Chapter Two

THEORETICAL BACKGROUND

2.1 Introduction

Interest in the question of what constitutes knowledge has concerned researchers for some twenty five hundred years, from the days of the Greek philosophers such as Plato, Socrates and Aristotle to present day cognitive scientists. From the cognitive revolution in the 1950s came the recognition that a scientific study of the mind was possible (Gardner, 1985). New lines of inquiry into cognition such as information processing and cognitive processing arose from this period. Investigations into the activity associated with human development was seen to involve more than the observing of, accounting for and measuring of an individual's behaviour which prior to the 1950s, had been the concern of the behaviourists such as Watson, Thorndike, Pavlov, and Skinner.

This chapter aims to address the question of what is meant by cognition by reviewing literature about cognition and metacognition; components of cognition such as attention, comprehension, memory, problem solving, social cognition, and listening; theories of cognitive development; the use of language and music tools in learning; and the child as an active learner. The focus of this thesis, as identified in Chapter One, is on the development of listening skills in children with learning difficulties through a music program. It is assumed that through the development of these childrens' listening skills, cognitive processing skills also should develop.

2.2 Cognition

Neisser (1976) states that "cognition is the activity of knowing: the acquisition, organisation and use of knowledge" (p. 1). He associates cognition with something that both organisms and people do. Neisser (1976) focuses on perception as the basic cognitive activity and sees cognition as a constructive act, "in which the perceiver 'makes' one perceptual object rather than another" (p. 18). Bigge (1982) in his discussion of cognitive-field learning theories, expands on the term *cognitive*:

> The term cognitive is derived from the Latin verb *cognoscere,* which means ' to know '. The cognitive. . . deals with the problem of how people gain an understanding of themselves and their environments and how, using their cognitions, they act in relation to their environments (p. 171).

He extends this idea by saying that people with such understanding react to their environment through a "learning" or interactional process whereby new insights or knowledge structures are attained and old ones changed. Cognition is examined by Bigge (1982) in the context of learning. The acquisition of knowledge, understanding, meaning, and behaviour are studied within the context of educative situations.

Bruner, Goodnow and Austin (1956) define cognitive processes as "the means whereby organisms achieve, retain, and transform information" (p. xvii). In studying categorising or conceptualising, one of the simplest and general forms of cognition, Bruner *et al.* (1956) were concerned with the process of how concepts were identified. Experiments were conducted by them to provide "an adequate analytic description of the actual behaviour that goes on

when a person learns how to use defining cues as a basis for grouping the events of his environment" (p. 23). Crucial to these early studies into cognitive processes was that the participants in the experiments were seen as active and constructive problem solvers. Bruner *et al.* (1956) found that thinking was a strategy which took time; it was an active act that required a "*processing of information*" (p. xii).

Flavell (1977) says that it is "neither possible nor desirable to define (cognition) and limit its meaning in any precise or inflexible fashion" (p. 2). He argues for cognition to be considered as a broad and complex concept which encompasses routine processes such as perception and remembering, higher mental processes associated, for example, with thinking and problem solving, and varieties of social cognition such as in the use of language. To Flavell (1985) the human mind "is not a collection or aggregate of unrelated cognitive components, but rather a complexly organised *system* of interacting components" (p. 4).

2.3 Historical Background

During the 1960s, information processing theories developed along with the advent of the computer, and cognition came to be synonymous with the study of information processing (Neisser, 1976). Concepts such as *information, monitor, input, output*, and *processing* became associated with this study in "the attempt to trace the flow of information through the 'system' (i.e. the mind)" (Neisser, 1976, p. 6). Brown, Bransford, Ferrara and Campione (1983) state that "the majority of information processing models attribute powerful operations to a central processor, interpretor, supervisor or executive system that is capable of performing

intelligent evaluation of its own operations" (p. 110). The idea of a central control thus provides an access to learning through the information processing system.

Developmental theorists around this period focussed on the learner's activities and on the learning strategies of the child. By the mid-1970s, studies of the development of active acquisition strategies of learning such as rehearsal, categorisation, elaboration, retrieval mechanism and metacognition had become prevalent in developmental journals (Brown *et al.*, 1983).

An overview of the major research and theories associated with cognition by Brown *et al.* (1983), discussed the formation of an alliance between information processing theorists and developmental theorists during the 1970s and the 1980s. A common interest in learning strategies by each school had led to investigations into the study of control processes by the information processing theorists and the development of memory strategies by the developmental theorists. Training studies were initiated and research into cognition became concerned with memory and the use of strategies. In their studies of young children, Flavell, Beach and Chinsky (1966) had observed that training these children in the use of strategies such as verbal rehearsal, improved their memory. Training studies, however, failed to provide long-term methods for the acquisition of practical strategies for learning. It was found (Brown, 1978; Brown & DeLoache, 1978) that the employment of strategies, for example, in the training of memory skills, was effective only while learners received instruction. Despite the short-comings of training studies, a common interest in strategies and their control continued among the theorists as a concern for a cognitive theory of learning became an issue (Brown *et al.*, 1983).

2.4 Metacognition

A particular area of cognitive research that has concerned developmental theorists in recent years is metacognition. Brown *et al.* (1983) argue that "the processes that have recently earned the title metacognitive are central to learning. Metacognition refers to one's knowledge and control of the domain cognition" (p. 106). In distinguishing these two forms of metacognition - knowledge about cognition and the control or regulation of cognition - Brown *et al.* (1983) state that "knowledge about cognition refers to the stable, statable, often fallible and late developing information that human thinkers have about their own cognitive processes" (p. 107). The regulation of cognition, on the other hand, is concerned with those processes which regulate learning such as the planning, the monitoring and the evaluation of activities.

Pramling (1990) distinguishes three research approaches to metacognition:

1. The knowledge children have about their own cognition.
2. The control and regulation of one's own cognition.
3. The view of metacognition as conceptions about learning.

2.4.1 Metacognition as knowledge

Flavell (1971), a pioneer in the field of metacognition, first used the term "metamemory" in relation to the awareness by children of their own memory. He has defined metacognition mainly in terms of reference to "one's knowledge concerning one's own cognitive processes and products or anything related to them e.g. the learning-relevant properties of information or data" (Flavell, 1976, p. 232). Subsequent extensions of this definition of

metacognition by Flavell have considered the nature of a number of factors such as the memory-relevant characteristics of people and tasks, and possible strategies that a person must know (Flavell & Wellman, 1977), the action and interaction of these factors or variables affecting cognition (Flavell, 1979), and the differentiation of metacognitive knowledge, metacognitive experiences, metacognitive and cognitive strategies within a model of cognitive monitoring (Flavell, 1981). Metacognitive knowledge refers to the knowledge one has about oneself as a learner such as knowing that reading for an examination requires more concentration and understanding than reading for pleasure. Flavell (1985) subdivides metacognitive knowledge into the knowledge one may have about persons, tasks and strategies, and the interactions and combinations which occur amongst these three categories.

Metacognitive experiences associated with cognitive acts can occur before, during or after an activity. Garner (1987) provides an example of a reading activity in history, where prior to the reading activity the learner might experience relief upon hearing that the next reading lesson will be based on a familiar quiz format. During the reading of a history text book the learner might realise that verbal rehearsal of the dates in history could assist in recalling these dates for the quiz. After finishing reading the history text the learner may also become aware of the bold-face topic headings which may be helpful for the future quiz.

In discussing metacognitive strategies and how these can be used to monitor cognitive strategies, Garner (1987) says that while the learner may use the cognitive strategy of verbal rehearsal, as in the previous example, the learner also may use a metacognitive strategy such as writing down the dates for future recall. Flavell (1985), in distinguishing between cognitive strategies and

metacognitive strategies states "cognitive strategies are invoked to *make* cognitive progress, metacognitive strategies to *monitor* it" (p. 106).

Interrelationships in the sequence of metacognitive knowledge, metacognitive experience and strategies also are discussed by Garner (1987). These interrelationships such as metacognitive experiences prompting revision of metacognitive knowledge, or cognitive strategies producing metacognitive experiences, are illustrated in Garner's (1987, p. 21) slightly modified form of the Flavell model (1981) wherein strategy use replaces cognitive actions:

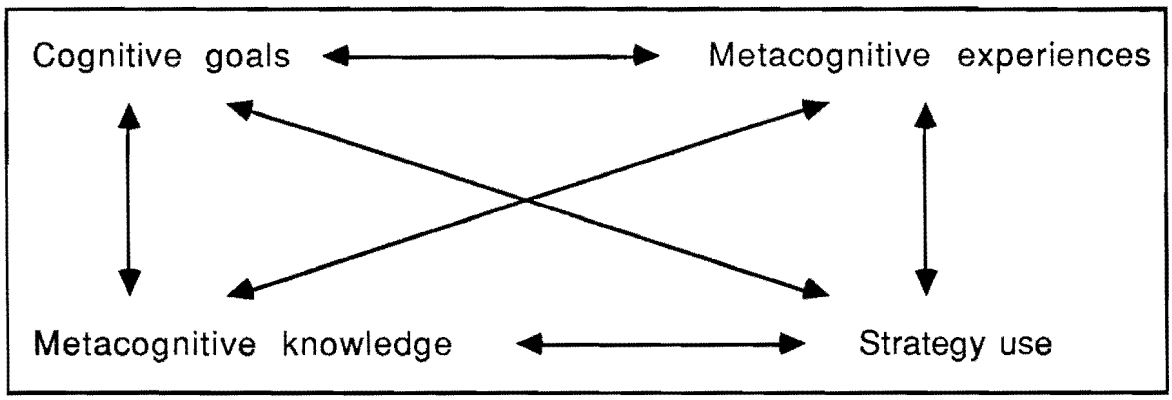

Figure 2.1. Flavell's Model of Metacognitive Components as Modified by Garner (1987)

Such a model illustrates how each component of metacognition is interrelated and can interact with other components and with associated cognitive goals.

Wellman (1985) says that while metacognition refers to one's knowledge of cognitive processes such as memory, attention, knowledge, and so on, his interest is in what conceptions people have about these processes. His research into the origins of metacognition indicates that "acquiring metacognition is . . . quite a

complex and extended process" (Wellman, 1985, p. 2). Wellman (1985) identifies five different types of knowledge in a person's metacognition:

1. Existence - A person knows that thoughts exist and that there is a distinction between these and external acts.
2. Distinct Processes - There are differences between mental processes such as guessing and knowing, dreaming and daydreaming.
3. Integration - All mental processes are similar and related such as thinking, dreaming, in that they all reside in the mind, and not in the body.
4. Variables - There are many factors which influence mental performance. Remembering, for example, depends on the task, the context and the strategies used.
5. Cognitive Monitoring - The ability to understand and assess one's cognitive processes such as knowing when one knows or does not know something, is or is not dreaming, guessing, imagining.

Wellman (1985) thus argues that metacognition cannot be considered or assumed to be "some singular developmental acquisition" (p. 2), but that within a person's knowledge there are a variety of known concepts and knowledge which form metacognition.

2.4.2 Metacognition as executive control

The second metacognitive research approach identified by both Pramling (1990) and Brown *et al.* (1983), is concerned with the control and regulation of one's own cognition. Such an approach is

guided by a central or executive control and focuses on the teaching of strategies to the learner. The "notion of executive control" is discussed by Brown (1978, 1987) as one of the historical roots of metacognition which arises out of the information processing models of cognition where the idea of a central control system is associated with learning (see 2.2). Brown (1978) states the basic requirements of such an executive are complex:

> It must include the ability to (a) predict the system's capacity limitations, (b) be aware of its repertoire of heuristic routines and their appropriate domain of utility, (c) identify and characterize the problem at hand, (d) plan and schedule appropriate problem-solving strategies, (e) monitor and supervise the effectiveness of those routines it calls into service, and (f) dynamically evaluate these operations in the face of success or failure so that termination of activities can be strategically timed (p. 82).

The influence of computers and interest in artificial intelligence which emerged concurrently with information processing theories, can be associated with this statement about the operations of a central processor. Brown *et al.* (1983) discuss two concepts which are central to information processing models, executive control and automated-controlled processes. Through the development of computer programs and planning models of artificial intelligence, the relatively slow and effortful controlled processes of thinking represented in earlier models, can become automated. A problem in relation to an automated system is one associated with regulation - "who or what does the controlling and who or what deciphers the output" (Brown *et al.*, 1983, p. 111) of cognition. This "demon" as Brown *et al.* (1983) call it, has traditionally concerned cognitive researchers. With the development of more sophisticated computers, information processing models and artificial intelligence, models have been used to examine metacognitive aspects of

learning such as preplanning, planning, and planning-in-action or control processing which involves monitoring, evaluation and revision of the learning processes.

Brown *et al.* (1983) say that "intelligent systems, be they machine or human, are highly dependent on executive orchestration" (p. 113). They report on a series of studies which demonstrate executive control. These studies, concerned with the learner's planning and monitoring processes, examine on-line monitoring of comprehension, the development of strategies in the trained learner and how the student allocates attention and effort in learning. Such studies demonstrate that the development of the learner's ability to monitor his or her own comprehension, for example, is not due to any "demon" but can be attributed to the strategies the trained learner develops and uses.

A tetrahedral framework of learning is discussed by Brown *et al.* (1983). In this model, the skills and knowledge of the learner interact with the activities of the learner such as the use of strategies, the criterial tasks and the learning materials. Brown *et al.* (1983) suggest that such a framework can be useful when considering the various factors and aspects of learning such as acquiring strategies for attention, comprehension, memory and problem solving.

Garner (1987) discusses distinctions and overlaps between metacognition and executive control. Distinctions relate to the historical background, the research methods and the language associated with the two approaches. She argues that it is largely the degree of emphasis that distinguishes the two approaches - "researchers in metacognition emphasize the *knowledge* learners bring or fail to bring to learning situations, researchers of executive control emphasize the *control* learners bring or do not bring"

(Garner, 1987, p. 24). The considerable overlap and emphasis on areas such as analysis of tasks, learner strategies, goal attainment, product examination and an active-learner focus, deem it "unwise to cast the two lines of inquiry as inconsistent or incompatible" (Garner, 1987, p. 25).

2.4.3 Metacognition as conceptions about learning

The third approach to research on metacognition combines both elements of metacognition discussed in the previous two approaches, knowledge of the processes and the products of cognition (Flavell, 1976) and the control and regulation of cognition (Brown *et al.*, 1983). The third approach used by Pramling (1990), is concerned with how children understand in relation to the world around them. Her view is that children have a knowledge of something in their world and she assumes that "children's thinking cannot be separated from the world since thinking is always directed towards something" (Pramling, 1990, p. 11). By assuming such a relationship between children and the world, she says, the content and context of children's learning can be considered from the viewpoint of the children. The theoretical basis for such an assumption is phenomenographic. Pramling (1990) states - "Phenomenography is concerned with describing people's conceptions of various phenomena in the world around them" (p. 23). The way in which these various phenomena are known, that is, perceived, conceived and understood by children, is the concern behind Pramling's research.

Metacognition is seen by Pramling (1990) as "a question of how children think about their own learning" (p. 2). Questions for her research focus on what the children think about the content in

their learning, how the children are thinking about this, and the "child's thinking about his own thinking about the content, which is the metacognitive level" (Pramling, 1988, p. 267). Pramling (1990) has investigated through a didactic approach children's conceptions of their own learning, how these can be developed and whether children become better learners by being aware of their own learning. Within this didactic approach the teacher directs children to reflect on how they are thinking in relation to the content and structure of their learning.

Studies by Pramling (1990, 1988) found that childrens conceptions of their own learning passed through various developmental levels from learning something by doing it, to perceiving that they could learn to know something such as facts, to finally realising that learning was understanding something. The childrens conceptions of how they thought learning occurred also passed through a series of stages. At first, children could not distinguish between doing something and learning to do something. This lack of distinguishing was followed by equating learning with getting older, and then to the final realisation that learning came about through experience. Pramling (1990) made an interesting observation about childrens conceptions of experiences. She found that although most four-year-old children connected experience with their own actions, some had the traditional school-learning conception of themselves as "passive consumers" of knowledge learning from an adult such as the teacher, rather than learning from their own active experience.

A metacognitive approach to teaching also has been proposed in studies by Biggs (1986) and Martin and Ramsden (1986). An emphasis in both these studies was on change in student's approaches to their learning. The study by Martin and Ramsden

(1986) investigated university students conceptions of what they saw as learning and how these conceptions might change with a teaching emphasis on relevant content and interactive student-teacher discussions, over a year-long history course. Biggs (1986) implemented possible alternatives for learning content in studies with university and senior high school students. Students were encouraged to reflect on their learning content through keeping diaries, discussion, and monitoring their progress. In discussing a metacognitive approach to teaching, Biggs (1986) identifies two issues in relation to learning - an awareness by students of motives, goals, task demands, context and abilities of cognitive content and processes, and the control over the appropriate strategies that students might apply. Biggs (1986) states - "Metacognition is not an end-state but a process: not as much a product as a way of life" (p. 138).

2.5 Event knowledge

Childrens knowledge about their everyday world and the familiar events that occur in this world has led to investigations into how these events are represented by children. In studying cognitive development, Nelson (1986) focuses on "event knowledge" and examines its structure and function in relation to the representation of events by young children. A reason behind the focus on "event knowledge" is that children's knowledge of the real world comes about through direct experience. These experiences, which shape children's cognitive processes, are given a social and cultural context through the interactions children have with others such as parents and adults, in their everyday world.

According to Nelson (1986) - "Events . . . involve people in purposeful activities, and acting on objects and interacting with each other to achieve some result" (p. 11). Events also are seen by Nelson (1986) to be organised around goals and to have a structure which is organised in a hierarchical sequence so that within the whole event smaller events can be examined in their entireties. Such a structure, which can be viewed as a whole "schema" or as a segment of a whole "schema", has implications in relation to the content and structure of children's event knowledge. Nelson (1986) views a "schema" as a "unique type of representional structure" (p. 8) within which representations of familiar events can be found on a continuum encompassing children's initial perceptual representations of an experience, through to more abstract representations such as the categorisation of concepts.

To analyse "event knowledge", Nelson (1986) uses the script model as a tool. This model of event representations is derived from Shank and Abelson (1977) who describe a script as "a structure that describes appropriate sequences of events in a particular context . . . A script is a predetermined, stereotyped sequence of actions that defines a well-known situation" (p. 41).

Nelson (1986) describes the script as "an event schema . . . a type of general event representation" (p. 12). She distinguishes scripts from other schemas saying that although the script is a general structure of knowledge, its actions make it different from other schemas. These actions within the script's hierarchical structure are linked sequentially in time and in space as a series of subscripts. Strong scripts also are distinguished from weak scripts. A strong scripted event such as the event, or script of getting dressed in the morning has an ordered time structure, occurs frequently and is understood by a child. A weak script is one

whereby the components of the event are specified, as at a birthday party, but the order in which they are to happen is not.

Research by Nelson (1986) into the functions of scripts has demonstrated that an individual's already existing event schema can help in the interpretation and understanding of new events and experiences. The importance of an established general event representation which provides a cognitive context for a situation, is discussed by Nelson (1986) in relation to a child's task performance. She believes that children with an already established general event representation who can provide a context for the task, are more likely to perform better than children who do not.

In their studies related to script-like event representations in young children, Nelson and Gruendel (1986) have demonstrated that in the use of verbal language scripts, certain basic characteristics of the script model are reflected in a child's knowledge. A series of experiments found that young children order the time sequences in their real life experiences such as a visit to a McDonalds restaurant, consistently and correctly. In those events where the components in a sequence can occur at various times such as opening presents at a birthday party, the children were found to be less consistent.

It would appear also from the studies (Nelson & Gruendal, 1986) that when children as young as three years were asked general questions about an event such as eating dinner, they had well developed general event representations for these familiar repetitive events. Hudson (1986), in her studies exploring general event representations and memory recall in children, found that children had difficulties in recalling specific episodes in routine events. Evidence from the studies suggested that familiar events

had to have something unusual happening within the course of that event to be recalled. A study involving children in a typical routine museum visit to a Jewish museum, but which provided the unusual event of seeing an archaeological exhibit, demonstrated that such an unusual episode in a typical event did not become part of the general event representation of most of the children and so accurate recall of that event was possible with most of the children a year later.

Criticisms directed at Nelson's data (Morton, 1990) express concern over the reliance of the studies on verbal, non-directive questioning of children outside the context of an event. In a study investigating these concerns with preschool children around four years old, Wilkinson (1988) found that there was poor recall for particular locations outside the context of an event. By reinstating the context of an event such as a walk in a park, the children's verbal and non-verbal recall improved through acting out and showing, in response to directive questioning.

2.6 Components of cognition

Cognition, the activity of knowing, involves numerous components. The difficulties in deciding which processes and products constitute cognition and where the boundaries of these begin and end is discussed by Flavell (1977). He states "mental processes habitually intrude themselves into virtually *all* human psychological processes and activities, and consequently there is no really principled, nonarbitary place to stop" (Flavell, 1977, p. 2). For the purposes of this study then, the more traditional components of cognition - attention, comprehension, memory, problem solving - and the more contemporary component, social cognition, will be

briefly discussed. Since it is one of the principal foci of this thesis, the cognitive component listening, will be discussed in more detail.

2.6.1 Attention

The ability to focus attention develops over time as children become more capable of controlling and directing their attention to things they select as relevant (Flavell, 1977). Such selection can vary from the visual attending to moving and novel objects by very young children, to the attending to specific task objectives by older children. The development of attention in children can be related to the strategies that children gradually acquire and use in the allocation of their attention. On the whole, the development of attentional strategies improves as children become older. This development, however, is not always age-related and can vary amongst children (Paris & Lindauer, 1982). Failure to concentrate (Wood, 1988), and failure to control, to adapt and to plan (Flavell, 1977), affects the development of attention. Training in the understanding and the use of attentional strategies can lead to improvement in the development of these strategies but children also must learn, and have skills to analyse, to co-ordinate and to monitor task activities in order for attention to develop (Paris & Lindauer, 1982; Brown *et al.*, 1983).

2.6.2 Comprehension

The ability to evaluate ones understanding of, for example, words, concepts and sentences in language, and to monitor their meaning within a context is not just a function of age (Brown *et al.*, 1983). A developmental investigation into comprehension

monitoring by Flavell, Speer, Green and August (1981) did find, however, that second-grade children are more likely to notice inadequacies in messages than kindergarten children. Other studies have found that divergence between learner ability and educational instruction with junior college students increased as the instruction became more difficult (Brown *et al.*, 1983), that children in third, fifth and sixth grades were unaware of inconsistencies while listening to information (Markman, 1979) and that junior high students, identified as weak in comprehension, were poor at recognising inconsistencies in reading texts (Garner, 1981; Garner & Kraus, 1981-82). A failure in children's comprehension monitoring to consider relationships within a substantial text also has been indicated in studies on listening (Markman, 1979), and reading (Garner & Kraus, 1981-82) with children in all grades.

The acquisition of comprehension and monitoring skills in children is considered important (Brown *et al.*, 1983; Flavell *et al.*, 1981; Paris & Lindauer, 1982). Children with reading difficulties have few flexible strategies for checking and regulating their understanding of a text (Paris & Lindauer, 1982). Brown and Smiley (1978) found that teaching children specific comprehension-related strategies such as those for studying texts, for example, note-taking and underlining, was dependent upon the children's ability and awareness to utilize specific knowledge. In these experiments, this involved the children's ability to identify the relevant points in the text. Problems exist in determining children's comprehension monitoring ability such as the measure used to assess the ability, the use of familiar materials for assessing (Brown *et al.*, 1983), and the recognition of individual children's cognitive styles such as reflectiveness and impulsiveness (Walczyk & Hall, 1989). It appears that in teaching specific comprehension-related

skills, the level of difficulty in the instruction, and the prior knowledge, ability and motivation of the learner, needs to be considered (Brown *et al.*, 1983).

2.6.3 Memory

Bartlett's (1932) study of memory related to schemas - "an active organisation of past reactions, or of past experiences" (p. 201), can be regarded as the pioneer work concerned with problems of remembering. The study of cognitive activities associated with memory development is an active concern of memory research (Brown *et al.*, 1983; Harris, 1978; Flavell, 1977, 1985). Current research approaches to memory development vary (Harris, 1978; Flavell, 1985). The information-processing approach to the development of memory investigates memory as a system concerned with processing information such as the development of encoding task information in, for example, balance scale problems in weight and distance dimensions (Siegler, 1978). Another approach studies the development of children's activities in relation to remembering (Brown & Smiley, 1978; Brown *et al.*, 1983; Flavell, 1985; Flavell *et al.*, 1966; Harris, 1978). Different aspects of children's memory are discussed by Paris and Lindauer (1982) such as recognition memory, which is highly accurate during childhood, and memory strategies which are poorly utilised by children in learning situations.

Flavell (1977) discusses four categories of phenomena - basic processes, knowledge, strategies and metamemory - useful in the analysis of memory development. The basic processes refer to fundamental memory behaviour such as recognition and recall, while knowledge, strategies and metamemory are more concerned

with activities associated with memory. The inter-relatedness of knowledge and strategy factors in association with a learning task is emphasised by Brown *et al.* (1983). It is the learner's knowledge, the kind of material to be learnt in the learning task which decides the use of a strategy. A memory strategy is described by Flavell (1977) as "a voluntary, purposeful move a person decides to make in an effort to enhance some desired mnemonic outcome" (p. 195). Flavell (1977) discusses the memory storage strategies of rehearsal, organisation such as clustering, or chunking information, and elaboration, for example, the use of visualisation in the processing of information, and the retrieval strategies the learner uses to recover information from the memory storage.

Studies investigating the development of memory strategies have demonstrated that very young children are capable of using strategies to remember (Brown *et al.*, 1983; Flavell & Wellman, 1977; Wellman, Ritter & Flavell, 1975), that the use of strategies such as verbal rehearsal, can be related to memory performance (Flavell *et al.*, 1966), and that it is not only age that determines the use of strategies but also being able to use strategies efficiently (Brown & Smiley, 1978; Brown *et al.*, 1983) and expertly (Chi, 1978). It also has been found that children can be trained to utilise and improve strategies (Brown, 1978; Brown *et al.*, 1983; Flavell *et al.*, 1966).

Metamemory - the awareness of different variables affecting memory (see 2.3.1), is discussed by Flavell (1977), Harris (1978), and Paris and Lindauer (1982) as a factor related to the development of memory strategies. Recent research has been concerned with the training of children in the use of metacognitive skills to create an awareness in children of allocating attention and concentration effectively for learning in educational activities

(Brown *et al.*, 1983; Flavell, 1985). Studies (Brown, 1978; Brown *et al.*, 1983; Flavell, 1985; Paris & Lindauer, 1982; Reeve & Brown, 1985) indicate that metacognitive skills such as predicting, planning, checking and monitoring processes can be successfully taught leading to improvement in children's cognitive activities, for example, reading comprehension. The role of metacognitive skills also is important in many cognitive activities such as attention, oral and reading comprehension, memory, problem solving and social cognition (Flavell, 1985).

2.6.4 Problem solving

Problem solving is closely entwined with human memory (Brown, 1978; Brown & Deloache, 1978; Flavell, 1977). It is generally acknowledged that usually there is a solution to most tasks and problems and that some sort of cognitive activity is necessary in attempting to solve these (Flavell, 1985). While studies have shown that a variety of cognitive strategies and skills for investigating and solving problems can be acquired by children from a very young age (Brown *et al.*, 1983), questions arise as to the development of the processes involved in the acquisition of these strategies and skills (Paris & Lindauer, 1982), and the intraindividual and interindividual differences in problem-solving processes (Kluwe, 1987). The development of children's strategies for gradually acquiring knowledge through substages of solving balance scale problems has been described by Siegler (1978). Studies (Greeno, 1978; Greeno & Riley, 1987) also have identified the acquisition of kinds of knowledge such as pattern recognition in geometry, and the development of understanding in student's problem-solving skills in mathematics.

A historical perspective of various approaches and theories to problem solving is reviewed by Mayer (1983). Aspects such as the past experience of the problem-solver, the representation of the problem, for example, the choice of wording for the problem, direction or help for the problem-solver in the form of hints, are discussed in relation to problem-solving situations such as concept-learning tasks. Models of problem solving also are discussed. Polya (1957), and his heuristic four-step-model for improving problem solving in mathematics - understanding the problem, devising a plan, carrying out the plan, and looking back to examine the problem - is reviewed by Mayer (1983) and by Biggs and Telfer (1987). The series of steps in such a model are refered to as "strategies" by Biggs and Telfer (1987, p. 175), who describe an adaptation of this model for teaching library skills to primary school children in Western Australia.

The teaching of problem-solving strategies is discussed by Mayer (1983) in association with creative problem solving. For this purpose, Mayer (1983) defines *creativity* "as a cognitive activity that results in novel solutions for a problem. Thus, creativity training involves teaching people how to generate new ideas for a given situation" (p. 327). While recent studies have illustrated that problem solving can be taught (Brown & Ferrara, 1985; Palincsar & Brown, 1984), a concern of researchers is the relationship between general problem-solving strategies and domain-specific problem-solving strategies within instruction (Brown *et al.*, 1983; Mayer, 1983).

Perkins and Salomon (1989), discuss the cognitive skills of effective problem solving, sound decision making, and insightful invention. They debate whether these skills are dependent on specific expertise in an area or whether there are some general

aspects of cognitive skill which apply across all areas of knowledge. A game of chess is used by them as an example to illustrate whether the specific problem-solving abilities needed to play chess are transferable to general thinking. Central to the discussion of general skill knowledge and domain-specific knowledge is the issue of transfer. A synthesis of general and specific knowledge is suggested by Perkins and Salomon (1989) which attempts to address this issue. Within this synthesis four conditions for general cognitive skills are offered:

1. The seeming use of general strategies within a specific domain.
2. The importance of the role of general strategies in problem solving.
3. The transfer of general strategies to other domains.
4. The common absence of certain strategies and the subsequent acquisition of these after intervention.

While Perkins and Salomon (1989) acknowledge that more studies need to be undertaken in the area of transfer, such as teacher effectiveness in the transference of knowledge across domains, they state that "cognitive skills are general tools. . . . for retrieving and wielding domain-specific knowledge" (p. 23).

2.6.5 Social cognition

The components of cognition such as attention, comprehension, memory, problem solving and listening are acknowledged as traditional activities associated with cognitive processes. A social dimension of cognition, however, also needs to be considered (Flavell, 1977). In discussing cognitive information-processing

research and models, and the criteria and tools associated with information-processing strategies, Forgas (1981) argues for the recognition of a social dimension to cognition. He states - "Cognition, when taken as a domain concerned with all the processes of knowing, is intrinsically, inevitably and profoundly social" (Forgas, 1981, p. 2).

For Flavell (1985), social cognition means "cognition about people and their doings" (p. 119). In discussing social cognition, Flavell mentions the varieties within this area such as "cognition directed at the world of human versus nonhuman objects and the social-communicative versus private-cognitive uses of language" (p. 2). He links cognitive tools such as knowledge structures, used for categorising, reasoning and remembering, to the social and nonsocial world. Flavell acknowledges similarities between social and nonsocial cognition, in that it is in the same mind that both take place. He also acknowledges differences such as the context of the individual, and the relationships between individuals. Flavell says that "most of the basic processes and operations used in social cognition are probably also used in nonsocial cognition" (p. 127).

Paris and Lindauer (1982) consider social cognition and strategy acquisition. These authors see children's natural use of strategies such as problem solving, developing into self-controlled cognitive strategies through social interaction with peers, parents and teachers. This development of cognitive strategies is, in turn, related to children's development in understanding social situations.

Flavell (1985) discusses three preconditions to the child's developing social cognition - *existence*, *need* and *inference*. An awareness that something, a fact or a phenomena, *exists* is an initial concept in social cognition. This awareness then develops into

a *need* to engage in an act of social cognition such as considering the feelings of another person. From such acts of social cognition the child develops skills in making *inferences* concerning, for example, the feelings of how another person may be feeling. Flavell (1985) relates these three factors in the development of social cognition to the development of the child's metacognitive knowledge - "The development of knowledge and cognition concerning the *self* closely parallels and overlaps the development of knowledge and cognition about cognition (metacognition) and about other people (social cognition in general)" (p. 162).

Studies by Doise and Mackie (1981) found that children's cognition developed through social interaction. Experiments involving motor co-ordination, spatial and conservation activities illustrated that cognition developed through interindividual activities. Further cognitive progress was found to develop as more complex social interactions such as socio-cognitive conflict, took place. Doise and Mackie (1981) likened this process to a casual spiral arising out of "the play of causality between social interaction and cognition" (p. 78).

Two aspects of direct interaction were discussed by Doise and Mackie (1981) in relation to the complex social interactive behaviours taking place between individuals. The first of these aspects considered the influence of factors such as the social status and relationship of the participants in the interaction. Doise (1985) observed that cognitive differences, related to such factors as the socio-economic backgrounds of children, disappeared after social interactive activity in "experiences of mutual education" (p. 118). The second aspect related to direct interaction, explored the issue of participants co-ordinating in an activity. Co-ordination, resulting from a passive modelling situation or from active interaction,

appeared to be dependent on social behaviour such as the co-operation of the participating individuals.

2.6.6 Listening

Many authors have attempted to define listening. Devine (1978), in his review of listening, writes that a simple definition of listening "has yet to emerge" (p. 296). Robinson and Smith (1981) note that there is no widely-accepted definition of listening and that the act of listening "is more than hearing; it is more than attending to sounds" (p. 2). Although Wolvin and Coakley (1985), state that "*the* definition of listening is still in the developing process" (p. 43), they define listening "as *the process of receiving, attending to and assigning meaning to aural stimuli*" (p. 74).

Barbara (1958) in his book "The Art of Listening" differentiates between active and passive listening:

> In listening actively, the individual does so with *all* of his self - his senses, his attitudes, beliefs, thoughts and intuitions. In passive listening, the listener becomes an organ for the reception of sound and has little self-perception, personal involvement, "gestalt" discrimination, or even alive curiosity (p. 80).

Barbara (1958) states that listening is an art and that as an art it "requires knowledge and effort" (p. 1). For listening to be practised as an effective art, Barbara (1958) considers three factors - discipline, concentration and comprehension, each requiring active participation for good listening. By contrast, the passive listener is considered to put little or no conscious effort, participation or feeling into the listening process.

Barker (1971) says that classifications of listening such as active and passive listening, "represents a specific way in which listening theorists and authors have chosen to discuss the listening process" (p. 9). He defines listening as "the selective process of attending to, hearing, understanding and remembering aural symbols" (p. 17). Alley and Deschler (1979) have a similar definition but have supplemented it to include "attending to and comprehending *nonverbal* messages (the non-linguistic channel)" (p. 278).

Channels of communication, linguistic and non-linguistic, are discussed by Wilkinson, Stratta, and Dudley (1974). Non-linguistic channels encompass paralinguistic communication, which "deals with how something is said and not what is said. It deals with a range of nonverbal vocal cues surrounding common speech behavior" (Knapp, 1978, p. 18). Other non-linguistic channels of communication are visual communication, which can include, for example, the appearance of a speaker, and kinesic communication, the speaker's use of body movement. Wilkinson *et al.* (1974) also include two vestigial communication channels, smell and taste. These non-linguistic channels convey to the listener non-verbal messages alongside the linguistic or verbal message which consists of the words and phrases of language and the sounds of word structures. Non-verbal messages need to be considered in conjunction with verbal messages (Wilkinson *et al.*, 1974). Often the non-verbal messages convey meanings to the listener that may have nothing to do with the verbal message. Thus, a listening situation which may appear positive from the visual and kinesic forms of communication, may in fact be negative due to an inappropriate intonation, a component of paralinguistic communication. Nichols and Stevens (1957) state "the nonverbal

messages that we receive as listeners reinforce, modify or even contradict the words that a talker speaks. Sometimes the nonverbal part of the communication received by the listener is far more important than the verbal part" (p. 61). The word "oh" is used by Nichols and Stevens (1957) as an example which provides many different sources of meaning to the listener depending on the way it is spoken.

2.6.6.1 Listening purposes

Anderson and Lynch (1988) acknowledge the complexity of the linguistic skills involved in listening such as comprehension. They also identify the involvement of non-linguistic skills which they associate with the purpose for listening. They state, "we listen for a *purpose*, not merely as a way of exercising language skills" (Anderson & Lynch, 1988, p. 4). Listening is seen by Anderson and Lynch (1988) to have some specific purpose such as for social interaction or for information acquisition. For these purposes additional non-linguistic skills are required by the listener as, for example, a listener judging the mood of the speaker in a social situation in order to make an appropriate response. To cater for the many situations requiring both linguistic and non-linguistic skills, Anderson and Lynch (1988) propose a continuum of listening which encompasses the social through to the informative aspects of listening.

Wolvin and Coakley (1985) identify five purposes for listening - discriminative, comprehensive, therapeutic, critical and appreciative. These five purposes are seen by these authors to provide different perspectives to enable the listener to understand

their listening responses and to develop appropriate response skills in relation to these purposes.

Barbara (1958), Nichols and Stevens (1957) and Wolvin and Coakley (1985) acknowledge the purpose of listening in informative situations and social situations when they discuss the detrimental effects of inefficient listening. In informative situations, inefficient listening has been recognised as having disastrous consequences for business or industry (Wolvin & Coakley, 1985), and in social situations inefficient listening can cause problems in peer communication and family interactions (Nicols & Stevens, 1957).

Settings for active listening are distinguished by Barker (1971) as social (usually informal) and serious (usually formal). In a social setting, listening for appreciation, conversation, courtesy and to indicate love and respect are associated with social listening. Serious listening is distinguished as being either selective such as listening to parts of a message, or concentrated, which involves listening to the whole message in order to understand what is being said.

2.6.6.2 Listening and communication

Communication is seen by Wolvin and Coakley (1985) as a "transactional process in which the source and the receiver *share* the communication experience as they simultaneously send and receive messages" (p. 87). Burley-Allen (1982) stresses the listener's responsibility in the communication process with the listener positively acknowledging the speaker whilst still listening objectively and with understanding. Barbara (1958) also states that "both speaker and listener must assume equal responsibility for their part in the total situation" (p. 81). Listening is viewed as a

reciprocal skill between speaker and listener by Anderson and Lynch (1988). Listening skills are considered as important as speaking skills and reciprocal listening as "the opportunity for speaker and listener to exchange roles" (Anderson & Lynch, 1988, p. 4).

2.6.6.3 Active listening

Anderson and Lynch (1988) extend their emphasis on listening as a reciprocal process to listening as an active process. They say - "successful listening is both an *active* process requiring the use of multiple information sources and a *reciprocal* process requiring the listeners to query and react to the speaker (or text) as they listen" (p. 107). The issue of what constitutes successful listening, where the listener successfully hears, understands, constructs and interprets a message, is discussed by Anderson and Lynch (1988):

> The role of the successful listener has to be thought of as an *active* one. Understanding is not something that happens because of what a speaker says: the listener has a crucial part to play in the process, by activating various types of knowledge, and by applying what he knows to what he hears and trying to understand what the speaker means (p. 6).

Barbara (1958) also places an emphasis on successful listening in relation to comprehending what one hears which he says is different to the actual physiological reception of sound in the auditory passages of the ear. He states that "*successful* listening presupposes hearing and *precedes* understanding" (p. 80). The process of understanding is assumed by most writers about listening to be part of the act of listening (Alley & Deschler, 1979; Burley-Allen, 1982; Nichols & Stevens, 1957; Robinson, 1989;

Robinson & Smith, 1981; Smith, Packham & McEvedy, 1986; Smith & Robinson, 1986; Wilkinson *et al.*, 1974; Wolvin & Coakley, 1985). However, Floyd (1985) and Barker (1971) have included the term *understanding* in their definitions of listening. Barker (1971) briefly qualifies his use of the term - "*understanding* refers to the assignment of meaning to the messages received (hopefully similar meaning to that intended by the initiator of the message)" (p. 17).

2.6.6.4 A listening model

Understanding is synonymous with *comprehension*. Robinson and Smith (1981) use both terms in their model of listening which allows for parts of the listening process to be assessed by examining some of the different skills involved in listening. In this model, the skills in a listening sequence are divided into three major parts - input, listening, and output. Each of these three parts has several components:

1. Input - The verbal and non-verbal messages the " speaker " conveys to the "listener" through the interaction of verbal components such as the clarity of articulation, the level of vocabulary, the complexity, duration and quality of the message, and non-verbal components as in visual communication.
2. Listening - The cognitive process which identifies the prerequisite skills of attention, acoustic competence (hearing), and language competence (perception, syntactic, semantic), as necessary before listening and the associated skills of comprehension and memory can occur.
3. Output - The observable response of the listener through, for instance, a verbal response, a physical response and/or a written response.

Robinson and Smith (1981), Smith and Robinson (1986), and Robinson (1989), also suggest that there is a reciprocal interaction between the three major parts, input, listening, and output. The observable response or output from the listener could, for example, provide a direction for future input. Similarly, a verbal response, a physical response or a written response can recall the listening task. Although the purpose of the model is for assessment and instruction, the identifying and isolating of parts, and certain components of these parts of listening, allows some access to the analysis of the process of listening.

An examination of the different components associated with listening provides the following information considered relevant to the research on the development of children's listening skills to be reported in this thesis:

1. How the listening process is set in motion can depend on how the message - verbal or non-verbal, linguistic or non-linguistic - is conveyed to the listener.
2. Identifying whether the listener has, or has not, the prerequiste skills of attention, adequate hearing and language competence will determine if the actual listening process can occur.
3. The listening part of the model has been identified as a cognitive process involving the components of attention, memory and comprehension (Robinson 1983, 1989; Robinson & Smith, 1981; Smith & Robinson, 1986).
4. The listener's response is observable through a physical or body movement response, a verbal response, and/or a written response.

Hearing, what the listener hears in relation to the frequency and pitch of sounds, has been demonstrated to be measurable through studies on tone (Johnstone, 1989). The process of listening, what actually occurs while listening goes on, however, remains elusive due to the complex combination of skills, linguistic and non-linguistic, that are involved in listening. A fundamental problem acknowledged by researchers is "direct access to the listening process itself" (Anderson & Lynch, 1988, p. 7). Although it has been demonstrated that listening skills can be taught (Anderson & Lynch, 1988; Nichols & Stevens, 1957; Robinson, 1983, 1989; Robinson & Smith, 1981; Wilkinson *et al.*, 1974), research into teaching listening skills to the child with learning disabilities has been "relatively neglected" (Smith & Robinson, 1986, p. 240). This neglect is a concern of this study.

In the present section a successful listener has been identified as an active listener (Anderson & Lynch, 1988; Alley & Deschler, 1979; Barbara, 1958; Barker, 1971; Burley-Allen, 1982; Floyd, 1985; Smith *et al.*, 1986; Wilkinson *et al.*, 1974; Wolvin & Coakley, 1985) and that active listening can take place in a social situation or in an informative, knowledge-acquiring situation (Anderson & Lynch, 1988; Barbara, 1958; Barker, 1971; Nichols & Stevens, 1957; Wolvin & Coakley, 1985). The listening process has been shown to involve the cognitive skills of attention, comprehension and memory for both linguistic (Alley & Deschler, 1979; Anderson & Lynch, 1988; Barbara, 1958; Barker, 1971; Floyd, 1985; Robinson, 1983, 1989; Robinson & Smith, 1981; Smith & Robinson, 1986; Wilkinson *et al.*, 1974; Wolvin & Coakley, 1985), and non-linguistic stimuli such as those involving paralinguistic, visual and kinesic communications (Anderson & Lynch, 1988; Alley & Deschler, 1979;

Nichols & Stevens, 1957; Wilkinson *et al.*, 1974; Wolvin & Coakley, 1985).

2.7 Theories of cognitive development

Five different models of development theories and the theorists associated with these models, are discussed by Dixon and Lerner (1984). Among the models they discuss are the organismic model and the dialectical model. Theorists linked by them to the organismic model include Piaget, and to the dialectical model, Vygotsky. In the following section, the neo-Piagetian researchers such as Pascaul-Leone, Case, and Siegler also will be considered in relation to the theory of Piaget, and the work of Luria and Leont'ev to the research of Vygotsky.

2.7.1 Piaget

The organismic model of development had its origins in biological growth and emphasised change in development through a pattern of stages (Dixon & Lerner, 1984). The work of Piaget derives from this model and has provided guidelines for child development that have been widely related to education and research. Piaget was interested primarily in the structure of thinking or cognitive development in the child. He described this structure of thinking as existing and continually changing in the activity of individuals. Piaget believed that the child actively constructs knowledge internally through continuous interaction with the environment. It is this continual assimilation (the incorporating of perceptions of new experiences into an existing framework) of external factors, that Piaget considered necessary

for the development and modification of new concepts in the child's thinking.

A corner-stone of Piaget's theory is the process of equilibration. Labinowicz (1980) describes *equilibration* as the complementary processes of accommodation and assimilation that operate simultaneously between the environment and children's internal knowledge structures. Through assimilation and accommodation children reach understanding, and as understanding expands they progressively attain higher levels of intellectual development - "Thus intellectual development may be visualised as a continuous spiralling process, with equilibration being the driving force behind this adaptation of the individual to his environment" (Labinowicz, 1980, p. 41).

The importance and difficulty of conceptualising the nature and development of thinking is discussed by Furth and Wachs (1974). They elaborated on eight principles of Piaget's theory and these are related to education in their book *Thinking Goes to School* (Furth & Wachs (1974, pp. 12-29). In summary, the eight principles are:

1. The separation of two processes that are related but are conceptually different - development and learning.
2. The interaction of hereditary, maturation and environment in the development of intelligence (this is fundamental to the equilibration theory).
3. The importance of high-level experience for intellectual growth.
4. That thinking is a self-regulating activity which begins before and goes beyond language.
5. The internal need a child has 'to know'.
6. The general pervasiveness of thinking; in actions,

perceptions, images, language and in all content areas of interest.

7. That intelligence is constructive and creative in the gradual creation of new mechanisms of thinking.

8. The description of successive stages of development.

It is the conceptualising of the development of thinking into stages by Piaget that has provided guidelines and teaching procedures for many educators. Piaget postulated a sequence of four predictable age-related developmental stages in cognitive development. There are many sources detailing Piaget's stages of development (Flavell, 1977, 1985; Furth & Wachs, 1974; Labinowicz, 1980). In brief these stages are the:

1. *Sensori-motor stage* (birth to two years): the child learns co-ordination of physical actions; both prerepresentational and preverbal.

2. *Preoperational stage* (two to seven years): the child develops the ability to represent action through thought and language; the child is prelogical.

3. *Concrete operation stage* (seven to twelve years): the child develops logical thinking; this is limited to physical reality.

4. *Formal operations stage* (twelve to sixteen years): the child develops logical thinking; this is abstract and unlimited.

Piaget's theory of assimilation and accommodation has been viewed as a "plausible working conception of how a child makes cognitive advances" (Flavell, 1985, p. 8). In recent research, however, it has become apparent that Piaget underestimated the cognitive capacities of the young child (Donaldson, 1978; Flavell, 1985; Harris, 1978; Paris & Lindauer, 1982; Wellman, 1985).

2.7.1.1 The neo-Piagetians - Pascaul-Leone, Case and Siegler

During the late 1970s, cognitive theorists looked further at Piaget's ideas. A neo-Piagetian school began to publish theories broadly paralleling those of Piaget but postulating different mechanisms within the Piagetian stages. Pascaul-Leone, Case and Siegler are amongst those researchers who differ from the traditional Piagetian position of structualism and look more at the link between learning and development. In recalling the eight principles relating to Piaget's theory (Furth & Wachs, 1974) it becomes apparent that it was the structure of thinking that interested Piaget, not the content of what children remember. The neo-Piagetians raised questions concerning several issues in Piaget's stages of development more related to the processing of information. Amongst the issues considered were the difficulties in measuring each stage level such as the "real" level of cognitive development, the range of generality of stages, and the different ways in which children perform tasks. The neo-Piagetian research evolved acknowledging that although there are endogenous limits to learning such as general cognitive abilities, these were not as structured as in the Piagetian sense.

Pascaul-Leone and Case attempted to modify Piagetian theory from an information-processing viewpoint. Their research focussed on the capacity of working memory. Pascaul-Leone (1970) and Case (1972) argued that limits in information capacity are dependent on the amount of working memory, or M-space, the child has available. In their view, it was necessary for the child's capacity in working memory to increase before the next Piagetian stage of development could be attained. Pascaul-Leone's research on linking development in working memory and the use of executive

strategies was extended by Case (1978) to a M-space model encompassing a wider age range from early childhood through to adolescence.

The neo-Piagetian position in relation to the development and acquisition of strategies in learning is summarized by Case (1978):

> During each of the major stages of intellectual development, there is a succession of substages. The first postulate of my theory is that this succession of substages stems from a succession of qualitatively distinct control structures or executive strategies. The second postulate is that two sorts of factors explain the succession of strategies within any stage. The first is the child's responsiveness to the strategy-related experiences he encounters. In order of increasing power, one would expect practice, practice with feedback, cue highlighting, and modelling to affect the rate at which a child progresses through a given strategy sequence. The second factor is a gradual increase within each stage in the size of the child's working memory. As working memory increases, it becomes easier to acquire and utilize more complex executive strategies. The third postulate is that the gradual increase in working memory does not stem from a structural increase in the attentional capacity of the organism but rather from an increase in the automaticity of the basic operations it is capable of executing. As these operations become more automatic, their execution requires a smaller proportion of total attentional capacity. The result is that more capacity is available for "storage" or "working". Exactly how the increase in automaticity occurs is unclear, but it seems likely that, if experimental input plays a role, it is general rather than specific. The fourth major postulate is that the executive strategies of each major stage involve qualitatively distinct underlying operations and that the operation at any given stage must be assembled in working memory from components available at the previous stage. It follows that the transition to any given stage depends on the attainment of a certain degree of automaticity during the previous stage (p. 64).

Siegler (1978) applied information-processing methods to the study of cognitive development in the three to five-year-old child's development in scientific reasoning. In attempting to explain the developmental changes between what the child already knows and

how the child acquires new knowledge, Siegler (1978) used a rule-governed approach involving a balance scale to assess the child's development in the use of problem-solving strategies. An outcome of Siegler's research was that the development of scientific reasoning appeared to emerge through the child employing a series of rules which gradually became more complex in relation to solving the problem. In discussing the child's development of existing knowledge, encoding, acquisition of new knowledge, and the development of the child's ability to respond to training and feedback experience in problem solving, Siegler (1978) states - "It seems likely that one thing that develops between ages 3 and 5 is the ability and inclination to generate systematic rule-governed approaches" (1978, p. 146).

2.7.2 Vygotsky

The dialectical model of development as seen by Dixon and Lerner (1984) is where "the activities of the individual are . . . viewed as being in dynamic interaction with the activities of the environment" (p. 25). The research of Vygotsky attempted to show that the history of the society in which the child lives, and the experiences the child has throughout his/her development in that society, influences the child's patterns and levels of thinking. Vygotsky (1962, 1972a) related his research to the development of conceptual thought and language. Within Vygotsky's thought and language theory were three inter-related themes (Luria, 1981). These three themes relate to the processes of learning:

1. A genetic or developmental approach through three forms of development - ontogenesis, phylogenesis and microgenesis - to explain the child's learning processes.

2. The higher mental processes in the child have their origin in social processes such as social experiences, and social interactions which shape the process of internalisation of knowledge.

3. The mental processes can only be understood if the tools, or signs that mediate these processes such as the use of language are understood.

(Vygotsky's theory illustrated the development of thinking in a hierarchical series of stages through the use of verbal language as a tool; Thomas, 1979).

Wertsch (1981b) ties together these three themes pertaining to Vygotsky by saying that each theme makes the other viable - development through social interaction gives rise to cognitive processes such as memory, which is linked to tools of mediation; in the Vygotskian perspective this was the use of speech. A central tenet of Vygotsky's theory was the internalisation of knowledge through two levels of cognitive functioning, the interpsychological level and the intrapsychological level. The interpsychological level involves social interaction which occurs when the child requires help in an activity or in the acquisition of new knowledge. The intrapsychological level is the level reached when the child is capable of carrying out an activity, or is able to acquire further knowledge from his or her own thinking.

A uniqueness of Vygotsky's perspective of internalisation was the emphasis on the social interaction taking place during the internalisation of knowledge. Vygotsky (1978) related the development and learning of the child in what he called the *zone of proximal development*. This zone was defined by Vygotsky (1978) as "the distance between the [child's] actual developmental level as

determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). Brown and Ferrara (1985) have studied Vygotsky's *zone of proximal development* by examining the performance of children on I.Q. tests. Their research showed that the children involved in the experiments deemed to have low I.Q.'s, improved on problem-solving tasks when directed to look for certain problem-solving features such as patterns, in the tasks.

2.7.2.1 Luria and Leont'ev

The research of Vygotsky's students, Luria and Leont'ev, extended the Vygotskian themes of a developmental approach, social interaction and mediation of cognitive activity into a theory of brain functioning (Luria) and a theory of activity (Leont'ev).

Luria (1981) developed Vygotsky's ideas on language and cognitive development in the areas of neurophysiology, neuropsychology, developmental psychology, neurolinguistics, and cross-cultural studies to formulate a theory of brain functioning. This theory made feasible the possibility that more than one structural system can be involved in cognitive processing (Luria, 1973). In the memory system, for example, there are many structural links in the cognitive process such as simultaneous and successive processes. Simultaneous processes integrate individual stimuli arriving into the brain as a single entirety related in space. Successive processes integrate individual stimuli which arrive sequentially, one after the other, into the brain. Luria's research demonstrated empirically that while either damaged links or non-functioning links can cause blocks in memory and learning, brain

functional systems can work together with a degree of interchangeability (Wertsch, 1981a).

Neo-Piagetian cognitive field theorists such as Biggs and Collis (1982), have discussed endogenous factors that include the variables of simultaneous and successive processing, in relation to cognitive development. The interchangeability of functional systems occurring in association with the simultaneous and successive processes offered by the brain functional system of Luria, can be related to the learning process (Bygrave, 1985, 1988b, 1990a). If, for example, there is a deficiency in successive processing or sequencing in learning this can be replaced with simultaneous processing, or vice versa. This is of relevance when considering the learning processes of children with learning difficulties, an issue of concern in this study.

Leont'ev (1981) integrated a Vygotskian emphasis into various levels of activity in his theory of activity. He wrote:

> If we removed human activity from the system of social relationships and social life, it would not exist and would have no structure. With all its varied forms, the human individual's activity is a system in the system of social relations (Leont'ev, 1981, p. 47).

Activity is seen by Leont'ev as a fundamental concept related to external behaviour and linked to the consciousness of the individual. Three levels of activity are analysed by Leont'ev (1981) - actions, goals and operations. Leont'ev says that before any activity can take place there has to be a perceived need for activity recognised by the individual. It is through this need that a goal is defined, the object of an activity. A motive for an activity also is identified by Leont'ev. He identifies the goal of an activity as the real motive for activity, and says that although there is always

some need, there can be no activity without a motive. Intermediate goals can be identified in the course of the activity before the final goal is realised. It is in the actions - the intellectual working out of ideas, and in the operations - the behaviours associated with the activity of the individual, that Vygotsky's notion of social interaction linked with learning and development in the *zone of proximal development*, can be considered in activity.

Leont'ev (1981) also substantiates Vygotsky's idea of the use of a tool in mediating activity and states that in order for an individual to carry out certain operations or behaviour in an activity, that individual must know how to use the tool involved in that operation and so "every operation is the result of the transformation of an action [intellectual working out]" (p. 64).

2.8 The use of a tool for learning

Language has been utilised as a means, by Piaget and Vygotsky, whereby the development of thinking and cognitive processes can be illustrated. Bryant (1986, 1990) discusses the difficulties in establishing the plausibility of cognitive development theories such as the theories of Piaget and Vygotsky - "one has to be able to establish empirically whether a theory is right or not" (1986, p. 182). Differences between the theories of Piaget and Vygotsky have been discussed elsewhere (Bryant, 1986, 1990; Bygrave, 1985; Nelson, 1986; Wertsch, 1985; Wertsch & Stone, 1985; Williams, 1989; Vygotsky, 1972b). The major difference between the theories of Piaget and Vygotsky of concern to this research study lies in Piaget placing less emphasis on social interaction (Dixon & Learner, 1984; Nelson, 1986). As mentioned in the previous section (2.7.1), it was the structure of thinking in the

child's understanding that was Piaget's prime concern, not the relationship between thinking and learning in a social context.

Two of the three themes in Vygotsky's theory considered social interaction and the use of tools in cognitive activity. Social interaction was linked to the child's development and learning in the *zone of proximal development* and to the use of a tool in mediating and understanding cognitive activity. Although Vygotsky (1981a) emphasises social interaction in his theory he extends this emphasis further - "Cognitive processes in individuals do not somehow magically emerge out of social interaction; rather, by coming to master the mediational means of social interaction, the child masters the very means needed for later independent cognitive processing" (p. 190). Vygotsky (1977) saw the function of a tool as "a means of man's external activity aimed at mastering, or triumphing over nature" (p. 72). The use of a tool in mediating activity also was applied by Vygotsky (1981b) outside the concept of language to illustrate the development of cognitive processing, namely in the operations or behaviours of memory and arithmetic. Vygotsky (1981c), provides an example of a knot tied in the corner of a handkerchief as an external activity associated with remembering. It has been proposed elsewhere (Bygrave, 1985, 1988a, 1990a) that music can be substituted as a tool, in lieu of Vygotsky's use of language, toward providing an understanding of how cognitive thinking develops in association with musical experiences.

The use of mediational means or tools to improve the listening skills of children now will be considered. Two such tools are programs in which listening is a component. One, a story-telling program is designed to develop children's listening skills in relation

to language, the other, a music program has listening as one of the musical activities in the program. Since music is one of the principal foci of this thesis it will be discussed in greater detail. As it is not the concern of this thesis to identify and justify specific programs, only general components of the programs are considered.

2.8.1 Language

How children learn to read has been associated with children's intellectual development (Bryant, 1986; Bryant & Bradley, 1985). Reading also has been identified by Paris & Lindauer (1982) as "a deliberate cognitive activity that involves perception, attention, memory, and evaluative thinking applied to specific goals" (p. 338). Learning to read and the development of language skills is a primary criterion in children's academic and school education (Ashman & Elkin, 1990; Bryant & Bradley, 1985; Dermody, Kehoe & Bochner, 1989; Kehoe & Dermody, 1989). In current theories of language-learning development, three specific linguistic factors have featured in association with the acquisition of reading skills (Dermody, Kehoe & Bochner, 1989; Kehoe & Dermody, 1989). The specific factors identified are:

1. Phonological processing abilities.
2. Word retrieval and word knowledge.
3. Listening comprehension skills.

Studies have been undertaken concerning the effectiveness of specific training and teaching programs in phonological processing (Bradley & Bryant, 1983; Bryant & Bradley, 1985; Lindamood & Lindamood, 1975; Maclean, Bryant & Bradley, 1987), word retrieval

and word knowledge (Gerber & Bryen, 1981), and in listening comprehension (Menders & Bryers, 1981).

During the past decade in Australia, the Speech Communication Research group of the National Acoustics Laboratory (NAL) has investigated the area of auditory receptive language (Dermody, Kehoe & Bochner, 1989; Dermody & Mackie, 1985). A project was undertaken that focussed on identifying children with potential reading difficulties in their early school years. Results from this project identified a lack of skills in phonological processing, lexical knowledge, and listening comprehension in children experiencing reading and language difficulties. In conjunction with NAL an intervention program was designed at Macquarie University specifically concerned with developing two of the auditory receptive language skills, receptive vocabulary and listening comprehension, associated with children's reading and language difficulties. The intervention program developed was based on the oral reading of short stories to young at-risk listeners (Field, 1989).

Recently, in various countries throughout the world such as in the USA, Sweden and Australia, educators have realised that children are not attentive listeners (Burley-Allen, 1982; Bygrave, 1991; Forster & Doyle, 1989; Linzander (personal communication, June 27th, 1990); Paris & Lindauer, 1982; Robinson & Smith, 1981; Sandberg, 1990; Wolvin & Coakley, 1985), that the acquisition of listening comprehension skills in young school children is a problem (Dermody & Mackie, 1985; Field, 1989; Holt, 1980), and that many listening programs are considered unsuitable (Field, 1989). The listening skills of children often are assumed by educators to develop automatically (Bygrave, 1991; Robinson & Smith, 1981; Wilt, 1950).

2.8.1.1 A story-telling program

In a study associated with the development of a story-telling program, Field (1989) discussed various theories of cognitive development such as information processing, the role of development, and the representation of knowledge structures or the "schematic" approach. She considered these different cognitive theories in relation to the development of memory and comprehension processing.

In tying together some of the cognitive theoretical threads discussed in this chapter with those discussed by Field (1989), the different approaches to cognitive processing thus can be related to story telling. An information-processing approach concerned with different forms of memory storage such as short-and-long term memory, would propose that the child stores a verbatim copy of a story listened to in his or her memory (Harris, 1978). Another approach, derived from the work of Bartlett (1932), would show that the child stores a representation or summary of ideas, not just the words, in his or her memory from a story he or she has heard. This representational approach, extended by Nelson (1986) to a script-based model (see 2.5), would assume that the general and specific event structures represented in the child's memory were related to a story by the listening child. Applebee (1978) has suggested that initially the child's concept of a story tends to be associated with familiar events and that gradually a story format is acquired as the child recognises that stories have certain characteristics such as a beginning and an end, characters, can be fact or fiction, and can use past tense. Field and Walsh (1989) have argued that an understanding of story format and the various

components constituting a story by the child, facilitates the child's skills in understanding and remembering a story.

The schema model approach to cognitive processing was viewed by Field (1989) as one that implied "dynamic and constructive comprehension memory processes" (p. 19) involving both reconstructive and reproductive functions. A concern of Field (1989) in developing a story-telling program was the application of the schema model to childrens' learning. Although it appeared from research that children and adults shared similar characteristics in relation to the schema model, for example, assimilating stories to the same type of schema in story comprehension (Harris, 1978), sensitivity to story structure (Mandler and Johnson, 1977) and in ways of recalling a story (Mandler and DeForest, 1979), the model did not specifically address the issue of how children used strategies for the encoding and recall of stories. This issue formed the basis of a rationale for designing a story-telling program concerned with the development of strategies for young children's literal recall such as inferential processing skills, and remembering skills (Field & Walsh, 1989).

The story-telling program adopted for use in this thesis focussed on teaching two of the auditory receptive language skills associated with children's reading difficulties, listening comprehension and vocabulary development. The program, which involved children listening to short stories read by the teacher and answering questions connected to the stories, aimed at providing children with opportunities to acquire and improve listening, organisation, comprehension and memory skills through the structure of a story.

2.8.2 Music

All elements of music - rhythm, melody, dynamics, tempo, timbre, harmony, form - can be adapted, revised, utilised and integrated to provide an educational means for knowledge acquisition. Through such means, musical activities can be related to the three major domains of learning - the affective domain, the psychomotor domain and the cognitive domain. Traditionally, the affective domain of learning - how the child received, was motivated by, responded to and valued an activity; and the psychomotor domain of learning - how the child imitated, manipulated and articulated skills involving use of the body and some use of the intellect, have been associated with music. Recent developments in music research have identified music with cognition through investigations of the thinking processes which occur when an individual takes part in musical activity.

Research into music activity has examined specific components of music in relation to cognition such as pitch in memory and attention (Deutsch, 1977; Deutsch & Feroe, 1981), in remembering melodies (Bartlett & Dowling, 1980; Dowling, 1982), and in the musical structures of pitch, melody and rhythm (Howell, Cross & West, 1985). Successive and simultaneous cognitive processing have been discussed in studies of music listening (Fiske, 1982, 1984), and in musical style (Serafine, 1983a). It has been suggested that cognitive processing takes place when the listener identifies what is and what is not music (Serafine, 1983a, 1983b, 1988), that there are cognitive aspects of listening to music such as memory structures (Minsky, 1982), and that listening to music involves cognitive skills of organisation and relationships (Hedden, 1973). The use of cognitive strategies such as image-comparison

and check-list strategies also have been studied in music listening (Fiske, 1985).

Models of music cognition have been proposed. These models include a model for testing the listener component of the music communication process (Heller & Campbell, 1982), a memory model for explaining music information processing (Williams, 1982), a model of music as an activity for developing cognitive processing (Bygrave, 1985, 1988b, 1990a), and a model of the music decision-making process (Fiske, 1987). The use of Gardner's theory of multiple intelligences (1983) has been proposed as a model for the study of music (Aronoff, 1988) and metacognition has been built into a model of musical development (Swanwick, 1988).

Serafine (1988), with her idea of music as cognition, replaced the more traditional views of music as trait, as communication, as behaviour, as nature, and as sound stimulus. Music was interpreted by Serafine (1988) as "a form of thought that develops over the life span much as other forms of thought develop, principally those such as language, mathematical reasoning, and ideas about the physical world" (p. 5). In her research, Serafine (1988) explored the development of cognitive processes through musical tasks with children and adults. Results from her experiments indicated that cognitive processes do exist in relation to musical tasks and although not strongly evident in children around five years old, are well established in children of around ten to eleven years of age. She also found that there was rapid development in the musical understanding in children of a similar age. Serafine's (1988) studies indicated that:

1. The child first identifies and understands the global features or characteristics of music such as texture ('thick' or

'thin' music), tempo (fast or slow music), dynamics (loud or soft music) and timbre (tone color) in a piece of music.

2. Children with no formal instrumental training were not disadvantaged in the musical tasks and performed as well as those children who had had training.

3. Traditional instrumental music training did not appear to influence the acquiring of cognitive processes.

4. Music cognition appeared to result from factors such as normal general cognitive development and through everyday experiences with music.

Sloboda (1985) linked music with cognition for the reasons that most responses to music are learned and emotional responses to music are not explained by 'conditioning'. A cognitive stage was identified in a listener before the affective stage by Sloboda (1985):

> A person may understand the music he hears without being moved by it. If he *is* moved by it then he must have passed through the cognitive stage, which involves forming an abstract or symbolic *internal representation* of the music (p. 3).

Sloboda (1985) discussed people's responses to musical activities and their actions as they listened to, memorised, performed or created music. The processes associated with these activities involved the use of skills such as memory recall of patterns and structures, and the relationships between these. Sloboda (1985) stated that "we *learn* the structures that we use to represent music" (p. 6). He defined two phases in the learning process:

1. Developmental enculturation - The acquisition of simple skills and knowledge about music such as singing a song, that children learn through daily social activities and experiences

within a culture.

2. The acquiring of special music skills through training; for instance learning concepts of rhythm or pitch in a musical activity.

The use of music in education has been related to various educational and cognitive theorists such as Gagné (Comte, 1981; Moog, 1982), Bruner (Comte, 1981; Heller & Campbell, 1982), Vygotsky (Bygrave, 1985), and Gardner (Aronoff, 1988). Perhaps the theorist most widely referred to in music education is Piaget. His developmental theory of stages of thinking has been discussed by many music researchers (Bygrave, 1985; Comte, 1981; Gardner, 1983; Heller & Campbell, 1982; Miller, 1987; Pflederer, 1964, 1967; Serafine, 1988; Slowo, 1981; Swanwick, 1988; Zimmerman, 1984) and aspects of his theory applied to music research and developmental music programs and curricula.

Since music has been identified as cognition (Serafine, 1983b, 1988), as a cognitive skill (Sloboda, 1985), and related to cognitive theories, the question arises as to whether the cognitive skills learned through music activities can be applied to other curricula. Music has been associated with teaching a specific curriculum such as mathematics (Madsen, Moore, Wagner & Yarbrough, 1975), and language (Draper & Gayle, 1987; Graham, 1987; Kalmár, 1988; McCarthy, 1985; McMahon, 1979, 1982; Price, 1980; Price & DeFosse, 1983), and in elements of language such as listening (McLullich, 1981), and spelling (Martin, 1983). Music education, curricula and training has been reported as developing and improving academic abilities both in ordinary school settings (Aronoff, 1983; Ban, 1981; Bentley, 1973, 1975; Bridges, 1979, 1984; Brown, 1987; Comte, 1982; Gifford, 1985; Kalmár, 1982;

Linzander & Aurell-Hellström, 1989; McMahon, 1984, 1989; Swanwick, 1988) and in special education settings (Atterbury, 1990; Bacon, 1981; Bitcon, 1981; Bygrave, 1984, 1985, 1989; Dervan, 1982; Dobbs, 1966; Duerksen, 1981; Graham, 1975; McRae, 1982; Smith, 1983; Thompson, 1982; Ward, 1976a, 1976b, 1976c; Weidenbach, 1981).

The role of music in child development has been discussed (Peery & Peery, 1987). A review of text book literature from 1887 to 1982 has provided a historical context of music education by examining the reasons for teaching music to children (Draper & Gayle, 1987) and articles have been written in relation to music teaching that discuss the development of cognition and thinking (McPherson, 1989; Small, 1987).

Studies have been reviewed that link musical ability with other abilities such as learning foreign languages, mathematics, science, other arts, literature, and intelligence (Shuter-Dyson & Gabriel, 1981). Research has been undertaken to examine whether intensive music education can influence intelligence (Laczo, 1985) and the relationship between intelligence and music aptitude - "the measure of a student's potential to learn" (Gordon, 1984, p. 223), has been the subject of discussion (Gardner, 1983; Gordon, 1980, 1984; Heller & Campbell, 1976, 1981).

So far, a review of the music literature would indicate that the discipline of music can be identified with various aspects of education and curricula, and that music can be associated with cognitive processing in children (Serafine, 1988). Sloboda (1985) and his phases of developmental enculturation and training in the acquisition of music skills in children, also can be considered relevant to this thesis. These phases imply that music has a role in cognitive development and that cognitive skills can be learnt either

through the participation of children in simple everyday musical experiences and activities, or through more complex specialised musical training. Whether cognitive skills learned through music activities and experiences can leap out of their context-bound association with music, however, is an issue that is considered later in this thesis.

2.8.2.1 A music program

A rationale for music in the school curriculum can be said to have begun with Plato (c. 427-347 B.C.). In Lee's translation (1974) of "The Republic", it is stated that Plato regarded music as an essential component in his curriculum. Plato recognised the power of music in the training of young children and although he advocated appropriate experiences in music as crucial from earliest childhood he also imposed rigid controls over the kind of music to be used in children's general education:

> For rhythm and harmony penetrate deeply into the mind and take a most powerful hold on it, and if education is good, bring and impart grace and beauty, and if it is bad, the reverse (p. 163).

Music was seen by Plato to be a medium through which the child learnt worthwhile values. The selection of song words, modes and rhythms were considered important. Words were determined by their content and form and certain rhythms and musical modes were selected for their association with evoking different types of feeling and character such as the Dorian and Phrygian modes for instilling elements of courage and self-control. The power of music also was recognised by the British Education System (Hullah, 1842), by the 19th century Methodist Revival in Britain and by countries

such as Russia, Hungary and China (Bonham, 1982), all of which utilised music for moral and/or political purposes. The use of music as a moralistic force has been identified in Australia. Stevens (1981) in discussing school music during the colonial era in Australia, writes - "The introduction of school music also had [a] strongly utilitarian basis founded on the belief that music could be of great value as a humanising and civilising influence upon society in general and upon children in particular" (p. 67).

Many music programs in use in Australian schools centre around musical activities and experiences associated with singing, listening, the playing of musical instruments, movement and creating (Bingham, 1983; Buxton & Orams, 1982; Education Department of South Australia, 1981; Education Department of Victoria, 1981; Farmer, 1982; Hoermann, 1980; Leask & Thomas, 1986; Lobb, 1978; Staton, 1985; Suthers, 1985). Rationales, aims and objectives for current music programs are concerned mostly with developing an enjoyment of music, performance skills, musical knowledge, relationships with others (Farmer, 1982), and to "aid development of aural and visual perception, thought, discrimination, speech and co-ordination" (Education Department of Victoria, 1981).

An emphasis on the skills of self-expression provides a basis for the rationale of one music program. Leask and Thomas (1986) discuss the everyday use of language and the capacity humans have from an early age to recall, reproduce and self-express sounds as a "means to communicating their own needs, their individuality and, bound up in this, thinking, dreaming and imagining" (p. 8). To these authors it is not the reproduction of knowledge that is important but the manipulation of it. Music learning is linked with cognitive development and response such as the mastering and

understanding of a concept, as well as with psychomotor and inventive responses.

A program of musical activities such as singing, listening, playing musical instruments, movement and creativity was adapted for use in this study. The program involved the teacher implementing the musical activities with children in the classroom and aimed at providing experiences and opportunities for the children to acquire a knowledge of musical skills and concepts.

2.9 The child as an active learner

In examining the development of children's cognitive processes, Bruner and Sherwood (1981) state - "From the start, the human infant is *active* in seeking out regularities in the world about him" (p. 28). The active character of cognitive development has been illustrated by studies of young infants. Studies have shown that young babies from birth can match pitched sung tones of their parents (Reis & Van Bloem, 1990), that at around six weeks of age they can manipulate visual focus (Kalnins & Bruner, 1973) and at four months activate flashing lights (Papousek & Bernstein, 1969), and that at six months can recognise their mother as a single person (Bower, 1971).

Bower and Wishart (1979) explore the nature of cognitive development in babies. These authors propose a model wherein the conceptual, perceptual and social development of the baby goes from the abstract to the specific. Experiments, involving ways in which babies deal with time and space, showed that babies progress from an abstract awareness of an event or task to a more specific identification or behaviour response in association with an event or task (Bower, 1974).

One of the characteristics, identified by Bruner and Sherwood (1981), to illustrate early cognitive processing activity in children is *abstractness*; the realisation that the infant can use and organise abstract rules. Three other characteristics are discussed by Bruner and Sherwood (1981) - *activity* in relation to effective experience or "means-end predictiveness" (p. 32), *systematicity* in the type of playful activity undertaken by children, and *transaction* or the social interaction between children and their caregiver/s. According to Bruner and Sherwood (1981), these four characteristics form the foundation of children's cognitive processes. However, for children to utilise these characteristics they state - "we should bear in mind that the best environment for childhood is one that challenges the young to do so" (Bruner & Sherwood, 1981, p. 49).

Studies in Britain have investigated the complexity and cognitive challenge of play activities in preschool children (Sylva, Roy & Painter, 1980). The most powerful factor found to foster children's thinking in terms of prediction on cognitive challenge, was the activity the children were involved in. Sylva, Roy and Painter (1980) noted that task-structured programs, where children often worked in more complex activities requiring sustained attention, were more cognitively challenging than fixed routines such as the milk-cum-story routine, or compulsory outdoor play which tended to be more adult-led. Music featured high as a cognitively challenging activity in preschool groups. Musical activities undertaken in these groups included "attentive listening to sounds, rhythms or music; playing instruments, singing solos, dancing to music" (Sylva, Roy & Painter, 1980, p. 32). Social interaction both with peers and adults such as staff, and assisting parents also was found to be a factor increasing the cognitive level of children.

2.10 Summary

Models constructed by Flavell, Nelson, Robinson and Smith, Piaget, and by Vygotsky, pertinent to the development of cognitive processes in children, have been reviewed in this chapter. Certain components of cognition, namely, attention, comprehension, memory, problem solving, social cognition, and listening, were discussed in relation to the development of cognitive processing strategies and skills. The use of tools for learning such as music activities, and story telling in language, were considered in the development of these strategies and skills. A factor also considered in this development was the child as an active learner.

Each of the models focus on different aspects of the development of cognitive processes. In brief:

- The modified (Garner, 1987) metacognitive model developed by Flavell (1981), emphasises a knowledge of ones own cognitive processes and products and things related to these such as the use of strategies. The control and regulation of these strategies has been linked to aspects of learning (Brown *et al.*, 1983). These two elements of metacognition, knowledge of cognition and the control of cognition, have been applied to teaching students (Biggs, 1986; Martin & Ramsden, 1986; Pramling, 1990).

- The script model used by Nelson (1986), focuses on the development of cognitive processes in children through their experiences associated with an event.

- A model of listening proposed by Robinson and Smith (1981) identifies three parts of the listening process - the verbal and non-verbal message, the cognitive processes involved in listening, and the response of the listener - for the purpose of teaching listening skills to students with learning disabilities.

- The organismic model associated with the work of Piaget provides a structure of stages for the development of thinking in children which has been applied to memory (Case, 1972; Pascaul-Leone, 1970), to strategies (Case, 1978), and to reasoning (Siegler, 1978) in learning.

- The dialectical model of Vygotsky (1978) relates learning and development through social interaction in the *zone of proximal development* and is concerned with the use of a tool in mediating activity. This model has been extended by a brain functional system which considers the interchangeability of simultaneous and successive processes (Luria, 1981), and by a theory of activity analysing activity (Leont'ev, 1981).

While models such as these can provide a means of investigating cognition, a problem exists as to how teachers can best develop cognitive processing skills in a learning situation as in a classroom. It is suggested that a positive impact on the development of these cognitive skills could be achieved through involving students in a music program. There is evidence in the literature (see 2.8.2) indicating that music can be an effective tool in developing such skills in children.

It would appear on the basis of experience outlined in Chapter One that music also can develop academic, cognitive and social skills in children in special education settings. The thesis thus sets out to establish that music can have an impact on the development of listening skills such as those associated with receptive vocabulary, phonological processing, and listening comprehension, especially on children with learning difficulties. The experimental methods adopted to establish the feasibility of such a study are discussed in the following chapter.