CHAPTER II

PERSPECTIVE

2.0  Introduction
2.1  Learning Contexts
2.2.0 Theoretical Orientation
  2.2.1.0 Paired Learning
  2.2.1.1 The Dyadic Process - Exchange Theory
  2.2.1.2 The Dyadic Process - FIRO
    A Theory of Interpersonal Relations
  2.2.1.3 Paired Learning: Peer-Tutoring Role Theory
  2.2.2.0 Programmed Learning
2.3.0 Programmed Learning and paired learning
  2.3.1 Similarities
  2.3.2 Dissimilarities
2.4.0 A Compromise - Programmed Learning in Pairs
  2.4.1 Theoretical Bases
  2.4.2 The Eclectic Approach
  2.4.3 Programmed Learning in Pairs - An Instructional Strategy
2.5.0 The Study Conceptualised
  2.5.1 'Programmed Learning in Pairs' Model - Orientation
  2.5.2 Classroom Application
  2.5.3 The Model in Action - Syntax
  2.5.4 Social System
  2.5.5 Principles of Reaction
  2.5.6 Support System
  2.5.7 The Framework of the Study
2.6  Conclusion
CHAPTER II

PERSPECTIVE

2.0 INTRODUCTION

The present study is cast in the sphere of recent trends in innovative techniques in individualised learning with special reference to pairing with peers. The approach adopted is experimental. The study seeks to examine the effects of different pairing modes, in programmed learning of mathematics, on the performance of underachievers.

Systematic evaluations of the effects of some pairing modes in programmed learning provide support for academic gains and positive attitude changes in the learners. (Reid, 1968; Amaria, 1970; Hartley, 1973; Jordan, 1977). The attitudes have been in general enhanced in paired programmed learning but the high ability pupils in mixed ability pairs expressed less favourable attitude in such situations (Hartley and Hogarth 1971; Lovatt and Broderick 1976). The own choice pairs have expressed a more favourable attitude than the teacher designated mixed ability pairs in an experiment on paired programmed learning (Hogarth and Hartley, 1973) and so also the submissive students paired with dominants (Sutter and Reid 1969).

These empirical investigations of paired programmed learning with different pairing modes have left
several questions unanswered. Only limited attention has been
directed toward the attitudes of both the learners in the dyad.
Although not all studies have found measurable effects and
interpersonal relationships, the causes of success or failure
of any one pairing mode are unclear. Apparently paired pro-
grammed learning is effective with some pairing modes but not
with others.

Dyadic approach in programmed learning often
differs in many ways; making it difficult to isolate the
factors that may be mediating change in achievement and
attitude. The diverse factors may be the effects of inter-
personal relationships and interactions between the pair of
learners involved; the tutor-tutee relationships in the dyad;
the characteristics of the two members; the programmed learning
material or the pairing mode and composition of the paired
learning cell. It is not clear, however, how these diverse
factors may mediate academic gains and positive attitude
changes. Without a conceptual model of the changes in learning
and attitude involved in paired programmed learning it is diffi-
cult to integrate some of these findings.

The theoretical bases of 'paired programmed
learning' have to be first understood to follow the main ideas
related to this innovative educational practice which would
serve as a useful frame of reference or model.
2.1 LEARNING CONTEXTS

Learning, can be defined as changing one's potential for 1) perceiving 2) thinking or manipulation of ideas 3) feeling and 4) doing through experiences partly perceptual, partly intellectual, partly emotional and partly motor (Morse and Wingo, 1955). Learning is personal and purposeful.

Children learn, acquire many attitudes and habits and develop certain abilities in a very informal way from the contacts they have with others. Formal learning being systematic, organised, planned and purposive, brings the child into close contact with what is best in the community life and prepares him for life.

Formal learning as observed today is still through class teaching where 40 or 50 students are mostly taught collectively as one group at the primary, secondary and higher secondary levels.

Children are not the same in their abilities, interests or needs. They vary in their learning abilities and motivation for learning. So the same method or technique of teaching may not help all the students learn to the optimum level. They need different approaches that best suit their cognitive abilities and strategies and affective levels.
Those concerned with education and present
day educational practices are therefore not satisfied with the
conventional, classroom, collective teaching. Various modifi-
cations have been attempted. Large and small peer groups as
settings for learning are common as most education takes place
in group situations. The small group setting for learning
includes learning in threes or twos which helps to individua-
Lise instruction in a social set up. The extreme form of
individualised technique is the independent study by the
learner himself. In the group and individual learning
approaches, variations in physical setting, pairing or grouping
of students, pacing, instructional materials, feedback, motiva-
tion and role of teacher have been observed.

PHYSICAL SETTINGS IN LEARNING: Researchers have been working
on modifications in formal learning in the classroom and it is
interesting to study the discussion and findings on physical
settings and learning in the classroom as reported by Hawkins
and others (1975). Seven settings: large, small group and
paired, with teacher in different positions have been shown
in the figure 2.1. Settings four, three and seven, have been found
to be significantly popular with students and teachers. Setting
four is the semicircular arrangement of students with the teacher
in front; three, the usual classroom setting and seven, the dyads
with the teacher moving around.
### PHYSICAL SETTING IN LEARNING

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*X = Teacher*  
*0 = Student*

**FIG. 2.1 SOME POSSIBLE SEATING ARRANGEMENTS.**  
*(Hawkins et al 1975, P.44)*
**PAIRED SETTING:** Setting seven indicates 'paired' approach in learning with the teacher moving freely around guiding the learning, creating a congenial atmosphere and maintaining an appropriate climate for dyadic discussion. This physical setting and learning context are the bases of the innovative instructional technique of programmed learning in pairs using different modes of pairing which is the 'problem' of this investigation.

The other settings are the large (6, 2) and small (1) groups with the teacher, and dyads without the teacher (5). The small group setting (1) has not found favour with the students and teachers in that research study.

**GROUP WORK:** Not only the physical settings but teaching-learning approaches other than the traditional class teaching have been probed into by researchers, Abercrombie (1975) recommending group work as a complement to traditional learning observes that two biological facts – that man is essentially a social animal and that he has to undergo an exceptionally long period of development are to be noted in organising group work. The group work should aim at helping the student learn a 'subject' or learn how to continue to learn.

**LARGE GROUP SETTING**

Both the homogeneous or like-ability grouping and the heterogeneous or mixed ability grouping have been
and researchers. Ability grouping is associated with increased attainments by high ability students (Borg, 1966; Douglas 1964; and Heathers 1967) and with 'decreased attainments by low ability students (Abrahamson, 1959; and Goldberg and others, 1966). Slow learners tend to score higher on achievement tests when taught in heterogeneous or mixed ability groups than when placed in low ability groups, (Borg, and Heathers, 1967).

**SMALL GROUP SETTING**

Davies (1981) describing informal instructional settings reports the research findings of Robert Sumner on small group learning which indicate that learners in small group prefer side by side seating positions for cooperative types of interaction and that small groups are more effective and efficient than large ones. The small group learning is a via media or a compromise between collective and individual work methods as small groups provide for both individual and cooperative learning.

**INDEPENDENT – STUDY METHOD**

In the extreme form of independent study the individual learner works alone choosing the necessary learning materials himself. At the school level this approach is not possible and practical and the young students need initiation direction and control by the teacher. The purely independent
study has been alternated with other individualised instructional techniques such as Winnetka, Dalton and Morrison plans.

With the emphasis on educational technology in recent times programmed instruction has given a great impetus to independent study by making a programmed learning material or book available to the individual learner to work through. This approach is particularly reinforcing and helps to insure mastery.

Individual differences in aptitude, ability, knowledge, skill, attitude, personality, style of learning, age and experience affect the performance of students on a learning task. Differentiation of instruction or diverse grouping arrangements for learning could be tried to make the best of these differences.

Farrell and Farmer (1980) suggest that on a day-to-day basis the teacher can work at different teaching-learning approaches by
1) assigning individual projects which span a wide range of interests and skills
2) dividing the class into several heterogeneous groups so that a variety of talents may be shared or using more homogeneous groups each assigned different activities
3) initiating a 'buddy' system where 'pairs' of students work together at stated times seeking the advice of the cooperating teacher before deciding who will be paired with
How small is a 'small' group? Actually there is no clear cut dividing line between small and large groups. A small group for learning is a unit in which students are organised into small two to five member task oriented teams. Group composition may be academically heterogeneous or homogeneous.

If the group is composed of two students who learn together then the learning cell is called a 'dyad', the team of three, a triad and so on.

The composition of the dyad may be mixed - ability/trait, or like ability/trait, a tutor - tutee or mutual tutor - tutee pair or any other combination of two learners may form a dyad. The 'pair' works on a one-to-one basis for the common goal and the completion of the task in realising the desired objectives. Paired learning can also be looked upon as an individualised technique with an added advantage of interpersonal relationship and interaction between two learners.

The process involves the formation of the dyad or pairing of students for learning a topic, with clear objectives in view and cooperative planning on the procedures, tasks and goals by teachers and students. The learners as members of the dyads carry out the plan with the teacher closely following the progress of each dyad and offering assistance when needed.
Students as individual members of the dyads learn on their own and discuss the difficult portions of the lesson and assignments with the abler learner of the two helping the other to understand better. Questions are raised, doubts cleared supplying more examples and illustrations; perhaps and evaluation is mutual. The teacher's evaluation would include both individual and group assessments.

2.2.1.1 THE DYADIC PROCESS - EXCHANGE THEORY

Thibaut and Kelley (1959) proposed a theory or rather a framework to explain interpersonal behaviour and group processes. Although their analysis was limited largely to the dyad they believe that their 'exchange theory' applies to larger groups as well.

The key concepts in the theory are interaction, interpersonal relationship, behaviour sequence and behaviour repertoire.

By interaction is meant the emittance of behaviour of the two in each other's presence, creation of products for each other or communication with each other. The central feature of interaction is the interpersonal relationship and two individuals form a relationship if they interact on several different occasions.
When the two individuals participating, exchange views on the task on hand, there will be the 'behaviour sequence' which consists of some specific motor and verbal acts organised and directed towards some immediate goal (of clarifying a doubt or writing down a step). Thibaut and Kelley (1959) used the term 'behaviour repertoire' to refer to all the possible behaviour sequences that a given person might enact during interaction with another person.

The consequences (outcomes) of interaction are described in terms of rewards and costs. The pleasurable, enjoyable, gratifying or satisfying aspects the individual finds are the rewards. Costs refer to anything that inhibits the performance of the behaviour sequence. An individual generally repeats a rewarded response but does not repeat a costly response.

In applying these concepts to the analysis of group behaviour the authors made use of a behaviour matrix, modelled after game theory formulation. An example of this matrix is shown in figure which represents the possible outcomes of interactions of persons A and B. If A enacts behaviour sequence $a_1$ and B enacts behaviour sequence $b_1$, the interaction fails in the upper left hand corner of the matrix, in the figure A's outcome is 6 units and B's outcome is 2 units.
These are arbitrary units which represent the resultant of costs incurred and rewards received during the course of that particular interaction.

\[
\begin{array}{c|c|c|c}
 & a_1 & a_2 & \ldots \\
\hline
b_1 & 2 & 6 & \ldots \\
b_2 & 1 & 0 & \ldots \\
\vdots & \vdots & \vdots & \ddots
\end{array}
\]

Dyadic Behaviour Matrix (Shaw, 1976, P.28)

Figure 2.2

The exchange theory contributes to the organisation of empirical data and the prediction of interpersonal behaviour on the basis of rewards and costs in the dyadic process.

2.2.1.2 THE DYADIC PROCESS - FIRO: A THEORY OF INTERPERSONAL RELATIONS

FIRO (FUNDAMENTAL Interpersonal Relations Orientation) theory formulated by Schutz (1955, '58, '67) attempts to explain interpersonal behaviour in terms of
which can be applied to the different aspects of group behaviour.

2.2.1.3 PAIRED LEARNING: PEER-TUTORING - ROLE THEORY

In mixed-ability paired groups the able peer is often asked to teach or assist the other learner in completing the task assigned. The composition of the dyad is that of tutor-tutee and sometimes the roles are exchanged between the learners so that the tutor-tutee roles are mutual. This type of paired learning is based on the role theory (Allen, 1976).

According to the role theory enactment of a role produces changes in behaviour, attitudes and self-perceptions consistent with role expectations. Allen and Feldman (1973) suggest that the role of a teacher represents competence, prestige and authority. As peer tutors begin to perceive themselves as more competent they develop more positive attitudes towards school and learning. The prestige and authority of the tutor role will also increase their feelings of importance, power and self-worth.

Contextual variables may exert influence on role perceptions. For example when the students have been assigned the role of tutor because of demonstrated competence; or if the role assignment is based on a 'teacher like' physical characteristic say 'voice' or based on chance, the role perceptions generated vary in degree and quality. The effects of
contextual variables on the attitudes and attainments of tutees are less clearly defined in a role theory analysis. Bieman and Furman (1981) observe that to some extent, one would expect that conditions bolstering the role of the peer tutor would reflect negatively on the status of the tutee role.

2.2.2. PROGRAMMED LEARNING

Programmed instruction (or) learning is the arrangement of material to be learnt into an orderly series of learning experiences in each of which material is presented to the learner; a response is elicited and feedback given.

Programmed instruction emerged out of experimental researches on operant conditioning in human learning. The basic principle of operant conditioning may be summarised as the principle of reinforcement to effect behavioural changes in successive approximation to the desired goal.

According to Pipe (1966) programmed learning owes its potency to four characteristics: small steps, active participation by the student, immediate knowledge of results, and self-pacing.

The development of programmed learning was mainly based on the research findings of Skinner's theory of learning called operant conditioning. Skinner designed teaching machines which could serve as tutors, teaching, asking the learner
to take one step at a time, hinting, prompting, suggesting, testing, helping him to come up with the right answer and reinforcing the student for his every correct response not only to shape his behaviour most efficiently but to maintain its strength holding the student's interest (Munn, 1969).

**TYPES:**

There are different approaches in programming the learning material. The linear style given by Skinner is called the straight line programme. The learner is led to a desired behaviour in small steps, following a straight line path logically through the subject matter being reinforced step by step by the immediate knowledge of the results. In a linear programme the learner learns by avoiding errors but there is no scope for flexibility.

The branching or intrinsic method of programming originated by Crowder is a programme which adapts to the needs of the students without the medium of an extrinsic device such as a computer. The branching programme differs from the linear type in the frame size which is larger in the amount of information given, and the response mode which is multiple-choice item against the constructed response type in a linear programme.

The hybrid programmes such as the skip linear, linear cum branching and the 'mathetics' programme are some of the variations in programming.
PROCESS:

The operations involved in programmed instruction (whether the text, machine or computer controlled) are as follows:

The learner reads the information (frame) presented line by line; he responds to the required response situation by writing an answer; by immediate feedback system he is informed as to the correctness of his response; if he is correct, his response is reinforced and if he is wrong he may see the correct response provided and learn; the learner understands what has been explained in that frame, acquires knowledge or develops some skill and he proceeds with the other frames one by one the same way and the stimulus - response - reinforcement cycle is repeated until the series of several frames present a complete programme.

A programme is self instructional only in that a pupil may gain certain knowledge, but the relevance and the applicability of knowledge must be indicated by the teacher, observes Nickson, (1971). Whatever the format, the means of presentation of the programme or the aids involved, it is only when used with the necessary preliminary motivation from the teacher and developmental follow up work, that programmes can achieve their potential effectiveness.
2.3 PROGRAMMED LEARNING AND PAIRED LEARNING

Programmed learning will achieve its potential effectiveness only with the teacher's guidance and necessary motivation from the teacher. In the self-paced programme learning, students are isolated from each other and this results in the absence of social interaction. Dyadic learning provides for social interaction and mutual guidance and thereby can increase the motivational level of the students also, for learning.

The instructional technique of programmed learning with pairing strategy is a novel approach to learning. Hartley of Keele University and others (1973) have tried such an approach, the cooperative programmed learning in pairs and met with moderate success. In American studies, paired work at each computer assisted learning terminal has been found to be more advantageous than individual work (Love, 1969; Reid and others, 1973; Okey and Majer, 1976).

2.3.1 SIMILARITIES

In programmed learning the learner has a tutor in the programmed text or the teaching machine or the computer control itself. Whereas in the paired learning cell each of the pair of learners has his partner as the tutor though not throughout the course at least in some stages along with some learning
materials. The behaviour sequence and control during the learning process are built in the programme and in paired learning these are manipulated by the pair of students themselves. The feedback is readily available in programmed learning and that is reinforcing the learner to proceed further. In the dyad also constant evaluation and mutual checks by the pair concerned, interactions, and behavioural sequences that are rewarding provide the feedback and reinforcement.

Both the approaches on their own are rewarding to the individuals concerned and productive in terms of effective learning.

2.3.2 DISSIMILARITIES

While programmed learning is claimed to be solely individualised, paired learning is both individualised and group instructional. Programmed learning though self-paced and individualised is productive only with teacher's assistance and guidance at least at the school level. Paired learning is partially self-paced with a learning material or work sheet provided and strengthened by peer assistance, interaction, interpersonal relationships and compatibility and it results in profitable learning for both the individuals.

In programmed learning the individual works in a social vacuum as the opportunity for the student to consult
the teacher is limited. His tutor is either a booklet or a machine. This need not necessarily mean the weakness of the programmed learning material; it is just the human tendency to consult competent persons and get things confirmed. In paired learning, individuals are important, so also their interactions, social relationship, mutual concern, respect, help and compatibility so that the individuals react meaningfully to others. Paired learning while catering to individual needs provides a conducive social atmosphere for learning.

2.4 A COMPROMISE - PROGRAMMED LEARNING IN PAIRS

Programmed learning and paired learning have been found to be based on sound theories and psychological foundations of education. Each has its own merits and drawbacks. The common features and the differences in the theoretical bases, processes, functions and uses have paved way for evolving yet another novel but effective learning approach free from some of the defects in each of the techniques. A judicial combination of the two techniques, a natural blend of the processes and an integrated approach give rise to another technique namely 'paired programmed learning' or 'programmed learning in pairs.'

The advocates of programmed learning who claim the method as purely self or auto instructional device may not agree with this compromising formula of programmed learning.
in pairs but they are aware of the fact that without the teacher's assistance and guidance this self learning is not a success at the primary and secondary levels of education.

The individual learner does not feel comfortable in an individualised instructional setting working alone. Programmed text or the computer may serve as the tutor but the personal, human touch is lacking and the social aspect or atmosphere is absent. The learner cannot develop his abilities and capacities fully and achieve high, all by himself without some collective action. A pair of students would find learning the programme interesting, motivating and effective.

Paired learning by itself without proper plan of attack, structured behaviour sequences and predesigned operational stages will not be socially useful and productive in terms of achievement by the learners involved. Given the programmed learning materials the direction is clear for both; the sequence, is followed step by step and evaluation is mutual. Reinforcement is doubled and to that extent learning is strengthened. The experience will stimulate individual thinking and each individual will be motivated to contribute more towards achieving the learning goal by sharing his ideas with the partner.

The academic discussion within the structured cooperative learning group promotes better quality of reasoning process. Cooperative interaction will promote the ability to conserve (Johnson and Johnson, 1970) and to derive meaning.

In programmed learning in pairs the individual can have his choice of the partner and there is scope for productive, collaborative participation, cooperative learning, interaction and meaningful relationships.

3.4.1. PROGRAMMED LEARNING IN PAIRS – THEORETICAL BASES

The exchange theory of Thibaut and Kelley (1959), FIRO, (the fundamental interpersonal relations orientation) theory of Schutz (1959) and the role theory of Allen (1976) and Skinner's theory of operant conditioning all form the basis for programmed learning in pairs.

This integrated learning approach draws much from Thelen's group investigation and Roger's student-centred non-directive teaching methods also.

GROUP INVESTIGATION:

Thelen's (1960) group investigation model attempts to combine in one teaching strategy, the form and dynamics of the democratic process and the process of academic inquiry:
Three concepts enquiry, knowledge and the dynamics of the learning group are central to Thelen's strategy. The first element of inquiry is an event which the individual can react to and puzzle over a problem to be solved. In the classroom the student simultaneously inquires into something (Participates in the study) and observes himself as an inquirer. He tries simultaneously to learn and to improve himself as a learner. Inquiry being a social process basically, the student is aided in his self-observer role by the opportunity to interact with other puzzled individuals. In comparing his reactions to those of others, he is better able to see himself. This comparative interactive process occurs throughout the course of inquiry and serves different purposes at different points.

Activities are potential channels for inquiry but inquiry must emanate from the motivations and curiosity of the students. The teacher is just an observer in 'social inquiry' in the classroom.

Thelen views a learning situation as one which involves the emotions of the learner, emotions arising from student involvement, growing self-awareness, seeking of personal meaning and reflective behaviour. The social involvement of group investigation is hence a route to disciplined academic inquiry.
ROGERIAN THEORY OF NON-DIRECTIVE TEACHING

Roger (1951) assumes that the individual is able to handle his own life situations in constructive ways. The teacher has to respect the student's capacity and use this relationship to help the student identify his own problem and formulate solutions to them. This means the creation of an interpersonal situation in which material may come into the student's awareness and a meaningful demonstration of the teacher's acceptance of the student as a person who is competent to direct himself. Such an interpersonal relationship will facilitate the individual's reorganization of himself so that he will (1) be more integrated, more effective, (2) have a more realistic view of himself and (3) be less defensive and more adaptive to new situations and information.

The teacher is to be non-directive. Non-directive teaching is primarily aimed at improving the general functioning of the individual and especially his ability to develop himself on his own terms. An integrated self, reaching out to others and the physical world, able to develop and modify goals and means, empathetic with others yet independent, is the goal.

2.4.2 THE ECLECTIC APPROACH

The various approaches to learning, behaviour, modification, interaction oriented, non-directive, student-
centered, each emphasizing one aspect or another aim at individual development and achievement. What is required is a combination of all, a judicious mixture of the 'good' in all, tailoring or providing appropriate social environments to facilitate individual progress. This leads to the 'personal' or 'individual' and 'social' development model.

Learning is both cognitive and affective. The learning outcomes depend upon cognitive and affective factors that the learner brings forth to operate on the learning situation. A carefully chosen instructional environment rich in nurturant potential would lead to worthy values both academic and affective, as the nurturant potential of educational environments gently nudge the learner rather than forcing him to progress.

Hunt (1970) has developed an interesting teaching model which is designed for two purposes, (1) to adapt teaching to the characteristics of the individual in order to increase his personal flexibility and his ability to relate to others productively and (2) to provide an environment which is matched to the ways that the student's personality relates to the environment, so that the individual student will be comfortable and able to carry on his tasks. The purpose is to build a model for optimal growth which enables teachers and others to match the learning environment to the characteristics of the individuals.
2.4.3 PROGRAMMED LEARNING IN PAIRS - AN INSTRUCTIONAL STRATEGY

Programmed learning in pairs (or groups) is based on the essence of the eclectic approach of matching environments to the characteristics of the individuals, to education and instruction.

The individuals are paired, pairing based on their characteristics mostly and the learning cells or dyads are formed. The instructional material is a programmed unit in any form (book, teaching machine or computer-managed).

NURTURANT VALUES

The nurturant potential of this approach is a set of values: (1) independence for each learner in the dyad (2) mutual respect and concern between the pair of learners (3) commitment to the task in hand and common goal through joint efforts (4) twin goals of self and social development and above all (5) the interaction, interpersonal relationships, compatibility, inclusion and affection in the learning cell.

INSTRUCTIONAL VALUES

The educational environment provided in the form of the dyadic learning cell with the use of a programmed learning material includes the following instructional values:

1) Self-learning of the programmed unit 2) behaviour sequences,
discussion, consultation clarification, social investigation and disciplined inquiry 3) effective and productive dyadic process and control for useful didactic exercises and 4) a variety of goals and rewards; academic, social, intellectual and personal.

The pairing of students and the preparation of the programmed learning material could be appropriate to the individual learners concerned as the teacher thinks fit and decides.

The didactic exercises in this dyadic approach in programmed learning will provide experiences that are perceptual, motor, intellectual, and emotional for better learning.

2.5 THE STUDY CONCEPTUALISED

Programmed learning in pairs, forming of the 'dyads' done purposefully is an effective technology of learning based on sound theories of learning, which emphasises individual and social development, rewarding behavioural sequences, compatibility between the learners leading to productive interpersonal relationship and cooperative learning and interactions and would result in cognitive reasoning abilities, ensuring academic success. The instructional and nurturant effects of this instructional strategy have been discussed earlier.
'PROGRAMMED LEARNING IN PAIRS' MODEL

PROGRAMMED LEARNING IN PAIRS

- Independence as a Learner
  - Respect and concern for co-learner
- Self Learning of Programme
  - Behaviour Sequences consultation, clarification, discussion and disciplined academic inquiry, exchange of views
- Commitment to social Inquiry
  - Effective and productive dyadic process and control, didactic exercises
- Self and social development
  - Interaction Interpersonal Relationship Compatibility Inclusion and Affection
  - A variety of goals and rewards academic, personal, social intellectual-cognitive reasoning stimulated thinking

→ NURTURANT VALUES INSTRUCTIONAL

FIGURE 2.2
The social involvement of the two learners concerned, with their personal and common goals is a route to disciplined academic inquiry. As the 'dyad' confronts a puzzling situation, the reactions of the individuals' learners vary widely and the mutual concern, compromise and guidance will be both rewarding and productive.

Reinforcement in the form of confirmation or knowledge of results in the programmed instructional material and the consultations clarifications, discussions and reasoning among the participants in the paired learning cell will enable the learners to perceive new alternatives and extend each student's experience by serving both as a source of self-awareness and a stimulant to his curiosity.

2.5.2 **CLASSROOM APPLICATION**

Programmed learning materials on topics that are important, difficult and for which adequate reference material may not be available may be prepared and students, can be randomly assigned to 'dyads' for learning such topics effectively. The pairing may be based on ability or dominance in the subject area also; homogeneous or heterogeneous with regard to any or a combination of traits; may involve students requiring special attention and personal help in subjects; or the composition of the 'dyad' could be anything that the teacher decides fit for a certain educational purpose. Out of
this formal and structured programmed learning in pairs may
emerge, informal dyadic approach in learning may logically and
sequentially structured instructional material for academic
success.

2.5.3 **THE MODEL IN ACTION (SYNTAX)**

The model begins with the pairing of students
with a clear and definite purpose using a suitable pairing
mode. The next step is the confrontation of the two students
with a stimulating learning task in the form of the programmed
learning material, book, machine or computer managed. Frame
by frame each learner proceeds, responds and is reinforced by
the correct response provided as well as by mutual checking by
the partners. The learners discuss a point or consult each other
or suggest alternatives wherever necessary and whenever they feel
like. Their individual responses to the practice and testing
frames are either self evaluated or evaluated by the partner.
When both the learners in the 'dyad' find anything difficult
and beyond their level the teacher steps in and gives a helping
hand. The pre and post course evaluations are done by the teacher
in terms of the original purposes of the programmed learning in
pairs looking for more 'rewards' for both the learners than
'Costs' by ensuring compatible interaction patterns.

2.5.4 **SOCIAL SYSTEM**

The social system is compatible, cooperative
and democratic preserving the individuality of each learner
and the teacher is the initiator and controller of this instructional process for creation of acceptant climate and for the development of the individual and the 'dyad'. Most of the reinforcement is intrinsic in paired programmed learning. The activities of the paired programmed learning cell have only a minimal amount of external structure provided by the teacher. The pair of students in each dyad and the teacher have equal status as individuals except for role differences.

2.5.5 PRINCIPLES OF REACTION

The principles of reacting and responding are carefully determined by the principles of operant conditioning and the selected schedules of reinforcement in the programmed lesson. The teacher is to function as an academic counsellor and guide the pair of learners in each dyad, to examine individually the sequentially presented information in the programme carefully, to discuss and clarify if need be, to get at the requirements of the task in hand. The teacher's behaviour is mostly governed by the principle of understanding but not judging the reactions and interactions of the learners concerned, in each 'dyad'.

2.5.6 SUPPORT SYSTEM

The most difficult and important aspect of the instructional strategy of paired programmed learning is the design of the programmed material into an organised, logical
sequence. Much preliminary work is required by the instructor prior to the presentation of the programme.

The pairing mode is another critical aspect which the teacher has to carefully and judiciously decide to maximise the potential of all concerned and materials used. The optimal support system is of course the understanding, sympathetic, enthusiastic and non-directive but guiding teacher as mentioned earlier and finally a library or related reference material which invariably is a support system for any kind of teaching learning process.

2.5.7 THE CONCEPTUAL FRAME WORK OF THE STUDY

The present investigation is to study the effects of different modes of pairing in programmed learning on the performance of underachievers in mathematics. The 'paired programmed learning' model of instruction is comprehensive and integrating the goals of individual academic pursuit and development, with social interaction, social process and development. This instructional strategy can be used in all subject areas with all students where the teacher desires to emphasise individual study enhanced by peer assistance, tutoring or guidance. In this study the student group is that of underachievers, the subject being mathematics.
THE CONCEPTUAL FRAMEWORK OF THE STUDY

STUDENTS' ACADEMIC PERFORMANCE

ABLE PEERS

PROGRAMMED LEARNING IN PAIRS

UNDERACHIEVERS

NURTURANT AND INSTRUCTIONAL VALUES

ABLE PEERS

Self and Social Development

Raised self-esteem, positive role, self perceptions and attitudinal outcomes, self learning and tutoring, cognitive abilities—superior reasoning strategies (Discussion); derive satisfaction, increased competence and prestige, helped by helping, enhanced learning and achievement.

UNDERACHIEVERS

Self and Social Development

Increased self-concept, stimulated thinking, self learning and inquiry-cognitive gains (Discussion), better emotional and social adjustment for progress, positive attitude to study—higher educational aspirations. Better use of the potential, learning and achievement.

GAIN FOR PAIRMATE (ABLE PEER) $A_2 - A_1$

PERFORMANCE

GAIN FOR UNDERACHIEVER $U_2 - U_1$

FIGURE 2.4
An underachiever in mathematics can be paired with an able peer (high achiever) in different ways such as mixed ability, teacher choice, random or 'choice' pairing, own choice or student choice pairings and the pairs may be asked to learn a programme in mathematics. The pre and post course evaluations can be done to assess the patterns of the learner's gains especially that of the underachievers involved in this dyadic approach of intervention for improvement in their performance (Figure 2.4).

2.6 CONCLUSION

Underachievement is achievement below the potential level of an individual. Underachievers can be helped to reach their optimum level of achievement through paired programmed learning with able peers. The pairing will facilitate better social interaction that would motivate the underachiever and result in higher instructional achievement by the underachievers. The nurturant and instructional effects of pairing under achievers with able peers in programmed learning are conceptualised and a model evolved that forms the theoretical basis of the study.