# Children's Perceptions of the Learning Process

by

GILLIAN VALERIE BICKERTON

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Department of _E P S E_

The University of British Columbia
Vancouver, Canada

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# ABSTRACT

The present study set out to investigate children's perceptions of themselves as learners. An understanding of how learning occurs in children is of central importance for planning curriculum and designing instruction. Although recent research is providing a more complete picture of the learning process, what is apparent is the relative absence of any in-depth inquiry into what "learning" itself means to children.

The objective of the study was to determine if there are stages of development in children's understanding of the learning process, such that children of the same age think in a similar fashion about learning and there is increasing complexity in understanding with age. A neo-Piagetian model of intellectual development (Case,1985,1992) was used as a theoretical framework.

A random selection of 83 children from a suburban elementary school participated in the study. The sample included children at the ages of 6 years, 8 years, 10 years and 12 years. These ages were specifically chosen because they represent the mid-points of the substages of development in middle childhood and beginning adolescence proposed by Case (1985,1992).

Children's explanations for the meaning of learning were elicited in a semi-structured interview, modelled after Piaget's technique. Specific questions were designed to extrapolate children's conceptions of two related aspects on learning in terms of a definition for the meaning of learning and a definition for the "source" of learning, that is, whether learning comes from an internal or external source or both.

The results of the study are based on qualitative and quantitative analyses of children's responses transcribed for this purpose. Scoring criteria reflect the levels of structural complexity hypothesized by Case (1985, 1992) in which children progress from simple conceptions of learning defined in terms of intentionality, in other words, learning as a behavioural act combined with an internal feeling or judgment state to more complex notions of intentional behaviour as they relate to the process of learning. In early adolescence, learning is defined as an internal state of mind, denoting a shift from concrete to abstract thinking. An interpretive understanding of the learning process characterized responses at this age level which is consistent with the postulates of the theoretical model. A statistical analysis of the responses showed significant differences between each age group.

The complexity of the "source" responses also increased with age. In the early stages, there was a clear distinction between external and internal sources. For older children, there was an awareness of learning taking place in a sequential manner from external to internal. Interrelatedness of the two sources was generally recognized by 12 years of age.

The pattern of understanding was age-related and hierarchical, consistent with theoretical predictions ( Case,1985,1992). By revealing common, age-typical patterns of understanding of the learning process, this study suggests that educational methods and materials should be consistent with children's levels of conceptual development. Such procedures would help solve "the problem of the match" (Donaldson,1979) between a learner's developmental stage and instructional methods.

The study presents an educational perspective on the metacognitive task of reflecting about one's own learning. If the goal in education today is to assist children in becoming independent learners, educators need to first of all understand children's conceptions of learning and then educate from the child's point of view.

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# CHAPTER 1: INTRODUCTION

The nature of learning has been the subject of an extensive body of research over the past forty years. An understanding of how learning occurs in children is obviously of central importance for planning curriculum and for designing instruction. A missing factor in curriculum development has been the apparent lack of consideration of learning from a child's point of view. This has been accompanied by a relative absence of research into children's perceptions of what learning is. Consequently, there is a clear need to search for a better understanding of the meaning of learning from a child's perspective.

Educators in British Columbia today are facing a major paradigm shift towards a new conceptualization of what learning is and what education should be. The old belief system viewed the learner as a passive recipient of knowledge, fostering a sense of dependency upon someone else. Learning is now postulated from the cognitive constructivist viewpoint. From this perspective, learning means the active construction of knowledge through interactions with others in the environment. In other words, the learner is perceived as an active creator of understanding in the sense that learning is more self-directed. One of the factors providing impetus to the new paradigm is current research about how children learn. With the implementation of the British Columbia Ministry of Education document, Year 2000: A Framework for Learning (1990), teachers are examining education in a new perspective and are attempting to build a new educational construct.

For example, "learning dimensions" defined as knowledge, skills and attitudes develop along a continuum over time and "increase in complexity, maturity, and level of sophistication" (p.13). If this is the case, then it should follow that children's perceptions and conceptions of what learning is should also increase in complexity, maturity and level of sophistication. In addition, the document also states that "generalizations can be made about the learning of a specific age group" (p.8). This raises the question, "Do children of similar ages have a common pattern of thought or conceptualization regarding the concept of learning?" For instance, do the responses of younger children indicate a limited conceptualization of learning relying on experiences that are immediate? Subsequently, do older children demonstrate a more elaborate and personalized response and has their concept of learning become more refined?

Over the past decade, educators have been turning to cognitive psychologists for answers

to the question, "How do children learn?". Unfortunately, they have been overwhelmed with a myriad of contradictory findings; the conclusion being that there is no straightforward answer to this question. Behaviourism, for example, defines learning as the "passive acquisition of facts, skills and concepts usually through the processes of drill, guided practice, rewards and punishments" (Marshall, 1992, p.6). Rote memory is considered to be a form of learning in the behaviourist tradition. The information-processing approach to learning portrays the mind operating like a computer (Slavin 1986, cited in Marshall,1992). According to this view, the mind actively operates on information (input) and produces responses (output). Its "mechanistic" interpretation to learning, combined with its emphasis on individual learning, indicates that this theory has its roots in behaviourism. In contrast, a number of cognitive approaches to learning have provided alternative views to the behaviourist perspective.

What much of today's educational research indicates is that former premises about children's learning, both how they learn and what they need to learn, are no longer valid in today's world and a new vision of what learning is and how it occurs is needed (Hilborn,1990). Previous conceptions of learning assumed that learners were simply "empty vessels to be filled with knowledge" (Marx, cited in Research Forum, 1990).

Marx claimed that "knowledge acquisition is not just the accumulation of information; it involves construction by the learner" (p.9). This new belief supports the cognitive constructivist view. For Piagetians, learning always involves construction and comprehension. In consequence, rote memory or memorization is not a part of intellectual development from a Piagetian perspective, since memorization does not require comprehension. Very briefly, constructivists believe that individuals actively construct knowledge and understanding, rather than passively receive information in response to external forces such as rewards. Learning is constructed in the sense that children develop an understanding by building on what they already know.

Construction of knowledge by the learner is one of the core postulates of a neo-Piagetian model of intellectual development (Case, 1985, 1992). According to this theory, learning is both constructed and strategic. It is constructed in the sense that children develop understanding by building upon what they already know about the world. "Learning is strategic in the sense that this search for understanding is not random" (Marx, 1990, p.9). Learners follow particular approaches to develop a conceptual understanding. This theory of intellectual development accepts the basic psychological tenets of Piaget's theory that "children are highly active thinkers, who are constantly

engaged in constructing ever-improved models of the world around them" (Case & McKeough, 1990, p. 835). This theory also supports the notion that "children's spontaneous cognitive activity leads to stage-characteristic understandings or models of the world that transcend any particular task" (Case & McKeough,1990, p.837). In other words, Case's model preserves a universal sequence of cognitive-developmental stages and substages which are age-related.

However, one way in which the theory differs from Piaget's is in the detail and manner in which the cognitive structures are defined at the different stages. Case's neo-Piagetian theory is based on variations of both cognitive and social constructivism. It takes into consideration that learning is constructed not only in the individual's head, but in social interactions among individuals or between individuals and materials over time (Bruner,1986; Vygotsky, 1978). As such, it seems a valuable framework within which to investigate how children conceptualize the learning process.

## OBJECTIVE OF THE STUDY

The objective of this study was to provide an opportunity for children to verbalize their own thoughts about what learning means to them and the types of learning strategies employed during the learning process. When students engage in conversations like these, they are likely to view thinking as an integral part of lifelong learning because they are included in the process and recognize that their perceptions are also valued.

Case's (1985, 1992) theory was used as a framework not only to gain more insights into the possible hierarchical development of children's conceptions of learning from the ages of 6-12 years, but also to determine whether there are prototypic behaviours at different age levels.

## SIGNIFICANCE OF THE STUDY

Although recent research is providing a more complete picture of the learning process, what is becoming most apparent is the relative absence of any form of in-depth inquiry into what "learning" itself means to children. In other words, the most natural resource - the child - has been left untapped in our attempt to answer this question. Research has offered sophisticated taxonomies of different possible approaches to learning, but these are essentially descriptive and not explanatory when it comes to articulating the child's understanding of the nature of learning

itself.

The commencement of any educational reform, as proposed by the <u>Year 2000</u> document, must begin by rethinking the nature of learning. There is often a tendency to overlook the central role played by the learner as well as the different conceptions of how children learn. Investigation into learning from the child's perspective should be the starting place for improving education.

## RESEARCH   QUESTIONS

Two general research questions guided the study:

1.   Are there stages of development in children's understanding of the Learning Process; that is, do children of the same age have a common pattern of thought or conceptualization regarding learning?

2.   Are there cross-age differences in children's conceptualization of the meaning of learning such that children's responses increase in complexity with age?

Literature pertaining to these research questions will be reviewed in the following chapter.

# CHAPTER 2: REVIEW OF THE LITERATURE

The major goal of the study is to determine whether or not children's conceptual levels of understanding of the learning process change systematically with age in a progressive manner consistent with neo-Piagetian stages of cognitive development as described by Case (1985). Relevant literature is reviewed under four major headings describing perspectives on learning and the learner, theories of mind, research in the Piagetian tradition, and research in the neo-Piagetian tradition.

## Perspectives on Learning and the Learner

Learning is a complex and challenging mental process. Since learning is not one phenomenon but many, depending on what one is learning about, the context itself plays an integral part in the learning process. The difficulty with understanding the process of learning is that it functions at a variety of levels depending upon the type of situation in which it occurs. Learning is an interactive process, a constant engagement with the environment and with other people. Social forces are at work steering a child's early attempts at learning, for example, parents, teachers, language, customs, and the media.

Piagetian and Vygotskian theories raise two different aspects of learning. On the one hand, Vygotsky recognized that a key factor in social learning was the young person's ability to learn by imitation while Piaget built a strong case for children being able to independently construct their own knowledge through their active interaction with the environment. In other words, Piaget believed children are capable of developing self-constructed schemes in their attempts to make sense of the world. In contrast, Vygotsky stressed that much of what we learn we learn from others and that individual development and learning are influenced by communication with others in social settings, a fact that Piaget seemed to downplay. To acquire a more complete picture of the learning process there is a need to consider both social and individualist aspects of learning.

In the works of Margaret Donaldson (1978) there are two very clear messages. The first concerns the need to consider the whole child when trying to discover a child's capabilities or understanding. The second is the need to consider the situation from the child's point of view. Traditionally, research into human learning is conducted from a "first-order perspective" (Marton & Svensson, 1979). This means that the emphasis is placed on the researcher's description of

children's learning behaviour. Marton and Svensson define this perspective thus:

> We the researchers observe the learner and describe him as we see
> him and we observe the learner's world and describe it as we see it.
> We frequently relate our description of the student to our description
> of his world and generally do this within an explanatory framework.
> (p. 472)

A more recent approach to human learning has shifted from a descriptive explanation to first-hand information of the learner's point of view; in Marton's words (1981) a "second-order perspective." With this type of research, information is extrapolated from the learner and then categorized by the researcher to reveal the various ways in which people view or experience important aspects of the world around them. In this latter approach, the perspective of the learner and not the researcher becomes the starting point in any investigation with the emphasis on describing and understanding and not on explaining human learning.

The nature of inquiry in studies of learning and thinking are changing from "mental mechanisms" and "information-processing devices" to the study of "conceptions of reality." Marton (1984) clarifies what is meant by this latter phrase:

> Conceptions and ways of understanding are not seen as individual
> qualities. Conceptions of reality are considered as categories of
> description to be used in facilitating the grasp of concrete cases of
> human functioning. (p. 74)

One of the pioneers of research into the area of subjective conceptions of phenomena such as knowledge and learning is William Perry (1970, cited in Richardson, Eysenck & Piper, 1987). His work was based on participant observation of students trying to adapt their learning procedures to the world of the university. Perry suggests that "behind the learning difficulties encountered at university there may not necessarily be insufficiencies in 'processing capacities' or 'motivation' but in conceptions of knowledge that are at variance with those held by the faculty" (p.104).

Perry claimed that first-year university students tended to equate knowledge with the acquisition of facts, that is, "statements about the world that are accepted as true and correct" (p. 104). Consequently, students interpreted their task at university as one of essentially memorizing the "Answers" to a set of "Questions." In Marton and Saljo's (1984) research, as in that of others (van Rossum & Schenk, 1984; Watkins, 1983), it has become evident that there is a "functional

relationship between the mode in which people subjectively construe learning and the way they go about dealing with learning tasks" (p.115).

A good example of research from a second-order perspective is a study conducted by Saljo (1979). He investigated adult views about learning and in an interview situation asked the subjects the following question: "What do you actually mean by learning?".

From the responses, Saljo identified five qualitatively different conceptions of learning. Learning was seen as:

1. A quantitative increase in knowledge
2. Memorizing
3. The acquisition of facts, methods, etc., which can be retained and used when necessary
4. The abstraction of meaning
5. An interpretive process aimed at understanding reality.

According to Saljo, in the first three definitions, learning is conceptualized as an "activity of reproduction." In other words, the meaning of learning is to transfer units of information or pieces of knowledge into the head. The last two conceptions defined learning as a constructive activity - an interpretive process of abstracting meaning and making sense of the world one lives in.

Until recently, teachers' beliefs about the nature of knowledge and the nature of the learning process seemed to emanate from behaviourist views of learning, that is, an emphasis on factual and procedural knowledge. Cobb (1988) claimed that "such an emphasis on isolated facts and procedures seems to constrain conceptual understanding" (cited in Marshall, 1992, p.19). This could be one of the reasons for so many university students in Saljo's study conceptualizing learning as activities of reproduction.

Marton and Saljo (1976) discovered two distinctive ways in which first-year university students tackled the studying of a text. Some conceived the task as mainly reproductive and approached it by learning and memorizing the text itself. Other students took a more constructive view of the task and tried to understand the intention of the author of the text. The researchers called the first approach surface-level processing and the latter deep-level processing.

In another study, conducted by Van Rossum and Schenk (1984), the authors concluded that variations in approaches to learning were linked with variations in conceptions of learning. Their results indicated that deep approaches were associated with Saljo's conceptions four and five and surface approaches with his conceptions one to three. In addition, a very strong

relationship was found between these two levels of processing and the quality of the learning outcomes. A learning outcome of relatively high quality was usually associated with both a deep-level approach and a constructive learning conception. Saljo himself has suggested that conceptions one, two and three are most common among students adopting a surface approach to a learning task. Conceptions four and five, on the other hand, are usually those of students adopting deep approaches to learning tasks.

According to diSessa (1988), current educational approaches place less emphasis on students' factual knowledge and more on their conceptual understanding in the areas of science and mathematics at the late high school and early college years. She reports that physics students, in particular, possess "intuitive physics," a fragmented collection of ideas loosely connected that constitute a series of "independent layers of understandability" (p. 55). From Marton's (1976) perspective, these students lack any deep-level approach to understanding the physical world. They are functioning at a surface-level and believe that problem solving simply requires finding the solution or right equation.

Teachers are now focusing their attention not only on students' factual knowledge in the sciences but also on their procedural knowledge as students attempt to acquire "meta-cognitive abstractions" generated from internal experience (diSessa, 1988, cited in Forman, 1988). Therefore, diSessa suggests that "knowledge fragments" inherent in many college students provide the basic material to develop scientific understanding; the intention being to "build a new and deeper systematicity" (p. 62) in order to integrate these pieces of knowledge. Continuity becomes the key factor in this process as students progress through stages of understanding over a period of time, like a "flow system" towards acquiring a "deep-level" conceptual understanding passing beyond initial perceptions and conceptions.

At the other end of the educational system, Ingrid Pramling (1983) conducted a study for the purpose of investigating and describing the nature of young Swedish children's conceptions of learning. Responses were categorized in terms of what they think they have learned and how they think they have learned it. Pramling's findings indicated three developmental levels of conceptions were present within the ages of 4 to 8 years. In the very early stages of children's awareness of their own learning, their first notion is that they learn something by doing something. The next stage of development indicates a raised level of awareness to the realm of knowing something and the final conception is construed as understanding something.

Regarding the question of how children think learning occurs, Pramling reported that in the early stages children have not yet distinguished between "doing and learning to do something". The next stage in their awareness relates learning to growing older and the highest level of awareness was captured in the idea that learning takes place through experience.

The overall results of this study indicated that the majority of four-year-olds believed that "you learn to do something by gaining experience in the form of your own actions" (Pramling,1983, p.80). According to Pramling, children at this age have not yet reached a level of awareness of their own inner mental state. Instead knowledge and knowing is connected externally to some adult telling them something.

This result supports Pillow's (1988) hypothesis that young children initially conceive of the mind as a passive recipient to external influence and that it is not until they are older that they develop a conception of their own active mental experiences. This hypothesis will be discussed in more detail in the section titled Theories of Mind.

## Theories of Mind

The development of children's knowledge about the mind is a relatively recent area of investigation in cognitive psychology. Research into the development of children's understanding of a variety of mental phenomena establishes the criteria for the selection of the second category of studies to be examined under the following subheadings: metacognitive awareness, externalization hypothesis, and children's understanding of mental verbs.

Developmental psychologists have conducted research into children's understanding of the existence of internal states, cognitive monitoring, intentions and the conception of emotion. Although these topics usually have been considered independently, they all involve understanding or awareness of psychological events or characteristics. Considerable attention has focused on the development of what children know about cognition, that is, their metacognition. As Donaldson (1978) pointed out, "If a child is going to control and direct his own thinking he must become conscious of it" (p. 94). Metacognitive research has attracted increasing attention in recent years, since it is assumed that children's metacognitive knowledge and skills play an important role in their ability to learn.

## Metacognitive Awareness.

Children's thoughts about various cognitive activities involved in the process of learning such as knowing, remembering, understanding and problem solving are generally regarded as metacognitive aspects of thinking. The significant role of metacognitive awareness in learning is becoming more prevalent (Costa, 1985). Encouraging students to reflect on the process of learning appears to be one possible method of raising a child's awareness of different learning strategies that can be drawn upon to help them develop new knowledge, concepts or ideas. It has been maintained that helping children to become metacognitive about their learning, and at the same time teaching them a repertoire of strategies to choose from, will enhance their learning (Biggs, 1985).

The forerunner of metacognitive research is Flavell (1979). He defines metacognition as "children's knowledge of their own cognitive processes" (p.221), that is, what they know about cognition. Most of Flavell's studies are experimental in design and have been concerned with preschool and early school-aged children. As a developmental psychologist, Flavell reached the conclusion that children progress through general stages of development, similar to those described by Piaget. Flavell's research made no connection to any particular content or situation.

From a different perspective, recent metacognitive research (e.g., Griffin,1992; Pramling,1988) used the child's point of view as a framework for interpretation. With this approach, content and situation are key factors. The nature of inquiry is dependent upon how children think about and understand specific phenomena in the world around them. Qualitatively different categories of conceptions are regarded as levels of metacognition. For example, children's awareness of their inner world, in terms of conceptual understandings of different feelings, can be identified in age-related stages of development (Griffin,1992). The results of Griffin's study suggest that children conceptualize internal states quite differently at the ages of 4 years, 6 years and 8 years.

The metacognitive hypothesis used in Pramling's (1988) study is that metacognition is a question of how children think about their own learning. She set out to discover different ways of influencing preschool children's conceptions of their own learning. Her main intent was to determine how conceptions of learning can be developed by directing children to use their own thoughts and reflections on learning. Children's conceptions of learning were identified from interviews at the beginning of the year and provided the basic starting point on which to conduct

the study. Positive results were obtained from interviews at the end of the school year to determine the possible effect of a metacognitive component built-in to the preschool programme. There were noticeable shifts or changes in children's conceptions of learning indicating an increased awareness of themselves as learners.

In conclusion, metacognition, considered in terms of conceptual understandings, is always present and differs qualitatively from one individual to another and within one individual depending on the content considered.

### Externalization    Hypothesis.

Pillow (1988) in his report, <u>The Development of Children's Beliefs about the Mental World,</u> claims that children's understanding of certain mental states such as perceptual experience, memory, intentions, and emotions, suggests a general developmental hypothesis:

> Young children view the mind as passive in relation to the external world and regard external events as determining subjective experience, whereas older children know many ways that psychological activities influence experience. (p.1)

Pillow (1988) claims that this "passive-to-active" hypothesis "captures a general developmental trend in children's conception of the mind" (p.2).

Piaget provided the most general account of children's understanding of mental events. He maintained that young children initially externalize the mental world. Wellman (1985a,1985b) has labelled this claim as the *externalization hypothesis :* children under the age of 7 years are unable to discriminate between psychological and physical events. They perceive psychological events as external and physical (Piaget,1929,1930). For example, in Piaget's study, children under 7 years identified thought with the act of speaking.

### Children's Understanding of Mental Verbs.

Studies investigating children's comprehension of mental verbs indicate that preschoolers often treat verbs that refer to mental states as if they refer to overt actions (Misciones, Marvin, O'Brien & Greenberg, 1978; Shatz, Wellman & Silber,1983). Misciones et al. (1978) stated that:

a)  children under the age of 4 years were "unsystematic" in their use of the terms *know* and *guess* ;

b)  between the ages of 4 to 6 years, they increasingly used *know* to refer to correct choices of a hidden object's location and *guess* to refer to incorrect

choices, regardless of prior knowledge; and

c) at the age of 6 years and above, children were able to differentiate these two verbs on the basis of "epistemic states" or internal knowledge rather than observable outcomes. (cited in Pillow,1988, p.3)

Misciones et al. concluded that children initially use both *know* and *guess* to refer to external, perceptible aspects of a situation, and gradually acquire their true meanings as they become aware of psychological processes.

Wellman and Johnson (1979) reached similar conclusions about young children's understanding of the verbs *remember* and *forget*. In their study, 4-year-olds tended to judge that a story character had remembered the location of a hidden object whenever the correct location was chosen, regardless of whether the character had previous knowledge of where it was hidden. Both 5- and 7-year-olds used *remember* to refer to the presence of prior knowledge accompanied by making the correct choice of the location. The term *forget* was solely judged by all ages on the basis of whether the correct location was chosen.

Wellman and Johnson (1979) concluded that *remember* is understood earlier than *forget* , and that children progress from understanding these verbs in terms of overt behaviours to understanding them in terms of inferred cognitive states. In summary, the results reported in these two studies confirm Pillow's "passive to active" hypothesis in which he claims that there is a developmental trend from perceiving the mind as passive to active in relation to its influence on the external world.

However, Johnson and Wellman (1980) conducted another experimental study which carefully varied the factors of behavioural outcome and knowledge state. The results indicated that 4-year-olds can go beyond reference to overt performance in their use of *remember, know* and *guess*. For instance, in a trick condition, children who had previously seen an item hidden insisted that they knew where it had been concealed even though their attempts to find the object were consistently unsuccessful. Johnson and Wellman (1980) concluded, "In limited contexts, preschool children are able to distinguish between "mental" and external states and between different uses of mental terms. Yet only during the early school years do children typically exhibit a more definitive understanding of the cognitive implications of the terms" (p.1102).

Using a more naturalistic approach in determining children's understanding of mental states, Shatz et al. (1983) reached similar conclusions about young children's acquisition of mental

verbs. They used a "multi-pronged" method to investigate the early use of mental terms in naturally occurring speech to assess young children's ability to communicate about a mental state. Language samples of children's spontaneous conversations were examined in detail. A coding system was designed to characterize the function of each mental term used during the conversation. The authors claimed that the coding system helped to distinguish clearly conversational uses from a potential mental reference. For example, they found that 3-year-olds made "explicit contrasts" between mental states and external reality, such as, "I thought there wasn't any socks, but when I looked I saw them." In addition, language samples were assessed to determine syntactic competence regarding each subject's "linguistic preparedness" for producing mental state expressions. Shatz et al. (1983) claimed that this method is capable of determining the time at which the understanding of mental states emerges.

Results suggest that the earliest uses of mental verbs are specifically for conversational functions rather than for mental reference. It is not until the second half of the third year that first attempts at mental reference become evident in some children's speech. Converging evidence from experimental tasks and analyses of natural speech provides a consensus on the abilities of children aged 4 and above to differentiate mental states and processes from external behaviours and events.

The discrepancy between findings for and against Pillow's externalization hypothesis may reflect both methodological differences and an incomplete understanding of children's early knowledge of the mental world. Evidence for externalization comes from two sources: interview studies and studies of semantic development. The use of open-ended questions in interview studies may underestimate children's understanding because children's performance may reflect poor verbal skills or inadequate understanding of what constitutes a satisfactory explanation, rather than lack of knowledge (Donaldson 1979; Pillow, 1988).

Donaldson (1979) reported that research "tended both to underestimate children's competence as thinkers and to overestimate their understanding of language" (p.155). She claimed that too much attention was directed towards the grammatical level of sophistication of children's speech and not enough to its meaning. This problem was solved in a recent study conducted by Griffin (1992). Children from the ages of 4 to 8 years were individually asked to provide explanations for the internal states happy, sad, good and bad. To prevent children from being penalized for immature language, Griffin developed a scoring criteria permitting children to obtain a score with a "bare-bones" response. Griffin defined a "bare-bones" response as "one

which met the criteria for the postulated structure in a minimally articulated form" (1992, p.204). In this way, her study was able to accommodate children with difficulties in expressing their understanding of feeling terms.

Wellman (1985b) suggests, because mental states are internal and invisible, they may be less salient than external events. Thus children may have an understanding of mental states, but this understanding often may be obscured because their judgments are influenced by more salient external factors. In contrast, the findings from a number of studies using a variety of methods indicate that some appreciation of the distinction between the physical and mental worlds is apparent during the preschool years. Nevertheless, the generality and robustness of this understanding remains open to further investigation.

Children's understanding of mental verbs appears to provide a more sensitive index of their ability to distinguish mental states from external events, but has not yet portrayed a clear picture of children's overall understanding of mental activities.

Pillow (1988) reported, "Not only is the differentiation of physical and mental events necessary for the acquisition of detailed beliefs about the mind, but further learning about psychological processes may help children to understand how particular mental representations and objective reality can occur" (p.6). Pillow (1988) claimed that there are two patterns of conceptualizing the mind and that they are developmentally ordered and are not distinct stages of development. He believes that there is a transition between conceiving the mind as passive to conceiving the mind as active and that the "transition may be a gradual trend toward increased knowledge of the involvement of mental activities in the experience of external events" (p.14 ).

He states that "young children think of the mind as passive in its relationship with the external world. That is, they do not understand that psychological activities can transform, organize or select information received from the environment. Instead they view the mind primarily as a passive recipient and storage place of information and experiences" (p.12).

This idea corresponds to Chandler and Boyes (1982) "copy theory" of knowledge in which objects are thought of as "transmitting objective knowledge directly into the mind of any observer who looks in their direction" (cited in Pillow,1988, p.9).

Sodian and Wimmer (1987) concluded that children younger than 6 years seemed to understand that "knowledge may be received through perceptual contact with the environment, but they did not seem to understand that knowledge may be constructed through mental activities such

as inferencing" (cited in Pillow,1988, p.15).

In contrast, older children conceive of the mind as active. They begin to develop an understanding of different ways the mind acts upon information. The crucial feature of an active conception of mind, according to Pillow, is "understanding that psychological characteristics can influence the experience of external events" (p.14).

For instance, older children are aware of short-term memory limitations that influence the number of items a person can recall and that psychological characteristics and activities impact on memory performance. Brown (1978) found that children under the age of 8 or 9 years do not realize that "active memorization strategies such as rehearsal or categorization are more effective than passive strategies such as merely looking at the items to be remembered" (p. 86).

In addition, Miller and Weiss (1982) found that 7- and 10-year-olds believe that the presence of "distracting objects," a "person's goals," and "ongoing thoughts" can have consequences for learning. Thus, older children's appreciation of psychological influences on learning and attending is consistent with the proposal that, as children grow older, they consider the mind to play a more active role in the reception of information.

For the most part the studies discussed in this review were not designed as investigations of Pillow's passive-active hypothesis; in retrospect many of them provided only indirect evidence to support it. Nevertheless, some consistency was achieved in findings across the different areas of children's understanding of mental phenomena.

For instance, the studies investigating young children's acquisition of mental verbs provided evidence that children as young as 4 years were able to differentiate mental states. In other words, mental reference in speech reflects a conceptual acquisition of mental processes.

The term "learning" itself is a mental verb, by definition a complex one, that encompasses a variety of mental acts. In a study conducted by Johnson and Wellman (1982) titled Children's Developing Conceptions of the Mind, there was significant evidence that children are learning about the mind as a whole, distinguishing a category of mental acts. Results from this study indicate that by 4 years of age children demonstrate awareness that the brain is an internal body part associated with a variety of mental acts such as *think , know , remember and dream.* This runs counter to previous characterizations of young children as failing to distinguish mental from overt behavioural acts. In summary, children are naturally making inferences about the difference between mental states and external events.

In the Swedish studies (Marton & Saljo,1976; Pramling,1983; van Rossum & Schenk,1984) previously discussed, learning was described as it related to specific content, that is, a descriptive analysis of the students' qualitatively different views on specific content, typical of the phenomenographic tradition. However, in the work of Biggs (1980) there is an attempt to describe the quality of the learning outcome on a specific task. Bigg's view on learning is less content-directed and more focused on analyzing performances and responses in terms of their cognitive structural complexity. To indicate that the students' performances on a specific task can differ enormously from each other as a result of the way students approach the task, he developed a taxonomy named the SOLO (Structure of Observed Learning Outcome) in which Piagetian developmental stages are clearly recognizable. Five categories were created ranging from simple and concrete to complex and abstract. The levels of performance are successively categorized as "pre-structural, uni-structural, multi-structural, relational and extended abstract."

Biggs maintained that the quality of the learning outcome is possibly related to what he called the student's "Hypothetical Cognitive Structure (HCS)." Marton and Saljo's (1976) study did not take into account that the quality of the learning outcome could be directly related to the level of a student's intellectual development. Although hierarchical levels of conceptual development were identified, there was no attempt to determine a relationship between age and level of structural complexity. Piagetian and neo-Piagetian analyses of cognitive development provide educational researchers with a theoretical model by which age-related differences in children's knowledge, skills and concepts can be sequentially defined in a hierarchical order. These analyses will now be considered for their relevance to this study.

## Research in the Piagetian Tradition

Qualitatively different categories are established which are consistent with age-level norms postulated by Piagetian or neo-Piagetian theory. The categories characterize different ways of thinking about various phenomena, and can be critically analyzed to determine what constructions (rules and generalizations) students have regarding content or concept under discussion. These are described in terms of cognitive structures.

### Piagetian Theory.

According to Piaget, there are three components that constitute intelligence: content,

function, and structure. Content refers to observable behaviours, specifically sensori-motor and conceptual that reflect intellectual activity. Function, as the name suggests, refers to the goals or purposes that direct cognitive development. These cognitive functions remain constant throughout the course of development and do not change with age. As a result of this, Piaget refers to them as functional invariants that guide cognitive activity during all stages of development. He proposed that there are two functional invariants: a) *organization* and b) *adaptation* that are as relevant to biological and physical growth as they are to intellectual development. Piaget believed that intelligent behaviour does not seem to be a random or trial-and-error process but is characterized by forethought and planning. In Piaget's terms, it is organized into "coherent and discernible patterns" or "structures." As a trained biologist Piaget was comfortable with the idea that important functions are carried out by biological structures, for example, the function of respiration is carried out by structures known as lungs or gills. Therefore, it is not surprising that Piaget approached the function of thinking and learning in terms of mental and cognitive structures that make it possible. Although they are unobservable and completely abstract, Piaget regarded these structures as being quite real. In essence, Piaget believed that the developing child was busy constructing cognitive structures. Structures are not considered to be "innate"; that is, they do not exist in children's thinking in themselves, nor do they exist in the content to be learned. Marton (1988) suggested that structures are created by the child when he or she thinks about something. In other words, children create their own structures on the basis of experience and development. This notion is extended by Pramling (1990) who claimed that children have the ability to relate one thing to another in the sense that they perceive various relationships which in turn forms the basis of understanding. Probably the most important implication of Piaget's theory is that children construct knowledge from their concrete actions on the environment.

Piaget's second functional invariant, *adaptation*, is instrumental in helping to induce conceptual change. Piaget borrowed the biological notions of assimilation, accommodation and equilibration to explain how cognitive structures develop. *Assimilation* is the cognitive process that continually integrates new stimuli into existing structures (schemata). *Accommodation* is the creation of new structures or the modification of old ones. Either one of these actions results in a change in or development of cognitive structures (schemata). Cognitive structures accommodate in a special manner called equilibration. The equilibration process is an example of *adaptation* at work. In a way the process can be described as a recurring cycle whenever there is a loss of

equilibrium in understanding a new concept. First assimilation is attempted leading to accommodatory change and finally a return to mental equilibrium.

The development of these cognitive structures and knowledge is an "evolutionary process" (Wadsworth,1984) that takes place within every individual. It is manifested in an individual's schemata, that is, a network of mental structures that are constantly undergoing change. As a child develops, cognitive structures become more differentiated, less sensory and more numerous; the network they form becomes increasingly more complex.

Flavell summarizes Piaget's theory and interpretation of what is meant by structure as:

> Interposed between function and content, Piaget postulates the existence of cognitive structures. Structure, like content and unlike function, does indeed change with age, and these developmental changes constitute the major object of study for Piaget. What are the structures in Piaget's system? They are the organizational properties of intelligence (schemata), organizations created through function and inferrable from the behavioural content whose nature they determine.
> (Flavell, 1963, cited in Wadsworth, 1984, p. 21).

Piaget concerned himself primarily with the structure of intelligence, although he dealt with function and content to a lesser extent. He described and analyzed qualitative changes in the development of these cognitive structures but in very broad and general terms. Piaget suggested that cognitive development is a function of the interaction of maturation, physical experience, social interaction and *equilibration* which Piaget defines as a *"self-regulatory process"* .

At the beginning of this chapter learning was described as essentially a social cognitive process by nature. Children learn by trying to make sense of the world around them. Inquiry into children's attempts to construct meaning of specific phenomena of the "social world" may enable cognitive psychologists to gain insight into the nature of learning from a child's perspective. Further, such an investigation may contribute a clearer understanding of how children intuitively conceptualize learning as a process. Theoretical predictions postulated by Piaget enable researchers to plot children's growth in their conceptual understanding of different concepts as they mature with age.

## Methodology in the Piagetian Tradition.

A common research strategy that developmental studies tend to adopt when addressing their

inquiry into children's conceptual knowledge of the social world is to take some known development task, such as experimental tests for conservation, to provide additional support for the stage theory. Performance on these tasks serve as "anchors" or indices of a child's cognitive developmental level by providing an independent measure. If, as developmental psychologists claim, children's concepts of specific phenomena are embedded in a matrix of cognitive structural variables (physical or social causality or identity concepts), then there should be a correlation between these matrices and the qualitative analysis of age-related conceptual differences of a specific social concept. This method of research ensures reliability that the new concept under investigation follows a developmental sequence compatible to Piaget's stages. For the purposes of analysis and description, Piaget divided the continuum of development into four stages: sensori-motor (0-2 years), preoperational thought (2-7 years), concrete operational thinking (7-11 years), and formal operational thinking (11-15 years).

For example, Sparks and Cantor (1983) not only interviewed children after watching each video segment taken from the television program The Incredible Hulk to determine their emotional response, but also administered a standard liquid conservation task to correlate each subject's identity conservation ability with their level of fear response. The ability to perform identity-conservation tasks was considered to be related to the ability to decenter from perceptual cues and to the comprehension of transformations. This corresponded to the transformation stage in the hero's appearance from human to monstrous form. The results of the study confirmed that there was a high association between the child's performance on the conservation task and the preoperational and concrete operational stages of Piaget's theory.

Similar methodology was applied in a study investigating children's concept of age and aging. Although Piaget provided the basis for researchers to study the child's concept of age and aging, there is is only a small amount of literature addressing this area. One study conducted by Galper, Jantz, Seefeldt, and Serock (1981) utilized the questions posed by Piaget(1969) and developed a Concept of Age Test designed to provide a standardized procedure for placing children's concepts of age into a cognitive developmental framework. The researchers claimed that the administration of this instrument to 180 children ages 3 to 11 would provide "systematic normative data for the support of such a theoretical framework" (p.150).

In order to provide an "indice of criterion validity," the researchers also administered three conservation tasks involving the ability to conserve two-dimensional space, substance and

discontinuous quantity. They believed that the child's performance on these tasks would provide an independent measure of cognitive level of ability. If children's concepts of age are embedded in a cognitive-developmental matrix as was hypothesized in Sparks and Cantor's (1983) study assessing emotional cognition, then performance on both tasks should be correlated.

A modified clinical technique was adopted by the interviewers in which children were asked to reply "Yes" or "No" to a set of 12 statements. Children were then prompted to justify their responses so that the interviewers could locate the developmental level of each child. The findings of this investigation indicated that the total Concept of Age score highly correlated with conservation level ($r = .79$), supporting the hypothesis that children's understanding of age and aging proceeds through a Piagetian cognitive-developmental sequence of three stages.

The researchers also identified a developmental progression within the stages; responses usually given by younger children scored in the initial phase of the stage while older children were consistently rated toward the upper stage hierarchy. This consistent increase in stage scores with increasing age supports the notion that children's concepts are both progressive and sequential and increase in accuracy with age.

The weakness of this study was in the test instrument. The types of statements presented to the children were as follows:

> You will grow older but your father will stay the same age.
> If someone was born first, then they are older than you.
> If someone is five years older than you, they will always be five years older than you.
> Someone is two years older than you, but you will catch up to them and be the same age someday.
> How old were you when you were born?

Statements such as these have some degree of syntactical and semantic complexity, and may be the cause of cognitive confusions and inaccuracy. Such statements most likely narrow the perspective of young children's thinking about the topic in general and force reasoning powers to interpret the meaning of the statements.

Language is, in Donaldson's (1978) terms, "embedded" in a context of relationships and personal concerns. Children would have been less context-bound if they had been asked to respond to open-ended questions enabling them to focus on a more holistic explanation of age. This would have enabled the children to respond within a more general and broader scope on the topic of age. The distinction drawn by Donaldson between "embedded" and "disembedded" tasks

would seem to provide an important message regarding conditions under which researchers place children to assess their cognitive abilities. She also reminds us that young children may have difficulty disembedding the language in such situations as these.

When children describe their understanding of such abstract concepts as age and aging embedded in the matrix of time, they are not expressing the ideas which they have obtained directly from experience; it is through inference they are constructing their knowledge. It may be possible to conclude that children are not only taking in verbal information about aging, but also processing this information according to their cognitive structural level. What was interpreted as children's misconceptions about age by these researchers, may have been in part a result of the child's reasoning and processing of information which was too complex for his or her developmental level.

### Summary.

In summary, two major approaches were used in research conducted in the classical Piagetian tradition that not only impact on each other but may determine future directions in research into children's social concept development. The first concerns itself with the reliance upon children's verbal responses to open-ended or semi-structured questions on a specific topic.

Piaget claimed that "observation of natural phenomena permits children to use their "concrete" (logical) intelligence, whereas in order to form such notions as "family" and "nation" children are forced to employ verbal intelligence which causes them to develop ideas and images based in large part on the words they hear spoken by adults"(Piaget, 1924, cited in Berti, Bombi & Lis, 1982, p. 222). This was particularly relevant to the Berti et al. (1982) study inquiring into children's understanding of economic concepts. Background information provided in the parent questionnaires confirmed that children constructed knowledge about the local factory based on verbal information provided by the parents. This second type of intelligence received very little attention from Piaget. His principal concern had been with concrete intelligence, concentrating more on children's ability in "logico-mathematical operations" in their attempt to understand the natural physical world. Most of Piaget's studies were experimental in design requiring students to perform formal tasks. Piagetian conservation and perception tasks were criticized by Bruner (1986) and Donaldson (1978) as being too contrived. According to Donaldson (1979), such formal tasks limit thinking skills due to the emphasis they place on disembedded thought and

language.  She claims there is a disparity between children's skills as thinkers in everyday situations and those in formal experimental tasks.

In recent years, educational research has been "more sensitive to the experimental aspects of cognition, and more open to using personal introspective accounts of learning processes" (Richardson,1987, p.5).    Miller (1976) argued that Piagetian clinical interviews "rely too heavily upon verbal skills" (cited in Green,1978, p.1045).  However, a truly complete or holistic picture of the child's thought development must also take into consideration the way in which the child perceives different aspects of reality in the social world.  Language becomes the vehicle researchers depend upon to determine children's level of understanding of different social phenomena.  Empirical investigations can yield this type of information about the child's conceptions of the social world, revealing both similarities to and differences from their conceptions about the physical world.

This leads directly to the second major approach often used in developmental studies, those which examine children's performance on experimental tasks as well as their verbal responses in an interview.   Several studies in this category employed this common research strategy in the area of cognitive development.   Researchers administered pertinent Piagetian-type developmental tasks with the intention of using them both as "anchors" or indices to locate a previously unexplored area of thought.

As previously stated, children's conceptual understanding of a specific phenomena is embedded in a matrix of cognitive-structural variables constrained within the level of an individual's processing capacity.  This being the case, then the results from performance tasks which assess a subject's ability in "logico-mathematical" operations and the qualitative category which gauges a subject's level of conception of a specific phenomena should be correlated.  Such a correlation would thereby strengthen a study's reliability in its claim that children's ability to understand a specific concept corresponds to the stages of  development in Piagetian theory.  Results from the studies discussed in this section confirm a high association between children's conceptual and cognitive development.

A cross-analysis of these studies also reveals similar conclusions regarding children's concept development of different phenomena in social and emotional domains:

1.  Children's conceptual understanding of a specific topic systematically

increased in complexity with age supporting the hypothesis that the concepts are ordered in a developmental sequence.

2. Concept development progresses through a series of general and universal stages. Further, differences within each stage portrayed a developmental hierarchical sequence from the initial to the final part of the stage.

3. Age-related developmental changes that took place in children's conceptual understanding of a specific notion were compatible with the three stages of Piaget's theory of cognitive development.

4. Specific social concepts are embedded in a matrix of cognitive structural variables such as physical or social causes, conservation or identity concepts. Consequently, conceptual understanding is limited by the child's level of cognitive growth. Children process and construct new ideas according to their cognitive structural level; in other words according to their level of ability in "logico-mathematical operations." Information about a given topic is not simply taken in ; it is assimilated or transformed to the child's present cognitive level.

5. In Piagetian theory, a new stage grows out of and subsumes the one before it in a slowly evolving developmental process.

6. Qualitative data, extracted from the children's interviews, illustrated the content of the concepts in a particular area and the necessary "components" or "units" of thought required for its development.

The classical Piagetian analysis is essentially a descriptive model and Piagetian explanation by way of *assimilation, accommodation,* and *equilibration* is perceived as intrinsically weak by neo-Piagetian theorists such as Case (1985), Demetriou (1987), and Pascual-Leone (1987). In particular, Piaget's somewhat mysterious regulatory process known as *equilibration* has been criticized as logically unfounded (Fodor,1976, cited in Wellman, 1990). Evolving from the review of studies in this section is a growing awareness for the need of a more "fine-tuned" model that specifically describes and explains the developmental process of how cognitive structures increase in complexity within each stage. Case's (1985,1992) neo-Piagetian model attempts to provide a more indepth explanation of the development of increasingly complex cognitive structures .

Marton (1981,1988) argued for a phenomenographic approach to learning and instruction

which stemmed from his observation that students hold different conceptions of what learning is. Phenomenography is the study of the quality of the conceptions which people have of various phenomena. In this theoretical framework, learning is about the "shifts or changes in those conceptions", and instruction is about "inducing this conceptual change" (Marton,1989). This perspective on the nature of learning is congruent to the fundamental beliefs upon which Case's (1985, 1992) neo-Piagetian theory is founded.

As a developmental psychologist, however, Case attempts to analyze the cognitive structures that bring about these changes in conceptual understanding. Little progress was made towards creating a theory that explained the cognitive structures indicative of developmental changes in children's concepts of specific phenomena until a series of revised and refined neo-Piagetian models was developed in the early 1980's. The neo-Piagetian model presented in the next section provides a more systematic structural model of cognitive growth within substages. Further, this theory also offers a description of the major structural change from one stage to the next.

## Research in the neo-Piagetian Tradition

Piaget's theory of intellectual development has played an influential role in psychology and education for the last sixty years. However, all theories in psychology are constantly changing; they are being reorganized, refined, tested and validated. Critics of Piaget's theory reached a common conclusion that its weakness lies within a "domain-general" interpretation of logical structures (Wellman, 1990).

In the light of new research in developmental psychology, intellectual development appears not to evolve in such a broad-based manner as Piaget assumed; it is highly content, domain and task specific (Case & Mckeough,1990). The neo-Piagetian model developed by Case (1985) enables researchers to conduct a "fine-grained" analysis of children's intellectual development across social and cognitive domains. As its name implies, neo-Piagetian theory was designed with the intent to revise Piaget's theory after acquiring new information on cognitive development from task-related studies in a variety of different domains. Case's intent was to preserve the strengths of classical Piagetian theory while eliminating its weakness. He retained a core set of postulates that explained the universal features of cognitive development. These include the notion that children's cognitive operations proceed through a universal sequence of stages which postulate characteristic

understandings of the world according to age. Piaget claimed that these stage-characteristic or levels of understandings would transcend any particular task. As previously stated, Piaget's theoretical model was primarily descriptive and offered only a very general explanation of the developmental cognitive processes that took place within stages and to the next stage. This lack of explanation of non-universal aspects of cognitive development was considered a weakness by many developmental psychologists, including Case.

Case (1985, 1992) developed a set of "structural transformation processes" or sub-stages that explained the cognitive shifts that occur within each major stage. He accomplished this task by claiming that knowledge can be conceptualized as being charted along two axes. On the vertical axis he attempted to explain actual performance variation within each stage as sequentially ordered "discrete steps" or "structural levels". The horizontal axis involved the application of these structures across other domains.

Case maintained that, in any given content domain, children progress through a series of cognitive-developmental stages and substages. He believed that children's conceptual understanding has a distinctive organization or structure at each of the following age levels: Infancy, early childhood, middle childhood, and adolescence. Consequently, four major stages are still hypothesized, following the classical Piagetian theory: Sensorimotor (0-18 months), Relational (1.5 - 5 years), Dimensional (5 - 11 years) and Vectorial (11 -19 years).

Progression from one stage of development to the next occurs when two qualitatively different conceptual structures or "mental units" are coordinated and consolidated at the end of the previous stage. Transition from one substage to the next takes place by the differentiation and subsequent integration of two structures that have been brought into a higher-order form of relationship (Case,1991).

For example, in the Dimensional Stage, behavioural events in the physical world are differentiated from but related to mental states in the form of feelings, judgments or processes. The cognitive structure describing social cognition in the Dimensional Stage is termed the "Intentional" structure. It represents a causal relationship between the external world of action and the internal world of mental states and processes.

There are three substages defined within the Dimensional Stage. From 5 to 6 years of age, children are able to differentiate and coordinate a behavioural event with one mental state and this cognitive level is described as the "unidimensional" stage. By the ages of 7 to 8 years, children are

able to differentiate and coordinate two mental states to a behavioural event and this level is defined as the "bidimensional" stage. The last of the substages (9-11 years) is described as an elaborated coordination of the "bidimensional" stage . The intentional structure is characterized by a higher-order relationship in its attempt to integrate internal and external states in a more complex fashion. An abstract model of this structural development within each substage of the Dimensional Stage is shown in Appendix A.

These three substages constitute the "structural levels" that lead to the consolidation and coordination of mental units. They attempt to explain developmental increases in structural complexity consistent with the theory of cognitive development. Within each of the four stages, Case (1985) hypothesized the occurrence of this same dialectical cycle of identical substages. At a more general level, this assumption existed within the classical Piagetian tradition, but in the context of Case's neo-Piagetian theory it exists in a more stringent form. A cyclic recursion supports the notion that "in the construction of any understanding at any level of development, there is a progression through exactly the same sequence of structural steps as at previous stages" (Case,1987, p.779).

The social cognitive structure specifically related to the Vectorial Stage is defined as the "Interpretive" structure and corresponds to formal operational thinking in the classical Piagetian tradition. In other words, this stage marks the initial development of abstract control structures in adolescence. Thought at this level assumes a psychological dimension in the social domain and in Case's terms is defined as "abstract dimensional" (Case,1985).

For example, in the verbal domain, children are able to make analogies. "To perceive an analogy, one must perceive a higher-order vector along which two lower-order dimensions may be compared" (Case,1985, p.109). In other words, children are able to compare one dimensional operation with another and this process in turn may be described as a "second-order" or "abstract dimensional" operation. The next section will discuss the developmental progression of children's social cognition as it relates to neo-Piagetian theory.

## Intentional Knowledge in Middle Childhood.

Studies reported in this section derive from neo-Piagetian theory. As previously stated, this theory places greater emphasis on domain-specific experience. Although it utilizes constructs from contemporary cognitive science to characterize high-level structures which children develop,

the model is defined in such a fashion that it is not restricted to any particular domain or type of mental functioning. Unlike the classical tradition, less emphasis is placed upon logico-mathematical structures and more attention has been directed to capacities upon which these structures are believed to be dependent, such as working memory.

The following study provides an example of children's development of narrative knowledge from the ages of 4 years to 10 years and how they relate to the theoretical predictions proposed by Case's (1985) model. Further, comparisons will be made with this study to the work of Goldberg-Reitman (1992) who investigated the conceptual development in children's understandings of a mother's role. The purpose of this comparison is to reveal similar age-typical patterns of structural development in children's understanding of two different concepts.

McKeough (1984) conducted a study that attempted to relate the way in which children structure stories at different age levels to the general stage characteristics proposed by Case. Further, she set out to determine whether a relationship existed between the subjects' performance on two measures of short-term memory and the narrative compositions task.

Four-year-olds, 6-year-olds, 8-year-olds and 10-year-olds participated in the study. These ages are believed to typify the general cognitive strategies applied at the different substages in the Dimensional Stage proposed by Case. Different story structures were discovered at the ages of 4 years, 6 years and 8 years with some indication of further development taking place at the age of 10 years.

A prototypic 4-year-old story grammar appeared in the form of separate integrated script-like event sequences in which action and characters' feelings are fused or blended within what Bruner (1986) calls the "Landscape of Action". McKeough concluded that four-year-olds possess an "action event schema" (1993) which Case classifies as a pre-intentional stage of cognitive development. There is also evidence that 4-year-olds are able to apply this cognitive procedure to other tasks, as is indicated in their explanation of a mother's actions when her daughter was in some kind of discomfort or danger. Goldberg-Reitman (1992) showed a series of cartoon strips that portrayed a child in different problem situations and asked each subject what the girl's mother would do and why. Goldberg-Reitman's findings showed that 4-year-olds explained a mother's actions in terms of one-step actions and when asked to explain the reasons for the mother's behaviour, responses still remained in Bruner's "Landscape of Action".

For example, one cartoon showed a little girl beginning to slide off a roof and consequently

she calls out for help. A typical 4-year-old's prediction is that "the mother will catch her" and the common explanation for why is "because she's falling down." The majority of responses made no reference to either the mother's or daughter's internal state.

By the age of 6 years, children's stories became more coherent by introducing a problem, goal, or desire that links the event sequences with a common theme or point to their story. Action sequences are now coordinated with the character's mental states in the form of feelings, thoughts or desires. For instance, in the first episode of a prototypic 6-year-old response, a baby lamb is lost and lonely. Then a horse comes along and rescues the lamb and they go away together. The first sentence typifies unidimensional thought consistent with Case's theory. Six-year-old children are able to differentiate and coordinate an event (a lost lamb) with one mental state which in this case is the lamb's feeling of loneliness. McKeough (1993) described 6-year-old narrative structure as an "intentional" schema "because the intentions of the characters motivate the action" (p. 5). This episode also demonstrates a simple version of Bruner's (1986) "dual-landscape" narrative in which the Landscape of Action is related to an intentional state (the lamb's feeling of loneliness) which Bruner describes as the Landscape of Consciousness.

This integrated intentional structure also reflects 6-year-old responses in Goldberg-Reitman's (1992) study in which children were asked to predict a mother's reaction and feelings to a problem situation in which her daughter was involved. In the cartoon task previously discussed, a common response of 6-year-olds was "a mother would catch her little girl because she didn't want her to get hurt."

In contrast to a 4-year-old response, a typical 6-year-old response provided a rationale for the mother's actions by making additional reference to the mother's intentional state in terms of an immediate plan of action. In the context of neo-Piagetian theory, this coordination of external events or actions with the characters' internal world of feelings,ideas or plans is characteristic of children at this age.

Narrative at the 8-year-old level had a tendency to "flesh out" the problem, goal or desire into an event sequence but still relate it to the major plot. In addition, a second focus is introduced into the story in the form of a sub-plot that complicates a straightforward resolution to the story. For example, a lost little lamb is found by a girl. Her goal is to care for it (major plot). However her father prevents her from achieving this goal by refusing her request to keep it (sub-plot). The addition of this sub-plot introduces a second intentional state and thereby demonstrates

bidimensional thought. Children are able to differentiate and coordinate two mental states to a behavioural event at the bidimensional stage. In this case, two problems now surface that need to be resolved: a lamb in need of care and a father to be "gotten around" (McKeough,1984, p.7). Several unsuccessful attempts are usually made before both problems are finally resolved.

> Problem 1 ------An attempt is made to solve the problem
> (A house is built in the woods)

> Problem 2-------A successful resolution
> (Father is happy because little girl agrees to return the lamb
> to its rightful home!)

At the ten-year-old level, children elaborate upon the 8-year-old structure by composing additional episodes that develop the resolution more extensively. As a result, stories contain a characteristically well-developed plot that is associated with a more elaborate network of characters' intentional states woven into the action of the story.

This integration is also evident in the Goldberg-Reitman (1992) cartoon task. Ten-year-old responses provided alternate behaviours in which the mother might respond to a particular problem situation. These alternate behaviours were integrated under the umbrella of a more abstract "maternal disposition," that of the mother's sense of "caring" for their daughter. Further reference was made to a more elaborated set of intentional states that directed the mother's selection of a particular action sequence. Goldberg-Reitman claims that such responses are consistent with Case's theory in general, in the sense that 10-year-old children are beginning to construct an abstract notion of the mother's role. In fact, Goldberg-Reitman claimed that by the ages of 12 or 13 years, they were conceptualizing the role in explicit abstract terms.

By way of summary, the results from these two studies can be compared to those studies conducted within the classical Piagetian tradition. As was identified in children's conceptual understandings in other domain-specific tasks, elementary school-aged children's narrative compositions and understandings of a mother's role proceeded through a series of increasingly complex stages of development. Further, a relationship was established between performance on the narrative task and on two working-memory tasks. In support of this result, Goldberg-Reitman (1992) suggests that from her findings "a sequence of central conceptual structures may exist for the domain of social cognition" (p.151).

As in other areas of cognitive growth, development is easier to describe than to explain.

Case reports that one possible mediator that could be partly responsible for the transition from one stage to the next is an increase with age in information-processing capacity. As children mature, their short-term memory capacity increases making it easier for them to hold more than one representation in mind at the same time. This might be the controlling factor in determining age-related levels of structural complexity in the amount of elaborative detail not only in children's narrative composition but across other social domains.

From a slightly different perspective, Flavell (1988) and his colleagues who study *theories of mind* claim that children begin their discovery of the mental world by learning that they and other people have internal experiences that are cognitively connected to external objects or events. As children mature, they gradually realize that these "cognitive connections" entail inner, "mental representations." Griffin (1992) conducted an inquiry into children's understanding of mental states. Her study confirms the developmental trend of young children's theory of mind from cognitive connections to external events to mental representations. Children aged 4 years, 6 years, and 8 years were specifically asked to explain the meaning of four feeling terms: happy, sad, good and bad. The purpose of this task was to determine whether there would be age-related differences in levels of conceptual understanding of these affective states. Griffin (1992) predicted that the structural complexity of these three levels would be consistent with the developmental progression postulated by neo-Piagetian theory.

Between the ages of 4 and 6 years, children's conceptions moved from defining a feeling as an external event to conceptualizing a feeling as an internal state arising from an event or a sequence of events. For example, one 4-year-old response defined happy as *playing*, and sad as *mommy leaving* . On the other hand, a typical 6-year-old response combines Bruner's Landscape of Action with the Landscape of Consciousness, as this example shows: "Happiness means, well, like I'm all alone and then my feelings turn from sad to happy when I get a friend over". Eight-year-old responses still remained in the "dual landscape view" in their explanations, but tended to coordinate an action event with two distinct internal responses. Griffin (1992) claims that "responses such as these lend support to a suggestion that is implicit in the model (Case's neo-Piagetian): that the postulated structures are actually inside children's heads, and are used by them to make sense of their internal and external worlds" (p. 204).

<u>**Interpretive Knowledge in Adolescence.**</u>

This review of literature was able to locate only two studies that investigated adolescents' conceptions of different phenomena in the social domain from a neo-Piagetian perspective. As previously stated, Case predicts a shift in cognitive development from the "intentional" mode where actions are differentiated from and coordinated to internal states (e.g. feelings, desires or beliefs) to an "interpretive" mode. This "interpretive" cognitive structure exists within the Vectorial Stage (12 years -18 years) in Case's theoretical model.

In studies conducted by McKeough (1987,1993), adolescent narrative knowledge takes on a psychological theme by placing more emphasis on the inner world of the character's traits and psychological make-up by describing the reason behind the character's intentions. In other words, the story-line is developed from the character's perspective. The inclusion of literary techniques such as flashbacks or foreshadowing enabled the reader to "interpret the intentional states of story characters" (McKeough,1993, p.7). Consequently, adolescent narrative marks a shift to a higher plateau of thought defined as the Interpretive structure.

A more detailed description of the Interpretive structure is found in a recent study conducted by Salter (1993). She analyzed adolescents' interpretation of "family stories" (significant accounts of a past event involving a particular family member). Students aged 10 to 18 years recounted in writing a particular family story relating to themselves or some other member of the family. Each subject was then interviewed and responded to a series of questions that probed into each student's personal interpretation concerning the message they gleened from the story. Results supported the hypothesized developmental progression proposed by Case in the Vectorial Stage. In addition, there was significant evidence of a qualitative shift from an "intentional" level of understanding, characteristic of 10-year-olds, to an "interpretive level" of understanding reflected in 12-18 year-olds. This qualitative shift in conceptual understanding marks the transition from the Dimensional to the Vectorial Stage of Case's model.

Prototypical 10-year-old responses described an action and then attributed a social rule in the form of a judgmental statement to that action (e.g., you shouldn't leave little kids alone). On the other hand, 12-year-old interpretations applied a psychological dimension to the social rule in the sense that the students related it to their own personal life. Further, an understanding for the rule was articulated (e.g., I shouldn't play on construction sites because I might get hurt like my uncle did).

It can be concluded from these studies that the following Piagetian postulates have been preserved in Case's neo-Piagetian theory:

1. Children are highly active thinkers and are in control of their learning;
2. Children construct knowledge from their actions on the environment;
3. Cognitive operations proceed through a series of developmental stages;
4. Stage-characteristic understandings that transcend any particular task can be identified.

The new theory differs from the classical tradition in a number of different ways:

1. Greater emphasis is placed on "domain-specific" experience in general. An analysis of the content relating to a specific task is considered in more detail.
2. A more explicit description of the processes by which children progress from one stage to the next is provided.
3. Minor substage shifts in structural complexity are also clearly defined within each major stage.
4. The structural model presented in this new theory is flexible enough to incorporate the effects of environmental influences, social experience in particular, in cognitive development.

## Bruner's Social Perspective on Learning

Bruner (1986) postulated two modes of thought or "cognitive functioning", each providing "distinctive ways of ordering experience, of constructing reality" (p.11):

1. Paradigmatic or Logico-Scientific. "A formal mathematical system of description" (p.13), similar to Piaget's logic and rational thinking;
2. Narrative - "deals with human or human-like intention and action and the vicissitudes and consequences that mark their course" (p.13).

The latter mode denotes an area of mind we know very little about in any formal sense and as its title infers, Bruner compares it to creating good "stories." A good story, according to Bruner, must construct two "landscapes" simultaneously:

1. Landscape of Action - This corresponds to a story grammar describing events that take place in the physical world;
2. Landscape of Consciousness - This corresponds to the mental states of those involved in the action: in other words, what the characters know, think or feel.

In this Narrative mode, Bruner postulated a "dual landscape view" matching the "inner vision and outer reality" (p.21). In other words children are mindful actors with plans and intentions that they attempt to put into action in their physical setting.

This analogy has significant reference to cognitive functioning in the intentional structure of Case's Dimensional Stage. Thought represents a causal relation between the external world of physical states and events (Landscape of Action) and the internal world of feelings and mental states in the form of ideas or plans (Landscape of Consciousness). A brief reference to Bruner's "narrative" mode of thought has already been mentioned in relation to 6-year-old cognitive operations. The structural model developed by Case (1985,1992) enables researchers to take into consideration Bruner's social perspective on the nature of learning and on the process of knowledge construction.

Explanations in the intentional mode impose both cognitive and linguistic demands on the child. It is cognitively demanding in that the child has to distinguish between the reason and the result, despite the fact that they are interdependent. This would require a good understanding of the conception of intention. On the other hand, children need to acquire an understanding of linguistic expressions of intention to explain their thinking. Donaldson's studies indicate that even five-year-olds have the cognitive and linguistic abilities for giving and understanding explanations of events and actions, particularly those involving intentions, motives and purposes; in other words, situations which make "human sense."

Bruner (1986) states, "Human mental activity depends for its full expression upon being linked to a cultural tool kit - a set of prosthetic devices"(p. 15). He emphasized the importance of taking into account the "tools" employed in that activity when studying mental activity. "Society provides a tool kit of concepts, ideas, theories that permit one to get to higher ground mentally" (p.73). Piaget didn't deny that social interaction and communication help facilitate cognitive development. He claimed that they did so "by creating disagreement and cognitive conflict which induce self-constructed cognitive changes that advance a child to the next stage of development" (cited in Wadsworth, 1984). Piaget accepted verbal reasoning as a major vehicle upon which logical operations operate.

## A Constructivist Viewpoint on Learning.

An alternative conception of the nature of the learning process is that learning is constructed, not only in an individual's head, but in interactions among individuals and materials as they occur over time (Bruner,1986; Vygotsky,1978). Very briefly, constructivists believe that individuals actively construct knowledge and understanding (cf. Piaget), rather than passively receive information in response to external stimuli.

Constructivist theory emphasizes the search for meaning and understanding in learning. Attention is focused upon the process of learning and subsequently developing an understanding of one's own learning strategies through metacognition (McGuinness,1991).

Marshall (1992) said: "Learning consists of building on what the learner brings to the situation and restructuring initial knowledge in widening and intersecting spirals of increasingly complex understanding" (p.11). For example, Paley (1986), acting as researcher in her own classroom, came to the conclusion that she was unable "to teach the children that which they don't already know" (p.126). Paley (1986) discovered that children try to connect what they already know to what they don't know.

Although constructivists view learning as an active process, social and cognitive constructivists vary in how they regard the nature and influence of the social world in the process of knowledge construction. On the one hand, cognitive constructivists perceive learning as a process within an individual's mind, even though they acknowledge that the learner is often under the guidance of an adult or expert.

On the other hand, social constructivists place greater emphasis on the role of social interaction through which "contexts, knowledge, and meanings in everyday life are constructed and reconstructed" (Marshall, 1992, p.11). In a social constructivist framework, learning and thinking are situated in social contexts rather than occurring solely in an individual's mind.

Bruner, Vygotsky, Donaldson and Wood support the tenet that knowledge is constructed through negotiation with others. Wood (1988) also claimed that learning derives from "vicarious experiences, interaction, media and tutors." In addition, Bruner emphasized that "human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (1986, p.88). From this perspective, learning is viewed as a social process in which:

- children's knowledge is constructed through social interaction of

participants around them;
- learning is cooperatively established by the members of community; a shared mutual understanding;
- Shared meanings are established through participating in communicative discourse involving explanation, justification and negotiation of meaning. (adapted from Wood, Cobb, & Yackel, cited in Marshall,1992, p.181).

Wood (1988) also claimed that children tend to draw upon the closest and most relevant experiences when they attempt to construct new meaning or tackle new and unfamiliar problems. He also concurs with Vygotsky that "knowledge and expertise are often a product of shared constructions by teachers and children"(p. 224). From a social constructivist's viewpoint therefore, the importance of communication and instruction through social interaction is of central importance in facilitating children's intellectual development. Case concurred with this and consequently incorporated a social constructivist viewpoint on learning into his model.

## Conclusion

From an educational perspective, valuable information is often extrapolated from a critical analysis of the data collected from children's responses to a particular topic. It is possible to determine what constructions or generalizations children have regarding content under discussion. The type of content and the common patterns of thought that are generated by children of similar ages provide insight into how children intuitively approach a problem or construct a conceptual understanding.

Children construct, in diSessa's (1988) terms, "an intuitive knowledge system" which is rooted in their experience with the environment. DiSessa claims that this "intuitive knowledge" provides the basic material with which to develop a deeper understanding through appropriate instruction.

If the goal of teaching is to support children's learning then Lindfors (1984) recommends that, "We would do well to try to understand what children's learning is like, what the child is trying to do" (p.605).

Three hypotheses were generated as a result of the literature review.
1. Children's conceptual levels of understanding at the ages of 6 years, 8 years, and 10 years will correspond to the developmental sub-stages of "dimensional thought" in middle childhood as described by Case (1985,

1992) such that there will be significant age-related differences in level of understanding of the meaning of learning.

2.  Children's conceptual levels of understanding at 12 years of age will indicate a transition to the Vectorial Stage. There will be a significant difference between 10-year-olds and 12-year-olds, indicating a qualitative shift in understanding of learning from intentional to interpretive.

3.  Children's conceptual levels of understanding of whether learning comes from an external source, internal source, or both sources will show a developmental progression from the ages of 6 years to 12 years in a hierarchical fashion.

Methodology used to test these hypotheses is presented in the following section.

# CHAPTER 3 : METHODOLOGY

Children's explanations for the meaning of learning were elicited using a semi-structured interview technique. A brief overview of the pilot study conducted in the Fall of 1992 will first be discussed followed by a detailed account of the final study procedures. The chapter will conclude with a description of the scoring criteria established to interpret the results of the study.

## Pilot Study

A pilot study was conducted in September 1992 to develop specific interview guidelines and to field test both the questions and types of responses obtained from children at the five different age levels.

A total of 28 students from an elementary school in the Greater Vancouver Regional District participated in an interview with the researcher. Six 4-year-olds who lived in the school's catchment area were also included in the pilot study. A small sample of children representing each of the following five age-levels responded to a set of four questions in an informal interview situation: 4 years, 6 years, 8 years, 10 years and 12 years.

The keystone to the success of the final study is based on subjects' responses to a set of questions and the interviewer's skillful use of probes. Therefore, the researcher felt it necessary to gain insight into the nature of the responses and to confirm research predictions prior to commencing the study. By conducting pilot interviews, procedures and questions could be refined to maximize the type of information required for the study.

During the pilot interviews, it became evident that different kinds of probes were required to either clarify or extend children's responses. Consequently a set of probing questions and statements was developed to be used in the final interviews whenever they were deemed necessary. The structured questions used in the pilot study required very little revision, but the order in which they were presented was changed for the final interviews.

In addition, the data collected from these pilot interviews helped to provide insight into the general parameters of thought units emerging at each of the different age groups, so that scoring criteria could be developed. Although 4-year-olds were not included in the major study, their responses enabled the researcher to gain insight into the nature of the responses at this age in order

for a base to be established on which to build a hierarchy of scoring levels to categorize children's conceptual understanding of learning.

In summary, the pilot study confirmed research predictions that the resulting data could be quantified and analyzed in the manner intended.

## Procedures

### Subjects.

Eighty-three subjects ranging from 6-years to 12- years old were individually selected from the same elementary school in which the pilot study was conducted. A stratified random sampling procedure using gender and age as the two factors for subject selection was used. The population included 20 six-year-olds (mean age = 6.7), 20 eight-year-olds (mean age = 8.8), 20 ten-year-olds (mean age =10.7) and 23 twelve-year-olds (mean age = 12.7). Each age group was evenly divided by sex (10 males and 10 females) with the exception of the 12-year-old age group (10 males and 13 females). Due to the small population of 12-year-old students enrolled at the school, subjects at this age-level came from one class. Every student in this division received a letter for parental permission to participate in this project and consequently all students who returned their permission slip wanted to be interviewed. Subjects were randomly selected from four different classrooms for each of the the other age groups due to the preponderance of primary students at this school. Descriptive statistics are presented in Table 3.1. The mean age is calculated in months for each age group.

The interviews took place between January and March of 1993 and were individually conducted in a room set aside by the school for the purpose of this study. The school setting for the study is a suburban, lower-middle class neighbourhood adjacent to an Industrial Park (the surrounding area was once rural and has been recently developed into many housing subdivisions). The Elementary school has a population of 485 students and is in its second year of operation.

Prior to commencing the interviews, a letter requesting parental consent was sent home with all subjects selected (See Appendix B). Written parental permission was required to interview each student. In addition, the interviewer informally asked for verbal consent from each subject.

Ecological validity was established by conducting the interviews at the school in which the children were enrolled. Not only was the school considered to be the most convenient setting in

which children's classroom routines would be the least disturbed, but also the most naturalistic setting for children to talk about their understanding of learning.

### Interview.

In order to standardize procedures, all interviews were conducted in essentially the same manner. These interviews, described as "informal conversations," in Piagetian terms, were modelled after his approach. For instance, when Piaget was asked by an interviewer how he knew when to end the interview, he responded : "I have only one criterion. I consider an investigation finished when we no longer find out anything new, that's all." (Bringuier,1980, cited in Arlin,1990, p. 82).

## TABLE 3.1
Descriptive Statistics for Age Groups

| Age Group | N (M, F) | Mean Age in Months (SD) |
|---|---|---|
| 6 | 20 (10,10) | 79.1 (3.8) |
| 8 | 20 (10,10) | 103.8 (3.3) |
| 10 | 20 (10,10) | 127.3 (2.7) |
| 12 | 23 (10,13) | 151.5 (3.7) |

Piaget's clinical method (Piaget, 1965) is a special type of interviewing technique intended to reveal the nature of children's thoughts. Interviewers using this method are also observers as they watch how children react to the questions posed to them.

Feedback from the pilot interviews confirmed the need to support the structured questions with open-ended probes to clarify and extend responses when needed (See Appendix C). In other words, these unstructured questions facilitated the explanation and understanding of the responses to the structured questions. A letter was attached to each type of probe to serve as a coding system when transcribing each subject's taped responses.

Based on this description, the interviews conducted in this study used a semi-structured approach. The researcher in the role of an interviewer elicited verbal responses to the following set of four questions:

1) What does learning mean?
2) What is happening when you are learning?
3) When you are learning, where is your learning coming from?
4) Can it come from anywhere else?

The first two questions selected were intentionally designed to elicit each subject's explanation of what learning means to them. A definition for the "source" of learning was assessed by asking children a third question: When you are learning, where is your learning coming from? The intent of this question was to determine individual and cross-age perceptions of whether learning comes from an external or internal source or both.

The interviews took place over an eight week period from January 8 1993 to March 5 1993. At the onset of each interview time was taken to engage in friendly conversation to not only establish rapport but to put subjects at ease. It was crucial to establish from the very beginning that the interview was based on a non-evaluative activity. The interviewer communicated to each subject that it was not a matter of looking for the right answer, but provided each subject with encouragement to share his or her thoughts about what learning means. A preamble to each interview was administered as an introductory statement prior to asking the set of four questions (See Appendix D - Setting the Stage).

Each subject was individually interviewed by the researcher for about 10 - 15 minutes in a small room located near the school library. The order of the structured questions remained constant throughout, but the use of probes naturally varied according to each subject and interview session.

Subjects' responses to the set of four questions were tape-recorded during the interview session and subsequently transcribed verbatim on to a protocol sheet (Appendix C). All probing questions were included where applicable by means of a code. A letter was attached to each type of probe to serve the purpose of identifying the type of probe used by the interviewer to clarify or extend a subject's response at different times during the session.

## Scoring

Coding the interview transcripts involved both judgment-making and the development of categories prototypic of each age group. Whereas quantitative studies are usually based on preset categories for both analysis and statistical hypotheses testing, qualitative researchers avoid establishing categories prior to the data collection so that they will be open to the patterns of behaviour that emerge from the data itself. The latter was the procedure followed in this study.

The first step undertaken by the researcher was to examine the responses by age to determine commonalities within each age group. Children's conceptions of learning were operationally defined from the pooled responses to Question 1 and 2. Common patterns of thought were then extracted from each age group, which enabled the researcher to develop age-related categories. Theoretical predictions, proposed by Case's (1985, 1992) neo-Piagetian model, helped to generate these categories for each age group. Using this model as a theoretical framework, age-related differences could be explained in terms of age-level postulates of the general theory. Based on these characteristics, prototypical response categories were created, which could potentially reflect any child's conception of learning at any age. A description of these categories is presented in the section describing scoring levels.

Regarding the "Source" task, in which subjects were asked to determine where their learning was "coming from", pooled responses to Questions 3 and 4 were analyzed and rated as one of the following categories:

1. External source
2. Internal source
3. Both external and internal sources mentioned
4. An integrated response

A more detailed description of these categories can be found in the section outlining scoring levels.

Each response protocol was then scored with respect to its conformity to one of the categories in its definition of learning. In addition, the "source" response was also classified and numerically recorded. Although language could be considered an uncontrolled variable in this study, the researcher ensured that each subject's response was not penalized for language immaturity. This was accomplished by paying minimal attention to the surface language structures in the response such as the levels of grammatical, syntactical and vocabulary sophistication, and by devoting more attention to the overall meaning. The scoring criteria permitted a subject to obtain a

score at any level, with a "barebones" response, as long as the "thought units" met the criteria for the postulated structure. Very few subjects in this study displayed language as a barrier in conveying their thoughts to the interviewer.

### Scoring Criteria.

A detailed description of the scoring criteria is stated in this section. First, the researcher holistically examined all 83 protocols and from the response productions was able to identify three different types of information across the four age groups:

1. Responses defining learning as a sequence of specific behavioural events
2. Responses defining learning as a mental act
3. Responses defining learning as a combination of both a behavioural event and mental act

Within each category, more specific "thought units" were defined and a list of descriptors was developed to help identify the type(s) of information children refer to when asked to explain what learning means. These descriptors were created from the "pooled" responses to Questions 1 and 2. Three general categories were established from the data and within each category a list of more detailed and refined descriptors were generated. They are presented in order of complexity.

### 1. Type "B" Information - behavioural events.
#### (Bruner's Landscape of Action)

1. Response relates learning to an external action or an event performed by self as active agent.

These acts can be either:-

a) specific behavioural acts:

For example :-    "Going to school"

"Learning how to read or write"

"Learning about penguins"

"Printing new words such as "you"

"Counting up to 10"

"Going to the library and taking out books."

or    b) general behavioural acts :

For example :-    "Doing something new"

"Trying to do your best at something."


2. Response relates learning to an external action performed by another person; subject becomes passive agent- receiver of information.

For example:- "Someone teaching you something"

"Listening to the teacher"

"It's where you get taught things by people who have already experienced those things."


3. Response relates learning as a social interaction between self and others, both being active participators :-

For example:- "My Dad showed me how to do ___ then I tried to do it on my own."

"My teacher teaches me new things and then I can tell it to someone else."

"I can learn from people who have already learned it."


In other words, there is a recognition of the essentially social and interpersonal nature of learning. However the level of conceptual understanding in this response is that learning takes place in the form of a sequential event, that is, subject is first a passive recipient of information and then becomes an active agent of the newly acquired knowledge.


4. Response incorporates the interactive component of #3, but acknowledges that learning can be reciprocal.

For example:- "You can learn from each other"

"You share your ideas with each other during class discussion."

There is also reference to cooperative learning.

For example:- "You can practise for a test with a partner. You could have somebody give you a little test that has the same kind of questions but not exactly the same questions and you try to answer them. Then you test your partner."

With this response, "Self" is clearly stated as a self-motivated active agent who draws upon a variety of external sources to maximize learning.

For example:- "Other people will have suggestions and answers and you listen to

what they have to say. You might get an idea from what you've heard
from other people or you just use your own."


## 2. Type "M" Information - a specific mental state or process.
### (Bruner's Landscape of Consciousness)


1. A mental state may be represented as a feeling or judgment (Griffin, 1992) which is related to an action or to learning itself. Usually judgmental statements fall into two categories :

    a) **Personal Judgments** - for example, responses that infer personal values such as the following :

    > " Learning is very special to me"
    > " I like learning"
    > " Learning is fun when you get to play games"
    > " Learning is good for you... it helps you... "
    > " Learning can be pretty hard or fun stuff..."


    or b) **Social Judgments** - for example, learning judged in terms of social values and/or implications :

    > " Learning is important because you need to get a good job."
    > " You've got to learn  because you've got to get a good education
    > to get a good job so you can get money to support a family."


2. A mental process may be defined as an internal act functioning separately or concurrently with an external event. Reference to a mental process  may be represented by the following terms: "knowing", "understanding", "remembering", "memorizing", "thinking" and "listening"; or phrases such as: "making things up", "getting good ideas", "Your brain is absorbing the information" and "You have all that knowledge and it's going around and around in your brain."


## 3. Type "B + M" Information - a combination of a
### behavioural event with a specific mental state or process.

Responses that are classified as this type demonstrate that behavioural events in the physical

world are differentiated from but related to mental states.

1. Response demonstrates an awareness of an internal or mental state in terms of a feeling or personal judgment related to an action or to a learning experience in general. This response demonstrates an attempt to coordinate two qualitatively different structures - a behavioural event with a mental state in a unidimensional manner. One structure (behavioural event) is used as a means to draw a conclusion about the other. Generally the event is related to a personal judgment, (e.g.,"getting smarter", "If I do good work I get happy.").

2. Response refers jointly to a behavioural event and two mental states instead of one. A judgment statement and a personal component are related to an event. Information is received from external events or agents and then internalized, (e.g., "I'm thinking about it (work)", "Your brain receives all this information."). External acts are differentiated from but related to mental acts, (e.g., "You're thinking of something and trying it out."). In addition, an attempt to coordinate the two states is made by implying a cause and effect relationship, (e.g.,"You practise a lot so you get better at it" ; " You're getting smarter because you're learning more."). There is a focus on a second dimension in this response. Learning is becoming more personalized. Therefore, this response demonstrates an attempt to coordinate the two structures in a bidimensional manner.

   The integration that is beginning to take place involves the subordination of one structure (external state) to another (internal state), in a means-end fashion. There is a qualitative difference in the concept of "self" as a result of a learning experience with the understanding that personal effort plays a key role in this new "inner" concept of self, (e.g.,"You get better at it if you try your hardest.";"Most of the time you're trying to see what you can do.").

3. Response demonstrates a higher-order relationship in its attempt to integrate internal and external states and/or experiences during the learning process. The two intentional states - a judgment and a personal component are coordinated in an elaborated bidimensional manner. The "personal component" is more differentiated and explicitly defined such that preferred learning styles (seeing, hearing, doing) or different sources are incorporated into the description of learning.

There is more flexibility in the definition of learning. For instance, responses are becoming less specific and more generalized in their descriptions.

For example:

> "To me learning means knowing how to do something without having any problems doing it."
> "It means getting an education so when you grow up you can graduate....get a good job.......make lots of money so you can have a good living."

Different modalities of learning are explained and cause and effect relationships become more complex, (eg.,"If you memorize something, you remember it."; "Someone explains it, and you remember it.").

In addition, responses to question 2: *What is happening when you are learning?* - include a number of alternative behaviours (both external and internal) that take place during a learning experience. There is also an indication of a conceptual understanding that learning takes place in a sequential fashion from external to internal, (e.g.,"The person is telling you what this thing is, and you're putting it into your head.").

4. Response relates learning to a self-motivated intrapersonal act. In other words, learning is defined as an internal state of mind while at the same time the learning process is conceptualized as reciprocal (external to internal ; internal to external). The following examples characterize this type of response:

> "Learning is developing a smarter mind."
> "Learning is gaining knowledge ......expanding your horizons......
> taking in information.....it's when things go into your brain and you just remember it."
> "If you learn something, you can see it in a new light, a different opinion from what you used to have."

There is also an understanding of the interactive nature of learning between one's learning experiences in the physical world and an individual's psychological state. According to neo-

Piagetian theory, social cognition at the Vectorial Stage may be defined as an interpretive structure. This is evident in the individual's description of their personal learning style.

Conceptual understanding of what learning means has moved from the concrete to the abstract at this level. The implication of this response is that learning is an individual process, the subject being the active agent (e.g.,"You take the instruction and make it work."). There is also a recognition that learning can be transferred to "real life" situations in adulthood. For example, "You've got to do math, so you can do your taxes when you're older." These responses demonstrate the beginning of hypothetical thinking.

## Scoring Levels.

### The "Definition" Responses.

Responses were scored and categorized into five levels of structural complexity consistent with the age-level characteristics postulated by Case's neo-Piagetian theory. Using these theoretical characterizations, and the data obtained from the pilot study, a 4-year-old's definition of learning is described as a sequence of behavioural events (e.g., playing, going to school, building towers) or the presence of a learning "agent", such as Mom, Dad, or a teddy bear. Even if there is a conceptual awareness of an internal state at this age, (e.g.,"You learn something you never learned before."), it is predicted that 4-year-olds do not generally relate an intentional state to external events. This level of thinking is defined as the pre-dimensional stage.

Six-year-old thought is labelled unidimensional, with only one intentional dimension considered at a time. An intentional dimension can be defined as a causal relation between behavioural acts and internal states and feelings.

Eight-year-old thought, in contrast, is labelled bidimensional, suggesting that two intentional dimensions will be simultaneously considered and coordinated with a behavioural act but only at a rudimentary level. Prototypic responses at this age level revealed two intentional states: a judgment and a self-component which are both related to a behavioural act.

Ten-year-old responses can be defined as "elaborated" bidimensional. Like the previous substage, two coordinated intentional states are present, but are now represented in a higher-order relationship by integrating and differentiating the "personal component" in the description of learning.

Twelve-year-old thought manifests the emergence of formal-operational thinking and a transition occurs to the Vectorial Stage. New structures transcend those of the previous stage. Learning is defined as an internal state of mind and is conceptualized as both an interactive and reciprocal process between the physical world and the psychological world.

## Level 0 (Age 4 years)

A score of 0 was assigned if the subject's response conformed to the theoretical predictions of 4-year-old conceptions of learning. For instance, if a child referred exclusively to only one type of information, specifically a learning experience in the form of an observable external action or event then he or she received a score of 0. In addition, a score of 0 was awarded if there was the exclusive mention of a learning "agent" (Mom, Dad, or other person(s) or even an object such as a teddy bear).

Responses at this level referred only to a sequence of external events and there was no reference to an internal state. As a result, this level is labelled the pre-dimensional stage.

PROTOTYPIC 4-YEAR-OLD RESPONSES'
CONCEPTIONS OF LEARNING
Pre-dimensional Stage

| Behavioural Event | Intentional State |
|---|---|
| Going to school | I don't know |
| Playing and growing up | |
| Build a zoo, tower | |
| Learning to read | |
| Teddy Bears | |

## Level 1 (Age 6 years)

A score of 1 was assigned if the response conformed to the predictions for 6-year-old conceptions of learning. At this level, a child referred jointly to a learning experience in the form of a behavioural event or learning "agent" (Teacher, Mom, Dad) and a personal judgment that indicated an awareness of an internal state as an outcome to the learning experience.

For example:

> "Sometimes it (learning) gets me frustrated because I make so many
> mistakes"
> "If I do good work I get happy"
> "I learn lots of things when I do my math and spelling, so I can pretty soon
> get to High School".

This level of thought parallels the unidimensional stage hypothesized by Case (1985,1992).

If the term "fun" was included in the response, it was not considered a personal judgment as the researcher considered that subjects were not referring to a mental state but a behavioural act.

<div align="center">

PROTOTYPIC 6-YEAR-OLD RESPONSES'
CONCEPTIONS OF LEARNING
Unidimensional Stage

</div>

| Behavioural Event | Intentional State |
| --- | --- |
|  | (Feeling or judgment) |
| Learning how to read/write | Getting smarter |
| Color or draw | Getting to know stuff |
| Learning about penguins | You have to spell |
| Having fun | Special, something good |
| Getting ready for Grade 2 | It's when you get good ideas. |

## Level 2 (Age 8 years)

A score of 2 was assigned if the response conformed to the predictions for 8-year-old conceptions about learning. These responses referred jointly to a behavioural event and/or a learning "agent" with an attempt to coordinate two intentional states. In a similar manner to 6 year-old responses, a judgmental attitude is mentioned but in addition, a personal component is now incorporated into the response as a second intentional state. This information is described by incorporating "self" in the experience with the understanding that some personal effort is involved to bring about learning. As a result of this personal effort, a new "inner" concept of self is recognized.

For example:

> "You get better at it if you try your hardest"
> "Most of the time you're trying to see what you can do."

The implication of a cause and effect relationship is inferred between the physical and mental states, in an attempt to attribute an internal state as a consequence to this external experience.

For example:

> "We do better things 'cause we learn more about it."
> "You learn the question off by heart and then you can get better and better at the thing you're learning."
> "You grow better in learning and get more things done."
> "If you keep on learning , you'll probably know more things you do right now."
> "You listen to the teacher and that's when you learn how to do stuff."

The following terms are used in this age's responses to describe what is happening during learning:

> figuring out questions
> thinking about your work
> memorizing it
> It takes practise to learn how to........

At this level, there is evidence that an internal process is happening during learning. The two intentional dimensions are simultaneously considered and coordinated to the behavioural event in a rudimentary manner. This level of thought parallels the bidimensional stage hypothesized by Case (1985, 1992).

PROTOTYPIC 8-YEAR OLD RESPONSES'
CONCEPTIONS OF LEARNING
Bidimensional Stage

| Behavioural Event | Intentional State |
|---|---|
| Learning different things | You're most of the time |
| When you learn how to do something | Trying to see what you can do |
| Someone's helping you learn | My things are going into my brain |
| Someone's helping you learn stuff (Math, Social Studies) | It goes into your memory and it means working...that helps |
| You learn | You can't forget it |
| When you learn something | You're thinking, trying to figure out questions |
| You'll just get better at it | |

**Level 3 (Age 10 years)**

A score of 3 was assigned to responses that conformed to the prediction for 10-year-old conceptualizations. These responses demonstrated a higher-order relationship by integrating and elaborating both internal and external states during the learning process. For instance, the "personal component" becomes more differentiated such that different modalities (seeing, hearing, being shown/kinesthetic) and/or different sources (books or people) are incorporated into a more complex description of learning.

The underlying concept in these responses relates learning to a social interactive process. Often self becomes the passive agent (e.g., "Someone explains it and you remember"; "Being taught by the teacher").

Cause and effect relationships include judgmental statements with social implications, (e.g.,"Learning means getting an education so when you grow up you can graduate and get a good job, make lots of money so you can have a living").

The definitions of learning are now becoming more generalized and both external and internal processes are more varied and flexible. There is also a transition towards a conceptual understanding that learning takes place in a unidirectional fashion from external experiences to internal/mental processes. (See description B + M #3)

<center>

PROTOTYPIC 10 YEAR-OLD RESPONSES'
CONCEPTIONS OF LEARNING
Elaborated Bidimensional Stage

</center>

| Behavioural Event | Intentional State |
|---|---|
| Learning means getting a good education because when you grow up you need to learn | Someone explains it and you remember it |
| | You listen and write things down |
| Getting to know new things | Every time I do it, I get a little better at it |
| You've got to learn 'cause you've got to get a good education to get a job to work | You're knowing more |
| | Stuff is flowing through your brain |
| | You have to think in order to learn, learn in order to think |
| Learning means people teaching | |

**Level 4 (Age 12 years)**

A score of 4 was assigned to responses that conformed to the predictions of 12-year-old thoughts about learning. These responses manifested a more "internalized" sense of what learning is. There is an understanding of the "inner world" of learning which marks a shift from an "intentional" level of understanding to an "interpretive" level of understanding consistent with Case's neo-Piagetian model of cognitive development. Learning is described as the increase of knowledge, as "memorizing things so you can remember it in your brain until you need it later on", as "knowing and understanding things you didn't know before". At this level of conception, learning is perceived as an increase in knowledge together with the concept of understanding.

An intrapersonal perspective relating to a subject's personal style is evident in his/her response to Question 2: *What is happening when you are learning?* The interaction of self in the physical world with reference to a variety of sources and experiences is more differentiated at this level. Further, there is a notable transition from "practising" to "memorizing" and a developing awareness of building on prior knowledge.

PROTOTYPIC 12-YEAR- OLD RESPONSES'
CONCEPTIONS OF LEARNING
Univectorial Stage

| Behavioural Event | Interpretive State |
|---|---|
| Expanding your horizons so when you're older you'll know what to do | If it's something I like, it stays in my mind and I remember it |
| Gaining new knowledge | You have to understand it before you can learn it |
| Being able to experience new things | |
| Learning is thinking | Think it through before I can understand it |
| It's keeping things organized and stored in your head for when you need them, like in a test | Trying to understand what you're thinking<br>Think about other things that I know will relate to that |
| Remembering what people tell you | Studying, you memorize it so you'll know it |
| | Observing, listening, trying it |

## The " Source " Responses.

Children's responses to the question, *"When you are learning,where is your learning coming from?"*, were scored as follows:

1. An External Source. If learning was located in either an action or a "learning agent" (e.g., going to school, an object such as a book, or another person usually an adult (Mom, Dad, or teacher), a score of 1 was assigned.

2. An Internal Source. If location was made within the physical or psychological self (eg., head, brain, mind), a score of 2 was assigned.

3. External and Internal. If both Sources are recognized independently of each other, a score of 3 was assigned.

4. An Integrated Response. External sources are distinctly combined with an internal source demonstrating a conceptual understanding of their interrelatedness.

   For example:-

   > "You read it and then you think it over."
   > "Learning can come from a number of places but practice comes from you, from the brain, from things around you...like when you're listening, you just remember it."
   > "It's coming from words. It's like the brain is talking ...talking outside and talking inside."
   > "From my brain and people and things"
   > "Somebody talks to me, my brain will store it and explain it to me."
   > "It's like taking something from the outside into the inside...like taking something from outside of a box and putting it inside of the box and keeping it there".

A score of 4 was assigned for such a response.

The complexity of the "Source" responses varies with age. In the early ages there is a wide gap between external and internal sources. They are stated in isolation of each other but as the student matures intellectually, there is a significant closing of this gap. There is an increasing awareness of learning taking place in a sequential manner from the external to the internal. From the ages of 6 to 12 years, a funnelling process occurs until the interrelatedness of the two sources is clearly identified. This synthesis of an external and internal source is generally recognized by 12 years of age. In addition, there is also evidence that 12-year-olds are beginning to make a shift towards developing a conceptual understanding that learning may also be initiated from the internal to the external.

A second rater, unfamiliar with the study, was brought in to measure the interrater reliability of the scoring criteria. The researcher provided the rater with a copy of the scoring procedures and gave a brief explanation of the different levels of performances. A practice session then followed until the researcher felt the rater was both comfortable and competent to score protocols independently.

A random sample of six interview protocols representing each of the four age-groups was scored by the second rater. Initially 5 out of 6 scores were confirmed in the 6-year-old group, and discrepancy over the one protocol was resolved through discussion, resulting in 100% agreement. There was total interrater agreement on the scores for both the 8-year-old and 10-year-old age groups. Regarding the scoring 12-year-old protocols, an initial 67% agreement was obtained. Most discrepancies in scoring were resolved through discussion resulting in 83% agreement for this age group. The overall independent ratings of the children's responses resulted in 96% agreement.

Statistical analyses of the children's scores will be presented in the next chapter.

# CHAPTER 4: RESULTS

The purpose of this chapter is to determine if there is empirical support for the hypothesis that children follow a cognitive developmental progression in their conceptual understanding of what learning means. To recap briefly, the main goal of this study was to confirm the prediction that there would be significant age-related differences in level of understanding of the meaning of learning.

To test this hypothesis, qualitative data generated from the interview protocols were coded numerically to be analyzed quantitatively.

The quantitative analyses in this chapter are based on two scores extrapolated from the interview data. The first section discusses the results of a statistical analysis of children's responses to the "Definition" task which requested a meaning for the mental term 'learning'. The second section provides an analysis of age-level responses to the "Source" questions which required the students to tell where learning "comes from".

## Analysis of the "Definition" Task

### Descriptive statistics.

Table 4.1 provides the means and standard deviations of the level scores attained by each of the four age groups for the "Definition" task. These mean scores are compared with the predicted score based on the expected age-level responses consistent with Case's model and operationalized in the scoring criteria.

### Analyses of variance.

A one-way analysis of variance (ANOVA) for gender was performed to determine the effect of gender on the mean level scores. The results indicated no gender effect and the sample was analyzed as a whole.

A one-way analysis of variance (ANOVA) was performed on mean level scores to determine whether there was a significant difference due to age. The results indicated a significant effect for age ($F$ (3,1) = 115.98, $p$ < .0001). A summary of these results is provided in table 4.2.

The Bartlett test was administered to test homogeneity of variance. Results indicated that the assumption was not violated (Bartlett-Box $F$ (3,1) = .42, $p$ = ns).

**TABLE 4.1**

Mean (SD) Level Scores by Age Group (Predicted and Obtained) on "Definition" Task

| Age | Predicted Mean | Observed Mean (SD) |
|-----|----------------|--------------------|
| 6   | 1              | 1.1 [.55]          |
| 8   | 2              | 2.1 [.45]          |
| 10  | 3              | 3.05 [.51]         |
| 12  | 4              | 3.7 [.45]          |

**TABLE 4.2**

Analysis of Variance Summary Table for the Mean Level Scores on the "Definition" Task

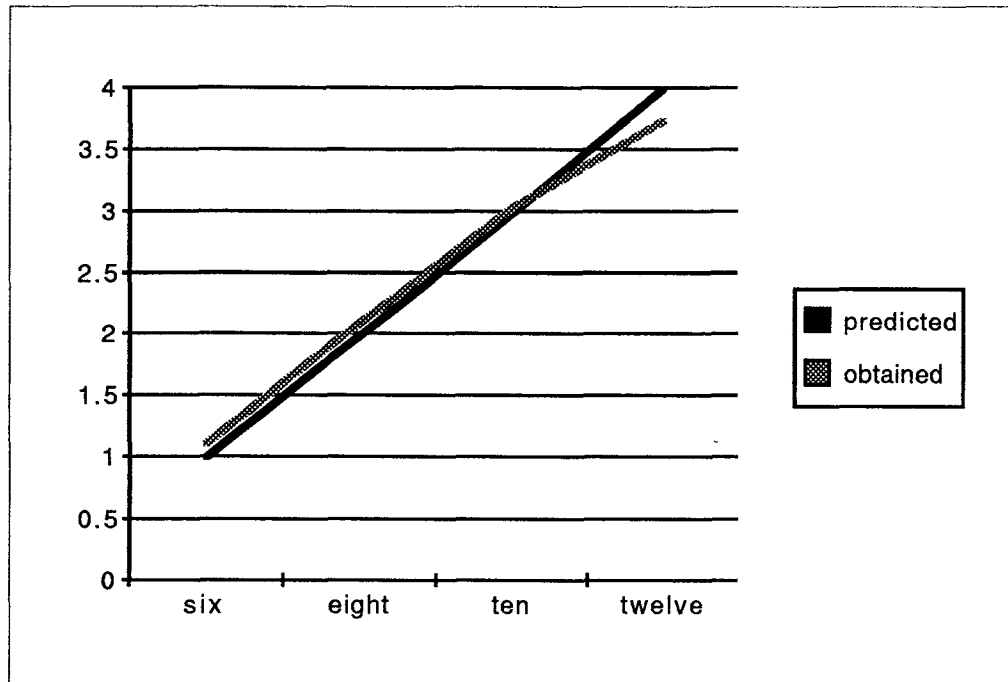| Source | Sum of Square | DF | Mean Square | F Ratio | F Probability |
|--------|---------------|----|-----|----|----|
| Between Groups | 83.62 | 3 | 27.87 | 115.98 | .00 |
| Linear Term | 83.25 | 1 | 83.25 | 347.6 | .00 |
| Quadratic Term | .50 | 1 | .50 | 2.08 | .15 |
| Cubic Term | .05 | 1 | .05 | .19 | .67 |
| Within | 18.99 | 79 | .25 | | |

Post-hoc comparisons were then calculated to specifically locate where the age differences occurred. The Scheffe Post-hoc Multiple Comparison method with alpha set at .05 was applied for this purpose and the results showed significant differences between each age group.

**Test for linear trend.**

Figure 1 graphically represents in linear form the observed relationship between age and mean level scores attained. A comparison is made between the observed and predicted age-level

means for each of the four groups. The predicted line was based on the expected mean level score

for each age group according to Case's developmental model.

**FIGURE 1**

Mean Scores achieved by Four Age Groups on "Definition" Task
in Relation to the Predicted Linear Trend

A trend analysis was performed to determine the linear relationship between age and level interaction to see if the predicted developmental progression was attained. The results indicated a significant linear trend ($F$ (3,1) = 347.60, $p$ = < .0001) with non-significant deviations from the predicted linear trend (Table 4.2). Although there is a slight indication at the 12-year-old level of a decrease in mean level score, no curvilinear trend was observed. The quadratic term was not significant. The reason for a lower mean level score for this age group could be a result of a ceiling effect since subjects' response productions could only be allocated a score of 4 or less. No criteria was established to determine a level 5 response that would rate above this predicted age level. As a consequence, no 12-year-old response received a score of 5.

Within all four age groups there was a certain percentage of response productions that scored above or below the prototypic level. Table 4.3 summarizes the percentages of subjects scoring above, below and at the prescribed level. The results indicate that each group performed close to age-level expectations on the "Definition" task. Although the performance of the 12-year-old group is slightly lower than the theoretical expectation, this deviation may be accounted for by the presence of a ceiling effect in the scoring criteria. However the results in general suggest that the hypothesized prototypical knowledge components unique to each age level were empirically validated.

**Table 4.3**
Percentages of Responses Falling At, Above and Below the
Prototypic Level for Each Age Group.

| Years | 6 | 8 | 10 | 12 |
|---|---|---|---|---|
| Predicted Level | 70% | 80% | 75% | 74% |
| Percentage Above | 20% | 15% | 15% | *0% |
| Percentage Below | 10% | 5% | 10% | 26% |

* A result of a ceiling effect, since scoring criteria above this predicted age level were not established.

In summary, the results of this statistical analysis indicate significant differences in response performance on the "Definition" task between all four age groups. This verifies the prediction of age-related differences in conceptual understanding of the meaning of learning across all four age groups.

The significant linear trend supports the hypothesis that children's levels of understanding of the meaning of learning increase in complexity with age. The predicted developmental progression through the four age groups was established. Further the significant linear trend confirms that the majority of children responded at the predicted level according to age.

## Analysis of the "Source" Task

Identical procedures were performed on the responses related to the "Source" task. To recap briefly, children's responses to the question: "When you are learning where is your learning coming from?" were numerically categorized as follows:

A score of 1 was assigned if the response referred to an external source;

A score of 2 was assigned for an internal source;

A score of 3 was assigned for the recognition of both an internal and an external source; and

A score of 4 was assigned to an integrated response that demonstrated a conceptual understanding of their interrelatedness.

### Descriptive statistics.

Table 4.4 presents the means and standard deviations of the level attained at each age for the "source" responses.

### Analyses of variance.

A one-way analysis of variance (ANOVA) for gender was performed to determine the effect of gender on the mean level scores. The results indicated no gender effect and the sample was analyzed as a whole.

## TABLE 4.4
Mean (SD) Scores on the "Source" Task by Age Group

| Age | N | Mean (SD) |
|-----|-----|-----------|
| 6 | 20 | 1.85 [.88] |
| 8 | 20 | 2.15 [.99] |
| 10 | 20 | 2.85 [1.09] |
| 12 | 23 | 2.9 [1.38] |

A one-way analysis of variance (ANOVA) for age was performed on the mean level scores to determine whether there was a significant difference due to age. The results are summarized in Table 4.5. The analysis indicated a significant effect for age ($F$ (3, 1) = 4.63, $p < .01$).

The Bartlett test was administered to test homogeneity of variance. Results indicated that the assumption was not violated (Bartlett-Box $F$ (3,1) = 1.55, $p$ = ns).

Multiple comparisons (Scheffe) were conducted to locate pairwise age differences. The Scheffe procedure revealed a significant difference ($p < .05$) between 6-year-olds and 12-year-olds only.
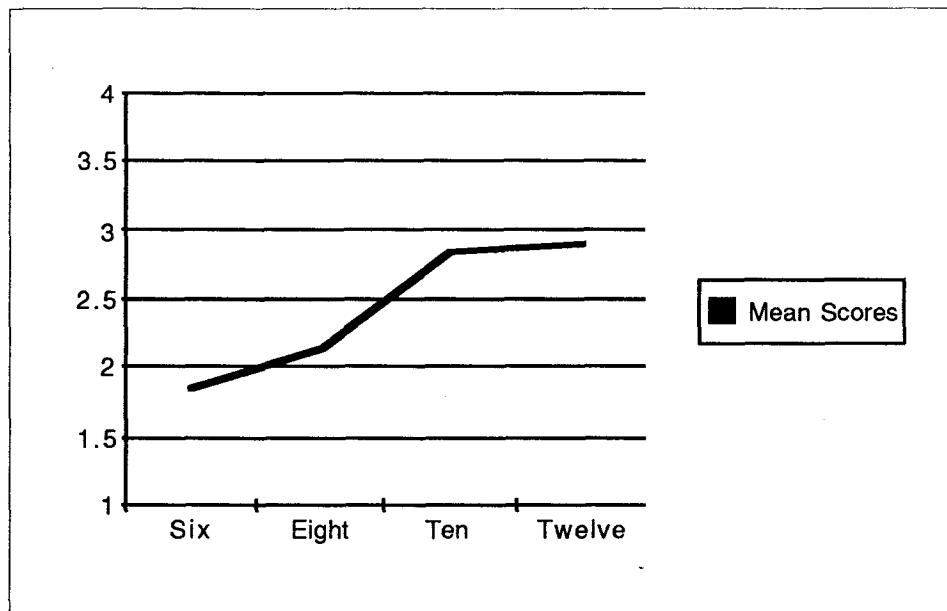
### Test for Linear Trend.

Figure 2 graphically shows the observed relationship between age and mean scores on the "Source" Task. A significant linear trend (F(3,1) = 13.02, $p < .001$) was obtained with no significant deviation from this trend.

**TABLE 4.5**
Analysis of Variance Summary Table for the Mean Level Scores on the
"Source" Task

| Source | Sum of Square | DF | Mean Square | F Ratio | F Probability |
|---|---|---|---|---|---|
| Between Groups | 17.13 | 3 | 5.71 | 4.63 | .01 |
| Linear Term | 16.01 | 1 | 16.01 | 13.02 | .00 |
| Quadratic Term | .29 | 1 | .29 | .24 | .63 |
| Cubic Term | 1.08 | 1 | 1.08 | .88 | .35 |
| Within | 97.48 | 79 | 1.23 | | |

**Figure  2**
Mean Scores achieved by Four Age Groups on the "Source" Task in Linear Form

The following bar graphs (Figures 3, 4, 5, and 6) graphically display the distribution of the four levels of "Source" responses in percentages at the ages of 6 years, 8 years, 10 years and 12 years respectively.

An analysis of the responses provided by 6-year-olds indicated that:

    45% expressed an external source

    25% expressed an internal source

    30% expressed a combination of both

No subject at this age provided an integrated response.

The distribution of 8-year-old responses was as follows:

    35% provided an external source

    20% provided an internal response

    40% provided a combination of both

     5% provided an integrated response

The distribution of 10-year-old responses was as follows:

    20% provided an external source

     5% provided an internal source

    45% provided a combination of both

    30% provided an integrated response

The distribution of 12-year-old responses was as follows:

    30% provided an external response

     4% provided an internal source

     9% provided a combination of both

    57% provided an integrated response

Table 4.6 presents the pattern of performance of each subject, across four ages and four complexity levels for the "Source" task. They are plotted in relation to each subject's score obtained on the "definition" task.
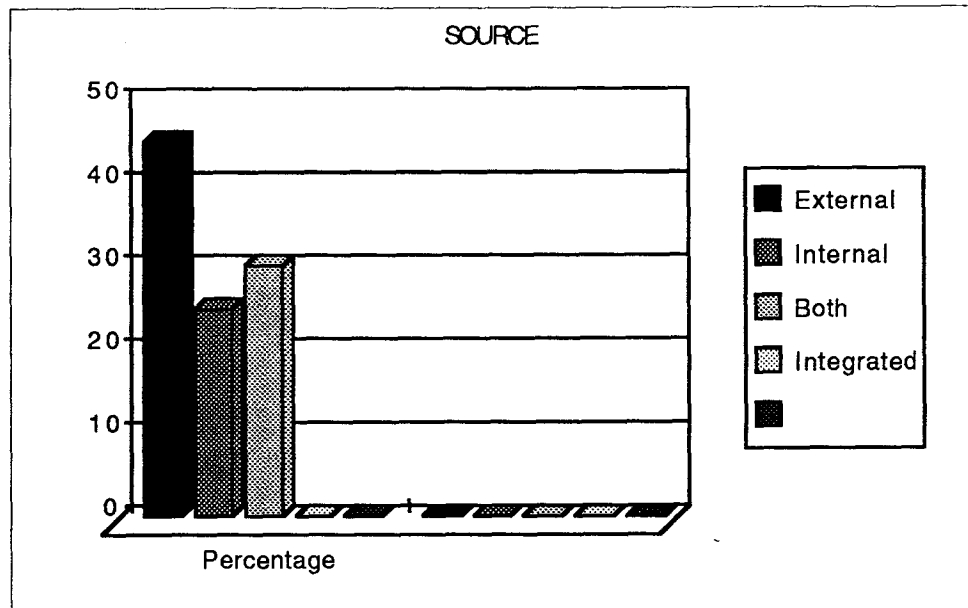
Figure 3
Distribution of "Source" Responses
Age 6

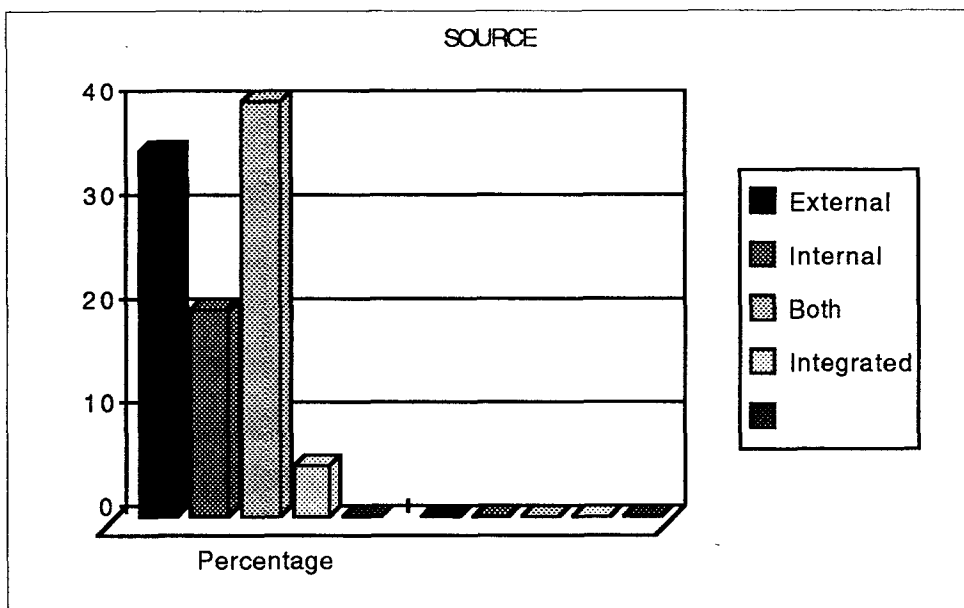**Figure 4**
Distribution of "Source" Responses
Age 8

Figure 5
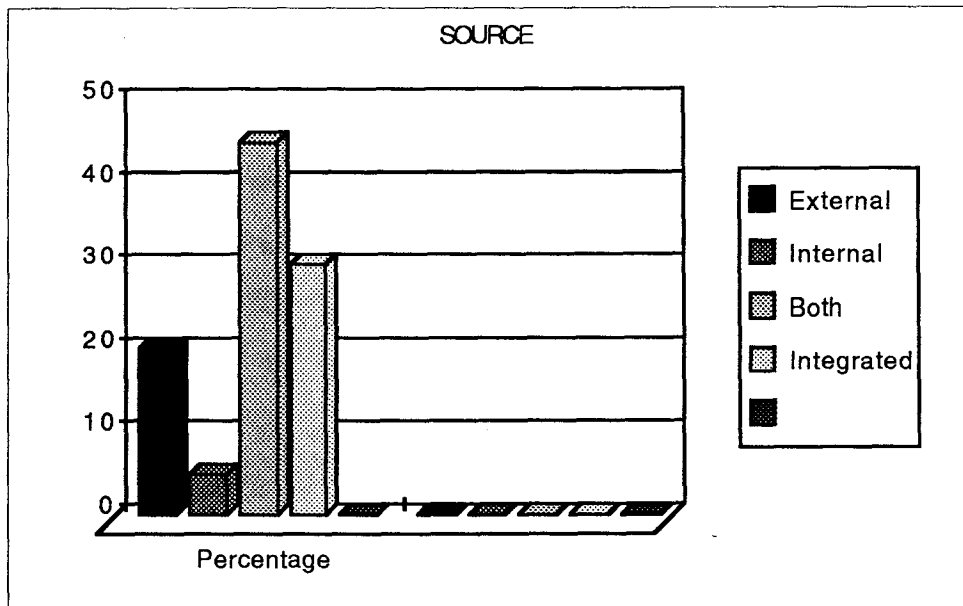Distribution of "Source" Responses
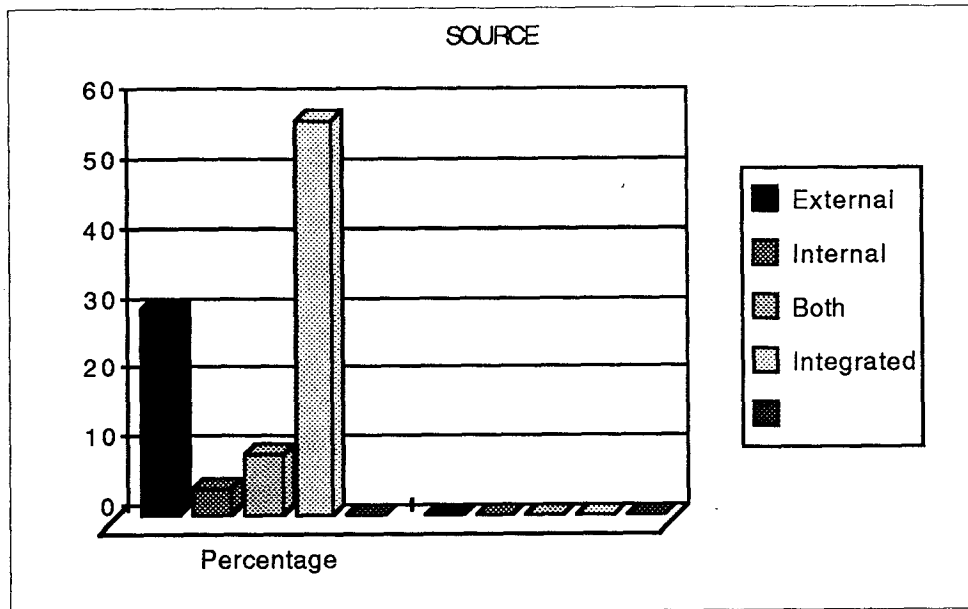Age 10

**Figure 6**
Distribution of "Source" Responses
Age 12

**Table 4.6**
Pattern of Performance of Each Individual Subject's
Response to the "Source" Task

| Level | Source Response | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|
| 4 | Integrated |  |  | *** | *********** |
|  | Both |  |  |  | ** |
|  | Internal |  |  |  |  |
|  | External |  |  |  | *** |
| 3 | Integrated |  | * | *** | * |
|  | Both |  |  | ******** |  |
|  | Internal |  |  | * | * |
|  | External |  | ** | *** | **** |
| 2 | Integrated |  |  |  |  |
|  | Both | * | ******* | * |  |
|  | Internal | ** | **** |  |  |
|  | External | * | ***** | * |  |
| 1 | Integrated |  |  |  |  |
|  | Both | ***** | * |  |  |
|  | Internal | *** |  |  |  |
|  | External | ****** |  |  |  |
| 0 | Integrated |  |  |  |  |
|  | Both |  |  |  |  |
|  | Internal |  |  |  |  |
|  | External | ** |  |  |  |

In summary, the results of a statistical analysis on children's "Source" responses indicate a significant difference between the 6-year-old group and 12-year-old group only. Although not statistically different across all age groups, the "source" attributions showed a steady increase in complexity as children matured with age.

An interpretation of the results of this study will now be discussed in the final chapter.

# CHAPTER 5: DISCUSSION

The chapter will begin with a detailed interpretation of the results of this study. It will examine children's conceptions of the meaning of learning followed by children's conceptions of the "sources" of learning, that is,whether learning comes from an internal or external source or both. Cross references and further research implications will be included when deemed appropriate. This section will be followed by a summary of the overall results of the study, approached from different perspectives. The chapter will conclude with a short discussion on possible educational implications as a result of this study.

The purpose of this study was to chart conceptual understandings of the meaning of learning at the ages of 6, 8,10 and 12 years and to describe qualitatively different substages in children's development of ideas of learning. Four different conceptions of learning were identified which became systematically more complex with age. These conceptions were consistent with cognitive development as modeled by Case (1985,1992), a neo-Piagetian theorist. The predicted developmental progression in children's conceptualization of the meaning of learning was supported. The major limitation of the study is that the participants in this project were randomly selected from only <u>one</u> elementary school. This therefore restricts the possibility of generalizing the results to a broader population of students of similar ages.

This study revealed that children's conceptions of learning from the ages of 6 years to 12 years take distinct forms. These forms were analysed from both a structuralist and content-focused perspective using Case's model of cognitive development as a theoretical framework. To recap briefly, neo-Piagetian theory relies heavily upon content-related information in response to a specific concept under investigation, in order to analyze the levels of performances in terms of their cognitive structural complexity. From a structural standpoint, prototypical responses of 6-, 8-, and 10- year-old subjects reflected the "intentional" structure hypothesized as typical of the Dimensional Stage of Case's theory, while prototypical responses of 12-year-old subjects marked a distinct transition to the "interpretive" structure typical of the Vectorial Stage.

During the interview sessions, it became very apparent that this study presented children with a challenging task by asking them to explain the meaning of learning. The requirement of an explanation of such a phenomenon entails the understanding of learning as a whole. Since learning is not one phenomenon but many, depending on what learning is about, both the context

and the content had to be taken into consideration when defining structural units of thought. Structures represent a relation between the child's way of thinking and the content on which the thinking is focused. Content itself depends heavily upon a child's experience and development. As a consequence of taking the learner's perspective on the nature of learning, everyday learning situations have to be in focus as children draw upon their experiences to explain such a phenomenon. In other words, children construct a conceptual understanding of learning by attempting to relate what they already know or have experienced about learning.

Surface differences in content were generally ignored in the age-level scoring criteria since the postulates of the neo-Piagetian model are couched at the level of deep structure and general domain content. The coordination between the external world of action and the internal world of mental states and processes captured the general pattern of subject responses in their attempts to articulate their conceptions of learning. Further, by representing the underlying structure that comprises children's responses, a basis is provided for developing scoring criteria. For example, if intentional state information in the form of feelings, judgments, or mental processes was related to a sequence of behavioural events in a child's response, an appropriate score based on theoretical predictions was assigned.

Initially, many subjects, particularly at the younger age levels, found this task quite difficult but with the help of probes and time to think, all subjects were able to respond to the set of four questions. The majority of subjects admitted that the opportunity to explore their own thinking about the meaning of learning was a new experience to them in terms of articulating their understanding of and clarifying their beliefs about what learning means. As one student perceptively mentioned during the conversation, "Sometimes you don't even know you're learning...Like probably right now I'm learning."

Children's conceptions of learning were dealt with in terms of two related aspects: what is learning, dealing with children's understanding of learning as a whole and the "where" aspect, investigating children's perceptions of the "source" of learning, that is, whether they think learning is coming from external or internal sources or both. The first part of the chapter will discuss the results of the study as they relate to these two aspects.

## The"Definition"Task

Children's responses to the "definition" questions supported the age-level predictions of Case's (1992) model. To ensure that the results did not simply reflect language competence as children matured rather than their level of understanding of learning, "bare-bones" responses were accepted at any level as long as they complied with the scoring criteria for the postulated structure. Verbal fluency, therefore, did not become a contributing factor to the increase in complexity of older children's responses. This concept of a "bare-bones" response was taken from the Griffin (1992) study briefly described in Chapter 2. General characterizations of children's development in their conceptual understanding of learning will now be summarized.

Children's concept of learning at the age of 6 years is generally associated with school activities such as learning to read, write, or do math. This could indicate that learning is perceived as a phenomenon that mainly takes place within the school context. The definition of learning is characterized by a sequence of behavioural events related to school. Learning as a consequence of doing an activity or a skill represented the common pattern of thought of this age group. In other words, learning was defined as a sequence of external actions that resulted in a changed internal state such as "getting smarter" or "getting to know how to do something." Generally speaking, a 6-year-old's conception of learning is equated with a positive mental state as evidenced in their mental reference "to know." This supports Flavell's (1988) belief that young children have learned that they can be "cognitively connected" to things in the external world generally through sight, and in light of this study, through action also, for example: "You need to write a lot...to help you know stuff." The term "know" was generally used in response to question 2, "What is happening when you are learning?" In the context of Bruner's (1986) theory, this sort of coordination is characteristic of thought in the narrative mode - Landscape of Action in the form of a behavioural event and the Landscape of Consciousness in the form of an internal state. Although 6-year-olds were able to demonstrate a clear distinction between external events and internal states, they were unable to explain psychological activities involved in the learning process that promote the "knowing" of something. In fact they indicated a very limited repertoire of mental processes as they relate to learning. From a structural perspective, responses typically reflected the first substage of Case's Dimensional period of cognitive development, which postulates two qualitatively different structures (action and consciousness) coordinated in a unidimensional fashion.

Children at this age were unable to define learning in general terms. Their responses tended to rely heavily upon their immediate experiences, for instance, "learning about penguins"; "printing new words" and "learning how to share books". The child's world at 6 years of age is a world of actions in which they are actively involved and this is clearly reflected in their way of thinking. The framework within which a 6-year-old's understanding can be categorized is that learning means to become *able* through experience in terms of action. Thus learning is perceived as a change from one state to another. For example, learning in terms of "how to do something" is seen as a distinction between *not being able* and *being able*. This indicates a transition from one state to another and children as young as 6 years are developing an awareness of this gradual change occurring within them. When this happens, an important step has been taken in a child's manner of thinking. The acknowledgment of an improvement in ability implies the understanding of a process progressing from *being able* to becoming *more able*. Underlying this conception, there is the idea of continuity: learning taking place over time along a continuum, which is advocated in the ministry document, Year 2000: A Framework for Learning (1990) and is also consistent with research (Bruner,1986; Pramling,1990; Saljo,1976; Vygotsky,1978). This study can conclude that children as young as 6 years are aware of their own active role in learning and also of their own thinking, but do not yet relate their own thinking to learning, nor their active role to thinking.

Whereas 6-year-olds had a very limited repertoire of mental processes associated with learning, 8-year-olds demonstrated an awareness of different cognitive processes which interact with external information to promote the acquisition of knowledge. Definitions of learning were more general and less specific, but the concept of learning *by doing* is still present in an 8-year-old's thought. In response to Question 2, "What is happening when you are learning?" different mental references were incorporated in appropriate contexts, such as "figuring out the questions";"thinking about it (the work)" and "memorizing so you can't forget it." This indicates that, at the age of 8 years, children are consciously aware of mental activities and are beginning to develop an understanding of the different ways the mind acts upon information during the learning process.

The most significant qualitative difference from 6-year-old conceptions is the inclusion of personal effort in the learning process. It may be that it is at this point in a child's development that the true concept of learning is born. When a child becomes aware of his/her own active role in the

process of learning, an important step has been taken. This more "mature" conception of learning implies that 8-year-olds have developed a deeper understanding of the role of experience in learning as compared to 6-year-old conceptions. Although children at 6 years of age are cognizant of being active learners, there was not a conscious awareness of the significance of personal effort in the learning process. The concept of practice in order to *learn something* was an active indicator of 8-year-olds' understanding of their role in the learning process. From this, it can be concluded that children at this age believe that an activity has to be consciously exercised in order for learning to take place. When children grasp this concept of learning as being able to do something through practice, continuity in terms of gradual improvement is understood. The data suggest a significant difference between 6-year-old and 8-year-old conceptions of learning. With the former, the concept of knowing is attributed to external events which supports Pillow's (1988) externalization hypothesis (discussed in Chapter 2), while the latter relate learning to practice and demonstrate an understanding of cognitive activities such as memorizing involved in the process. In other words, there is a significant difference in exercising a skill on purpose and learning it due to the fact that one happens to be involved in its execution.

In the context of neo-Piagetian theory, prototypic responses of 8-year-olds are consistent with the Bidimensional Stage of Case's model. A behavioural event was coordinated with two intentional states, that is, a mental process and a judgment statement associated with a "personal effort" component.

During the early 1980s, inquiry into children's beliefs about effort and interest as they relate to learning was conducted. A number of studies indicated that children believe that interest and effort influence learning. For example, Wellman, Collins, and Glieberman (1981) found that 5-year-olds understood that effort and the number of items to be recalled contributed to memory performance; effort was regarded as the more important variable. The authors concluded that these results suggest that effort may be a particularly salient aspect of mental activity for young children. This notion is consistent with the findings of the present study.

Similarly, children tend to judge interest as influencing learning and also as affecting performance (Miller & Zalenski,1982). In Miller and Zalenski's study, *interest* was conveyed as a positive characteristic by 3- and 4- year-olds, similar to *trying hard*, and both were correlated with positive outcomes. The authors predicted that "children may conceive of variations in the intensity of mental activity as affecting performance before they understand specific activities and their

consequences" (p.871). What can be determined from these studies is the fact that children relate positive attributes to positive outcomes but are yet unable to understand the underlying causal relationships involved.

However, by the ages of 6 and 8 years, the findings of this study suggest that children are developing a repertoire of psychological activities associated with learning. It is also evident from the response productions that, during these two years, children make a dramatic increase in their understanding of their own involvement in the process of learning. However, this raises the concern that the younger children may have conceptions of learning which they do not express spontaneously. In the interview situation the main idea was to enter into a developing interaction with each subject, in terms of motivating and stimulating the child to explore his/her thoughts to the greatest extent possible. It may be quite possible that children's conceptions are dependent on the questions being asked. For many of these children it was their first reflection about the phenomenon of learning since generally speaking, learning is usually taken for granted. All of a sudden, the children were confronted with a task in which they had to think about and verbalize what is usually "taken for granted."

The study confirms a hierarchical structure of qualitatively different conceptions as children mature which are consistent with the age-related postulates of Case's model. In one respect, one could say that these conceptions are additive. Older children revealed a greater variety of modalities (seeing, hearing, being shown) and sources of learning (teacher, books, T.V.); they had access to a wider repertoire of cognitive strategies to promote learning. To have a more differentiated repertoire means a greater flexibility with regard to content. Such was the case with 10-year-old responses which reflected a knowledge of a variety of learning strategies and preferred learning styles. The general conception of learning at this age can be characterized as information absorbed through listening, watching or doing, which is subsequently internalized and stored in the brain. In other words, there was a common understanding of learning taking place in a sequential fashion from external stimuli to an internal state of knowing with an increased knowledge of mental processes involved in the learning process.

Counter to 6- and 8-year-olds' conceptions of learning, the general pattern of 10-year-old thought was the conception of self as the passive recipient of knowledge as was evidenced in their explanations of the meaning of learning. Comments such as the following reflect this conception of self as a passive learner: "listening to the teacher"; "getting taught how to do things (math, or

science etc.); "Learning means people teaching you"; "Learning is when a teacher asks or assigns a question and you have to answer it"; "Learning is when you get taught things by people who have already experienced those things." The results of a comparison between the general pattern of responses to question 1 and 2 suggested a possible contradiction of understanding of which subjects may have been unaware. For instance, prototypic responses to question 2: "What is happening when you are learning?" expressed an awareness of the mind as an active receiver of information, for example, "stuff (information) is flowing thorough your brain all the time while you're learning."; "Your brain is working harder...it's thinking."; "When you have a math question to answer, you put your brain to work to sort the question out to find the answer." ; "You have to think in order to learn, and you have to learn in order to think." Such comments indicate that 10-year-olds are developing a conception of their own active mental experiences even though they view themselves as mainly passive learners. This contradiction of thought suggests that the more salient or visible aspects of learning continue to dominate 10-year-old conceptions. For example, often when asked, "What are you doing when you are learning?" responses tended to lean towards the visible or more overt external behaviours such as "paying attention in class"; "taking notes if the teacher is talking"; "looking in books." Conceptions of learning at this age-level could be considered in a transitory phase of bridging the gap in conceptualizing learning in terms of concrete thought to conceptualizing it abstractly or symbolically.

The concept of learning at the 10-year-old level corresponds to the final substage in Case's Dimensional Stage of cognitive development. Responses represent an elaborated bidimensional level of understanding of learning by integrating internal and external states in a more complex fashion. This is reflected by references to preferred or alternative cognitive processes children experience during the learning process.

Another common factor that can be extracted from 10-year-old response data is the emphasis on the importance of learning from a social judgmental perspective, for example, "Learning means getting a good education, so when you grow up you can graduate, get a good job...make lots of money so you can have a living." Children's conceptions of the meaning of learning are a consequence of their reflections on experienced reality and the impact of social and environmental influences on their beliefs about learning. Children's learning experiences stem from two different milieu, their home situation and elementary school. Within these two social settings, children are exposed to a variety of learning tasks, experiences, and influences and, as a

consequence, they reflect upon different realities. In spite of individual varied learning experiences, it was possible to chart common patterns of thought at each of the four age-levels. Learning defined from a social judgmental viewpoint emerged at the 10-year-old age-level and extended over into the next age group. It seems reasonable to conclude that children's conceptions at these age-levels may be strongly affected by social and parental influences. Further investigation in this area would be of value.

Learning as a social interactive process is also characterized in 10-year-old responses. This concept is very clearly summarized by one subject's comment: "Other people will have suggestions and answers.... you listen to what they say and you might get an idea yourself." The data suggest that children are beginning to acknowledge and appreciate others' viewpoints in order to make sense of their own learning about something.

Although it is relatively straightforward to describe the minor transitions that occur within one stage of neo-Piagetian theory, the analysis of a stage transition is often difficult to interpret. According to Case (1985), " The appearance of new structures at each stage appears to have a certain mysterious quality, as though they arose out of the depths of the child's intrapsychic life, by some little-understood transformation of the cognitive system as a whole" (p.72).

The results of this study indicate the development of new structures as an outgrowth of the previous stage. The two new structural units of thought that characterized the responses of 12-year-olds were:

a) Psychological Self and its relationship to learning; and
b) Social Interactive Process of Learning.

As Case (1985) articulated: "The emergence of formal-operational groups has to await the consolidation of more concrete operational groupings." (p.72). Children at 10 years of age perceive learning taking place from external experiences to internal processes which would account for the combination of concrete definitions of learning in terms of salient observable learning behaviours (e.g. "Learning to me is going to school, sitting down in a desk and learning from the teacher what she thinks.") and the emergence of abstract explanations of mental processes, (e.g.,"If you memorize something you remember it.") The link between the outer world and the inner world is expressed in terms of acquiring information through listening, watching, or doing.

Twelve-year-olds conceptualized learning in abstract terms such as, "Learning is

developing a smarter mind." Learning was generally perceived as an internal state of mind that was associated with the concept of understanding. A higher-order conception emerges with the link between gaining knowledge and understanding. The mental term "understanding" was present in the majority of protocols at this age and was applied in the context that, without understanding, learning (in school) cannot be transferred to "real life" situations in the big world, for example, "You've got to learn math so you can do your taxes when you're older." Similar to 10-year-old protocols, the "personal component" perspective continues to remain a prominent feature in 12-year-old responses to the set of questions. However, there is one significant difference observed between the two age-groups with regard to the context in which it is described. A transition has been made from the concept of self as a passive to an active agent during the learning process. Subjects at 12 years of age presented themselves as learners intrinsically motivated to gain knowledge through experiences in the physical world. As a consequence, conceptualization of learning transcended from the unilateral direction (external to internal) to an understanding of learning as a reciprocal interactive process (external to internal or internal to external) possibly as a reflection of the changed image of self as the active agent in the learning process.

Whereas 10-year-old responses represented the predicted "intentional" structure (i.e. learning activities were qualified in terms of mental states that motivate them, such as personal or social judgments), 12-year-old responses indicated the presence of the predicted "interpretive" structure by providing a meta-perspective of one's interplay of psychological activities and physical experiences to promote learning. In this sense, learning assumes a psychological dimension which reflects formal-operational thinking.

At this point in the discussion, it is important to mention that a possible ceiling effect may be the contributing factor towards a relatively low mean score of 3.7 at the 12-year-old level of conception. Scoring criteria for a Level 5 (a predicted score for a14-year-old conception of learning) was not generated and consequently no 12-year-old subject was allocated a level 5. However three protocols were rated as 4+ due to the presence of additional information that surpassed the criteria expected at Level 4. For example, included in these responses were references to the following:

a) the concept of building on prior knowledge, for example,
   "I'm trying to understand and think about other things that I already know that will relate to that."

b) the concept of restructuring knowledge, for example,
"I rehearsed it (new information) in my brain and put it how I want it....for example if somebody teaches me something like math, I find an easier way.... I would do my own way rather than theirs."

c) the concept of learning as the abstraction of meaning, for example,
"If you learn something, you can see it in a new light....have a different opinion from what you used to have." or "My brain takes in the information and explains it to me, if I didn't understand it, I guess the brain would work it through more and help you know."

These conceptions of learning assume a psychological dimension in their understanding of how cognitive processes are able to "interpret" or restructure information received from the environment. In other words, learning is conceived as an interpretive process with the intention of making sense of the world in which they live. Responses incorporating information of this nature indicate the presence of a second dimension to the definition of learning. An attempt has been made to coordinate two interpretive structures to the Psychological Self (conceptualized as an active agent in restructuring knowledge) in a bivectorial manner which raises the conception of learning to the next substage in Case's Vectorial Stage.

Psychological Self (PS) --- Social Interactive Process (SI)
Psychological Self (PS) --- Interpretive Process (I)
(Active Agent in Restructuring knowledge)

## The Source Task

Children's responses to the "source" questions provided information on a second perspective of learning. In this task children were asked to define their "sources" of learning, that is, whether learning comes from an external source (located in an action or "learning agent"), an internal source (located within the physical or psychological self), or both sources. The complexity of the "source" responses increased with age but a statistical analysis indicated more variance within the groups than the "definition" task, which suggests the presence of an individual learning style variable as a possible contributing factor to a variance among responses of similar ages. However, age-related patterns of thought were identified in the data.

A brief discussion of the results in operational terms will now be presented. At the 6-year-

old level, sources of learning were generally attributed to personal "learning agents" such as teachers, moms and dads. One subject's response succinctly summarized the general pattern of conception: "It's (Learning) coming from people you're learning from." Consequently, children identify *learning to know* as a question of external influence (communication of other people's experience), while they regard learning to do things as a question of personal experience, for example, "If I do good work, I get happy." From an educational perspective, it is important to take note of 6-year-olds' perception of the adult playing a significant role in the learning process.

When an internal source was identified, children initially referred to their "head" which was subsequently clarified as the "brain" and sometimes the "mind". Probing questions confirmed that the terms "mind" and "brain" were interchangeable in meaning at the ages of 6 and 8 years. For whenever an initial reference was made to the "mind," it was usually qualified as the "brain." Further probing into what children at this age knew about the brain, resulted in the identification of "thinking" as a function of the brain. When asked how thinking was associated with learning, the general response alluded to the idea that "it helps you learn.....get ideas." It is worth mentioning that a few 6- and 8-year-old responses expressed the "voice" or "mouth" as a source of learning, but it usually was an extension of their reference to the "brain," for example, "It's (Learning) going around and around in your brain and then comes out of your mouth." Empirical data such as this run counter to Piaget's belief that children fail to distinguish mental acts such as "thinking" from overt behaviours such as "speaking". The data suggest that children recognize a sequence of events involving these two processes: thinking transformed into words and then spoken. However, further inquiry is necessary to confirm this hypothesis. The majority of 6-year-olds were aware that their learning is transmitted to the brain, but their responses indicate that they conceive of the mind as passive in relation to the external world even though they recognize an internal change as a consequence of a learning experience.

Similar results were identified with 8-year-old responses when reference was made to external sources. However, responses were more differentiated; there was a greater range of "learning agents" with a more frequent reference to friends, brothers and sisters. There was also a growing awareness of learning taking place at home and at school with a small number of children making references to specific resources such as books or computers.

An internal source was generally equated with the "brain" and the concept of "thinking hard" which reflects the inclusion of "personal effort" in their definition of learning. In addition

there were several references made to the "body" and body parts such as "fingers" to count on, which reflect the concept of practice "in order to get it right." The general concept of the brain at this age is a "place for storing things" as one subject expressed: "It's (brain) searching for more data...just like a computer does in a game".

Sources of learning are generally perceived as the media (books, T.V.) and the environment in general by the age of 10 years. An underlying concept of learning through both perceptual and physical experiences surfaces at this age which suggests a growing understanding of learning as an interactive process between self and the outside world. Similar to 8-year-olds, the brain continues to be conceived as a storage place for incoming information through the senses. Some children made analogies in reference to the brain. For example, one subject related the brain to lots of bottles of knowledge: "It's just like people storing things in little bottles. It's thinking of something and then keeps it and whenever you come back to it, you just have to open up that bottle remember it and then write it down."

With 12-year-old responses, there was reference to a greater variety of sources and modalities by which knowledge could be acquired as one interacts internally and externally with new information in order to understand it. Perceptual experiences were more clearly defined as children were able to distinguish between firsthand and secondhand knowledge. The latter generally referred to verbal information communicated to them, for example, "Older people telling you about their experiences." Internal sources were frequently defined as "thinking about something in order to understand it" in contrast to references to the "brain" in younger children's responses. Only a few protocols referred to the process of building on prior knowledge as an extension to the meaning of "thinking".

### Summary Of The Results.

In the early stages of development there is a clear distinction between external and internal sources. As children mature there is a developing awareness of the reciprocal process that takes place between external and internal experiences as they are subject to and manipulated by a variety of psychological activities during the learning process (e.g., "You read it and then think it over."; "Someone explains it and you remember it."; " Observing, listening or watching and trying it out yourself.") By 10 years of age, children clearly identified learning taking place in a sequential

manner from external to internal. By 12 years of age, the interrelatedness of the two sources was generally recognized and, since children at this age have developed a conception of their own active mental experiences that control learning, there is an additional understanding of learning taking place from internal to external. The developmental progression of the "source" responses from the ages of 6 years to 12 years reflects a funnelling process; the two sources initially are conceptualized as two isolated sources and as children mature, external and internal sources become siphoned into one combined source. This synthesis is generally recognized by 12 years of age. In summary, these conceptions of the "source" of learning, although not statistically different across all age-groups, showed a steady increase in complexity which was hierarchical in nature.

On close examination of the content of children's protocols, it can be concluded that 6- and 8-year-olds' scope of general knowledge is limited whereas 10- and 12-year olds showed a more sophisticated understanding of this concept. Young children related knowledge to facts learned at school which may be a consequence of their tendency to draw upon their closest and immediate experiences to attach meaning to something (Wood,1988). Older students extended their knowledge to the world in general with particular reference to nature and animals and also demonstrated an understanding of acquiring knowledge through a variety of resources such as people, books, and T.V. By 12 years of age, children had begun to realise that they could begin to self-direct their own learning (e.g.,"If I want to find out about Australia, I go to an encyclopedia and look it up").

However, children's responses to the interview questions included a coordination of all types of knowledge. From the findings of this study, it can be hypothesized that the levels of awareness will increase with age. For example, the relationship between declarative (facts, information) and procedural (strategies, rules) knowledge to induce learning was identified and applied in many ways to define the meaning of learning. Conceptual knowledge was also present both in terms of beliefs about learning and where learning "comes from" and in their process of constructing meaning (schemes) to make sense of the learning phenomenon. Knowledge "in pieces" is meaningless and redundant in helping children develop a conceptual understanding of specific phenomena (diSessa,1988). It is feasible to predict from the results of this study that younger children may not be consciously aware that they are able to integrate and articulate cognitive activities in their explanations about their perceptions of learning. Conceptual understanding of specific phenomena demands an integration of all types of knowledge.

Unfortunately cognitive research attempts to isolate rather than integrate mental processes which often proves unproductive in terms of educational practice. If research programs placed greater emphasis on integrating rather than isolating cognitive acts in their inquiries into the nature of learning, educators would be provided with information that would help in designing learning opportunities that enable such integration.

## Summary

In summarizing the results of this study, it can be concluded that 6- and 8-year-olds' way of thinking is dominated by the notion of action. In these early years a child approaches learning in terms of concrete experiences which impact on his or her conception of the meaning of learning. Learning is most commonly expressed by children as becoming able *to know* something by *doing*. The most significant difference between these two age groups is the differentiation between learning activities. Six-year-olds perceive learning as a sequence of events while 8-year-olds equate learning with practice involving personal effort. With the former conception, external circumstances create the learning, usually in the form of a learning agent (e.g.,teacher or parent), while self-regulation is the dominant aspect of learning by practice and recognized by 8 year-olds. By 10 years of age, social implications in terms of expectations and the importance of learning surface as a key factor impacting on their conception of learning. Conceptions of self in the learning process move from self as active learner to passive recipient of knowledge reflected in their definition responses (e.g.,"Listen and watch to learn"; "Someone teaching you"). Although children at this age have an understanding of knowledge as a variety of mental activities, the actual conception of the mind as active remains in a transitory or dormant stage awaiting the consolidation of concrete thought towards learning. It is not until 12 years of age that the definition of learning is expressed in symbolic or abstract terms. There is a conscious awareness of the mind's active role in learning to ensure that all incoming knowledge is understood.

It can also be concluded from this study that children's responses to the meaning of learning from the ages of 6 years to 12 years support a cognitive constructivist viewpoint of learning. Explanations were drawn from experiences in children's attempts to make sense of the phenomenon called learning. As children matured, new conceptions were an outgrowth of old conceptions and yet previous conceptions did not disappear; they were woven into a more intricate description of the meaning of learning. For every new level of conception, the child has a broader

repertoire of previously conceived ideas from which to construct a more sophisticated and advanced level of conception. This corresponds to the postulates of a cognitive constructivist theory of development which maintains that new levels of conceptual understanding are built on what the children already know.

There is a general trend towards more advanced conceptions of learning and yet, in light of a similar study conducted by Saljo (1979) with first year university students, there have to be some reservations, since these earlier conceptions of children are also to be found among adults. In comparing Saljo's (1979) results with this present study, there appears to be very little progression in conceptual understanding from the ages of 12 to 18 years. It seems apparent that future research into adolescent conceptions may yield valuable information regarding this issue. The extension of this study to subjects aged 14, 16, and 18 years of age would complete the chart of plotting school-aged children's conceptions of learning in B.C.'s educational system.

The developmental trend in children's conceptions of learning can be analyzed from different perspectives. For instance, the results of this study support Pillow's "passive to active" hypothesis in which he claims that there is a gradual developmental transition from conceiving the mind as passive to conceiving of it as active. Whereas young children's view of the mind is passive in relation to external experiences, older children's view of the mind is active which reflects an increased awareness of their own psychological involvement in the learning process. This is of central importance in cognitive development in general as it empowers children to become active and independent learners.

In looking at the results from a Piagetian point of view, it can be concluded that, on a general cognitive level, children's conceptions become more *decentered*. As the child matures, learning is seen from a broader perspective involving different perceptions and processes; there is an increase in abstraction in children's conceptions from 6 years to 12 years.

The mapping of children's conceptions of learning as portrayed in this study is an example of what Marton (1981) described as an approach to research from a second-order perspective: children's conceptions of learning are elucidated from an internal perspective. The child's view of learning at four different age-levels is described in qualitatively different categories that can help educators understand children's conceptions of learning at each age level and the developmental stages in conceptual understanding of the meaning of learning from 6 years to 12 years of age.

Current research in learning supports the notion that learning may be perceived in terms of

changed conceptions or changed meaning of the phenomenon learnt about. Subjects as young as 6 years inferred that an internal change does occur from *not knowing* to *knowing* . The central focus of attention in older children's (10 and 12 years) responses to the question, "What is happening when you are learning?" was the idea that learning is the reproduction of knowledge (e.g., "memorizing facts so you will remember them"). Rote learning and constructive learning are distinctly different cognitive processes and, from the perspective of educational practice, are the underlying principles for two differently structured teaching approaches. In addition, these two concepts of learning respectively represent the old and new beliefs of our educational system in B.C. The acceptance of children's learning in terms of memorization and rote learning promotes or supports the concept of learning as an "activity of reproduction" (Saljo, 1979). Educators are experiencing today a paradigm shift from conceptualizing learning as reproducing knowledge, a "surface-level" conception (Marton,1984]), to learning as a process of constructing meaning from experiences. In other words, "As students acquire new information and filter it through prior knowledge, they transform their individual beliefs into <u>deeper</u>, more coherent understandings" (The Intermediate Program: Foundations,1992, p.58).

The research conducted by Marton and Saljo (1976a) and Van Rossum and Schenk (1984) suggested that a person's conception of the learning situation has implications for what one thinks one has to learn and how one will accomplish it. This therefore raises a very important question: Are children's conceptions of learning a reflection of the type of learning experienced in school as a result of instructional methods and teachers' expectations or do they truly represent children's attempts to make sense of what learning means to them?

From another perspective: to what extent do variables such as parental and social expectations and teaching methods affect children's conceptions of learning? A comparative study between elementary or secondary school childrens' conceptions of learning and teachers' conceptions of learning (as reflected in their instructional methods) would provide valuable insights into the frequent misconceptions of the interactive teaching-learning process. There is often a dramatic gap between the teacher's way of thinking and the student's way of thinking (Lindfors,1984). Lindfors analyzes this dilemma as follows:

> Often teaching-learning connections are not apparent at all, with teacher's efforts to increase children's knowledge and skills, and children's efforts to make sense of their world, going on quite independently......as defined here, (they) are two distinct ventures which often get confused with one another. (p.600)

The most valuable skill we can teach a child is <u>how</u> "to think" and not just simply <u>what</u> to think. To develop the child's thinking demands an awareness of the child's way of constructing knowledge. Conversations and interviews with students provide teachers with avenues to gain insight into children's level of understanding of different concepts while at the same time providing an opportunity for children to reflect upon their own perspective on learning. A missing factor in many educational programs today is the tendency to ignore student levels of understanding of specific concepts and how students organize and reconstruct new information in their efforts to make sense of it.

Identification of a child's existing level of conceptual understanding of the meaning of learning will assist educators in designing effective instruction that promotes meaningful learning in conjunction with the child's conceptions of learning. By listening to, and observing children, the teacher should work with aspects of the child's reality which are meaningful and important to him or her. It is important that teachers take the child's way of thinking seriously as the foundation stone on which to build curriculum. As Paley (1986) states, "The first order of reality in the classroom is the student's point of view.....Someone must be there to listen, respond and add a dab of glue to the important words that burst forth" (p.127). If we want to develop the child's way of thinking, then we must begin by learning about how the child actually thinks. One of the current goals in education is to support student learning. By providing opportunities during the day for children to think and reflect about their own learning, teachers are helping to develop children's awareness towards a positive attitude in learning. There is a need in elementary schools' curriculum for teachers to encourage children to reflect on their own knowledge and learning.

Elementary teachers often take for granted that learning is achieved as a consequence of an activity. If the learning is seen in terms of basic skills this is probably true, but if learning is perceived in terms of a qualitative change in the child's way of thinking, there has to be another element involved in the activity. Research provides evidence of positive outcomes when curriculum incorporates the component of learning-to- learn interventions into programs.

Pramling (1990) set out to determine whether children learn "better" if they are encouraged to become more aware of their own learning. This "descriptive-experimental" study involved four groups of preschool children between 5 and 6 years of age: two groups were experimental and the other two served as control groups. The teachers in the two experimental groups used a "didactic" approach with their students by directing the students' thoughts towards reflecting upon their

conceptions of learning in general and their own understanding of the content related to different themes. In everyday situations created by the teacher or the children, time was taken to reflect upon the particular activity in a way that promoted the children's metacognitive awareness about how they themselves and others think about the specific content.

The results of this study showed that the children in the experimental group significantly outperformed the children in the control group in relation to their preparedness towards learning new content. They also indicated an increased level of awareness of how they learn.

A similar study examined two programmes designed to improve student learning in two history departments at British universities. Martin and Ramsden (cited in Richardson, Eysenck & Piper,1987) obtained undergraduate students' pre-course and post-course conceptions of learning by asking the question: "What do you actually mean by learning?"

This information was then used to evaluate two different programs of learning skills interventions designed to enhance the process and outcome of student learning while taking a history course. Students who registered in the history course also participated in either a study skills program or a learning-to-learn program which ran concurrently with their course. The results indicated a definite movement towards higher level conceptions among the learning-to-learn students. They progressed from initially conceptualizing learning as an "increase in knowledge or memorization" to conceiving of it as "the abstraction of meaning or understanding reality" (Saljo,1979, p.158).

Further, an examination of the relationship between students' conceptions of learning and their first-year performance revealed a positive association between grade and conception. The researchers emphasized that if interventions of this kind are to be of any success, they need to be carefully linked to both the content of what is being learned and to the context in which it is to be learned. However, they remained skeptical as to whether any significant development in the student's conception of learning or in learning strategies can actually be achieved in this manner. Although their results offer tentative support for further experimental interventions of a similar holistic nature, Martin and Ramsden reached the conclusion that activities designed to improve student understanding of learning are really inclusive in the whole process of teaching.

This study presents an educational perspective on the metacognitive task of reflecting about one's own understanding of the meaning of learning. Children do not reflect spontaneously about their learning and yet if the goal in education today is to assist children in becoming independent

learners, educators need to first of all understand children's conceptions of learning and then educate from the child's point of view.

# CONCLUSION

By revealing common patterns of understanding of the learning process in children of similar ages, this study suggests that educational methods should be consistent with children's levels of conceptual development (cf. Case & Mckeough, 1990; Case, Sandieson, & Dennis,1986). Galaper (1981) further claims that education should be designed to take into account a cognitive-developmental sequence and the patterns of reasoning of children at different stages in their development. Such procedures would help solve "the problem of the match" (Donaldson,1979) between the learner's developmental stage and instructional methods. Children's understandings of what learning means and where it "comes from" should be a guiding principle in education.

By engaging students in a conversation that enables them to explore their own thinking by articulating their understanding and clarifying their own beliefs about the meaning of learning, teachers can assist children to become powerful thinkers and independent learners. The following statement from the Sullivan report, A Legacy For Learners (1988) provides an appropriate concluding remark:

> To be effective, an educational system must respond to children in ways that are suitable to their specific levels of intellectual, (social, emotional, and physical) development; this implies that these ways should change as children mature. (p.103)
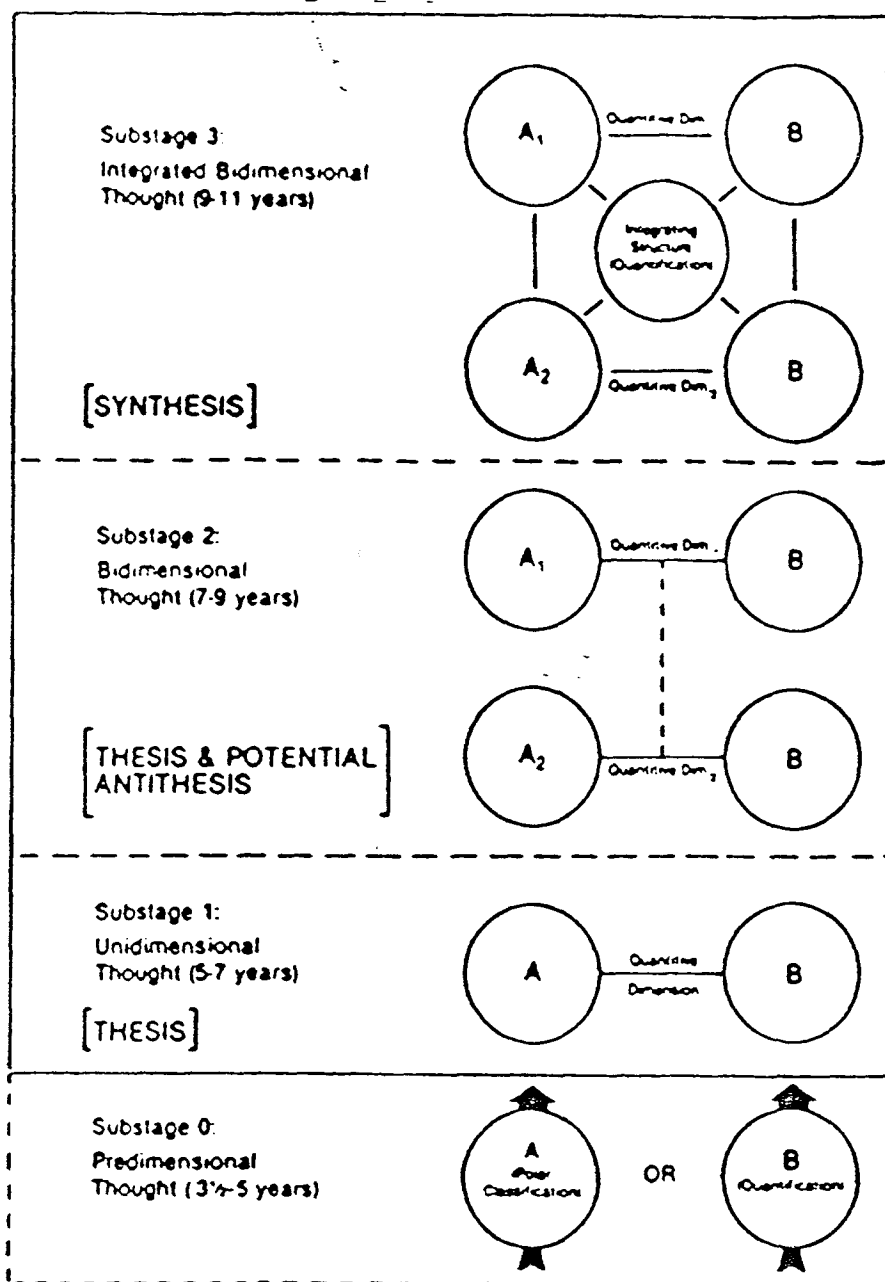
# APPENDIX   A

## DIMENSIONAL   STAGE



## Figure 1

Abstract model of logico-mathematical progression during dimensional stage. Solid horizontal lines indicate major transition in thinking. Dotted lines indicate more minor transition, as the field of centration expands and implications of a major transition are worked out. (Note: The general form of notation in this figure is taken from Fischer (1980). The particular representation of substage 3 thought is taken from Pascual-Leone (1969).) [Taken from Case, 1988]

# APPENDIX   B

Letter to Parents Requesting Interview

Dear  Parent or Guardian,

Over this past summer I have been working on my thesis to complete my Master's Degree at UBC. My research is based on children's perceptions of  themselves as learners, what they believe learning is.  I would appreciate greatly your child's contribution to this project and request therefore your permission for him/her to participate in it.

The purpose of this study  is to provide an opportunity for children to talk about their own thoughts about learning so that we as teachers may gain more insights into learning from a child's perspective.  Hopefully, such information will prove useful to teachers when planning instruction or designing  programs.

The study involves your child being informally asked some questions about what learning means to him/her.  I would  like to meet with your child on an individual basis.  Each interview will take approximately fifteen minutes and will occur at Gordon Greenwood School.

Responses will be tape-recorded.  To ensure confidentiality, no identifying information will be recorded and all of the data will be coded by number.  Your child's participation is voluntary and you may refuse permission if you wish, or withdraw your child from the study at any time. Refusal or withdrawal will not influence your child's class standing.

I would very much appreciate your assistance with this study. Please sign this letter in the space provided below indicating whether you do or do not agree to let your child participate, and return it to your child's teacher.  Please also sign and retain the second copy for your own records.  Should you have any questions , please feel free to call me or Mr. Sasaki at the school at 882-0114 .  In addition, you may also contact the District Administrator for Planning at the School Board Office or my faculty advisor Dr. Marion Porath who would both be pleased to discuss my study with you.  Dr. Marion Porath can be reached at 822-6045.  Thank you very much for your cooperation.

Sincerely yours,

Gillian Bickerton

I, _____, parent or guardian of

_____, _____ do _____ do not consent to

allow my child to participate in this study.    I acknowledge that I have received a copy of this

consent form.

Signature : _____    Date :_____

# APPENDIX C

## STUDENT INTERVIEW PROTOCOL

### RESPONSE SHEET

Subject # : _____          Age: _____

Date : _____          Birthdate: _____

Question # 1 :  What does learning mean?

Question # 2 :  What is happening when you are learning?

Question # 3 :  When you are learning, where is your learning coming from?

Question # 4 :  Could it come from anywhere else?

**Possible probes that could be used during the interview :**

a)  What do you mean by _____?

b)  Tell me more about it.

c)  What are you doing when you are learning?

d)  Ask for clarification for vague words such as "things", "stuff",
    What kind of _____ ?
    What do you mean by _____ ?

e)  If response to #4 is "your brain", probe: What is your brain doing when you're learning ?

f)  Extend a response by asking:Then what do you do with _____ (eg., information, ideas etc..).

# APPENDIX D

## Setting the Stage

### Preamble to Each Interview

Each child will be given the following introductory statement prior to being asked the set of questions.

The interviewer:

"I'm interested in how children learn and what they think learning is. It is very important for me to find out what your thoughts are. I am writing a book and will be using your ideas to help me understand what children your age think about learning. Questions I'll be asking you today, I will also be asking other children of the same age. I want you when you answer these questions to be as honest as you can be. Tell me what you think. There are no wrong answers. All I'm interested in is what you think."

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