- the organism, who is total individual.
- the phenomenal field which is totality of experiences and
- the self which is differentiated portion of the phenomenal field and consisting of a pattern of conscious perceptions and values of the 'I' and 'me'.

The properties of 'self' according to Rogers' theory
of self are:

- It develops out of organism's interaction with the environment.
- The self strives for consistency.
- The organism behaves in ways that are consistent with the self.
- Experiences that are not consistent with the self-structure are perceived as threats.
- The self may change as a result of maturation and learning.

Hall and Lindsey (1957) point out two different meanings of self-concept. The first denotes the person's attitudes, feelings, perceptions and evaluation of himself. The second meaning involves a group of psychological processes which govern behavior and adjustment of the person.

Lundholm (1940) distinguished between a subjective self and an objective self. Subjective Self, according to him, comprises those words by which the individual is aware of himself and the Objective Self consists of those symbols by which others describe the person.

The self-concept includes three components:
Perceptual: a way in which the person sees himself, idea of the impression he makes on others; Conceptual: a person's
idea of his own peculiarly distinctive characteristics, abilities and limitations; and Attitudinal own feeling of identity in environment, attitudes regarding present and future and degree of self-esteem.

1.4.1 Origin and Development of Self-concept

Self-concept is not hereditary, rather it develops in a person as a result of his interactions with the environment. It is a life-long process and develops continuously in a social setting. As a child grows and develops, he learns more and more about himself. It is not taught to him by others, but a child acquires it as a by-product of learning experiences. Gale (1969) states that man 'creates his world' from experiences around him. The development of self is a social product. According to him, self-awareness does not happen all at once, but it is dynamic on going developmental process that begins during infancy and early childhood and continues until death.

Glanz and Walston (1958) are of the opinion that many of the adjectives that a child hears, become a significant part of his earliest conception of his self-image. Sherif (1968) points out that the earliest manifestation of self-hood starts with the bodily states like hunger or sleep, then facilitations and resistance, acceptance and punishment by persons, etc. are all responsible
for formulation of self-system.

Hash (1970) reported that it is difficult to say, just when the child becomes aware of himself. But one thing is certain that other familiar persons like parents are recognised before self-awareness begins.

Watson and Lindgren (1973) suggest that through learning the opinions, attitudes and expectations that others have for him, the child learns about himself.

Thus, building of self-concept is a slow process, which grows out of the reaction of parents and others to the child's early behaviour. Self-concept of an individual undergoes changes during the course of his life. It is a dynamic and not a static characteristic of an individual. Bugental (1955) observed that self-concept of an individual is bound to be affected by the success with which he adjusts himself to the problems of adult life. An individual's self-concept undergoes a change by the challenge offered by the circumstances of life and the way people respond to him.

1.4.2 Aspects of Self-concept:

Staines (1971) says that the aspects of self are of supreme importance for behaviour since many of the individual's actions are ordered by his constant efforts to maintain and enhance these various aspects of self-picture.
James (1950) while describing the "Constituents of the Self", makes a mention of (a) The Material Self, (b) The Social Self, (c) The Spiritual Self and (d) The pure ego. Gage (1959) refers to bodily self, social self, perceptual self and the ideal self.

Smith (1961) feels that the self has at least four following dimensions:

- The Perceived Self: This is an individual's concept of the kind of person he is. It is influenced by his physical self, his physical appearance, dress and grooming, by his abilities and dispositions, his values, beliefs and aspirations.

- The Real Self: Real Self means one's nature with all its potentialities. A person is aware of some aspects but unaware of other aspects of his own self. The real-self includes what he is aware of and he is not aware of -- it is perceived self plus unconscious self.

- The Ideal Self: Butler and Haig (1954) define the ideal self as, "the organism's conceptual patterns of characteristics and emotional status which an individual consciously holds desirable (or undesirable) for himself". The assumption
is that the individual is able to order his self perception along a line of value from "what I like to be" to "what I would at least like to be".

The self-concept has tremendous implications in terms of the development of the individual. In fact this concept stands at the core of what a person does not and does do. McClelland and Winter (1969) say that, "What does seem to be essential is that the man develops a strong faith in himself as an origin or agent of change, as someone who can solve problems efficaciously on his own. The most effective strategy in other words appears to be to change the man's image by direct instruction, on this key point and then leave the rest to him."

The concept of self is not restricted to attitudes and adjustments but is equally important in the area of academic learning. Whenever learning involves 'self' the learner learns well. It is the self-concept, which is to a greater extent responsible for a high or low achievement. The self-concept is responsible for the success of a person in life. The more confident he is of himself, the more able he is to tackle problems on his own. It has been found that greater success of children from high status families can be attributed to the 'self-image' that leads to extra-effort and extra persistence.
The studies of Harris (1931, 1940), Emma (1942), Garrett (1949) and Gouan (1960), pointed to the role played by non-intellectual personality factors in the academic performance. Deo & Sharma (1968) found both very high and very low discrepancies result in the low achievement, whereas moderate self ideal discrepancy was found to account for high achievement.

Thus, self-concept is an important factor which has an unquestioned bearing upon the academic performance of an individual. Lewis & Adank (1975) found positive inter-relationships among the measures of intelligence, achievement and self-esteem for all groups exposed to different modes of instruction. In view of its importance in determining the success of a child in academics, it has been taken up as a variable along with intelligence, for the present study.

1.5 ACHIEVEMENT-MOTIVATION:

Motivations, values, drives are important factors in educational success. Some 'need' or 'desire' must be there to provide an initial push towards the activity. An analysis of the learning process points to the view that needs and desires provide the initial urge to learn and later keep the learner at the task. These make a learner, who is average in intelligence, a high performer and a success in school. These motivational forces are present in every
learning situation. There has to be a motive behind our every act. A *motive* is *something that moves a person*. It is concerned with various urges, desires and needs that arouse and sustain behaviour. Motives can be classified as primary motives and secondary or learned motives. The relationship between learned motives and learning is more complicated than the relationship between primary motives and learning. An important feature of the learned motive is that it becomes a strong motivating force.

It was Murray (1938), who first of all used the form 'n-Ach' to refer to achievement needs. Murray (1938) defines n-Ach as, "to accomplish something difficult, to master, to manipulate or organise physical objects, human beings or ideas, to do this as rapidly and independently as possible, to overcome obstacles and attain a high standard, to rival and surpass others and to increase self-regard by successful exercise of talent".

Frenkel and Brunswick (1959) define n-Ach as, "the desires to obtain a high standard of objective accomplishments, to increase self-regard by successful exercise of talent, to select hard tasks and high aspiration level".

To Farquher (1983), it is a combination of forces which initiates, directs and sustains behaviour towards
a scholarly goal. He believes that "motivation is an
evasive octopus which as ever expanding spiral envelope
the whole field of learning".

McClelland (1964) defines, achievement motivation
as, "Performance in terms of standard of excellence as
reflected in competition with the standards set by others
or simply as a drive to be successful".

Kohli (1964, 1971, 1974) stressed the fact that
motivation is a great source of inspiration to learn or
achieve better and quickly.

According to Gates et al (1953) motivation has a
trio functioning of energizing the behaviour, selecting or
determining the behaviour and tendency to react to different
situations as well as direct behaviour.

Atkinson (1964) postulates that a learner’s
disposition to achieve, called the achievement motive,
provides a tendency for the individual to seek success in
achievement situations. Atkinson (1964) believes that
motivation in the field achievement refers to a capacity
for taking pride in accomplishment when successful
performance has been achieved. He further argues that
taking satisfaction in accomplishments, seeking and enjoying
success are basic aspects of achievement motive.
Motivation, thus is a force that affects an individual's preference to perform in one or another act.

Heckhausen (1967) is of the view that achievement-motivation can be conceptualized as the striving to increase or keep as high as possible one's own capability in all activities in which a standard of excellence is thought to apply and where the execution of such activities can, therefore, either succeed or fail.

1.5.1 Origin and Development of n-Achievement:

The motives as such originate along with the cognitive step in maturing. These are not innately present in an organism. Some psychologists look on all human behaviour as the organism's attempt to reduce tensions and reach a state of equilibrium. But there are other psychologists, who believe that non-organic or psychogenic motives such as the desire for status and esteem can also move an individual to activity. According to Hovetailed (1935), the human beings are capable of being motivated not only by organic needs that are immediately present and felt but also by mere anticipation of such needs.

It has been observed that really important motives are hidden in early childhood. Acts which appear to be "achievement motivated" in early childhood include various behaviour repetitions. Lewin et al (1944), Muller (1958)
and Khamma (1957) report that phenomena like 'wanting-to-do-it-alone', make their appearance at the start of the second year during familiar routines in the home. Kagan & Ross (1962) found that duration of being occupied in early childhood had no predictive value for the later achievement behaviour.

Crandall et al (1960) take the view that achievement motive develops somehow from the earlier motives. They were of the view that achievement-motivation is exclusively a product of social learning and that achievement behaviour originated as a result of reinforcement by social sanctions. Heckhausen (1969), however, does not agree to this view. He points that motives descend ontogenetically from earlier motives.

According to Heckhausen (1967) concentration and persistence in the pursuit of achievement goals increases with age, clearly from 4½ years on.

Crandall and Robson (1960) report sex-difference playing a role in the development of achievement-motivation. They found that girls preferred to work with solved problems, while boys attempted the ones they had not been able to solve before.

Crandall et al (1960) find motivational goal as obtaining approval and avoiding disapproval. This study

Atkinson (1964) is of the view that a motive or trait assumes the role of motivation, as an active and effortful process when the individual encounters a situation in which there is a moderate expectation of success.

1.5.2 Theory of n-Achievement

The achievement-motivation theory assumes that high n-Ach subjects prefer intermediate difficulty tasks. A high n-Ach subject if unable to solve a difficult problem, shifts to another task, as inability to solve that particular difficult task does not gratify him. Whereas, low n-Ach subjects usually prefer very easy or very difficult tasks. They persist longer in the face of failures.

Studies of Lewin et al (1944) demonstrate that motivation in a task generally increases following success and it decreases after failure.

Rosen & D'Andrade (1959) reported as a result of their study that parents of n-Ach boys expected their sons to achieve higher and their expectations were often fulfilled.

Some psychologists believe that independent training contributes to n-Ach. However, Smith (1969) points
out that independence may be a pre-requisite but not a guarantee of achievement.

Atkinson and Birch (1970) are of the view that formulation of motivation, whether it be of achievement, affiliation or whatever activity, calls for an analysis of how an individual distributes his time engaging in the various types of activities available.

Raynor (1969) believes that future consequences of immediate success or failure contribute towards an achievement task. Performance on an immediate task is perceived by the individuals in terms of its long ranging future implications. Even though performance on an immediate task may have a bearing on the intrinsic need to achieve, very often the level of achievement has consequences for future attainment.

Kukla (1970) found that low n-Ach subjects see failure as arising from lack of ability, a stable factor that is unlikely to change quickly. It is not surprising that they give up. On the other hand, high n-Ach subjects tend to perceive their failure in terms of lack of effort on their part. As a result, they are willing to persist. They are convinced that once they really start trying, they may succeed. High n-Ach subjects tend to approach achievement opportunity, whereas low n-Ach subjects avoid it.
It may be concluded that n-Ach is a goal-oriented behaviour of the individual with a felt need and power to achieve higher. It has been observed that academic performance is affected by achievement motivation. Researches of Cattell & Butcher (1968) found that variations in achievement are accounted for in equal measures by ability, motivational personality and environmental factors. According to Strang (1957), success requires motivation as a drive as well as an opportunity to learn.

Self-concept is supposed to be nourished by motives, especially in the setting up of future goals and ideals. Martire (1956) reports that subjects who get high n-Ach scores were found to have significantly greater discrepancy between their self-ideal. Academic achievement is popularly thought to be significantly affected by n-Ach as well as self-concept. If this is so, combining the measures of n-Ach with measures of intelligence and self-concept could lead to more precise prediction of achievement. This study is an attempt to provide some indication of effect of these variables on academic performance, in various combinations.

1.6 STATEMENT OF THE PROBLEM:

The problem under study is as stated below:

Achievement of High School students in Relation to the Instructional Design, Self-Concept, Intelligence and
Mara, the performance of students is a dependent variable on which the effects of four independent variables viz., instructional design, intelligence, self-concept and n-Achievement are studied. These independent variables are varied at two levels each.

Objectives of the Study:
The present study has been conducted keeping in mind the following objectives:
- To study the effectiveness of instructional design on students' performance,
- To find out the impact of intelligence on students' performance,
- To investigate the effect of self-concept on students' performance,
- To ascertain the effect of n-Achievement on students' performance,
- To study the interaction effects (double, triple and quadruple) of instructional design, intelligence, self-concept and n-Achievement on pupils' performance.

1.7 HYPOTHESES:
The hypothesis formulated for the present study
are as follows:

- Programmed instruction will yield better results than those of adjunct programming, with regard to the students' performance on the criterion test.

- The performance of high intelligence group will be significantly better than that of low intelligence group.

- High self-concept students will perform significantly better than the students with low self-concept.

- The students with high n-Achievement will achieve higher on the criterion test, than those with low n-Achievement.

- The two way interaction between two levels of instructional design and two levels each of intelligence, self-concept and n-Achievement will be significant.

- Intelligence will interact with self-concept and n-Achievement, each varied at two levels, in two way interaction to produce significant results.

- Levels of self-concept and n-Achievement will interact significantly with each other to affect
performance of the students.

The triple and quadruple interactions of the four variables viz. instructional design, intelligence, self-concept and n-Achievement will be significant.

1.8 JUSTIFICATION OF THE STUDY

For the present investigation, variables of instructional design (programmed instruction and adjunct programmed text), intelligence, self-concept and n-Achievement have been selected to study their effect on the performance of students for the following considerations:

Hughes and McNamara (1961), Bruce (1962), Henderson (1963), Bertrand (1964), Sharma (1965), Desai (1966), Gleason (1968), Rauhussen (1972), Vernon (1973), Vinett et al (1975), Arimoto (1976), Gredler (1981), Waters (1981) and Gupta (1983) and many others reported the superiority of programmed instruction over the conventional methods of teaching. At the same time, there are other researchers like Zukerman, Marshall and Georesberg (1961), Holt (1962), Smith (1962), Dessart (1962), Geller (1963), Grill (1964), Lease (1964), Stannard (1969), Shushan and Sharma (1975), Fairbrother (1981), Dean (1981) and Duke (1981), who as a result of their independent studies found no difference in performance of students as a result of
different teaching methods employed. In view of these contradictory studies, it was thought worthwhile to combine two teaching styles together resulting into Adjunct Programming. A comparison between the performance of students taught by adjunct-programmed text with those taught by programmed-instruction alone, may yield interesting results. Bemelman (1974), as a result of his experimental study, showed advantages of maintaining traditional teaching while teaching through linear programme. Pressey (1963) also talked of presenting confusing and difficult parts of the topic in the form of linear frames. These frames, according to him, could be placed at different places in the chapter. Hence, linear type of programmed instruction and text-book format have been combined together to form adjunct-programmed text.

Most of the studies cited above, have been conducted to compare conventional methods of teaching with programmed instruction. The number of studies comparing programmed instruction with adjunct-programming are very few. It makes it worthwhile to compare the performance of those taught by linear programme alone and those taught by adjunct-programme.

Besides explaining the performance of the students in terms of instructional design, it may be

However, researchers like Stoulzow (1962), Green and Farquhar (1965), Burrow (1973), Safer and Allen (1973), could not find any correlation between I.Q. scores and performance of pupils. Correlations obtained by Stephens (1956) between these two variables varied from .10 to .90. Uppal (1970) reported a correlation of .30 between intelligence and Algebra scores, whereas Carter (1950) found correlations ranging between .45 and .50 for the two variables. Hence, review of the past literature presented a picture which could not be called very clear on the role played by intelligence in the academic success.
Studies of Porter (1959) and Stoulrow (1962), indicated that role played by intelligence is affected by different modes employed to teach. Recently, there has been important shift in the emphasis of the problem because of extreme performance of some children than what was expected of them on the basis of their intelligence quotient. The weak role of intelligence as a distinguishing factor is supported by the findings of Biglow and Egbert (1968), Palechanol (1972) and Jeddon (1972).

According to Gates (1929), "The discrepancy that prevents complete agreement between the measures of scholastic achievement and intelligence does not arise entirely through errors in measurement of these two qualities, but probably due to the presence of factors other than intelligence in the situation."

The imperfect nature of effectiveness of intelligence on students' performance has left much scope for explanation other than intelligence to account for academic performance. The studies of Harris (1957) and Krug (1959) show that personality factors also contribute to academic success.

Voluminous literature comprising research studies of Harris (1931), Garrett (1949), Coopersmith (1955),

Another variable considered significant for the present study pertains to the achievement-motivation of the students.

n-Achievement. However, Hills (1958), Cole et al (1962), Ringione (1968), Fedell (1971), Girijs et al (1975) and Margol (1980) found no significant correlation between the two variables. Parrish & Rethlinghafer (1954) and Lazarus et al (1957) found a negative correlation between these factors. It makes it obvious that psychologists and researchers differ in their opinion about the effect of n-Achievement on the performance of the students. The conflicting findings of the past investigations make it desirable to study the impact of this variable on students' performance.

The variable-wise justification of the problem leaves much scope for studying the combined impact of all these variables in different combinations in a factorial frame of reference. The present study, it is hoped, will have significant bearing on the classroom situations, wherein the classification of students by the teacher on different variables under study may be used with benefit with the relevant instructional design to ensure maximum help to the students. It may be safely concluded that variables of intellectual ability, academic performance, self-concept and n-Achievement are overlapping factors and if studied together they can throw much light on the realm of academic performance. The interactions between
instructional design, self-concept, intelligence and n-Achievement, all taken together or in different combinations of two or three (two, three or four way interactions) appear to have validity. So, all these factors were taken together to study their effect on the students' performance.

1.9 DELIMITATION OF THE STUDY:

The present study has been delimited with respect to variables of the study, content, sample, tools and techniques.

The independent variables of the study are - instructional design, intelligence, self-concept and n-Achievement. All the four variables are studied at two levels each.

The content has been taken from Biology and is further delimited to the concept of micro-organisms and the detailed study of only one type of micro-organism- amoeba; its habitat, morphology and physiology.

The study has been delimited with regard to sample as well. The size of the sample is 1401, drawn from the various English Medium Schools of Chandigarh. The sample has been restricted to ninth class students.

The various tools used for the present study are; linear programmed text, adjunct programmed text, the
'General Mental Ability Test' by Jalota (1972), P.W.L. inventory by Deo (1971) and n-Achievement test by Mehta (1960). Hence, the results will be guided by the data collected by these tools. The interpretation will be governed by the theoretical considerations underlying the tests.

For statistical treatment of the data, analysis of variance technique is used. F-ratios and t-ratios were interpreted at .05 and .01 levels of significance.

In order to create a practical background to the plan and procedure of the study in hand, it is desirable to refer to the related studies pertaining to one's field of work. Best (1963) considers survey of related literature as an important pre-requisite to actual planning and execution of any research project. The subsequent chapter provides the necessary theoretical and research framework on which the edifice of the present investigation has been built up.