REVIEW OF RELATED LITERATURE

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CHAPTER 2

REVIEW OF RELATED LITERATURE

- Theoretical Overview
- Review of Related Studies
REVIEW OF RELATED LITERATURE

The review of related literature is an important part of a scientific research. It has been done so as to get an awareness of the relevance and trends of the study undertaken by the investigator. Therefore an attempt was made to review literature so as to get a theoretical outline of Models of Teaching. Direct Instruction Model of teaching specifically and the studies related to Direct Instruction Model. Studies thus surveyed were categorised and presented under the following subtitles:

2.1. THEORETICAL OVERVIEW

2.2. RELATED STUDIES

2.1. THEORETICAL OVERVIEW

The methods of teaching involve three major components such as the teacher, the student, and the curriculum, which imply the existence of the strategies. The human components are the teacher and the student and the curriculum/content constitutes the material components. The skill-based components are the methods of teaching. So the success of any teaching activity depends upon the interplay among these three components of teaching. All the components together create a teaching-learning environment, which is geared to achieve educational instructional objectives. Researchers try to sort out what goes with and influences in the very complex environment of teaching and learning. The researchers are also interested in arranging these variables into models that can explain teaching more fully.

Since all the components to teaching play an equally important role in the process of teaching, researchers have done extensive studies on all the components of teaching. But researchers have shown special interest in
methods of teaching. In any human activity, it is the method, which determines the achievement of objectives formulated. Similarly in the teaching process, the achievement of the instructional objectives depends on the process of teaching. Therefore, it is worthwhile to study the nature of the methods of teaching. Philosophers, psychologists, educationalists, and technologists have viewed methods of teaching in different ways in different historical era.

Although methods of teaching have passed through several developments in the history of pedagogy, teachers followed a particular way of teaching in the classroom. It is because the educational programme for teachers, prepare the teacher to follow one of a few fixed ways of teaching such as the Herbartian Method, Objective based instruction, based on modern models of teaching and the like. Attempts were made to design suitable teaching techniques based on popular educational theories. Following a few fixed ways of teaching, it has failed to achieve a variety of educational objectives, for which teaching is designed and performed. Pupils have multidimensional personalities having different learning styles. The common implications of both these facts are that the teachers should use different strategies of teaching to match the objectives of teaching, and different learning styles and personalities of students. (Passi, Singh and Sansanwal, 1990). This is due to differential content offered for the study, differential students abilities and aptitudes, and the differential classroom climate in the school. Models of Teaching emerged out of the search by Joyce and Weil (1992) to find a variety of approaches or strategies of teaching to match the various learning styles. They present a solution to the dilemma of differing learning styles.
2.1.1 MODELS OF TEACHING

During the last many decades a lot of attention has been given to improve the process of teaching, resulting in the development of a number of Models of teaching by various researchers (Dececco, 1968, Haddan 1970, Joyce & Weil, 1972, Brady, 1980). A model of teaching consists of guidelines for designing educational activities and environments. It specifies ways of teaching and learning that are intended to achieve certain specific goals. The fundamental purpose is to increase the capacity of self-education and personal acquisition of knowledge. A model of teaching is an instructional strategy to help good teachers in making their teaching more systematic and effective.

The term teaching model encompasses a broad, overall approach to instruction rather than a specific strategy. Models of teaching have some attributes that specify what the strategies and methods do not have. The attribute of a model has a coherent theoretical basis and rationale. A point of view and an orientation about what students should learn and how they learn, and recommended teaching behaviours and classroom structures for bringing about different types of learning.

Models of teaching help students to acquire information, ideas, skills, values, ways of thinking and means of expressing themselves. It is actually meant for a long-lasting outcome and increased capacities to learn easily and effectively in future. According to Joyce and Weil (1972) a teaching model is a pattern or plan, which can be used to shape curriculum or course to design instructional materials and to guide a teacher’s action. A model of teaching can be used to design face-to-face teaching in classrooms or tutorial settings to shape instructional materials, including books, films, tapes, computer-mediated programmes and curriculum and long-term courses of study (Joyce, Weil & Showers, 1992). It creates the necessary environment, whichfacilitates the teaching-learning process. The core of the process of teaching is
the arrangement of environments within which the student can interact (Dewey, 1916). Thus a model of teaching consists of guidelines for designing educational activities and environments. It specifies ways of teaching and learning that are intended to achieve certain kinds of goals (Joyce and Weil 1978).

It is a step-by-step procedure that leads to specific learning outcomes (Gunter, Estes and Schwab, 1990). Models are prescriptive teaching strategies, designed to accomplish particular instructional goals (Eggen Paul, et.al, 1979). Thus a model of teaching is designed to achieve a particular set of objectives. It is not a substitute to any teaching skill; rather it creates the conducive teaching-learning environment in which teachers teach more effectively, by making the teaching more systematic and efficient

2.1.2. CHARACTERISTICS OF MODELS OF TEACHING

The following are the Characteristics of models of teaching as listed by Joyce & Weil (1980)

(i) they are some sort of plans or guidelines or patterns or strategies of teaching
(ii) they are the systematic procedures to modify the behaviour of the learner
(iii) they specify the learning outcomes or instructional objectives in terms of observable and measurable performance of students.
(iv) they specify in definite terms the environmental conditions under which a student’s response should be observed
(v) they specify the criteria of acceptable performance expected from the students.
2.1.3. FUNCTIONS OF MODELS OF TEACHING

Models of teachings have three main functions in the teaching-learning or instructional process. They are the following:

(i) designing of curriculum or course of study
(ii) development and selection of instructional materials.
(iii) Guiding the teacher's activities in the teaching-learning situation.

2.1.4. BASIC PROCEDURES FOR IMPLEMENTING OF A MODEL

A model can serve as an important communication device for teachers. Joyce and Weil (1986) classified various approaches to teaching according to their instructional intents, their syntaxes, and the nature of their learning environments. Instructional intents are the type of learning goals the model has been designed to achieve. The use of a particular model helps the teacher to achieve some goals but not others. Joyce and Weil designed a procedure for the implementation of any instructional model. Four concepts used by them are: Syntax, Principles of Reaction, Social System and the Support System.

2.1.4.1 SYNTAX

Syntax of a model is the overall flow of a lessons activity. That is, the syntax of a model refers to the description of the model in action. That is the kinds of activities, which are sequentially organised at well-defined stages of the whole programme typically the educational environment belonging to each model. These sequences of activities are called phases. The syntax of various models differs.

2.1.4.2 PRINCIPLES OF REACTION

Principles of reaction guide the teacher's response to the learner, they tell the teacher how to regard the learner and response to what he does. In some models the teacher overtly tries to shape the behaviour of the student by
rewarding certain student’s activities and maintaining a neutral stand towards others.

2.1.4.3 SOCIAL SYSTEM

The social system provides a description of the student and teacher roles, and relationships and the kind of norms that are encouraged. The leadership role of the teacher varies greatly from model to model. In some models the teacher is a reflector or a facilitator of group activity; in others a counsellor and in still others, a taskmaster.

2.1.4.4 INSTRUCTIONAL AND NURTURANT EFFECT

The description of the effect of a model is categorised as direct or instructional effects and the indirect or nurturant effects. The instructional effects are those directly achieved by leading the learner in certain directions. Formulation of conceptual structures and meaningful assimilation and ideas are the important instructional effects. The nurturant effects came from experiencing the environment created by the model. Interest in enquiry, habits of precise thinking and the like are the nurturant effects.

2.1.5 CLASSIFICATION OF MODELS

During the last four decades a lot of attention has been given to improve the process of teaching, resulting in the development of a number of models of teaching. Some have been developed by educational researchers investigating how children learn and how teaching behaviour affects students learning. Others have been developed by classroom teacher experimenting with their own teaching in order to solve specific classroom problems. Still others have been invented by psychologists, industrial trainers and even by philosophers. All these models are based on empirical research, theories, hunches, postulates, hypothetical propositions and the like.
In the late 1960's, Bruce Joyce and Marsha Weil began tracing down the various teaching approaches available. They developed taxonomy to analyse the basic characteristics of a particular approach in terms of its theoretical base, its educational purpose, and the teacher and the student behaviour required to successfully execute the approach. They labelled each of these approaches 'A teaching Model'. According to them, a model is an overall plan or pattern for helping students to learn specific kinds of knowledge, attitudes or skills. A teaching model has a theoretical basis or philosophy behind it and encompasses a set of specific teaching steps design to accomplish desired educational outcomes.

Each model differs in its basic rationale or philosophical base, and in the goals it has been created to achieve. Each model shares many specific procedures and strategies such as the need to motivate students and define its expectations. The monumental work by Joyce and Weil (1980) classified teaching models into four categories and labelled as "families of models". The four major families are the following:

1. Information Processing Family
2. Personal Family
3. Social Family
4. Behavioural System Family

2.1.5.1 Information Processing Family Model

The major purpose of schooling is to help students acquire and process information. This purpose includes both the acquisition of new information from the various academic disciplines and the use of existing information to organise, categorise and think critically. The information-processing model of teaching has been designed to help teachers to accomplish the above-mentioned goals. This family of models aim at fostering the information processing ability in the learner. These models help the learner to seek and
master information, organise it, build and test hypotheses. Joyce and Weil (1980) define information processing as the ways people handle stimuli from the environment, organise data, sense problems, generate concepts and solutions to problems, and employ verbal and nonverbal symbols. It involves intellectual skills required to analyse information, which include the ability to make observation and through the use of inference, to generalise, to predict and to explain events.

Models focusing on Information Processing come from several sources such as metacognition, learning theories, the academic disciplines, and developmental studies of human intellect. The long-term goal of all models in this family is to teach students how to think effectively. The different models mentioned by Parsi, et. al. (1990) and Joyce and Weil (1992) are presented in the following text.

Cognitive Growth Model is based on studies of students’ intellectual development by Piaget, Kohlberg, Sullivan and Sigel. It is used to help adjust instruction to match the stage of maturity of an individual student and to design ways of increasing the student’s rate of development. The other models in this family are Concept Attainment Model (Bruner), Inductive Thinking Model (Hilda Taba), Inquiry Training Model (Suchman), Advance Organizer Model (Ausubel) Scientific Inquiry Model (Suchman), Memory Model (Levin & Pressley).

2.1.5.2 Personal Family Models

The personal family models begin with the perspective of the individuals and allow teachers to impart self-awareness so that learners become responsible of their own growth. Teachers use the models in this family to develop student’s personal characteristics - those trails that will help them lead productive lives. Skills associated with positive self-concept, self-awareness, creativity and meta cognition are the goals of this family. The
major characteristics of this family of models are better-developed self-assertion and self-actualisation. Learners will increase their learning capacities and will increase academic achievement. Self-actualisation leads to lifelong learning skills that promote quality of life.

The models such as Non Directive Teaching (Roger), Awareness Training Model, Synectics Model (Gordon), The Model Classroom Meeting are included in this family.

2.1.5.3 Social Family Models

The teachers have responsibility to enhance the students' academic skills and also to help students to relate to all groups within our multi-cultural society. The social interaction model emphasise social understanding and skills and to think and inquire about important social and public issues. They range from the simple process of organising students to work together to elaborate models that teach democratic social organisation and the analysis of major social problems and critical social values.

Examples from the social family as presented by Joyce and Weil (1992) are Co-operative Learning (Salvin, David and Johnson), Role Playing Model (Fannie and Shaftel), Group Investigation Model (Dewey), Jurisprudential Model (Oliver and Shaver).

The social family models are appropriate for a broad range of learning objectives: the 'basic skills' as well as the more complex cognitive and social goals of schooling.

2.1.5.4. Behavioural System Family Models

The family was evoked from attempts to develop efficient systems for sequencing learning tasks and shaping behaviour by manipulating stimulus, response and reinforcement. The family stresses the modification of behaviour in response to tasks and feedback. These models are used in a wide
variety of application to increase comfort and relaxation, decreasing phobias, changing habits and learning to control one’s behaviour. They emphasize changing external behaviour of the learner and describe them in terms of visible behaviour rather than their underlying behaviour.

The models under this family include Contingency Management Model (B.F. Skinner), Self Control Model (Rimm and Masters), Mastery Learning (Bloom) and Direct Instructional Model (Engelmann).

Of the four families of models of teaching the investigator proposed to study the effectiveness of Direct Instruction Model of teaching. This model seems to be important for the investigator because much of a teacher’s work in Mathematics teaching is aimed at helping students to acquire procedural knowledge and specific skills. Acquiring procedural knowledge and specific skills consists in most instances of mastering a set of specific and often sequential tasks - which is important for efficient mathematics learning.

The characteristics and the procedure of using Direct Instructional Model are explained in the following text.

2.1.6. DIRECT INSTRUCTION

Behaviour theories of teaching assume that human behaviour is shaped by contextually relevant consequences of behaviour. The discipline therefore applies principles derived from experimental analysis of behaviour to the enhancement of educational performance. The accomplishment of specific motivational, management and learning objectives are viewed in relation to their contingent consequences, antecedents and other contextual factors.

Precision in teaching emphasizes fluency building by augmenting the students’ rate of response. First the students master a simple or complex fact or skill (for e.g., correctly spelling a word, applying a mathematical algorithm, giving a list of episodes proceeding a historical event). The
mastery is often accomplished with the assistance of the teacher, programmed material, scripted lessons', small group, interactive instruction such as "Direct Instruction" (Becker and Carnine, 1981).

'Direct Instruction' is an instructional method that first and foremost requires that the teachers should have a command of the subject matter as close to a mastery level as possible. Whether subject matter is at elementary level, middle school level, high school level or college level, the teacher should thoroughly 'understand' the content. That means the teacher knows more than the facts, but also the structure of the content. It helps the teacher to understand each item of the content in more than one way. So that the provided information enable all students to attain the stated objectives at a level of mastery.

Direct Instruction grew out of the work of Engelmann and Carl Bereiter at the University of Oregon. Over the past 30 years, it has been developed for teaching the 'elementary' through 'secondary' language, reading, maths, higher-order thinking (reasoning), writing, science, social studies and legal concepts.

The primary goal of 'Direct Instruction Model' of teaching is to increase student achievement through carefully focused instruction. The instruction involves identifying particular skills and showing students how to apply these skills in increasing complex situations. The model aims to provide intense efficient lessons that will allow all children to master academic skills. The central element is that clear instruction eliminates misinterpretations and accelerates learning. The different meanings of Direct Instruction Model as described in International Encyclopaedia of Education are as follows.

2.1.6.1. Meaning of Direct Instruction

The general term 'Direct Instruction Model' of teaching has acquired different meanings. Each meaning is based on a particular instructional
practice. A general sense of ‘Direct Instructional Model’ of teaching refers to instruction led by the teacher. That is the teacher-led meaning, which means, "the teacher provided direct instruction in solving the problems." The procedure that emerged from the teacher effectiveness research is referred as the teacher effective meaning. The procedure used by teachers and researchers when they teach cognitive strategies to students is the cognitive strategy meaning. The procedures associated with the DISTAR programme is referred as the DISTAR meaning and finally some authors have used the term direct instructional model of teaching to refer to the teaching behaviours that they believe, which is taken as the undesirable teaching meaning.

2.1.6.1.1 The Teacher - Led Meaning

The most general meaning of Direct Instructional model of Teaching is the teacher-led meaning. It refers to academic instructions led by the teacher, without reference to how the instruction was done.

"In Direct Instruction Model the teacher, in a face to face reasonable formal manner tells, shows models, demonstrates and teaches the skills to be learned. The key word here is the teacher who is in command of the learning situation and leads the lesson as apposed to having the lesson ‘directed’ by a work sheet, kit, learning centre or work book” (Bauman, 1982).

The teacher-led meaning covers all the different meanings of Direct Instructional Model of teaching and all the other meanings are subsets of this meaning.

2.1.6.1.2 The Teacher - Effectiveness Meaning

Direct Instructional Model of teaching also known as ‘Explicit Teaching’, "is a systematic method for presenting materials in small steps, pausing to check for student understanding and eliciting active and successful
participation from all students (Rosenshine, 1986). That is effectiveness being determined by students score on achievement tests.

Observational studies and subsequent experimental studies in mathematics and reading have yielded a wealth of information on the instructional behaviours of successful teachers (Brophy and Good, 1986).

The effective teachers use a pattern of instruction in the instructional procedure. Rosenshine and Stevens grouped the instructional procedures under six teaching 'functions' as review of previous lesson, presentation of the goals and detailed instruction, guided practice, feedback and corrections, independent practice and weekly and monthly reviews. Hunter's (1982) work is another example of teacher effectiveness meaning of Direct Instruction Model of teaching.

2.1.6.1.3 The Cognitive Strategies Meaning

The meaning of Direct Instructional Model or the new term Direct Instruction is also used for instructional procedure that teach student’s cognitive strategies which enable them to become independent learners and help them to acquire higher level cognitive tasks, such as predicting, classifying, question generating and summarising. It also enables the learner to become independent learner. The predominant instructional procedure for teaching a cognitive strategy involve providing students with 'scaffolds' on which they can rely during initial learning. The scaffolds are diminished as students learn the strategy and become independent.

2.6.1.4. The DISTAR Meaning

DISTAR programme is another use of Direct Instructional Model of Teaching and to the specific instructional procedures that accompany those curriculum packages (Beeker, 1977). The acronym originally stood for Direct
Instructional System in Arithmetic and Reading. This meaning overlap with teacher - leads meaning and includes many of the instructional procedures used in the teacher effective meaning.

Engelmann develops the DISTAR Procedure in 1960s. Researchers (Gersten et. al; 1987) in the DISTAR tradition suggest Direct Instruction has 6 critical features,

- an explicit step-by-step strategies
- development of mastery in each step in the process.
- specific strategy corrections for student errors
- gradual fading from teacher directed activities towards independent work
- use of adequate and systematic practice through a range of examples of the task.
- communicative review of newly learned concepts.

2.1.6.1.5. The undesirable Teaching Meaning

Some literature used Direct Instruction Model in a pejorative, referring to different types of undesirable teaching. It is most often a statement of criticism toward various forms of teaching, which include teacher-led teaching, the teacher effectiveness pattern and DISTAR.

Examples of undesirable teaching meaning include description of Direct Instruction Model as "authoritarian" (McKeen et.al; 1972), "regimented" (Borko and Wildman, 1986) "fact accumulation at the expense of thinking skill development" (Edwards’, 1981), and "focusing upon tests" (Nicholls, 1989). Direct Instruction has also been portrayed as a 'passive' mode of teaching (Becker 1980) and in term of a metaphor of pouring information from one container (the teacher’s head) to another container (the
student’s head) (Brown and Compione, 1990). Many classroom settings in which instruction was led by the teacher, in particular settings when the teacher lectures and the students sit passively are the undesirable teaching meaning.

These five meanings attributed to the term Direct Instruction Model of Teaching do not have distinct boundaries that can separate them. Teacher-led meaning is the broadest which covers the entire range and the other meanings are subset of it. The three instructional meanings overlap a good deal. Instructional procedures such as guided practice active student participation and fading of teacher directed activities in all three meanings, as do scaffolds such as modelling by the teacher and coaching of students. Cognitive strategy meaning was derived from research on the teaching of “less structured” task such as scientific reasoning and the teacher effectiveness meaning was derived from research on the teaching of well structured task such as arithmetic computation.

2.1.7 LEARNING PRINCIPLES UNDERLYING DIRECT INSTRUCTIONAL MODEL OF TEACHING

The naturalistic research shows that those sorts of behavioural changes called “learning” are lawful. Persons acquire skills and knowledge, and alter actions in certain ways, under certain conditions as they interact with their environment. The goal of all practice is mastery - the ability to perform a skill independently and without error.

Direct Instruction Model of Teaching draws on the work of scientific philosophers (e.g. John Stuart Mill, in a system of logic) who discovered strategies for including causal relationship and communication (instruction) (Engelmann and Carrneine, 1991). Learning occurs as individuals and groups interact with physical environments, other persons in social exchange and activities and their own stream of behaviour. The critical thing involved in
interaction is that the learner becomes communicative as the result of which he builds complex skills.

- **Communicative**: As a learner becomes communicative when he acts and receives information of three kinds - signals, consequences and prompts. Each kind of information helps persons to learn more about how the world works and how to change actions in the direction of greater competence.

  (i) *Signals* - Signals provide information that some thing is about to happen or that there is an opportunity to take actions.

  (ii) *Consequences* - All acts have results or consequences. They provide informative feedback on the effects, and effectiveness of actions. These consequences teach what happens when the learner acts in certain ways - use this information either to continue acting the same way or to alter action. It is important at first, and especially when persons have learning difficulties; to create environments with consistent or reliable consequences (information), so students can include generalisation enabling them to predict the effects of actions and therefore guide their actions.

  (iii) *Prompts*: - Prompts direct attention to signals, help craft ongoing in a more competent fashion; or help direct attention to the result of past actions. Prompts include (i) gesture, (ii) suggestions, (iii) instructions, (iv) highlighting features of the settings and (v) models.

  Direct Instruction Model of teaching plays close attention to prompts, students may need. If students can overcome a difficulty by trying again, a teacher encourages this because trying again or persistence is an important aspect of behaviour. If students are not overcoming a difficulty, the teacher identifies a minimal prompt to help students to succeed. Otherwise students may make the same error again, and again and see themselves as incapable of
mastering the task. Teachers in Direct Instructional Model of teaching also teach students to prompt themselves.

- **Building Complex Skills** - Teachers of Direct Instructional Model of teaching are alert to information (signals, consequences, prompts) students need to learn difficult concepts and skills. Teachers help students to assemble component skills into complex tasks and activities. Many activities are long sequences of steps. Solving a mathematical problem are sequences. Many steps must be accomplished to do the task well. Some skills are taught by working on the whole sequence at once - "a whole task presentation". Other skills and activities have so many steps that students may not learn the activity by working on the whole sequence. Therefore teachers and students work on manageable chunks. That is when students can do the first step of the problem, the teacher help them to do the first plus the second step, and so on until the students do the whole sequence; which is known as "forward chaining". The whole task (more naturalistic) method is preferred. However, if a task is too long or too complex, some students will give up and so part-to-whole methods work better.

- **Stimulus Equivalence** - Stimulus equivalence refers to emergent knowledge that is not taught directly. Instructive educators help students to develop complex concepts and skills by designing instruction based on the large literature on stimulus equivalence.

2.1.8. BASIC PROCEDURE OF IMPLEMENTING DIRECT INSTRUCTIONAL MODEL OF TEACHING

2.1.8.1. Syntax

The direct Instructional Model of teaching consists of five phases of activity: Orientation, Presentation, Structured Practice, Guided practice and Independent Practice.
Phase one is the orientation phase. The three steps in this phase are (1) teacher provides the objective of the lesson and the level of performance, (2) the teacher describes the content of the lesson and its relationship to prior knowledge and/or experience, (3) the teacher discusses the procedures of the lesson.

Phase two is the presentation phase. At this stage teacher explains the new concept or skill and provides demonstrations and examples.

The third phase is the structured practice. Here the teacher leads the students through practice examples in lockstep fashion. The guided practice in the fourth phase gives opportunity for students to practice on their own.

Independent practice is the last phase of the Direct Instruction Model of teaching. The purpose is to reinforce the new learning to ensure retention as well as to develop fluency. The teacher’s role in this phase is to make sure that the student’s accuracy level has remained stable and to provide corrective feedback for those who need it.

2.1.8.2 Social System

The social system of direct instruction model of teaching is highly structured. The model requires the most careful orchestration while teacher is structuring the learning environment. To be effective, the model requires attention to every detail of defining the skill or content to be taught, and nature of demonstration as well as to the practice - schedules provided for students. There are enough opportunities for teachers and students to identify goals, but the model is primarily teacher directed. This does not mean that learning environment is authoritarian or free from humour and is task oriented with high expectations for student accomplishment.
2.1.8.3 Principles of Reaction

Principles of Reaction in Direct Instructional Model of teaching are formulated in accordance with the results of previous knowledge, help students pace themselves and offer reinforcement.

2.1.8.4 Support System

The support system includes sequential learning tasks, some times as elaborate as the sets developed by the individually prescribed instruction team.

2.1.8.5 Instructional Effects

The Direct Instruction Model of teaching has been specifically designed to promote student learning of the procedural knowledge needed to perform simple and complex skills and for declarative knowledge that is well structured and can be taught in step-by-step fashion. This model stresses the importance of teaching of skills. Its design is shaped to generate and sustain motivation through pacing and reinforcement. Through success and positive feedback, it tries to enhance self-esteem.

![Diagram showing the instructional and nurturant effects of Direct Instruction Model](image-url)

**FIGURE 2-1** Instructional and Nurturant Effects of Direct Instruction Model
2.1.9 CERTAIN FEATURES OF DIRECT INSTRUCTION MODEL OF TEACHING

Direct Instructional Model of teaching stresses basic skills, breaking down into mini components, children master each skill before moving into the next one. Teachers trace each student’s progress on daily charts. They also track behaviour, encouraging good conduct with praise. Even though there are some variations in the Direct Instruction Model proposed by different authors, there are certain common features. They are given below

2.1.9.1 Scripted Lesson Plan

Classroom scripts are all hallmark of Direct Instructional Model of teaching. All the concepts, rules and strategies that students need in any lesson is organised in a logical developmental sequence. Lessons followed by independent and small group activity to give student practice and generalise skills to new materials. Instruction gradually moves from teacher - guided to a more student - guided format, which is known as “mediated scaffolding”.

Daily lessons are a sequence of short, quick paced exercises. It includes (a) review of items from previous day to ensure students are firm before adding new examples (b) work on new materials from an earlier curriculum strand (c) independent, peer or co-operative activities to practice vocabulary, solve problems or write papers, (d) review of the day’s lesson.

The teacher’s words and demonstrations focus precisely on the point to be made; i.e. the objectives to be achieved.

2.1.9.2 Rapid Pace

The goal of Direct Instructional Model of teaching is to move students to mastery as quickly as possible, so a large proportion of class room time is spent on fast paced teacher - directed instruction, punctuated by rhythmic
choral group and individual student responses. For instructors this means a very full workday. The Direct Instruction Model of teaching programme requires teachers to ask 300 or more questions in six small group sessions each day to perform problem solving, to ensure that all students reach 100 percent mastery. This level of interaction, which produces substantial achievement gains, is made possible by the use of the heavily researched and highly refined scripts.

2.1.9.3 Achievement Grouping

Common periods for reading and mathematics are established across grades during which students are re-grouped by performance level, with the idea that all students will progress at the fastest possible pace and no student will be left behind. Students who need to be re-grouped reduce these groups in size. Frequent evaluation sustains the quality of instruction and students education, it prevent the drift towards mediocrity or failure.

2.1.9.4 Meaningful Learning Experience

“Young Children especially need to be engaged in experiences that make academic content meaningful and build on prior learning” (International Reading Association and the National Association for the Education of Young Children, 1998) as reported by Kozloff and Bessellieu (2000).

All Direct Instructional Model of teaching is done in children’s zone of proximal development - the area of difficulty and novelty that is within each child’s reach but fosters a slight “stretch”. This is ensured because: (1) the curricula in the Direct Instructional Model of teaching are in a developmental - logical progression of learning. (2) Children are always prepared (in previous lessons) for the new learning in current lessons, and (3) next lessons always teach children to use what they have recently learned. Whatever
children learn is relevant to their current and future activities and they are geared to the developmental interests of children.

2.1.9.5 Higher Order Thinking

"Children need to learn not only the technical skills of reading and writing but also how to use these tools to better their thinking and reasoning" (International Reading Association and National Association for the Education of Young Children, 1998) as reported by Kozloff and Bessellieu (2000).

There is a minimum of rote learning or memorisation in Direct Instruction Model of teaching. Virtually everything else in direct Instruction is cognitive learning; of concepts, propositions and rules (classification, cause effect) and cognitive strategies (solving arithmetic problems) finally students are able for analysing complex task and reasoning processes, they do this with little teacher direction.

2.1.10. CURRICULUM DEVELOPMENT

Curriculum development involves the analysis of teacher - student communication, analysis of knowledge and the analysis of student behaviour. The curriculum developer first analyses a knowledge system (e.g. mathematics, literature) into logical classes and relationships. Next these are transformed into a precise wording of teacher presentation (instructional communications) designed to be faultless, so logically clears that students will include the proper generalization and discrimination and correctly uses the concepts, propositions and strategies. Finally, the curriculum developer specifies activities of students (e.g. answer to the questions, responses to mathematical problems) that will indicate whether students have made the proper generalisations and discriminations and correctly used concepts and strategies. Children’s developmental preparation is always considered in
designing Direct Instructional Model of curricula and the lessons, which are arranged into skill tracks within levels (mastery)

For successful implementation of Direct Instructional Model of teaching for various purposes American researchers have offered the necessity of reorganisation of the curricula.

This Direct Instructional model of teaching is a sophisticated way of (i) determining what students need to succeed with meaningful material (ii) arranging learning environment so students receive what they need and (iii) helping teachers and students keep track of progress and difficulties. In this way curriculum and instruction can be improved.

2.1.1 CENTRAL COMPONENTS

2.1.1.1 Curriculum and Instruction

The curriculum and methods of instruction are the most important aspects of Direct Instruction. Direct Instruction provides highly scripted and interactive lessons geared towards small homogeneously grouped students. The reading, language, arts and mathematics curricula can be used separately. Direct Instruction also covers science, social science and fact learning.

2.1.1.2 Supplies and Materials

Teachers use “Presentation books” spiral bound lesson plans that enable highly scripted, rapid paced instruction. Within these presentation books instruction for monitoring and assessing student progress, and for providing immediate feedback to students. The model offers materials designed specially for older students who have not mastered basic skills.

2.1.1.3 Scheduling and Grouping

Students are grouped homogeneously for specific subjects. As some students may be weak in one subject and strong in another, the groups may be
different for different subjects. Thus, some implementations encourage each major subject to be taught at a specific time to allow for cross-grouping.

2.1.11.4 Monitoring Student Progress and Performance

A placement test is used for initial assignment of students by performance level. The pace of instruction is set according to the performance level of each group. Direct Instruction relies so heavily on grouping students by achievement levels that frequent assessment of student progress is essential. Teachers should monitor student performance every five to ten days, using such methods as calculating reading rates and error ratios. These data as well as weekly grades are used to re-group students according to their level.

2.1.11.5 Family and Community Involvement

Direct Instruction does not require family or community involvement. They recommend involving parents, by having parents use a ‘Parent and Child Home Practice Guide’ to work on their child’s skill at home.

2.1.12 FEATURES OF DIRECT INSTRUCTION MODEL LESSONS

First, the teacher is an instructional leader. The curriculum specifies the goals, lessons and tasks, and the teacher presents these to students. As students master the material, their activities are more open ended or student guided.

Second, the teacher closely supervises and coaches students during lessons and when students are working alone or in small groups. The point is for all students to master every concept with no exception. This is possible because after many field trials teacher presentations are so logically clear that most students include the proper generalisations and discrimination. After years of research and field-testing, even error identification and corrections are formatted. Even so, to strengthen student’s correct or improved actions and to correct every mistake on the spot, teachers and student engaged
continuously so teachers can foster high rates of student activity; and attend, evaluate and respond to student's actions.

Third, lessons are quick paced. The developers of Direct Instructional Model of teaching learned early on that a quick pace is essential for proper learning to occur. The pace sustains attention, encourages thinking, increases the number of opportunities to participate, and reduces problematic behaviour, as students are so engrossed.

Fourth, the absolute outcome of instruction on any lesson must be mastery. Every student in the group must be able to perform the skill independently and without mistake - firm and fluent. Much researches show that mastery occurs when lessons have the following phases.

- **Attention and focus** - No programme can be successful unless everyone is focused at the start of every lesson. If necessary, the teacher teaches attention and focus directly. Usually this does not take long. Lessons begin with an attention signal such as “Okay every one catches this”.

- **Orientation or Preparation** - The teacher orients students to the lesson by pointing out how the lesson builds on prior work. This is written into teacher presentation scripts.

- **Models** - In the next phase, the teacher demonstrate concepts, proportions, strategies or operations addressed in that lesson. The teacher makes the concepts, rules and strategies explicit or conspicuous. The particular ways the teacher demonstrates are carefully designed; they are called “formats”.

- **Lead** - Often, the next step is leading students through the operation just modelled. This step is guided practice; the teacher and students work together to find out the solution for the problem. The teacher transitions to having students respond alone when she feels the time is right. If students are not accurate, or if one student hesitates or respond incorrectly, the whole
group goes through a brief correction procedure until all children are firm. The point is for students to internalise the concepts, principles and strategies previously modelled by the teacher. So they can apply them to more complex/advanced concepts in subsequent lessons. This facilitates generalization, adaptation and maintenance.

- **Test** - “Tests” occur immediately after the teacher stops demonstrating and leading. The teacher looks for accurate and quick (firm, fluent) actions from students in response to the teacher signals (e.g. questions). When students appear to be firm the teacher gives opportunities for students to more independently to use what they appear to have learned: This “test” does two things (i) It gives student a chance to practice with less scaffolding or assistance, (ii) it enables the teacher to identify precisely what each student gets and does not get, so the teacher can prepare the error correction procedures.

- **Delayed Test** - The teacher provides many opportunities later in the lesson and in subsequent lessons to give extra practice and to assess mastery. If she discovers errors of definitions, rules or strategies, these are again corrected immediately. Repeated errors of the same kind suggest that students are not prepared for the new material and or that instruction must be adapted to meet individual or group needs. (e.g. certain steps of strategy may have to be taught in smaller steps)

- **Feed Back** - The teacher corrects every error of the group and individuals. This prevents the development of gaps. Repeat the sequence (including previous error spot) to ensure that students are firm. Chronic errors suggest the need for re-teaching.
2.2. RELATED STUDIES

A review of related studies was made regarding the relative merits and limitations of Direct Instruction Model of teaching in different school subjects. These studies were found to have conducted in different samples using different research designs. It is seen that most of the studies were conducted in school subjects where intellectual skills are the main objectives. As such many of them were confined to academic subjects like mathematics and languages. Representative studies were reviewed and presented under the following sections.

2.2.1 Studies relating to Direct Instruction Model as facilitator for Achievement in Mathematics.

2.2.2 Studies Relating to Direct Instruction Model which Do Not indicate Achievement Gains in Mathematics.

2.2.3 Studies Relating Direct Instruction Model in other Academic Subjects.

2.2.4 Studies using Direct Instruction Model conducted on Special Groups.

Studies under each subsection are briefly described below:

2.2.1 Studies Relating to Direct Instruction Model as Facilitator for Achievement in Mathematics

Several Studies had conducted to find out the effect of Direct Instruction Model on Achievement in Mathematics. The following studies revealed a positive effect on achievement in mathematics.

A longitudinal evaluation on direct Instruction mathematics by Gersten and Carnine (1981) on low-income students was done. 2000 students involved in the direct instruction. Follow Through approaches evaluated, students in
direct instruction model performed highest in all areas in Mathematics: (i) Computations (66% significant) (ii) Problem solving (55% significant) and (iii) Concept (37% significant). Mean Performance for 2897 students were at the fifty-fourth percentile for Total Mathematics.

Peterson and others (1981) investigated the relationships among student cognitive processes, aptitude, later achievement and attitudes, and direct instruction. Fifth and sixth – grade students (N=72) were selected as sample. Each class of twelve students were taught a two-day lesson on probability. Teaching followed direct instruction model. Tests and interviews were given at the end of the treatment. Results showed that independent of student ability, student's reports of their understanding of the lesson were significantly related to achievement. Students who reported using specific cognitive strategies did better on the achievement test than students who did not report using such strategies.

Becker and Gersten (1982) studied the later effects of direct instructions model of teaching, a follow-up of Follow through. Low income fifth and sixth grades who had completed the full three years of a first – through third-grade Direct Instructions Follow through programme were tested. Students appeared to retain the knowledge and problem-solving skills they had mastered in the primary grades.

Gersten and Carnine (1984) examined the effectiveness of direct instruction model in teaching mathematics to disadvantaged students. Results of the National Follow Through and the University of Oregon Evaluation supported the method for improving classroom practice and achievement.

Jones and Krouse (1985) conducted a study on direct instruction and to implications in verbal mathematical problem solving for elementary bearing disabled students. Feasibility of direct instruction model in special education
was established. The relationship of direct instruction model to the other promising models was also analysed.

Peterson and others (1989) evaluated the generally recommended concrete-to-abstract hierarchy for presenting a new skill with three students with learning disabilities in grade 1, 2 and 4. Following collection of baseline data, place value concepts and skills were taught using a concrete, semi concrete and abstract teaching sequence in a direct instruction model. Results indicated significant gains by all three subjects, with retention demonstrated three weeks later in a different classroom setting.

The study by Glaser and others (1991) attempted to find out which scientific reasoning skills are primarily 'domain-general' and which appear to be 'domain-specific'. Twelve Universities under graduates constituted the sample. The findings suggest that the most generally useful skill for Direct Instruction may be those for evaluating the kind of problem at hand and for selecting the most appropriate process and strategies.

Ross and Nradem (1991) compared effects of 'token reinforcement', 'cognitive behaviour modification' and 'direct-instruction' on learning-disabled elementary school students' mathematical skills. Treatment was provided to 94 students for four weeks in daily one-half sessions. Significant differential gain between treatment and direct instruction groups in achievement test scores was found. Higher gain scores were associated with direct instruction model.

Harper and others (1993) examined 'Class wide student tutoring teams' and 'Direct Instruction' as a combined instructional programme to teach generalisable strategies for mathematics word problems. Fifty-two second grades students were taught a generalisable problem-solving strategy for mathematics word problems. Results were mixed but were generally
supportive of the notion that 'class wide student tutoring team' and 'direct instruction' is useful assistance adjuncts to teacher-led instruction in word problem solving in mathematics.

Study conducted by Montague and others (1993) on Junior high School students (N=72) with learning disabilities received 'direct instruction' in cognitive strategies, instruction in meta-cognitive activities or both. Students improved in mathematical word problem performance and compared well with normally achieving peers.

Kitz and Nash (1995) assessed the application of effective instructional practice to the teaching of remedial algebra with dyslexic students at the University of Wisconsin. Practices involved 'direct -Instruction', 'Stranded lesson design', 'mastery learning', 'use of manipulative in problem-solving' and 'training and reading mathematical expression'. Results proved the effectiveness of the programme.

Effects of a 'Schema-based direct instruction strategy on addition and subtraction word problem - solving performance was examined by Jitendra and Hoff (1996). The sample was third and fourth grade students with learning disabilities. Results indicated that the intervention was successful in increasing the percentage of correct word problem for all students. Students interview also indicated that the strategy was beneficial.

An investigation by Woodward and others (1996) in different approaches to mathematics instruction for students with learning disabilities and at-risk for special education services. Results support the implementation of a diagnostic system designed to detect student misconception in addition and subtraction and the use of 'direct instruction' and 'diagnostic system' to supplement resource room mathematics class.
The action research project implemented and evaluated by Lane and others (1997) to improve student motivation and academic achievement. The targeted population consisted of seventh and eighth graders from a middle school in a small Midwestern community. The intervention was comprised of teaching goal-setting processes through two hours of direct instruction deeding advisor/advise for seventh graders. Results showed that lessons that included a great variety of multiple intelligences produced a higher level of intrinsic motivation among most students. The transfer of learning was most effective for short-term goals through direct instruction and enhanced students' to improve their grades.

Din (1998) investigated whether 'Direct Instruction' applied as a main instructional strategy, with a focused curriculum could hold students to quickly improve their basic skills. Nineteen students 7-16 years old problem students in mathematics problem received individualised treatment for 3 weeks or twelve hours uses of pre-test, treatment, post-test as a basic design. Results showed that after treatments, the students made significant gain in their mathematic basic skills with an average gain of approximately 2.0 in Grade Equivalent Score. Findings suggest that the integrated direct instructional approach, when used appropriately, can be both effective and efficient in helping students to improve their mathematic basic skills.

Wilson (2000) investigated the effectiveness of an instructional modification (DI) on the complex problem - solving ability of students who were seriously emotionally disturbed. The experimental group was provided with direct instruction and measured the amount of learning, rate of learning and the amount of learning maintained over time. Results found significant within group differences for the experimental group on amount of learning, rate of learning and amount of learning maintained over time whether the
group was experimental or control or whether the difference were within or between the groups.

The purpose of the study by Follmer (2001) was to investigate the impact of direct instruction on 'strategic reading' and 'problem solving' would have an enhancing students' mathematical thinking process when solving non-routine, text based mathematical problems. The study took place in a suburban, elementary school setting using fourth grade classes (N=48). Quasi experimental pre test/post test non equivalent peer group design was used for study.

The results indicated that the application of reading strategies and the problem-solving by the experimental group was statistically significant. Experimental and control groups show significant differences in three out of seven categories. Results also indicated that providing students with a framework for the strategic use and application of specific reading and problem-solving strategies was beneficial meta cognitively and in increasing students' level of confidence.

Study by King (2004) investigated the effect of an integrated teaching style on the mathematics performance of eight grade students in a pre-algebra class. The sample included forty eight, eighth graders in Abias Middle School in South Georgia. Treatment completed in six weeks. The instructional method for experimental group included three integrated teaching styles: direct instruction, mastery learning and co-operative learning. Results showed that the students taught through integrated learning styles scored higher when compared to students score in control group who were taught through conventional method.
2.2.2. Studies Relating to Direct Instruction Model which Do Not indicate Achievement Gains in Mathematics

While surveying the relative effectiveness of Direct Instruction Model on students learning outcomes on Mathematics, it was noticed that in some cases no advantage in the learning outcomes was reported and in certain cases the findings were considered inconclusive. Such studies are given below.

Evertson and others (1980) examined the relationships between classroom behaviours and student outcomes in junior high mathematics and english classes. Sixty eight teachers (thirty nine english and twenty nine mathematics) were observed on two of their class sections. Results suggest that elements of both the direct instruction model and indirect influence model are supported for mathematical classes.

The purpose of the investigation by Andros and Freeman (1981) was to determine if a teachers level of implementation of the direct instruction model would vary as a function of the type feedback received in maths during initial attempts to apply the model. Twenty five elementary school teachers were taken as sample. Three treatment conditions were (i) nine worked alone while analysing tape recordings of two practice lessons; (2) nine received some feedback from the instructor during these analyses; and (iii) seven worked through the practice tapes with there colleagues. Result of ANCOVA suggested three treatment grasps did not differ in their overall level of implementation of the model. Different types of feedback did not result in different levels of implementation of the model.

Arthur (2000) examined the effects of direct and indirect delivery strategies when teaching technical problem-solving activities. Sample include thirty one technology education students enrolled the transportation technology course at North Carolinian State University. A Quasi
experimental design was used for the study. Performance was measured using ranking system of performance variable score. A multivariate analysis of variance (MANOVA) was performed and no significant difference in problem-solving achievement scores and performance scores. Behaviour and attitude measures indicated a significant difference existed. Results of ANOVA showed no significant difference in achievement, performance and problem solving confidence.

Studies, which show advantage over direct instruction model, are given below.

Title (1996) analysed a think-aloud protocols of a teacher who used Mathematics Assessment Questionnaire (MAQ) to explore the mathematical disposition of her students. First direct instruction model was used and then changed to an alternate self-regulatory model based on a student-centered class. Findings support the self-regulatory model.

Reinhart (2000) examined the effect of direct instruction model on in-depth problems and tasks. Results indicated that a teacher-centred, direct instruction model often did not fit well with more in depth problems and tasks. Suggests a students centred, problem-based approach, questioning strategies help students engage in learning.

Alvarado (2001) examined direct instruction teacher deviations from lesson scripts and the effects on student's academic engagement during mathematics instructions. Participants were ten male elementary students and six instructors averaged four years experience in teaching through direct instructions. Script deviations and academic engagements were measured using Eco Behavioural Assessment System Software (EBASS).

Results showed that students from minority backgrounds were academically engaged at greater frequency than non-minority students. More
experienced teachers tended to remain more on script and engage students in academic responding with greater frequency.

2.2.3 Studies Relating to the effect of Direct Instruction Model on Other Academic Subject

Many studies were conducted to examine the effect of Direct Instruction Model on Achievement in English, especially on reading, acquisition of phonemic awareness and other language skills. The related studies, which show positive results, are given below.

The study conducted by Stevens and others (1991) on the impact of 'direct instruction' on reading comprehension strategies and the degree to which co-operative learning processes enhanced students' learning of strategies were studied using 486 third and fourth grades in Pennsylvania. Pre test-post test data highlight the significant impact of direct instruction and co-operative learning.

A practicum was designed by Micux (1992) to intervene and assist borderline elementary school RSP (Resource Specialist Programme) students in special education classes and/or through extra assistance within the regular classroom functioning in reading and related subject areas were placed in the RSP pull-out programme. The 11 students worked in an elementary school RSP classroom received treatment for three days a week for three months to improve their phonetic skills and other areas of language arts.

Practicum results were positive. Student's attitude about reading, school and related projects after the intervention were generally positive. Findings provide support for the use of school-based provision for borderline RSP student's early enrolment in this programme.
Casazza (1993) assessed the use of a model of direct instruction called EMQA (Explanation, Modelling, Questioning and Application) as a framework for teaching the rules of summary writing. The investigator found that teaching students to summarize using direct instruction model increases their comprehension of expository of college students.

Gettinger (1993) compared boys who received invented spelling guidance with creative writing periods and direct instruction with guided practice on spelling. Although direct instruction resulted in more targeted words spelled correctly, invented spelling resulted in more on targeted word spelled correctly, higher performance rating by children, and higher teacher rating.

Idol and Rutledge (1993) examined a rationale for integrating phonics with reading instruction for students with reading disabilities. It suggests that direct teaching of sounds be provided by constructing "sound sheets" with rows of sounds/letter combination taken directly from the text the child will read after practising the sounds.

Stephens (1993) developed a programme and implemented to improve the reading achievement of 56 learning-disabled students in grade five. Strategies for improving reading achievement include training for teachers in the use of direct instruction techniques, implementation of a direct-instruction model in the teaching of reading, use of the Corrective Reading Programme. Findings suggested direct instruction model for improving reading achievement.

Walker and others (1994) examined whether at-risk pre scholars would show gains in expressive and receptive language after using selected computer based activities in a teacher-directed, small group situation using direct-instruction techniques. Results indicated improvement in varying
degrees, suggesting wider use of computer combined with direct-instruction for disadvantaged children.

Ganschow and Sparks (1995) examined the effect of direct instruction in the phonology/orthography of Spanish on the native language skills and foreign language skills and aptitude of 14 high school women at risk for foreign language problems. Pre-test post-test comparisons with students not at-risk showed that subjects made significantly greater gains on phonological/orthographic measures.

Gleason (1995) examined the effective strategies for teaching reading comprehension, written composition of narrative and expository text; and used 'direct instruction' for integrating reading and writing. The results argued for teaching, reading and writing as connected process that has similar structure. Results support the using of direct instruction to integrate reading and writing for students with learning disabilities.

Spector (1995) is of opinion that learning how to read in an alphabetic system requires children to understand the complex relationship between print and speech. Results suggest that pre-reading and beginning reading instruction should be designed to facilitate the acquisition of phonemic awareness through the application of principles of 'Direct Instruction'.

A study by Dowdell (1996) examined the effect of 'Direct Instruction' on reading achievement of sixth graders. Subjects were 72 Chicago Public school students. A sample of 30 students who performed poorly with stains of 1, 2 and 3 on the Iowa Test of Basic Skills (ITBS) were chosen to receive reading instruction through direct instruction method. Results indicated that the experimental groups gain from pre-test to post-test.

The effect of 'direct instruction' examined by Wrobel (1996) on increasing student's reading competency. The population of the two years
study included 105 south-west Chicago area third-grade students from a low socio-economic background. Two random samples of 30 students were selected from the two identified population of 'Direct-Instruction' and 'Non-Direct Instruction' (traditional basal reading programme) and were classified as the experimental groups. The direct instruction group's Iowa Test of Basic Skills (ITBS) results indicated that there was a significant change in the gains of the raw score in 9 of the 10 reading achievement categories.

A study investigated by Aarnoutse (1997) the effectiveness of a listening programme using the reciprocal teaching procedure and the direct instruction model. 95, nine to eleven years old students from six special schools for children with learning disabilities were chosen as the sample for study. Results indicated that students in the experimental group showed better performance in both post-test and retention test. Results also indicated no interaction between group and listening level, and no transfer effect to general listening and reading comprehension.

Bump Sandra and other (1997) investigated a programme to improve reading and language skills. The targeted population consisted of students on 2 first grade classrooms (average class size 25) from a mid western elementary school. The review of literature combined with an analysis of the problem setting resulted in the development of a reading intervention programme of 'direct instruction'. Post intervention data indicated student's improvement in the targeted area of print awareness, phoneme awareness and phonological processing. Students increased their ability to recognize phonemes and process the use of phonemes in reading and language art activities.

Jitendra and others (1997) planed, implemented and evaluated an instructional unit that uses a 'direct instructional approach' to teach the basics of American Sign Language to elementary-age students with serious
emotional or behaviour disorders. Six students were selected for the study. Results showed that direct instruction was effective for teaching Sign Language to children with behaviour disorder.

Investigation by Din (1998) whether 'direct instruction' used as a main instructional strategy, with a concentrated curriculum can help students quickly improve their basic reading skills. Subjects, 18 (age 7 to 15 years) with reading disabilities received individualised treatment for 3 weeks. Pre-test post-test design was used. Results indicated that after the treatments, the students made significant gain in their basic reading skills.

The purpose of the study by Autery (1999) was to find out the effects of direct instruction and precision teaching and the persistence rates of adult learners in the age group 18 through 24 years who are high school dropouts. The findings revealed that students taught basic educational skills with direct instruction and precision teaching methodologies significantly increased their reading comprehension and the attendance rates. Adult learners showed increased achievement and reduced attrition with these methodologies.

In a study by Hawley (2000) compared the effectiveness of a computer assisted and a teacher-directed vocabulary supplemental programme to assess the effectiveness of various methods of direct instruction. Sample consisted of eighty seven fourth grade students from Mississippi Delta school districts. Findings of the experimental study indicated that method of direct instruction made significant differences.

Dichiara (2001) compared two highly dissimilar approaches to teaching reading to students to identify as at-risk on a sample of 162, 4th grade at-risk students. The first approach consisted a reading instruction using the traditional whole language basal reader as the primary means. The second approach consisted of a systematic code-emphasized, highly structured,
explicit instruction with tightly contracted procedures. Pre and post-test achievement scores were examined. One school system received direct instruction (code emphasis) while others received reading instruction from traditional basal (word emphasis).

Result suggests that students identified as at-risk can benefit from a highly structured, code-emphasized instruction, and perception were evident in both student and teacher responses.

King (2001) investigated the effects of type of curriculum (Direct Instruction, Literature-Based and Authentic Reading Probes) and instructional reading level (first, second and third) on the reading progress of students with specific learning disabilities. Fifty-six elementary students participated. Significant main effects for both curriculum and instructional level and a significant interaction were found. Differences among groups in the authentic literature were not significant. The literature-based curriculum yields the lowest mean slopes across groups, despite its lack of significant difference with the direct instructions curriculum at the first grade reading level.

Owens (2001) investigated the effectiveness of the spelling mastery programme on the spelling performance of elementary students with learning disabilities. Students with learning disabilities made significant gains while using the spelling Mastery Programme by Direct Instruction. The results indicated the increasing academic responsibilities of paraprofessionals and the positive impact they can have in the direct instruction.

The study by Hagerman (2003) evaluates the effectiveness of the accelerated reading programme when used as a supplement to direct instruction. Pre-test post-test quasi experimental design was used for the study on a sample of 121 students from two suburban middle schools in Oregon. Interaction scores by group and time showed a statistically significant
difference for the treatment group, suggesting accelerated reading be an effective supplement for reading practice.

Halstead (2003) conducted a study to ascertain whether a more complete set of instructional materials, containing direct instruction would be more successful at enabling students to interpret 'reflexives in a native-like manner'. The experiment was a single subject, multiple baseline procedure with cross budget replication. Results suggest direct instruction is very useful for language learners.

The purpose of the study by Johnston (2003) was to determine if direct, explicit and systematic instruction in phonological awareness increased literacy achievement scores in phonological awareness, reading and writing levels of kindergarten and first grade students. The other classes were provided with same instruction utilised in previous years. After treatment Phonological Awareness Skills Programme Test (PASPT) was administered. Significantly higher scores were associated with direct, explicit and systematic instruction.

Miller (2003) compared the Iowa Test of Basic Skills reading scores of Caucasians and Hispanics in 2nd, 3rd and 4th grades taught through direct instruction reading approach. Results show that significant differences exist favouring Caucasians and Hispanics in average total gain, average gain between 2nd and 3rd grade and the percentage of students at or above grade level at the end of three years.

A study by Mohler (2003) explored the effects of a programme of direct instruction in Phonemic awareness, multi-sensory phonics and fluency on basic reading skills on 25 low-ability, high-risk seventh grade students. Pre-test post-test assessments were done for (i) total reading score, (ii) word recognition, (iii) phonemic awareness or correct letter sequencing,
(iv) spelling or word spelled correctly and (v) oral reading. Regression analysis of individual and group performance was done. Results recommended for direct instruction for reading ability.

*A number of studies had been conducted to find out the effectiveness of Direct Instruction Model in Teacher Training Programmes. The studies are given below.*

Murphy and others (1986) examined the basic practice model of instruction – direct instruction model, on teacher effectiveness in a coherent pattern of teaching. Results indicated an instructional improvement in using direct instruction model.

Jones and Cooper (1987) examined the effective teacher-training programme in North Carolina on reading, mathematics, and language knowledge and to learning outcomes that consist of basic skills, factual knowledge, and concept name identification. Findings indicated that direct instruction inhibits the development of critical thinking an enquiry highly valued by social studies educators. Both in social studies and in language arts, teachers must be allowed to make professional informed decisions about learning activities so that they can select appropriate conditions for types and levels of learning.

Proctor (1989) conduct a survey on students and recent graduates of a generic under-graduate special education programme based on the Direct Instruction Model as a basis for methods of instruction about their attitude towards it. Result support previous findings with in-service teachers that experience with Direct Instruction increase positive attitudes toward it.

A quasi-experimental, treatment control group investigation was designed by Veenman (1992) to test the effect of a pre-service training course on effective instruction. Two direct instructional models, one model for
explicit or well-structured skills and one model for implicit skills or higher level thinking strategies. Based on trained observers pre and post training classroom observation, a significant treatment effect was found for student teachers teaching behaviours regarding effective instruction and for pupil engagement rates. The student teachers recommended instructional skill after completion of the course significantly better than prior to the course.

Lignugaris and Mechand (1993) evaluated an experimental programme in which eight special education student teachers supervised new preserves trainers in a 'Direct Instruction Practicum'. Improvements in trainer's practicum suggest the effectiveness of this peer coaching approach to supervision of field based practical.

A two-year professional development programme in Japanese Junior high School was described by Nakano and others (1993). School wide training institutes and individual practice sessions focused on behavioural methods of instruction. Observed teaching behaviours changed as a result of following the programme, and most teaches indicated the direct instruction model had major benefits, especially for slow learners.

A study conducted by Morgan and others (1994) evaluated the effect of peer coaching of five low-performing special education teacher trainers learning to deliver 'direct instruction procedures' to elementary students with mild disabilities. High performing peers videotapes and individual counselling to help trainees. Results showed increased effective teaching behaviours by the trainers.

The programme conducted by Fitzgerald and Semrau (1998) to provide efficient and effective training in a flexible, learner centred, hyper media format. The Classroom Behaviour Record (CBR) observation procedure and the instructional design of the CBR training programme, including 'direct
instruction model' that it is based on hyper media design elements, knowledge skills acquisition and fluency, the generalisation and maintenance stage. The results proved the effectiveness of implementation and validation of the training.

The study by Forte (2000) examined the impact of professional development programme in the direct instruction reading programme on student achievement at an elementary school. Training was provided for 3rd, 4th and 5th grade teachers. The results of the study suggested the professional development programme did impact teacher performance and student achievement in reading.

*The studies conducted to find out the effect of Direct Instruction Model in developing certain kind of Skills among pupils are presented in the following text.*

Siegel and Clapp (1981) conducted a project to determine the viability, attractiveness and effectiveness of computer based instruction with 225 severely and profoundly mentally handicapped and developmentally disabled institutionalised children and adult. A direct instruction model was used for designing the computer based lessons. The means of delivering this instruction was the *PLATO* system. Results suggested that carefully designed *PLATO* materials could provide effective and efficient instructional service.

Effectiveness of direct instruction model as an instructional method for developing computer literacy and computer programming skills was studied by Gelder and Maggs (1982) in Sydney. Fourth and fifth grade students constitute the sample. Statistical analysis of the result indicated that the most highly structured direct instruction was the most effective.

Worsham and Austin (1983) investigated the effects of language arts thinking skills programme (using of direct instruction n thinking skills) on
Scholastic Aptitude Test (SAT) performance. Highly significant differences were found between experimental group and control group for total verbal scores and reading comprehension scores.

Darch and others (1987) compared the results of direct instruction model on rural South Carolina students. Comparison of results of DI and conventional methods in reading, mathematics, language, and spelling on a sample of rural students, showed DI students outperformed local comparison students on virtually every measures.

Gersten and others (1988) evaluated long term effects of Direct Instruction follow through Model with 624 fifth and sixth graders and about 500 high school and older students who received follow through instruction. Achievement and college acceptance results consistently favoured the follow through groups over control groups with strongest effects in reading.

A direct instruction model was applied by Wesson and Keefe (1989) to the teaching of library skills to students with mild/moderate handicaps. The model involves determining students' skill levels, setting objectives, providing instructions and monitoring student progress. A term approach is recommended on direct instruction, involving the library media specialist and the special education teachers.

Weber (1990) designed lesson plans to elementary school students, the opportunity to use a highway maps to prepare for an imaginary trip to chosen destination in Illinois or surrounding state. Students who engaged in a direct instruction model that requires the use of basic skills, facts and knowledge showed positive results in their performance.

A study explored by McGoldrick (1992) the effects of direct instruction and modelling on students' ability to follow written directions. Subjects on the experimental group consisted of 62 eighth grade students
enrolled in a suburban New Jersey middle school. Results indicated that instruction in following written directions a significant gain for the experimental sample.

Davidson (1992) examined whether exposition as the dominant instructional method can be replaced by including alternative methodologies, such as 'demonstration discovery' or 'integrated curriculum methods' and 'strategies'. Changing the direct instructional models role from an instructional methodology to a planning tool allows the principal to introduce additional instructional methods based school and classroom characteristics.

Glang et al. (1993) reported two case studies of children, aged 6 to 8, with severe traumatic brain injuries (TBI) in which 'direct instruction programmes' were used to teach a variety of academic skills. After 12 hours instructional sessions, both students made substantial academic progress on their targeted instructional areas. The gains were seen in both discrete and more complex skills. Both students regained skills lost as a result of their injury and gained new skills.

Warger and Rutherford (1996) studied the practical way to teach social skills to all students in grade K-8, including of students with disabilities, in the classroom and cross other school settings. The instructional strategies included direct instruction, modelling, social reinforcement or feedback and self-control. Results showed the development of social skills using the collaborative approach.

*The survey of related literature also revealed that certain studies do not show any special advantage of Direct Instruction Model over other methods of teaching. Studies among such category are summarised as follows.*
Four classroom-based experiments in which teachers were trained to use a direct instruction model were analysed by Coladarci and Gage (1981) to compare the results of intensive and minimal training methods. Results indicated that teacher receive minimal training successfully implement it in the classroom with significant improvement in student achievement.

Baumann (1982) examined the effectiveness of direct instruction model for teaching children to comprehend main ideas of prose passages. 69 children in third, fourth grade classes were randomly assigned to an experimental group. Receiving direct instruction in main ideas, an experimental "strategy" group receiving massed basal reader instruction in main ideas, and a control group receiving vocabulary development exercises. All groups received eight, 54-minutes lessons over a period of three weeks. Post-test results revealed no significant differences between the three group's skills at comprehending main ideas.

The study by Devries (1991) examined the interaction between teachers and children in three kindergarten classrooms. Programme used in the classrooms were: a direct instruction (DI) programme, representing a cultural transmission paradigm; a constructivist programme (CON), representing the cognitive–developmental paradigm, and an eclective programme (ECL). Results indicated that the CON teachers had the most SE with children and the DI teachers the least. The DI teachers exhibited an authoritarian orientation and an academic emphasis.

Thomson (1991) examined the effects on 80 first grader's reading achievements when direct instruction phonics is incorporated as a supplement to a whole language approach. Two first grade classrooms used the Houghton Mifflies Integrated Literature Programme and two other classrooms supplemented programme with direct phonics instructions. Results indicated
that the direct instruction group did significantly poorer in the school readiness inventory.

Bay (1992) compared 'direct instruction' with 'discovery teaching' on learning disabled (N=10), behaviourally disordered (N=6) and non-handicapped (N=91) student's science achievement. No significant difference was found in the immediate post-test scores. Discovery learning students outperformed others on a retention test given two weeks later.

Smith (1992) examined the effects of direct instruction on the think-aloud protocol of ninth grade readers. Students made think-allowed protocol on two stories before and after instruction. Results showed that the instruction did not substantially affect students' interpretive operations in reading, some students were less submissive to the text.

Myles (1996) evaluated the use of 'Facilitated Communication' (FC) paired with 'direct instructional strategy' to improve the basic academic skills of 12 youths and young adults with autism. Results did not support the use of FC as an educational tool, with subjects averaging below-chance performance in FC and both control conditions.

Mosley (1997) conducted a study on the effectiveness of the direct instruction programme on reading achievement of sixth-grade students. Size of the sample was 30. Results indicated that students taught using direct instruction as opposed to students taught in the regular classroom had no statistically significant difference on reading scores.

Schweinhart and Weikart (1997) assessed the relative effects of direct instruction model and traditional nursery school preschool curriculum models. Results were found against using direct instruction in preschool programme and for using a well-defined curriculum model based on child-initiated learning activities.
Research on oral reading fluency by Komisar (1999) focused on reading with expression. The purpose of the study was to determine whether the addition of a direct instruction component to the Traditional Repeated Reading (TRR) approach would have a differential effect on oral reading expressiveness – modified repeated reading instruction (MRR) of 4th & 5th grade students with learning disabilities. Results indicated that students who received modified repeated reading instruction (MRR) became more expressive readers than traditional repeated reading (TRR).

A study conducted by Stein (1999) ascertains the effect of direct instruction on moral reasoning of high aptitude pre-adolescents as compared with average ability pre-adolescents. The study was a quasi-experimental with 2x2 factorial design. The relationship between ability level and moral reasoning were examined. 63 students took part in the study. The conclusion reached was that there was no effect on instruction in moral reasoning, between a high aptitude and average aptitude pre adolescent students in the test groups.

A Study by Dogm and Michal (2001) compared the personalised system of instruction to direct instruction in the training of direct-care staff from community residential facilities. 51 direct-care staff participated in the study. Pre test-Post test experimental design was used for the study. Results showed that there was no significant difference between the type of training received and direct care staff's ability to perform the skills.

Morris (2001) compared the effectiveness and efficiency of using a general or data-based self-evaluation tool by teachers to assess the implementation of appropriate teachers presentation behaviours when using direct instruction programme. Six teachers from rural South Georgia participated in the study.
Results indicate that using the data-based self-evaluation tool was more effective and efficient than using the general self-evaluation tool for the successful implementation of Direct Instruction Programme.

Jagar and others (2002) study the effects of teacher training on new instructional reading comprehension. Dutch 7th grade teachers were trained to apply either cognitive apprenticeship or direct instruction model in reading comprehension lessons. Control group teachers used the same conventional method of teaching. In both experimental conditions teachers successfully changed their behaviour, though they did not implement all characteristics of the instructional model offered in their training.

Morgenstern (2003) compared the effects of a low frequency criterion on and a high frequency Criterion on reading ability, retention, endurance, and DI Mastery check-out performance. Third grade elementary students were selected as the sample. 10-29 minutes sessions of repeated reading and paired reading with each student. The analysis of the data did not show a functional relation between frequency criteria and retention endurance, ability or the DI reading mastery check out performance.

2.2.4 Studies Using Direct Instruction Model conducted on Special Groups

The effectiveness of direct instruction model also has been experimented with select special groups such as disadvantaged, disabled, special need learners, problem learners, poverty level children (low-income children), at-risk students, behaviour disorders, low-achieving and the like. Some of these studies are given below.

Becker and Engelmann (1976) assessed the effectiveness of direct instruction model on a sample of 1200 disadvantaged primary-grade children for developing basic academic skills Wide Range Achievement Test, the
Metropolitan Achievement Test and Slosson Intelligence Test were used to measure achievement. Results indicated the effectiveness of direct instruction in building basic skills for a wide variety of disadvantaged students.

Duran (1980) examined reading curriculum for beginning Hispanic Bilingual children based on direct instruction. Results of a field test with 120 bilingual first graders indicate that the manuals direct instruction method of teaching significantly increases students' learning of vowels as compared to other bilingual methods.

Umbach and others (1987) examined differences between the reading scores of students taught by a traditional basal approach and a more structured direct instruction approach. 31, problem readers from two first grade classrooms in a low-income south-eastern rural community were selected as sample. Significantly higher achievement scores were associated with experimental group. One major factor contributing to higher scores appeared to be the direct instruction curriculum used.

Weisberg (1988) conducted a study on cognitive and academic behaviours promoted by an ongoing, long-term Direct Instruction preschool project for poverty level children (N=109). Children who received two years of training achieved at substantially higher normative levels than children trained for only one year and this advantage contained in first and second grades.

White (1988) examined the effectiveness of Direct Instruction programme with special education students in a meta-analysis comparison. Sample included 25 students. None of the studies showed results favouring comparison groups. Fifty-three percent of the outcomes significantly favoured Direct Instruction. Effects were not restricted to particular handicapping conditions, age groups, or skill areas.
Schlessman (1993) examined the impact of Follow Through, a comprehensive programme for low-income children in grade 1-3 and their parents previously enrolled in Head Start Programme. Evaluation of the Direct Instruction Model showed that parents felt that their children were receiving better academic instruction than students in any other approach.

Serafin (1993) examined the application of the Basic Direct Instruction Model (BDIM), a methodology designed to maximize student interest in instrumental and methodological courses, to graduate level educational leadership students. Sample includes 92 beginning level masters students at a midwestern U.S University. The study concluded that; if the fundamental purpose of the course content is to introduce new concepts and acquisition of new skills, then BDIM is the most appropriate instructional strategy.

The single subject study by Lorsardo and Bricker (1994) compared the effectiveness of two intervention approaches, 'direct instruction' and 'activity based invention on acquisition and generalisation of object names by six young children who were at-risk or had developmental delays. Acquisition of object names was enhanced by use of highly structured didactic approaches to intervention (direct instruction).

Marston and others (1995) implemented research-based reading interventions (peer tutoring, reciprocal teaching, effective teaching principles, computer aided instruction, and two direct instruction models) by 37 special education resource teachers working with 176 elementary school students with mild disabilities. The computer assisted, reciprocal and direct instruction approaches resulted in higher achievement.

Harris and Graham (1996) examined the effect of abolishing direct instruction and skill-practice opportunities could have serious consequences for special-needs learners. Teachers are provided explicit and focused, even
isolated instruction as needed and integrate it into the larger literary context. Findings supported the direct instruction model and skill practice opportunities.

The comparative analysis by Nelson and others (1996) examined effects of 'direct instruction', 'co-operative learning' and 'independent learning instructional practices' on the classroom behaviour of four third-graders with behaviours disorder. In the direct instruction condition, students displayed higher rates of on-task behaviour and lower rates of disruptive behaviour relative to the other learning conditions.

Swanson and Hoskyn (1998) conducted a comprehensive synthesis of experimental intervention studies that have included students with learning disabilities was based on 180 studies. Results support the pervasive influence of cognitive strategy and direct instruction model for remediating the academic difficulties of children with learning disabilities.

Swanson (1999) reviewed 180 intervention studies to identify instructional components that best predict effect size for students with learning disabilities. These included sequencing, drill-repetition, practice-feedback, and segmentation of information technology, modelling problem-solving steps, presenting cues to prompt strategy use, supplementing teacher direct instruction. A combined direct instructional model is recommended.

Bryant (2000) examined how fifteen special education junior and high school at-risk students perceived common questioning techniques used by teacher during direct instruction. The study focused on type of remembered information, distractions and the ability to participate in classroom discussion.

The results showed that students were interested in teacher questions. The findings also suggested that an inability to communicate well might be hindering their participation in classroom activities.
Grossen (2002) tested the effectiveness of direct instruction model for at-risk, low-achieving secondary students. The project began in a highly problematic California middle school and achieved record gains for all ethnic and linguistic groups and students at all levels of language arts and mathematics. The project established a professional development model that allowed for replication in other middle schools.

COMPREHENSIVE META-ANALYSIS OF EMPIRICAL RESEARCH IN DIRECT INSTRUCTION MODEL: STUDIES IN U.S.A

There is ample evidence to show that Direct Instruction has a positive effect on students' achievement. Adams and Engel Mann (1996) have reported 32 of the 34 studies qualifying for inclusion in their meta-analysis demonstrate that direct instruction is effective on student achievement. (i) their review found that Direct Instruction is effective in improving overall achievement in language, reading, mathematics, spelling, health and science. Several other studies confirm and reinforce these findings. Among them seven support direct instruction positive effect on reading, eleven on Mathematics, nine on language and four on affective behaviour and social skills (ii) Direct Instruction also appears to improve chances for later success. (iii) Research also suggests that students who begin with Direct Instruction with low IQs seems to progress at the same rate as students who begin with higher IQs. (iv) Two studies investigated the relation ship between the levels of implementation of Direct Instruction Supervision Code (DISC); these studies found a positive relationship between teacher rating (level of implementation in a classroom) and student performance on standardised achievement measures (e.g. the Comprehensive Test of Basic Skills Reading Assessment). The relationship varied depending on the component of the Direct Instruction approach being measured (e.g pacing format, correcting students) (v) Direct Instruction appears to improve students effective
behaviour and social skills: self-esteem/concept, attitude towards self and school attribution of success or failure to self or outside, and sense of responsibility.

In 1977 an evaluation of Project Follow Through was made in U.S.A. In that achievement results of 'High Poverty Direct Instruction students were compared to students of nine other early education programme which served as control group. Direct Instruction students outer performed control group students in other educational programme in every academic measure, moving from 20th percentile to about 50th percentile. Follow up studies of students taught by Direct Instruction in the early grades also show enduring benefits. One New York comparison found that more than 63% of Direct Instruction student's graduate from college, as opposed to 38% of the control group, mean ninth-grade test scores were grade test scores were higher (ES = +0.41, reading; ES = +0.29, Mathematics), retention rates were lower (21 percent vs 0.33 percent); and there were fewer dropouts (28 percent Vs. 46 percent).

Wesley Elementary School (Houston, Texas) has one of the longest, continuous Direct Instruction implementation in the country. The student population is over 99 percent minor and 90 percent eligible for school lunch subsidies – statistics usually signal low achievement levels.

This school has ranked in the top of all schools in the state – the success has been credited to the schools adoption of 'Direct Instruction' in 1973. In 1980, students have average test scores above the 80th percentile in the reading and vocabulary.

As a part of Utahs Accelerated Student Achievement Project (ASAP) to improve poor performing Title I School in U.S.A, three elementary schools adopted, school wide 'Direct Instruction Programme' during the 1994-95 School year. The Preliminary achievement data were impressive. After two
years in the programme, one school moved from last to second place (out of 24 schools) in the districts' annual Mathematics Olympics.

CONCLUSION

A survey of the literature relating to Direct Instruction Model shows that there is a rich base of empirical research incorporating Direct Instruction Model as a method of teaching, developing teacher efficiency and academic skills especially for special education students in the developed countries. An analysis of the literature reviewed reveals the following.

Direct Instruction Model is helpful in improving the achievement of the learner. Almost all the studies were conducted in America and a few studies in other developed countries. Out of the research studies many studies show positive effect of Direct Instruction Programme on the performance of subject but some studies do not show any significant gain from the programme. The investigator failed to identify any study in India or in Asia.

Out of 100 studies located, 86 of them were found to have positive effect. Twenty four studies were conducted on mathematics, among them six were found to have no significant gains on mathematics achievement – twenty six studies show positive effect on language achievement and reading, nine on teacher efficiency and eleven on developing other skills among students. From the review of related literature it is noticed that fifteen studies do not show any significant effect of direct instruction over other teaching methods on achievement. The studies also revealed that Direct Instruction Model is very much beneficial for special education learner.

Studies reviewed mostly indicate that Direct Instruction Model is helpful in improving the academic achievement of the learner. Studies were mainly concentrated on the acceleration of achievement in Mathematics and language especially on skill oriented activities. Most of the studies wee
conducted in developing countries especially on America and only one study each was from Japan, Australia and South Africa. Almost all the studies identified are experimental study using Direct Instruction Model treated singly or with other methods of teaching. Most of the Studies were concentrated on their effect on cognitive outcomes as instructional objectives.

Curriculum offered for general education in Kerala is fixed and subject oriented. Activity oriented method of instruction had been recommended but implemented only recently. But the curriculum with an overload of content has to be implemented in a rigid organisational school set-up. In the curriculum transaction a fixed duration for each subject and content area is recommended with a uniform standard of evaluation using a common textbook and learning materials. Practically teachers are not given freedom to experiment modern techniques of teaching and evaluation in the classroom with administrative support. Necessity of empirical studies on modern techniques especially methods like Direct Instruction Model of teaching and modern evaluation techniques is therefore felt imperative by the investigator. Considering the above points investigator decided to study the feasibility and effectiveness of adopting Direct Instruction Model using a select content in Mathematics.