THE LITERACY HYPOTHESIS

AND COGNITIVE DEVELOPMENT

by

Darek Dawda
B.A., Trent University, 1995
M.A., Simon Fraser University, 1997

Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of

Doctor of Philosophy

in the
Department of Psychology

SIMON FRASER UNIVERSITY

Spring 2006

Abstract

This thesis re-examines possible links between literacy and cognitive development from a medium perspective, where the child's engagement in literacy is assumed to enable literacy-specific forms of thought, and where the explanation for the nature of those cognitive forms is to be sought in the examination of how the physical and semiotic properties of literacy modify the child's symbolic interactions and thought. Specifically, I argue that the existing research suggests that at the onset of literacy the child acquires the ability for metalinguistic awareness. This can be explained by the fact that writing codifies speaking, thus turning words into objects of conscious reflection. I propose a reinterpretation of Piaget's stage of concrete operations within the literacy framework. Further, I argue that metalinguistic awareness enables the emergence of verbal thought, which, after a period of differentiation from the concrete context, can function independently from concrete, perceptual reality. This, I suggest, leads to the achievement of what I call *decontextualized thought*, which I argue lies at the origins of Piaget's formal operations. I outline several explanations for the emergence of decontextualized thought, and argue that the structural explanation, that writing codifies speaking and that phonetic writing characters are arbitrary with regards to the concrete image, is most central for the understanding of literacy effects. This thesis provides a critical overview of selected central contributors to the literacy hypothesis, addresses several most pressing controversies, and sketches a broader theoretical framework that places the literacy hypothesis within a constructivist framework that stresses the role of

child's activity. I suggest that literacy should be treated as an *enabling* and *necessary* but not *sufficient* factor for the emergence of literacy-specific cognitive forms, and that most past criticism of the literacy theory applies only to the 'strong' view of literacy as a *sufficient* cause. Because of the scarcity of direct research on literacy guided by the medium approach, much of the empirical research that I review requires reinterpretation. Hence, the current thesis is largely a hypothetical proposal of theoretical and empirical directions that the literacy hypothesis might take.

Keywords: Literacy hypothesis, medium theory, cognitive development, abstract cognition, symbolic communication, constructivism.

Dedication

To those who dare to live their dreams in spite of the circumstances.

Acknowledgements

Thank you to Constance Bundas and to David Lester for steering me onto this path. To all my family and friends: Adam, Luke, Agnieszka, Jacek, Mama, Dagmar, Danny, Gary, Gail, Sophie, Fernando, Al, Mia, and all the others who I have met at close range during these 15 years. And of course to my thesis committee for their relentless support, for enduring my lack of constraint, and for giving this thesis a definable shape.

Table of Contents

List of Tables

List of Figures

Chapter 1
Introduction

For some time now historians and anthropologists (e.g., Malinowski, 1954; Whorf, 1956) have understood that the introduction of new symbolic tools can have profound effects on the lives of the tool users. In the 1930s in Russia, Lev Vygotsky (1934/1986), who was concerned with how external material conditions affect thought, demonstrated that the introduction of literacy brings about profound changes in cognition such as a greater awareness of language and an emergence of the ability to think outside the immediate social and physical context. Because of Russian isolationism and the politically controversial nature of his research, Vygotsky's innovative ideas and findings did not fully reach the West until the 1970s (Luria, 1974/1976).

In the meantime, in the 1950s, Harold Innis began a uniquely Canadian tradition of medium theorizing, arguing, much like Vygotsky, that communicative technologies have their medium-specific cognitive and social effects[1]. Medium theories flourished in the 1960s, with Marshal McLuhan's (1964) famous pronouncement that "the medium is the message" (p. 7), accompanied by Eric Havelock's (1963) and Jack Goody and Ian Watt's (1968) pioneering work that attributed the birth of Western civilization in Ancient Greece to the medium of phonetic literacy. These early medium theorists sketched the initial outlines of the *literacy hypothesis*, which essentially postulated that the medium of

literacy was responsible for the emergence of numerous cultural and psychological phenomena. They particularly focussed on the rise of uniquely Western, highly abstract forms of thought after the introduction of phonetic writing in Ancient Greece. In general, these medium theorists proposed that the study of communicative conditions and the nature of the medium were necessary for understanding the emergence of new cognitive and cultural forms. The examination of the physical properties of a medium and the ways in which the medium modified or extended the body and shaped relationships was postulated to be the key to understanding the cultural and cognitive phenomena that emerged with the use of literacy. Such a thesis was compatible with Vygotsky's (1934/1986) materialist approach to psychology, which, unlike the mainstream internalist cognitive psychology of the day, emphasized the role of external conditions in shaping the psyche.

The literacy hypothesis had its Renaissance in the 1960s and 1970s. In the early 1980s, the literacy hypothesis as proposed by McLuhan (1962, 1964), Havelock (1963), and Goody and Watt (1968) was subjected to a criticism that significantly diminished the popularity of the thesis. In 1981 Scribner and Cole reported a series of cross-cultural studies arguing that it was not so much literacy as *schooling* that created the cognitive effects that the literacy theorists attributed to literacy. Scribner and Cole (1981) attacked the strong causal language that the early literacy theorists used, essentially arguing that literacy alone cannot be held responsible for the cognitive changes that the proponents of the literacy thesis attributed to it. In a similar manner, Graff (1987) published detailed

[1] Notice that literacy was a very popular area of study during the fifties and sixties, and that it was approached from various angles. For example, sociologists, linguists, and cultural theorists (e.g., R. Williams, B. Bernstein, R. Hoggart, K. Burke) considered broad political and social consequences of literacy. However, the medium approach, in which the very physical properties of the medium of literacy and the way literacy is used is analyzed to draw inferences about cognitive effects, may be said to begin with Innis and develop into a fairly distinct school of thought closely tied to Toronto, Canada.

historical research showing that the presence of literacy did not guarantee the effects that the literacy theorists attributed to literacy, arguing that complex contextual factors had to be considered in the study of the so called literacy effects. As I will elaborate later, on close analysis Scribner and Cole's (1981) or Graff's (1987) research provided more support for, than refutation of, the literacy hypothesis, if such a hypothesis was correctly conceptualised. Nevertheless, the criticisms from 1980s, combined with the political sensitivity of this cross-cultural topic (e.g., the accusation of ethnocentrism with regard to the specific claims concerning the effects of phonetic literacy; e.g., Greenfield, 1983), significantly diminished the academic popularity of the medium approach to the study of literacy. As a result, the literacy hypothesis until today remains far outside of the mainstream theorizing.

A second wave of literacy theorists (Walter Ong, 1982; Robert Logan, 1986; David Olson, 1994) attempted to restore the 1970s splendour of the literacy hypothesis by elaborating its claims, providing further supporting evidence, and in some cases becoming narrower and more specific with regard to the effects that they attributed to literacy. Some of the second-wave theorists (e.g., Logan, 1986; Ong, 1982) continued to attribute broad cultural and cognitive changes to literacy, whereas others (e.g., Harris, 1989; Olson, 1994) made more specific and modest claims about the scope of the literacy effects. Later, there emerged a distinction between proponents of the 'strong' and 'weak' literacy hypothesis (Brockmeier, 2000), the latter typically criticising the former for their use of strong *causal language* and their portrayal of literacy as an *autonomous agent* of change. Harris (1989) called the 'strong' literacy hypothesis a *romantic* view, criticising it for its Eurocentric sentiments. The proponents of the more modest, 'weak' hypothesis were typically more open to the consideration of other

contextual factors and narrower with regard to their claims concerning the cognitive effects afforded by literacy. Olson (1994), for example, focussed on the metalinguistic aspects of literacy, and Harris (1989) attributed to it the birth of a conceptual, theoretical space. Despite these and other attempts, the last three decades of elaboration and refinement of the literacy hypothesis did not do much to increase the popularity of this approach. Moreover, the literacy hypothesis has been especially poorly developed in the context of child development.

1.1 The aim of the thesis

The general goal of the present thesis is to argue that the literacy hypothesis specifically, and the medium framework in general, has a great, yet largely untapped, potential for enriching our understanding of certain aspects of cognitive development. There are two general related tasks that I set out for my thesis. First, I aim to revive the interest in the medium approach to literacy in the area of developmental psychology. Second, I strive to settle some of the disputes among the literacy theorists, disputes that have contributed to the weakening of the overall popularity of the medium approach. More specifically, the present thesis deals with several important issues that I hope to show have not yet been adequately dealt with by the literacy theorists.

1. The first and most crucial problem is one that the literacy theorists, for the most part, have not explicitly and adequately addressed, which is the issue of the nature of the *causal relationships* between the medium of literacy and its supposed cognitive effects. I argue that the proper way to view the role of literacy is *not* as a *sufficient*, but as an *enabling* and *necessary* factor in bringing about medium-specific cognitive changes. A similar claim for literacy as a *necessary*

factor in the birth of associated cognitive effects was previously postulated (e.g., Gough, 1968; Oxenham, 1980), but it was not explicitly assimilated or discussed by most other major literacy theorists. On the contrary, the general problem of many literacy theorists is their use of a strong causal language that may be interpreted as implying that these authors view literacy as a *sufficient* factor in the creation of literacy specific effects. I argue that such an interpretation (whether intended or not by the literacy theorists) is incorrect as it distorts the complex nature of the origins of psychological phenomena. It is not the medium itself, but how the medium is used, how much it is used, in what context it is used, or individual predispositions in accommodating the potential inherent in the medium that enable medium-specific cognitive forms. At the same time, I argue that without the medium, these medium-specific effects could not be present; hence the medium has to be considered as a *necessary* factor in bringing about the corresponding cognitive changes. I encountered no evidence for the existence of the specific forms of thoughts I attribute to literacy (metalinguistic awareness and decontextualized thought) without literacy. Thus, my casual stance with regard to the medium is neither overly 'strong' (as a sufficient cause) nor 'weak' (as merely one of the many potential enabling causes), but represents a middle of the road approach (as a *necessary* enabling factor). I argue that such an approach both best captures the existing data and best reflects the functioning of complex systems such as humans. Such a causal approach is consistent with a constructivist, systemic account of human functioning, and, importantly, it does not deny the historicity and contingency of literacy itself. Piaget demonstrated that more complex cognitive structures are rooted in concrete action on objects.

The emergence of various cognitive abilities is a constructive process, and there is a clear *continuity* in cognitive development. While not denying the historicity and continuity of cognitive growth, the present approach stresses that when a new mode of communication emerges it modifies the communicative context and thus affects cognition. Thus, I focus on *the emergent properties of the medium of writing* and on *writing's unique effects on cognition*, and treat writing as an independent variable (as a methodological choice), an enabling factor for these changes[2]. The examination of the development of the medium itself and its contextual variations in the use of writing is beyond the scope of this thesis. I argue that much of the misunderstanding of the literacy hypothesis, and many of the debates surrounding the hypothesis, have been fuelled by a lack of clarity regarding the issue of causality. The implication that literacy is a sufficient cause for its corresponding cognitive effects has made the medium theorists open to an easy criticism from the contextual camp which points out that many literate people do not posses the purported cognitive skills attributed to literacy. I argue that, once literacy is reconceptualized as an enabling factor, the criticisms from the contextual camp do not invalidate but rather enrich the overall medium framework I am proposing in this thesis.

2. My second task is to focus on selected literacy effects with regard to the development of cognition. This in no way implies that the effects I am postulating exhaust the potential taxonomy of literacy effects; it merely allows me to focus my thesis on a more detailed examination of the chosen effects. I specifically

[2] My focus on changes brought about by literacy in no way implies that change is more important than continuity in historical and individual development of cognition. Graff (1987), who clearly gives more

focus on the emergence of two broadly conceived cognitive abilities, the capacity for *metalinguistic awareness* and the capacity for *decontextualized abstract thought*. The literacy hypothesis can potentially be used to explain other psychological phenomena[3], but metalinguistic awareness and decontextualized abstraction are currently, I believe, the best documented cognitive forms enabled by literacy.

3. The third important issue that I address is a systematic classification and synthesis of the existing *explanations* for the literacy effects. Different theorists have different ideas about how and why the use of literacy enables the literacy specific effects. I argue that all existing explanations for the literacy effects can be classified into one or more of the five general categories: *perceptual modality* explanation, *persistence* explanation, *external storage* explanation, *structural* (or *arbitrariness*) explanation, or *relational* explanation. I believe that such an exhaustive taxonomy of explanations has not been provided in the literacy hypothesis literature. Further, literacy theorists frequently combine different explanations without explicitly acknowledging that some of these explanations apply more broadly, beyond the medium of literacy. In doing so, these theorists provide an explanatory framework that is too general to account for the specific effects they are attempting to explain. For example, Donald (2001) attributes the external storage explanation that is applicable to all forms of persisting visual media, specifically to writing, attempting to account for the birth of theoretical

weight to developmental *continuity*, asserts that to "focus on continuities does not require neglecting changes or *discontinuities*" (p. 8).

thought solely through this one form of explanation. To remedy such errors, I put special effort into clearly attributing the existing explanations either to all forms of persisting visual symbolic technologies (e.g., painting, drawing, notches), more narrowly to all forms of writing (phonetic and non-phonetic[4]), or specifically to phonetic writing. In the end, I synthesize the existing explanations and derive an explanatory complex for the effects of literacy more generally, and phonetic literacy more specifically.

4. Fourth, a more specific goal is to establish a clear conceptual and *developmental course* for the emergence of metalinguistic awareness and the emergence of the capacity for purely abstract, decontextualized thought. I argue that metalinguistic awareness emerges in the early stages of learning to read and write, whereas decontextualized abstract thought is a later development that requires a great deal of mastery of the medium of writing. I further argue that while metalinguistic awareness is enabled by any writing technology, decontextualized abstraction is greatly fostered by the arbitrary system of phonetic writing. I propose that the structural/semiotic explanation (that is the fact that the characters of phonetic writing are arbitrary with regard to the concrete image) is key to an understanding

[3] There is a wide array of issues that have been attributed to literacy. These include a multitude of changes on the cultural, political, economic, social, and psychological level. For the purpose of this thesis, I narrow my investigation to *metalinguistic awareness* and *decontextualized abstraction*, and discuss other phenomena only if they are closely related to these two cognitive achievements.

[4] Note that existing writing systems can generally be divided into non-phonetic and phonetic writing, even though some writing systems combine elements of both. Non-phonetic writing systems, such as pictographic or ideographic writing, are those technologies that use one sign to represent an object, event, or idea. Typically non-phonetic writing derives from a progressive simplification or abstraction of drawings. Among phonetic writing systems one can distinguish between syllabary writing, where a sign stands for a spoken syllable (note that a syllable is the most natural unit of sound), consonantal writing, where a sign represents a consonant, and fully phonetic writing with separate letters for consonants and vowels. Note that, unlike non-phonetic writing, characters in phonetic writing codify spoken sounds and are arbitrary with regard to the concrete image or event that the words composed phonetically represent. See Appendix A for a more elaborate discussion of the evolution of writing technology.

of the origins of a decontextualized cognitive plane that enables thought that has no direct links to concrete reality.

5. Fifth, the literacy hypothesis has been elaborated predominantly in the historical context, and the application of the hypothesis in the developmental context has been limited (e.g., Olson, 1994; Vygotsky, 1934/1986). The major task of my thesis is to apply the ideas derived predominantly from historical literature to child development. Although, clearly recognizing the differences between cultural evolution and ontogenesis, I argue that the medium framework can be applied in both contexts to explain the emergence of metalinguistic awareness and decontextualized thought. In Chapter 5, I synthesize the existing evidence to propose a fairly specific framework for understanding the birth of metalinguistic awareness and decontextualized abstraction in children. I relate the rise of metalinguistic awareness more generally to the rise of concrete operations, and the emergence of decontextualized thought to formal operations. Finally, I propose ways in which the current claims can be tested further.
6. Sixth, one of the problems of the current state of the literacy hypothesis is that it has not been adequately situated in a broader theoretical framework capable of accounting for the emergent nature of developmental phenomena. In the present thesis, the literacy hypothesis is nested within a broader medium framework. I argue that, once adequately developed, such a framework can enable an analysis and prediction of the effects of any mode of communication. I further situate the medium framework within a yet broader triadic constructivist model of cognitive development that stresses the importance of symbolic coordination of operative interactions (e.g., Carpendale & Müller, 2004; Chapman, 1991). This

triadic model jointly emphasizes action and communication, and is especially useful in understanding symbolic development. I further argue that the triadic model should be placed within a yet broader dynamic developmental systems approach (e.g., Gottlieb, 1991, 1997), a framework that itself derives from a general systems theory (e.g., Bates, 2005; Deacon, 1997; Oyama, 2000; von Bertalanffy, 1968). Hence, I propose a theoretical direction that can situate the specific literacy hypothesis within a broad theoretical framework. The elaboration of the parameters of such a general framework has been neglected by the literacy theorists, and the effects of this neglect has been a seeming disconnection of the claims made by the literacy theorists from a broader developmental and biological context. Even though a full elaboration of the theoretical underpinnings of the literacy hypothesis is beyond the scope of the present thesis, I am hoping to provide an outline of such a theoretical direction.

1.2 Points of clarification

There is a number of qualifications or clarifications that would be useful to address at this early stage in my thesis.

1. The first point of clarification is that in no way do I attempt to claim that literacy is superior to orality, or that phonetic literacy is superior to other forms of literacy, nor, by the way, vice-versa. I merely strive to examine the *differences* in how the properties of a communicative medium modify communicative action, and thus affect cognition. Each mode of communication adds to the human communicative and cognitive repertoire, each mode interacts and impacts other modes, each mode somehow transforms the total communicative and cognitive context of the

individual. My specific task is not to claim the superiority or inferiority of literacy, but hypothesize in what specific ways literacy affects communicative action and cognition, that is what is unique about the medium of literacy.

2. The second point of clarification is concerned with the *definitions* of *symbolic communication*, *literacy*, and *literacy skills*. My view of symbolic communication situates the classic semiotic science within a more dynamic developmental constructivist triadic context. This view is elaborated in Chapter 4; at this point it suffices to say that symbolic communication is *an interpersonal, and later cognitive, activity that involves the use of symbols.* As for the definition of literacy, it is a good starting point to adopt Graff's (1987) view that defines literacy as "*a technology or set of techniques for communications and for decoding and reproducing written and printed materials*" (p. 4), given that this definition is broadened to include electronic uses of literacy (New Literacy Studies – e.g., Gee, 2003; Jewitt & Kress, 2003; Langshear & Knobel, 2003)[5]. *Literacy skills* should be defined as *the ability to use the technology of literacy, the ability to read and write*[6]. There are also clearly different *levels of mastery of literacy* (from simple phonological awareness, through the mastery of letters and words, to the mastery of text), and these levels will become very relevant in defining criteria for the onset of the literacy-enabled cognitive stages postulated in this thesis. Finally, there are also various *contexts* and *uses of literacy*, and although these are crucial in the understanding of the emergence of specific literacy skills, and I

[5] The electronic use of literacy is a relatively new phenomenon; most traditional literacy research is concerned with the use of written or printed materials.

[6] Note that at this point I do not differentiate between reading and writing, even though these two abilities require a somewhat different set of skills and individuals may differ in their mastery of one versus the other.

in no way intend to dismiss those considerations, the analysis of contextual variance in the use of literacy is beyond the scope of my thesis[7]; my task here is to search for invariant features that can explain the role of the medium of literacy in cognitive growth.

3. Third, the present work is a *theoretical thesis*, and many of my claims are *hypotheses* at this point. I review research relevant to the present hypothesis but do not provide original data. I believe that the main value of the current thesis lies in the synthesis of the existing research, the examination and clarification of some central issues related to the literacy hypothesis, and the derivation of a specific proposal for how to apply the literacy thesis in the context of child development. Hence, it is important to treat many of my current claims as hypotheses that require further investigation, rather than fully substantiated claims. At the same time, the very methodology for the construction of the present theory has been driven by the deductive analysis of the existing evidence, and the final product reflects the lessons I have learned while studying relevant theory and testing it against existing data.
4. Fourth, I argue that the application of the medium framework is particularly useful at times of *major cognitive shifts*, such as the emergence of metalinguistic awareness at the onset of concrete operations or the birth of decontextualized abstract thought at the onset of formal operations. I hypothesize that the medium framework can account for the majority of the variance in these cognitive changes during these pivotal times of paradigmic shifts in cognition, and that

[7] I do not intend to differentiate among different literate modes in this thesis, even though one would clearly expect that different literate media would have different effects on their users. My thesis is concerned

other independent variables (e.g., amount of practice with a task) are more useful in accounting for the gradual cognitive changes occurring *within* the more distinct stages of cognitive development.

5. Fifth, literacy is a topic studied by various disciplines and from various perspectives, and there exist boundless theory and research on literacy. Hence it is important to select some criteria that guide the selection of my research materials. In this thesis, I focus on research and theory that are most directly related to the analysis of the impact of the medium and its use on cognition. My review of historical research focuses on those aspects of the literacy hypothesis that are most directly applicable to *cognitive* development. Even more specifically, I focus on those theorists that pay attention to *how the physical properties of the communicative medium modify communicative action,* thus affecting cognition. I do not include in any significant way the historical research concerned with cultural and social phenomena (e.g., the first system of codified laws; changes in social organization; changes in the distribution of knowledge; political issues of power and authority; etc.); these have at best secondary relevance to my present thesis. Literacy studies have also been central to theories in cultural theory, socio-linguistics, or phenomenology, where the role of literacy is typically examined within broader political and social context (e.g., Raymond Williams, Richard Hogart, Basil Bernstein, Keneth Burke, Elenor Leacock, Edward Thompson, or Mikhail Bakhtin); I do not include these debates in the present thesis. Moreover, relevance is also my main reason for focusing attention on historical developments in the ancient Hebrew and Greek cultures,

with the potentialities inherent in writing (enabling structural properties of writing systems) that can be

and not discussing developments in Europe during the Renaissance after the introduction of the printing press. All psychological effects central to the cognitive thesis I am proposing can be found already at the onset of Western civilization. Hence, some theorists of literacy, most notably Elizabeth Einstein (1979) who focus predominantly on developments during the Renaissance, are not included in my thesis.

6. Sixth, at some points in my thesis, I broaden my focus on metalinguistic awareness and decontextualized abstraction to include a discussion of the birth of Western dualism and the nature of Western metaphysics. Even though I clearly cannot do complete justice to this topic, I decided to include it because it places my specific thesis in a broader context, thus further illuminating the nature of metalinguistic awareness and especially decontextualized abstraction.
7. Finally, another point of clarification is that in Chapters 2 and 3, for reasons of communicative efficiency, I use a simplified semiotic model to discuss the literacy hypothesis. This includes the use of semiotic diagrams to graphically represent the structural aspect of my argument[8]. It is important for the reader to be aware that this simplification does not reflect my broader theoretical commitments, and that an outline of a more elaborate constructivist framework is introduced in Chapter 4.

actualized in any literate medium.

[8] The structural diagrams are designed as graphical aids to connect a number of theoretical ideas running through my thesis. The conventions used for the diagrams should become evident as I gradually develop my argument. At this point it is worth noting that the diagrams rely on the semiotic assumption that a unit of meaning (symbol) has an irreducibly dual structure (signifying element and the signifying content) (Lotman, 1990; Saussure, 1959). I sometimes use bolded lines to highlight the semiotic operation in question. I also occasionally use special separation to highlight the cognitive distance of a symbolic operation from concrete reality.

1.3 Thesis outline

In Chapter 2, I discus the pioneering work of Lev Vygotsky (1934/1986) and Alexander Luria (1974/1976), critically evaluating their approach and findings. I argue that Vygotsky showed both revolutionary insights into the workings of the medium of literacy, and significant limitations in developing a full-fledged medium framework. In Chapter 3, I review several literacy theorists, many of whom are associated with the Toronto School of Communication. I compare their approaches and claims and provide a running commentary on the value of their work. Throughout Chapters 2 and 3, I extract what I consider to be the most useful elements of the literacy hypothesis and gradually build up a set of claims to formulate my own interpretation of how the literacy hypothesis should be constructed. Hence, Chapters 2 and 3 foreshadow a more systematic discussion of the literacy hypothesis that I undertake in Chapter 4. Chapter 4 begins with a summary description of what I consider to be the most relevant cognitive complex capturing the effects of literacy. I then proceed to a description of the five explanations for the literacy hypothesis that together form an explanatory complex for understanding how literacy enables its cognitive effects. I then briefly recapture the most relevant aspects of the literacy hypothesis, proposing a series of claims that will be most relevant to the application of the literacy thesis in the developmental context of ontogenesis. In the final section of Chapter 4, I elaborate a broader theoretical context for the literacy hypothesis. Finally, in Chapter 5, I apply the literacy framework to child development, hypothesizing on stages involved in the mastery of literacy, and the cognitive effects associated with these stages. I argue that the literacy hypothesis is an important, unexplored area of cognitive development, and I propose specific ways in which the literacy hypothesis can be tested in the developmental context.

Chapter 2
Lev Vygotsky and the origins of the literacy hypothesis

The origins of the literacy hypothesis can be traced to the work of the Russian psychologist, Lev Vygotsky, who not only proposed a materialist framework that provided the basis for a psychological theory of the effects of media in general, but who also conducted a series of ingenious empirical studies on the effects of literacy. However, perhaps due to his short life or the political atmosphere in the Soviet Russia at the time, neither Vygotsky nor his collegue Alexander Luria developed a full-fledged medium framework to explain the psychological effects of literacy, typically under appreciating the emergent properties of literacy. This chapter is a brief critical survey of Vygotsky's and Luria's achievements and shortcomings with regard to the literacy hypothesis.

2.1 Becoming a psychologist

It is an interesting fact that one of the most prominent figures in psychology, Lev Vygotsky, did not receive any formal psychological training. Instead, he studied humanities, history, literature, and philosophy. After graduating from Moscow University in 1917 (just before the onset of the Bolshevik October Revolution), he left Moscow for Gomel to live with his parents. For the next few years, Vygotsky taught in the local provincial school and later in a teacher's college, at the same time vigorously developing his interest in psychology (Vygotsky, 1934/1986).

Vygotsky entered the world of academic psychology in 1924, after presenting some of his ideas at the Second Psychoneurological Congress in Leningrad. In his talk, entitled *The methodology of reflexological and psychological studies*, he argued that while the study of reflexes provided some basis for behaviour, it contributed little to the understanding of the more complex "construction" (Vygotsky, 1934/1986, p. xvi) that was raised on this foundation. This presentation defined Vygotsky's psychological trademark, which, in contrast to the reflexological, behaviourist trends of the time, became the study of higher psychological processes (Vygotsky, 1934/1986).

During his 1924 talk, Vygotsky triggered enthusiasm in his peer and future collaborator Alexander Luria, who at the time held an important position at the Moscow Institute of Psychology, and who successfully convinced the Institute's director to offer Vygotsky a position as a research fellow. Shortly after his appointment, Vygotsky finished the manuscript of his first book, *The Psychology of Art*, and presented it to obtain, in 1925, his PhD at the Moscow Institute of Psychology (Kozulin, 1986).

2.2 Psychology as historical science

As early as the 1920s, Lev Vygotsky put forward a thesis that criticized maturational approaches to cognitive growth, arguing that while basic psychological processes were the result of a natural function of brain development, higher forms of cognition were the result of the child's activity in the complex, historically determined cultural world.

The first task Vygotsky set for himself at the Moscow Institute of Psychology was to provide a critique of the state of contemporary psychology. In his 1926 manuscript, *The historical meaning of the crisis in psychology*, he recognized the irreconcilability of the divisions among various schools of psychology (behaviourism, reflexology,

psychoanalysis, Gestalt). Unsatisfied with the past attempts at the unification of the discipline, Vygotsky sought principles that could provide the basis for the study of consciousness. His investigation concluded that consciousness, especially higher thought, was created within socially mediated symbolic activity[9].

> The starting point for our observations was the assumption that separate psychological, and, in particular, cognitive processes (such as perception and memory, abstraction and generalization, reasoning and problem solving) are not independent and unchanging 'abilities' or 'functions' of human consciousness; they are processes occurring in concrete, practical activities and are formed within the limits of this activity. Not only the content, but also the structure of cognitive processes depends on the activity of which it is a part (Luria, 1971, p. 266).

Following the Marxist doctrine that focal phenomena could be understood only by the study of their history, Vygotsky stressed that a developmental approach was essential for understanding the emergent nature of psychological processes, thus asserting that the psychology of consciousness needed to be a historical science. Concluding his book, Luria (1974/1976) stated that "sociohistorical shifts not only introduce new content into the mental world of human beings; they also create new forms of activity and new structures of cognitive functioning" (p.163). Both Vygotsky and Luria criticized psychology for adopting a universalist and ahistorical view of cognitive development, recognizing that "the structure of psychological processes changes as a function of history" (Luria, 1971, p. 260). According to Luria,

> The greatest value of L.S. Vygotskii's ideas consists of the fact that while preserving the natural laws of the brain's organization and work, he showed the new properties that these laws take on, including a system of social-historical relations (Luria, 1971, p. 261).

[9] Note that Vygotsky's ideas were at least partially influenced by Janet, who was himself influenced by Royce and Baldwin (Van der Veer & Valsiner, 1988).

2.3 Symbolic communication and higher cognition

Vygotsky applied the principles of his theory to individual cognitive development as well as to the cultural evolution of cognition. He began by focussing predominantly on child development in his book *Thought and Speech*, which was first published shortly after his death from tuberculosis in 1934, and only much later (1962, then 1986 and 1987), translated fully into English as *Thought and Language*.

Narrowing his overall historical materialist thesis, Vygotsky (1934/1986) focussed on the development of higher cognitive functions, claiming that higher cognition resulted from the child's engagement in symbolic practices. He demonstrated that "it is a functional use of the word, or any other sign, as means of focusing one's attention, selecting distinctive features and analyzing and synthesizing them, that plays a central role in concept formation" (Vygotsky, 1934/1986, p. 106). In Luria's (1971) words,

> Using the historically laid down system of language, the mother shows the child an object and names it by the corresponding word, separating out the named object and turning the child's attention to it (pp. 260-261).

Vygotsky also asserted the primacy of the interpersonal with regard to higher cognition. The use of symbols first has to be learned by the child from others; only later can interpersonal interaction be internalized to serve as an individual cognitive tool. All higher cognitive functions appear first on a social level, and are later internalized.

> Each function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological), and then inside the child (intrapsychological) (Vygotsky, 1978, p. 57).

Vygotsky developed concepts such as *internalization* and *zone of proximal development* (ZOPD) to emphasize the primacy of symbolic interaction. The concept of *internalization* was concerned with the mechanisms by which the external symbolic action gets transformed into the internal psychological action. His concept of the *zone of*

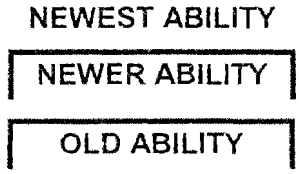
proximal development[10] emphasized the role of instruction and teaching as a way of passing complex cultural knowledge on to the child, and stressed the importance of a rich social milieu for child development. In Vygotsky's (1934/1986) words, "by and large, instruction precedes development [of complex cognition]" (p.185).

Higher cognition was thus essentially a cultural phenomenon for Vygotsky, and the structure of cognition was modelled on the structure of communication. "Words are first used unreflectively ('for-others') and only later reflectively ('for-oneself')" (Vygotsky, 1978).

> The mechanism of social behaviour and the mechanism of consciousness are the same. ... We are aware of ourselves, for we are aware of others, and in the same way as we know others; and this is as it is because in relation to ourselves we are in the same [position] as others are to us (Vygotsky, 1979, as quoted by Vygotsky in Preface to Vygotsky 1934/1986, p. xxiv).

Vygotsky (1934/1986) used the analogy of a layered geological structure to explain the emergent multilayered nature of symbolic cognition. Each new ability the child acquires through

Figure 1: Nested structure of symbolic cognition.



symbolically interacting with others builds on the cognitive foundation that the child already has. The new abilities have an emergent nature and cannot be reduced to their

[10] On the practical level, Vygotsky (1934/1986) used the concept of the ZOPD to measure the child's ability to benefit from instruction and made it an alternative to the more static measures of intelligence. The ZOPD could be measured for each child as the "discrepancy between a child's actual mental age and

foundations. Nor do the old layers entirely disappear. Instead, "all existing functions are incorporated into a new structure, form a new synthesis, become parts of a new complex whole" (Vygotsky, 1934/1986, p. 108).[11] Such a nested view of symbolic cognition is represented in Figure 1.

2.4 Literacy and cognition

In addition to recognizing that higher psychological forms are born within social symbolic practices, Vygotsky also recognized, at least to some extent, that as the symbolic practices changed their form so did the resulting cognitive organization. Some of Vygotsky's work specifically focused on the role of literacy. He was one of the first theorists to directly consider the effects of literacy on cognition, and to study such effects empirically. Yet, his appreciation of literacy as an autonomous medium was limited. Vygotsky's (1934/1986) most popular book on the subject of communication and consciousness, *Thought and Speech*, exemplified both his enormously progressive thinking and the limitations of his treatment of the medium of literacy.

On the positive side, Vygotsky (1934/1986) explicitly recognized that there was a significant difference between the medium of speaking and writing.

> Our investigation has shown that the development of writing does not repeat the developmental history of speaking. Written speech is a separate linguistic function, differing from oral speech in both structure and mode of functioning (Vygotsky, 1934/1986, pp. 180-181).

the level he reaches in solving problems with assistance" (Vygotsky, 1934/1986, p. 187). Vygotsky demonstrated that the ZOPD was a good predictor of the child's success in school.

[11] Note that Vygotsky's (1934/1986) position on the role of interpersonal communication and communicative tools was very similar to that of George H. Mead (1934/1974, in Kozulin, 1986). Vygotsky's and Mead ideas bear similarities in the emphasis on the role of intellectual tools in shaping human cognition, both emphasizing the dynamic, dialectical nature of the emergence of the self in its social context (Valsiner & Van de Veer, 1988).

Further, Vygotsky (1934/1986) recognized two main features that were important for understanding the differences between the medium of speaking and the medium of writing. First, unlike speaking, writing is a visual and silent medium that encodes spoken sound: "In learning to write, the child must disentangle himself from the sensory aspects of speech and replace words by images of words" (Vygotsky, 1934/1986, p. 181). Focussing on how different media engage senses leads to what I call in this thesis a *perceptual modality* form of explanation. Second, Vygotsky (1934/1986) recognized that, unlike speaking, writing does not require the immediate presence of the other:

> Writing is also speech without an interlocutor, addressed to an absent or an imaginary person or to no one in particular – a situation new and strange to a child. Written speech is monologous; it's a conversation with a blank sheet of paper (Vygotsky, 1934/1986, p. 181).

Focussing on how different media affect interpersonal relationships leads to what I call a *relational* form of explanation. Without explicitly naming them as such, Vygotsky (1934/1986) thus used the *perceptual modality* (image for sound) and *relational* (absent other) explanations to account for the cognitive effects of literacy.

As to the cognitive effects themselves, at one point Vygotsky (1934/1986) directly attributed engagement in the medium of writing to two related developments. First, he recognized that metalinguistic awareness was a direct consequence of writing.

> In speaking, [the child] is hardly conscious of the sound he pronounces... . In writing, he must take cognisance of the sound structure of each word, dissect it, and reproduce it in alphabetical symbols (Vygotsky, 1934/1986, p. 182).

As a result: "Written speech is considerably more conscious, and it is produced more deliberately than oral speech" (Vygotsky, 1934/1986, p. 182). "Writing ... brings awareness to speech" (Vygotsky, 1934/1986, p.183). As Luria (1946; cited in Olson, 1994) put it,

> a word may be used but not noticed by the child, and it frequently seems like a glass window through which the child looks at the surrounding world without making the word itself an object of his consciousness and without suspecting that it has its own existence, its own structural features (p. 34).

Second, Vygotsky asserted that it was the medium of writing that created abstract thought.

> These two features [what I call *perceptual modality* and *relational* explanations] serve as an explanation for why writing produces abstract thought. Thus, writing requires a double abstraction: abstraction from the sound of speech and abstraction from the interlocutor. ... The motives for writing are more abstract, more intellectualized, further removed from immediate needs (Vygotsky, 1934/1986, p. 181).

Vygotsky (1934/1986) demonstrated that for preschool children words signified concrete reality, and that abstract concepts could be understood only to the extent that they represented concrete examples. Lacking the capacity for meta-linguistic reflection, children do not see words as separate from objects but as being parts or qualities of objects (Vygotsky, 1934/1986). Nor do they recognize that language is an arbitrary signifying system, as shown in pre-school children's inflexibility with arbitrary word substitution (Vygotsky, 1934/1986).

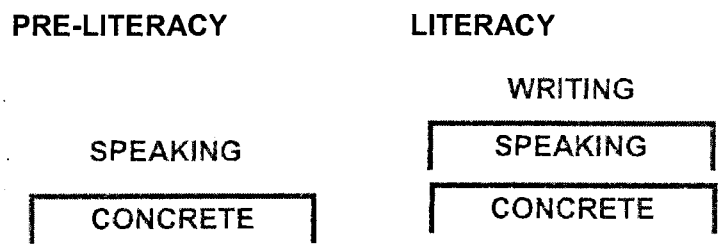
In addition to utilizing *perceptual modality* and *relational* forms of explanation to account for the emergence of metalinguistic awareness and verbal abstraction, Vygotsky also hinted at what I call a *structural* form of explanation when he wrote about "symbolization of the sound image in written signs [as ...] a second degree of symbolization" (Vygotsky, 1934/1986, p. 181). A structural/semiotic diagram[12], such as shown in Figure 2, can be used to elaborate this underdeveloped point and capture both

[12] Note that for the time being I use a somewhat simplified (static and individualistic) diagram to represent the signifying process, the sort of diagram one could find in a classical text on semiotics. In later chapters, I will elaborate this simplified view of the signifying process into a more complex triadic framework that stresses that signification is an irreducibly active and interpersonal process.

Vygotsky's (1934/1986) hints at a structural explanation and his metaphor for cognition as a layered geological structure.

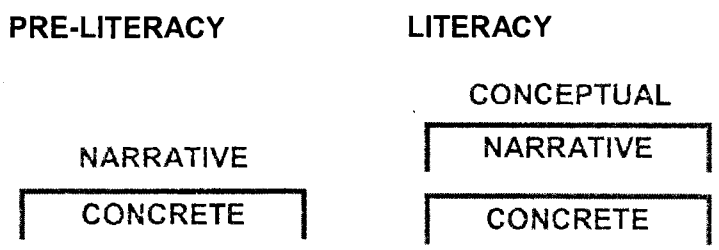
As Vygotsky (1934/1986) pointed out, preliterate speaking was

Figure 2: Semiotic structure of speaking and writing.



bound to the signification of concrete reality. As one is not conscious of the medium but only of the content of signification (McLuhan, 1964), preliterate children focus on the meaning of words but are not conscious of the words themselves. As a result, pre-literate speaking has a narrative structure[13]; it is a story about the concrete world. As writing encodes speaking, it adds an additional layer

Figure 3: Emergence of the conceptual level on the cognitive plane enabled by literacy.



to symbolic cognition, now turning the spoken words themselves into objects of conscious reflection, resulting in the emergence of metalinguistic awareness. The emergence of a symbolic operation on words that literacy enables further creates a

possibility for decontextualized abstraction, i.e., for purely verbal cognitive operations that are free from the level of the concrete[14]. "In written speech, we are obliged to create the situation, to represent it to ourselves. This demands detachment from the actual situation" (Vygotsky, 1934/1986, pp.181-182). Luria's (1974/1976) description of the transition to abstract thought suggests the same structure.

> It becomes possible to take assumptions as they are formulated in language and use them to make logical inferences, regardless of whether or not the content of the premise forms a part of personal experience (p.163).

In other words, as shown in Figure 3, literacy creates conceptual space that enables abstract concept formation[15].

Vygotsky did not explicitly elaborate a structural explanation for the effects of literacy in the way I have done here, but I argue that such a structural explanation is a natural and necessary extension of his theory. The basic explication of this explanation at this early point in my thesis will make the discussion of Vygotsky's other findings and claims more coherent.

2.5 Written word and spoken word

Given his recognition of the differences between speaking and writing, and his direct attribution of abstract thought and metalinguistic awareness to writing itself, it is surprising how little attention is given to the medium of writing in Vygotsky's (1934/1986) or later Luria's (1974/1976) theoretical explanations. Instead, most of the time, both

[13] By 'narrative' I mean a verbal account that is directly related to concrete reality, as contrasted with theoretical abstract language that has a degree of distance from the concrete.

[14] As should become evident as my thesis progresses, I argue in more detail that literacy does not necessitate decontextualized abstraction; it merely makes it possible.

[15] Decontextualized abstraction is a development that takes time. In a later section, I will discuss Vygotsky's (1934/1986) explication of the course and mechanisms of the development of decontextualized abstraction in children.

thinkers appear to feel more comfortable dealing with the more general concept of the *word*, thus essentially conflating writing with speaking.

The very title of Vygotsky's (1934/1986) book, *Thought and Speech*, relegates writing to the margins of his theory. He frequently calls writing *written speech*, thus minimizing the emergent properties of writing. Vygotsky (1986) wrote: "The structure of this book is perforce complex and multifaceted; yet all its parts are oriented toward a central task, the genetic analysis of the relation between thought and spoken word" (p. lx). Later in the same introduction, he stated that one of his tasks was to explicate "the specific psychological nature and linguistic function of written language in its relation to thinking" (Vygotsky, 1886, p. ixi). The only way for these two sentences not to contradict each other would be if Vygotsky (1934/1986) conflated speaking and writing, treated writing as a form of speech. Similarly, only by assigning identity to speaking and writing could one reconcile Vygotsky's (1934/1986) claim that "writing produces abstract thought" (p. 181) with his claim that "the development of concepts, both spontaneous and scientific, belongs to the semantic aspect of speech development" (p.160).

This tendency to minimize or under-appreciate the emergent properties of writing, or to conflate it with speaking, remains the greatest limitation of Vygotsky's (1934/1986) and Luria's (1974/1976) work with respect to literacy. Paradoxically then, Vygotsky, who conducted some of the most ingenious studies on the effects of literacy, will remain a mere predecessor of a more complete medium conceptualization, a conceptualization that would be entirely coherent with his own materialist framework.

2.6 Abstract concept formation

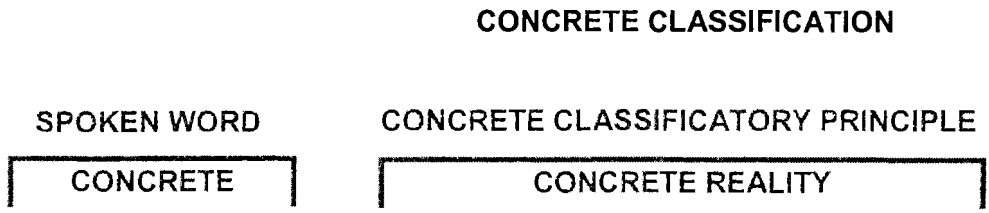
In this section, I describe in more detail Vygotsky's (1934/1986) findings regarding the course of the development of abstract cognition during the school years. For the most part, the language that Vygotsky (1934/1986) used to explain the evolution of abstract thought did not make direct reference to literacy. However, given the literacy hypothesis I am attempting to explore in this thesis, I will present a running commentary on Vygotsky's findings from a medium standpoint I am developing.

One way in which Vygotsky (1934/1986) examined the emergence of abstract cognition was by studying children's classification. Using a *blocks and nonsense-word* design,[16] Vygotsky (1934/1986) studied changes in children's categorization process and the role of words in this task. To simplify his findings, he demonstrated that preschool children used what he called "thinking in complexes" (Vygotsky, 1934/1986, p. 112) when sorting objects into categories. Thinking in complexes implies the use of classificatory principles; however, these principles can change at any point during the task, and no hierarchical classification is used. Thinking in complexes is "*concrete and factual* rather than abstract and logical" (Vygotsky, 1934/1986, p. 113), as the "child incorporates different things into a group on the basis of concrete imagery" (Vygotsky, 1934/1986, p. 132).

[16] In his experiment, designed to study the relationship between classification and language, Vygotsky (1934/1986) presented children with blocks of various colours, shapes, and sizes, hence introducing them to many possible concrete classificatory principles. The correct solution consisted in arranging blocks in four groups according to size and one feature of shape (flat or tall). Hence the solution was to group the blocks into large-flat, small-flat, large-tall, and small-tall. Corresponding to the correct solution were four types of non-sense words inscribed on the base of the blocks, initially invisible to the subjects. Children were asked to arrange the blocks in groups that might go together. After each grouping, one incorrectly grouped block was turned over and the subject was asked to arrange the blocks again. This procedure was repeated a number of times, providing data on children's thinking process during classification.

Importantly, the design of the *blocks and nonsense-word* task allowed Vygotsky (1934/1986) to demonstrate that classification was a result of the application of words themselves as categories. He claimed that "the very difference between the complex and the concept lies in the different functional uses of the word" (Vygotsky, 1934/1986, p. 139). As to the

Figure 4: Speaking as an enabler of concrete classification.



formation of complexes, Vygotsky (1934/1986) considered words to serve a unifying function to organize concrete imagery. "A word does not refer to a single object, but to a group or to a class of objects. Each word is therefore already a generalization" (Vygotsky, 1934/1986, p. 6). The classification into complexes does not require conscious awareness of words themselves. The relationship between speaking and concrete, non-hierarchical classification is depicted in Figure 4. My use of the structural diagram I proposed earlier is designed to emphasize the role of speaking in grouping objects and occurrences into concrete classes.

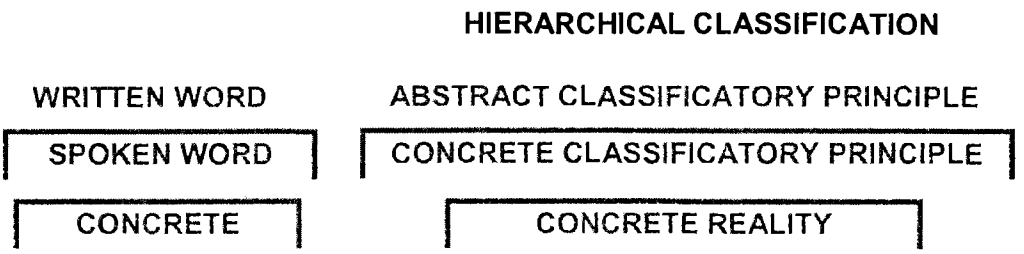
Words become conscious categories in abstract classification. "The decisive role in this process [advanced concept formation], as our experiments have shown, is played by the word, deliberately used to direct all the subprocesses of advanced concept formation" (Vygotsky, 1934/1986, p. 139). "Real [abstract] concepts are impossible without words, and thinking in concepts does not exist beyond verbal thinking" (Vygotsky, 1934/1986, p. 107). It is therefore the consistent application of a word-

concept that enables the child to distance herself from the concrete world and conduct systematic abstract classification.

Vygotsky (1934/1986) recognized that the emergence of abstract classification has to do with the child's increased capacity to cognitively distance himself from the concrete world: "In the contest between the concept and the image that gave birth to the name, the image gradually loses out" (Vygotsky 1934/1986, p. 132). Or in another place: "the global character of the child's perception has been breached. ... An object no longer enters a complex *in toto*, with all its attributes – some are denied admission" (Vygotsky, 1934/1986, p. 136).

Unfortunately, Vygotsky (1934/1986) did not explicitly tie the achievement of abstract classification to writing. Nor did he connect writing to the achievement of metalinguistic awareness. I believe that the medium of writing as an explanatory principle

Figure 5: Writing as an enabler of abstract hierarchical classification.



(as shown in the structural diagram in Figure 5) accounts more adequately for the mechanisms by which abstract classification emerges. Abstracting and following a classificatory principle presupposes an awareness of such a principle (i.e., metalinguistic awareness). Further, only by developing an intermediate level of signification (i.e., by conducting cognitive operations on words) is a child able to conduct hierarchical classification (i.e., sub-group inclusion). Vygotsky (1934/1986) showed that preschool

children who thought in complexes, were incapable of hierarchical classification, which suggests that writing might be necessary for hierarchical classification.

> As I discussed earlier, preschool children think in complexes that are inescapably tied to concrete reality. The principal function of complexes is to establish bonds and relations. Complex thinking begins the unification of scattered impressions; by organizing discrete elements of experience into groups, it creates a basis for later generalizations. But the advanced concept presupposes more than unification. To form such a concept it is also necessary *to abstract, to single out* elements, and to view the abstracted elements apart from the totality of the concrete experience in which they are embedded (Vygotsky, 1934/1986, p. 134).

Writing enables the awareness of words, which can then be consistently applied as classificatory principles. Furthermore, with the newly gained metalinguistic awareness, the child can learn the meaning of abstract terms (super-categories) as they apply to language itself.[17]

The same structural point was made even more evident and clear in Vygotsky's (1934/1986) chapter on *spontaneous* and *scientific concepts*[18]. "In operating with spontaneous concepts, the child is not conscious of them because his attention is always centred on the object to which the concept refers, never on the act of thought itself" (Vygotsky, 1934/1986, p. 171). "In the scientific concepts ..., the relation to an object is mediated from the start by some other concept" (Vygotsky, 1934/1986, p. 172). I propose that conceptual mediation is enabled by the semiotic verbal operation exemplified in the above diagram.

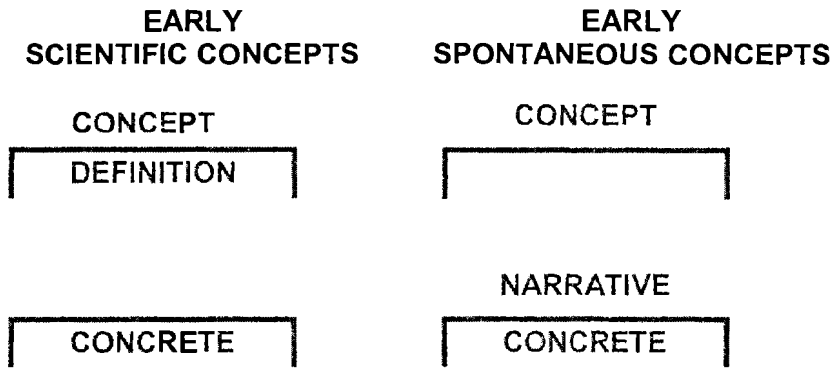
Vygotsky realized that abstract concepts were verbal constructions. "In the case of scientific thinking, the primary role is played by *initial verbal definition*, which being

[17] As I will demonstrate later, the vocabulary of abstract decontextualized terms proliferated after the introduction of 'decontextualized' (arbitrary) phonetic writing at the birth of Western culture. Children, however, do not have to create their own abstract terms, but rather have to learn those offered by their culture that is already saturated with such terms.

applied systematically, gradually comes down to concrete phenomena" (Vygotsky, 1934/1986, p. 148). "The difficulty with scientific concepts lies in their *verbalism*, i.e. in their excessive abstractness and detachment from reality" (Vygotsky's, 1934/1986, p. 148). The hierarchical symbolic structure I am proposing also accounts for the conceptual decontextualization, through creating a possibility for purely verbal operations.

Vygotsky's (1934/1986) chapter on spontaneous and scientific concepts provides valuable insights into the course of the development of abstract thought. He demonstrated that

Figure 6: Early stages of the development of scientific (abstract) and spontaneous (concrete) concepts.



during early school years there occurs a gradual increase in children's capacity for propositional scientific thinking. Interestingly, the attainment of scientific concepts begins with a reliance on verbal definition. Vygotsky (1934/1986) demonstrated that abstract concepts and their definitions are initially disconnected from concrete reality (e.g., concrete examples), and that the understanding of those concepts initially depended on the memorization of the concept definition, without the definitions necessarily being

[18] Note that the terms *spontaneous* and *scientific concepts* are somewhat related to the *complexes* and *concepts* respectively.

linked to specific concrete examples. The gap between the definition and concrete examples in the early stages of the development of scientific concepts is portrayed in the left half of Figure 6. During the initial years of schooling, this structural gap lessens, as the definitions of abstract concept become progressively more connected to the concrete level of phenomena.

In contrast to scientific concepts, spontaneous concepts are concerned with the narrative understanding that the child has been forming since learning to speak. As discussed earlier, such narrative structures (spoken language) are used but not reflected on. In order for concrete words to become *concepts*, one has to become consciously aware of them and thus able to define them. However, when faced with a metalinguistic task of talking about words (instead of just using them), the child is initially puzzled. "When asked to define the concept 'brother,' a student turns out to be more confused than when asked to define the Archimedean law" (Vygotsky 1934/1986, p. 158). This is because, "almost all empirical content of the concept 'brother' is already assimilated by the child. The concept of 'Archimedean law,' on the contrary, does not evoke such a repercussion in the child's own experience" (Vygotsky 1934/1986, p. 158). The right half of Figure 6 captures the initial gap between concrete significations and spontaneous concepts. I propose that during schooling, through increased metalinguistic practice (i.e., defining concrete words), this gap lessens.

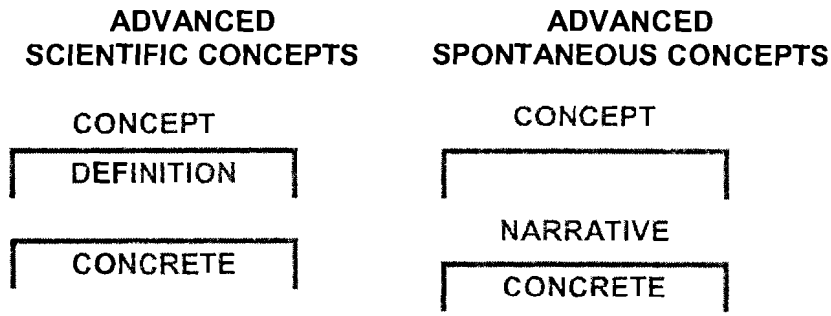
The development of spontaneous concepts thus proceeds from concrete examples to abstract principles and is achieved by defining concrete words, whereas the development of scientific concepts proceeds in the reverse direction, from abstract concepts through definitions to concrete examples. In Vygotsky's (1934/1986) words "*the development of the child's spontaneous concepts proceeds upward, and the*

development of his scientific concepts downward, to a more elementary and concrete level" (p. 193, emphasis in original). In other words, the child's task in abstract concept formation is to learn the definition of an abstract term and then later learn to apply the abstract concept at the level of the concrete. The child's task in spontaneous concept formation is to become aware of the already well-established concrete signification, and to be able to apply a definition to that signification. Interestingly, the development of spontaneous concepts during the first few years of schooling lags behind the development of scientific concepts (Vygotsky, 1934/1986).

> The greatest difficulty of all is the application of a concept, finally grasped on the abstract level, to new concrete situations that must be viewed in these abstract terms – a kind of transfer usually mastered only towards the end of the adolescent period (Vygotsky, 1934/1986, p. 142).

Around the onset of formal operations (Inhelder & Piaget, 1958), there occurs some integration of this three-layered signifying structure: "At about the fourth grade, verbalism gives way to concretization,

Figure 7: Advance stages of the development of scientific (abstract) and spontaneous (concrete) concepts.



which in turn favourably influences the development of spontaneous concepts. Both forms of reasoning reach, at that moment, approximately the same level" (Vygotsky 1934/1986, p. 149). My reinterpretation of the bridging of the conceptual and the

concrete, for both scientific and spontaneous concepts is captured in Figure 7. The remaining small gap in the right diagram represents the fact that some highly abstract (decontextualized) concepts will always resist easy concrete exemplification. Hence, the predominant conceptual space for decontextualized abstraction remains the definition[19], which is a verbal cognitive operation. In the same way, the application of definitions to everyday terms is only necessary in theoretical pursuits. In everyday use, concrete terms do not require definition, which is represented in the right diagram in Figure 7[20].

When discussing the emergence of scientific and spontaneous concepts, Vygotsky (1934/1986) did not explicitly connect them with literacy. It is my hope that the structural commentary I have added to Vygotsky's findings will provide a simple yet theoretically rich way of understanding the role that literacy plays in the development of abstract thought.

2.7 Literacy and adult cognition

Arguing that communicative conditions affect cognition in the context of child development would have left Vygotsky's materialist thesis vulnerable to counter-arguments from the 'brain maturation' camp. Children's brains undergo vast changes at the time they learn to read and write, and the proponents of maturational views of cognitive growth would argue that it is neurophysiological maturation that enables children to enter into the new realm of cognitive abilities. In order to make his materialist argument stand on its own, Vygotsky took his thesis beyond the context of child

[19] Of course, decontextualized abstraction is not only created within definitions. Mathematics creates decontextualized abstraction through equations. Abstractions can also be represented graphically. However, historical evidence suggests that it was writing (especially phonetic writing) that enabled the birth of the general cognitive level of decontextualized abstraction (Logan, 1986). Other theoretical pursuits, including theoretical mathematics, followed.

development, and into an ingenious research program concerned with the effects that changes in communicative conditions had on adults.

Even before that research trip, Vygotsky (1934/1986) already had compared children's concrete classification to that found in non-literate cultures.

> Primitive people think in complexes, and consequently the word in their languages does not function as a carrier of the concept, but rather as a family name for a group of concrete objects belonging together, not logically, but factually (p. 129).

He thus drew a parallel between cultural evolution and individual development: "If we trace the history of a word in any language, we shall see, however surprising this may seem at first blush, that its meanings change just as in the child's thinking" (Vygotsky, 1934/1986, p. 131).

A pivotal point in Vygotsky's research on cultural evolution of consciousness was his and Luria's expedition to remote villages in Central Asia in the 1930s, at a time when the area was undergoing rapid socio-economic and cultural restructuring, such as collectivization and elimination of illiteracy. The studies they designed directly considered the effects of literacy, and showed great cognitive differences between the illiterate peasants and those who received literacy training. Because such findings did not fit well with the communist glorification of the working class and peasantry, the resulting manuscript was banned from publication, and the study of cultural evolution itself was forbidden for the next 40 years. It was only in 1974 that Luria published these findings in his book *Cognitive development: It's cultural and social foundations* (1974/1976).

[20] Note the similarities between the course of development of Vygotsky's (1934/1986) scientific and spontaneous concepts and the distinction between deductive and inductive reasoning.

The general finding of Vygotsky's and Luria's research was that illiterate peasants, much like preliterate children, displayed difficulties with abstract reasoning tasks that required cognitive distance from concrete reality. In other words, preliterate adults were incapable of engaging in what I call *decontextualized abstraction*. In contrast, even elementary doses of literacy training enabled the peasants to reason without having to resort to concrete examples (Luria, 1974/1976).

Luria (1974/1976) provided many examples of non-literate peasants refusing to use words in abstract ways. Even when explicitly encouraged to do so, the illiterate peasants preferred to think in practical terms. For example, non-literate subjects did not assign abstract names to geometrical figures but used names of concrete objects (e.g., a circle was *a sieve*, *a plate*, or *a bucket*; Luria, 1974/1976). Similarly, non-literate peasants were uninterested in the question of definition (Luria, 1974/1976). As I already discussed, definition is a verbal operation and is normally required only when one deals with abstract concepts. Further, non-literate peasants were found to classify information according to practical demands. For example, when given three tools and a log, and asked to group them together, non-literate peasants put an axe and a log together, thus grouping them according to practical demands rather than some abstract classificatory principle. When asked, "Look, here you have three adults and one child. Now clearly, the child doesn't belong in this group," an illiterate subject replied, "Oh, but the boy must stay with others! All three of them are working, you see, and if they have to keep running out to fetch things, they'll never get the job done, but the boy can do the running for them" (Luria, 1974/1976, p. 55). Also, non-literate peasants refused to engage with *hypothetical* deductive problems (Luria, 1974/1976). For example, when given the following syllogism, "In the far North, where there is snow, all bears are white. Novaja

Zembla is in the far North and there is always snow there. What color are the bears?," the peasants would say that they did not know because they had never been to Novaja Zembla, or that all they knew were black bears and they never saw any other kind, or that one should ask the other person who actually went to Novaja Zembla and who therefore must know (Luria, 1974/1976). The non-literate peasants were able to solve deductive syllogisms but only if the syllogisms were related to the concrete practical reality they knew. These peasants thus were not incapable of logical thinking, but those conceptual problems that were separated from practical knowledge made no sense to them. All these results changed for those peasants who had achieved a mastery of literacy.

The findings from this line of Vygotsky's and Luria's research program provided significant support for the original materialist hypothesis, which Vygotsky initially developed predominantly in the context of child development, that a change in communicative conditions enabled a corresponding change in cognition. More specifically, the findings supported the thesis that it was the use of literacy that enabled decontextualized reasoning, not only in children but also in adults.

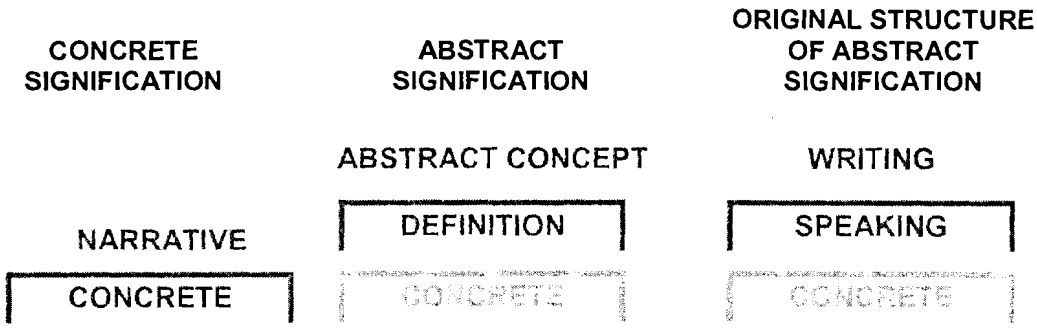
Given that literacy was the main independent variable in this research program, it is surprising that Luria (1974/1976), in his theoretical explanations, did not pursue Vygotsky's (1934/1986) earlier hints that it is literacy per se that enables abstract thought. Instead, Luria (1974/1976) favoured a less specific explanation for these cognitive changes, attributing them to the more general concept of the *word* or *education*. The following is an example of Luria's (1974/1976) explanation for his findings in the area of generalization and abstraction:

> Lacking the formal education that would have allowed for systematic intellectual development, these [illiterate] people regarded the logical

> procedures of categorization as irrelevant, of no practical value. Hence, they substituted procedures that were more meaningful to them, analysing an object according to its relevance to a functional situation. This approach took precedence over the verbal logical operations typical of abstract thinking. ...
>
> The semantic and psychological structure of this mode of thinking is unique. Words have entirely different functions than they do in a system of abstract thought; they are not used to codify objects in conceptual schemes but to establish the practical interrelationships of those objects.
>
> This mode of thought, however, undergoes a radical transformation once the conditions of people's lives change. When they acquire some education and participate in collective discussions of vital social issues, they can readily make the transition to abstract thinking. The acquisition of new ideas imparts added meaning to their use of language so that words become principle agents of abstraction and generalization. ...
>
> Education, which radically alters the nature of cognitive activity, greatly facilitates the transition from practical to theoretical operations (pp. 98-99).

I suggest that, instead of using the more general concepts of *word* or *education*, the above findings should be interpreted with more specificity in light of the structural explanation

Figure 8: The structure of concrete and abstract signification.



that I developed in this chapter. I argue that the application of the structural framework I am proposing is capable of bridging Vygotsky's historical and developmental findings on the effects of literacy. As shown in the left diagram in Figure 8, I propose that oral narrative is a verbal signification of concrete phenomena. In contrast, as shown in the

middle diagram in Figure 8, decontextualized abstraction is a conceptual signification of the verbal significations themselves (note that the highlighted part reflects the semiotic structure that can operate without a reference to the concrete). The right diagram in Figure 8 shows what I believe to be the original structure that enabled abstract signification (again the highlighted part reflects the semiotic operation on words without a reference to the concrete). I believe that Vygotsky's studies provided fairly strong evidence for my thesis that decontextualized concept formation was made possible because writing provided a possibility for a purely verbal cognitive operation that was free from the practical demands of concrete context.

It seems reasonable to hypothesize that once the conceptual structure is established, abstract thought can be conducted with the use of either writing or speaking. In fact, mathematics and graphical diagrams can also serve as media for decontextualized representation. However, Vygotsky's (1934/1986) studies as well as other historical research (e.g., Logan, 1986) suggest a hypothesis that the very possibility of abstract thought was in fact enabled by the technology of writing. Much as was the case before the birth of Western civilization (Logan, 1986), illiterate peasants from Vygotsky's studies used mathematics only for practical purposes before they acquired literacy (Luria, 1974/1976). Historically, even though it is a much older system than writing, mathematics became a theoretical discipline only after writing (Logan, 1986). A look at the properties of the medium reveals that mathematics in its original form is a symbolic mode that is irreducibly concrete. Numbers are mere abstractions of quantities of concrete events, and they in themselves do not encourage decontextualization any more than speaking does. Hence, at this point I operate on the assumption that other media that can carry decontextualized abstractions are the after

effects of the emergence of a general cognitive level of decontextualized thought enabled by writing.

2.8 Vygotsky and literacy: A summary

Overall, Vygotsky showed both revolutionary insights into the effects of literacy on cognition and significant limitations in the extent to which he developed his medium arguments. I suggest that Vygotsky's most noteworthy achievements with regard to the medium framework can be summarized in the following points.

1) In developing his materialist framework, Vygotsky provided a solid foundation for a cognitive theory that pays due attention to the role of external communicative conditions in the development of cognition. Such a framework provides a non-dualist, ecological view of the psyche that stresses human activity in its natural and social surroundings. Judging by my impressions from the ten years of my graduate studies, I can say that today, seventy years later, psychology still has not developed adequately rich insights into the depths to which the inner is structured by the external conditions of the subject's active involvement in the world. I believe that the consideration of how specific external conditions of action and communication influence cognitive development is a necessary complement to more conventional psychological studies of internal organization, brain maturation, or genetics.
2) Vygotsky stressed the importance of symbolic communication in the development of higher forms of thought. He recognized that complex cognition, while clearly requiring complex biology, is the result of symbolic practices in which humans engage. He recognized that complex knowledge is not stored in

genes but in cultural practices and artifacts, and that it has to be learned by the subject as she engages in complex human interactions. Vygotsky thus recognized that the development of complex cognition was a top-down process requiring the active role of others. In his concepts of *instruction* and *zone of proximal development* he stressed the importance of the optimal learning environment in facilitating the development of complex abstract thought.

3) While recognizing important differences between phylogenesis and ontogenesis, Vygotsky demonstrated that the principles of his materialist framework applied to both cultural development and child development, thus providing more generalizability for his framework.
4) Vygotsky was a pioneer in postulating that literacy played a role in child cognitive development. He later applied the same insight to cultural development. Importantly, he provided a wealth of empirical studies demonstrating the role of literacy in the development of metalinguistic awareness and decontextualized thought, both in children and adults after they learn to read and write. Interestingly, as will become evident in this thesis, although such a literacy framework has been developed fairly well in the history of cognition, rather little of it has to date been utilized in the area of child development.
5) Vygotsky provided a valuable explication of the course of development of decontextualized abstraction. He showed that in their early stages of development, scientific (deductive) concepts rely on verbal definition and are removed from the level of the concrete.

The following are some of Vygotsky's shortcomings with regards to the medium framework I am proposing.

1) Even though he made the distinction between speaking and writing, and considered the implication of writing on cognitive development, Vygotsky did not develop a full-fledged medium framework. Both he and Luria spent very little time directly discussing literacy; instead, they predominantly focussed on the more general concept of the *word*. Calling literacy *written speech*, Vygotsky de-emphasized the emergent properties of the medium of writing. As a consequence, the literacy thesis, which emerges from Vygotsky's program of research, has received much less academic attention than have his more general ideas concerning *internalization* and the *zone of proximal development*.
2) When discussing literacy directly, Vygotsky focussed predominantly on the *sensory modality* (eye for ear) and *relational* (absent other) explanations for the effects of literacy. He merely hinted at the *structural* explanation that I argue is central to the understanding of the literacy effects.
3) Overall, Vygotsky failed to clearly recognize, much less explain theoretically, that the ability to reason outside of the concrete context is enabled directly by literacy. Vygotsky correctly attributed the emergence of metalinguistic awareness to literacy. However, because he did not develop a structural explanation for literacy effects, he did not recognize the direct link between the achievement of metalinguistic awareness and the later development of the ability for decontextualized abstract thought. I argue that the explanation Vygotsky (1934/1986) provided for the emergence of abstract thinking (as resulting from the abstraction from sound and the abstraction from the other) is insufficient, without the consideration of the structural features of literacy, to account for the emergence of decontextualized abstraction. The chapter that follows will provide

more historical evidence showing that decontextualized abstract thought emerges only after the introduction of literacy.

4) Vygotsky (186/1934) criticized Piaget for paying too much attention to the child's solitary action and not paying adequate attention to the role of symbolic communication in the development of thought, rightly stressing that the development of higher cognition irreducibly relies on social interaction. However, focussing almost exclusively on the role of symbolic communication and higher cognition, and paying very little attention to the role of pre-verbal activity in the acquisition of knowledge, Vygotsky made himself vulnerable to the inverse of his own criticism of Piaget. Physical action on objects is an important precursor to the development of later abstraction. Vygotsky (1934/1986) did acknowledge the primacy of action – "The word was not the beginning – action was there first" (p. 255) – in much the same way Piaget acknowledged the central role of others and symbolic communication. Neither one of them, however, adequately developed these respective areas. Vygotsky and Piaget should thus be considered as complementary forces in the creation of an overall theory of emergent cognition.
5) The final point of criticism I wish to direct toward Vygotsky's work is related to the remnants of the dualist sentiments from which he struggled to free himself. A full application of Vygotsky's materialist principles would require a radical recognition of the extent to which our thought is concretely shaped by our engagement in our worldly context. Different forms of thought are but reflections (albeit transformed) of different modes of action and communication, and the course of development of those forms of thought runs parallel to the structure of action, especially communicative action, in which we are engaged and embedded. Our cognition is

a transformation of our overall experience. Once it is recognized that *the inner is a functional reflection of our external relations*, it is not necessary to draw sharp distinctions between communication and thought. In this light, thought is revealed as a living tapestry of our communicative history. Having failed to fully recognize this point, Vygotsky retained a rather idealistic notion of 'thought.' The following passage is testimony to his struggle to explain the relationship between thought and speech.

> The meaning of a word represents such a close amalgam of thought and language that it is hard to tell whether it is a phenomenon of speech or a phenomenon of thought. A word without meaning is an empty sound; meaning, therefore, is a criterion of "word," its indispensable component. It would seem, then, that it may be regarded as a phenomenon of speech. But from the point of view of psychology, the meaning of every word is a generalization or a concept. And since generalizations and concepts are undeniably acts of thought, we may regard meaning as a phenomenon of thinking. It does not follow, however, that meaning formally belongs in two different spheres of psychic life. Word meaning is a phenomenon of thought only insofar as thought is embodied in speech, and of speech only insofar as speech is connected with thought and illuminated by it. It is a phenomenon of verbal thought, or meaningful speech – a union of word and thought (Vygotsky, 1934/1986, p. 212).

This quotation does not do justice to Vygotsky's (1934/1986) complex explication of the relationship among thought, speech, and inner speech. However, it does show the categories within which Vygotsky's conceptualization operated, specifically his somewhat amodal/idealistic view of thought and the omission of writing as a medium that is separate from speaking.

Despite his shortcomings, Vygotsky laid an important foundation for later developments in the study of literacy. In the next chapter, I move thirty years forward to the 1960s, from which time the medium of literacy began to receive much greater consideration in theory and research.

Chapter 3
From McLuhan to Olson

Vygotsky's and Luria's research from the 1930s was not published in the West until the 1970s. In the meantime, starting in the 1960s, there emerged a group of multidisciplinary academics – the majority of whom were based in the University of Toronto, hence coined the *Toronto School of Communication* (Goody, 1987) – who became interested in the study of the cognitive effects of the use of communicative technologies, especially literacy. Once published in English, Vygotsky's and Luria's findings fed a broadening stream of medium theorizing.

In this chapter, I provide a brief overview of several key thinkers that contributed to the present day shape of the literacy hypothesis. I begin with an introduction to the work of Marshal McLuhan, Eric Havelock, and Jack Goody and Ian Watt, who were first to draw attention to the profound impact that literacy had on our society and psyche. I subsequently discuss the work of Sylvia Scribner and Michael Cole, as well as Harvey Graff, who provided some criticism of the 'strong' literacy thesis postulated by McLuhan, Goody, and Havelock. I end the chapter with a brief overview of the work of Walter Ong, Robert Logan, Merlin Donald, and David Olson, who responded to some of the criticisms, and further elaborated the literacy thesis.

Most literacy theorists focussed on the historical effects of the introduction of writing, leaving a scarcity of theory and research concerned with the literacy thesis in the context of child development. Hence, my task in the present thesis is to extrapolate relevant information from the more established historical context, and apply this information to

child development. Keeping this goal in mind, I narrowed my selection of the literacy theorists to those who were predominantly concerned with the emergence of phonetic literacy in Ancient Greece, because the emergence of new cognitive forms in Ancient Greece is most relevant to the hypothesis I am elaborating here. As a result, several literacy theorists that I could have included in this chapter, most notably Elizabeth Einstein, were excluded because their focus lay elsewhere (e.g., on the introduction of the printing press during the Renaissance).

3.1 Marshall McLuhan

Harold Innis (1950) was the first Canadian to talk explicitly about communicative technologies as having their *biases* that influence both social and psychological organization. But it was Marshall McLuhan (1962, 1964, 1988) who brought the notion of the *medium* to public attention. In 1964, McLuhan was an obscure fifty-two year old English professor at the University of Toronto, who, after publishing his book *Understanding media: The extensions of man* (1964), became a renowned world celebrity, making a great impact on the academy, arts, and pop culture of the day. Phrases as well entrenched in our psyche as *mass media*, *global village*, or *age of information* all originated in the writings of Marshall McLuhan (1962, 1964, 1988; Lapham, 1994).

McLuhan's (1962, 1964) overall project was concerned with the development of a general medium framework that could be applied to understanding the effects of any communicative technology. In his most famous pronouncement, "the medium is the message" (p. 7), McLuhan (1964) essentially proclaimed that there was no objective or medium-free meaning, as all meaning was structured by the medium in which it was

communicated. Different media enhance different features of the message and thus structure messages according to their own grammar, their own possibilities and constraints.

In order to understand the effects of a medium, one has to consider how the physical characteristics of the medium influence one's communicative engagement (McLuhan, 1962, 1964). Once adequately developed, the general medium framework may serve to predict the effects of any communicative technologies: "Simply knowing in advance which transformations to expect, knowing where and how to look, lets you predict the effects of any new device or technique before they actually appear" (McLuhan & McLuhan, 1988).

McLuhan (1962, 1964) had a tendency to discard communicative content in favour of communicative context: "Societies have always been shaped more by the nature of the media by which men communicate than by the content of communication" (McLuhan & Quentin, 1967). However, a sympathetic reading of McLuhan (1964, 1962) can render his emphasis on the medium itself as a *complement* to the more traditional idealist preoccupation with content. There is no pure meaning, as all meaning is medium-contingent. But of course, media exist only as conduits of content that lies beyond them (e.g., communicative intention and its context). Hence, one can arrive at a dialectical conception of communication: the total context of a communicative act shapes the possible experiences of meaning that can be born within such an act. Such a thesis greatly resembles Vygotsky's (1934/1986) materialist approach that stressed that the psyche was a result of our engagement in communicative practices. However, by applying his medium framework consistently across all situations, McLuhan (1962, 1964) rid himself of the idealist sentiments that Vygotsky (1934/1986) still exhibited.

While being broad in the application of his medium framework[21], McLuhan (1962, 1964) put notable effort into explicating two more specific major cognitive and cultural shifts, one that occurred after the introduction of writing (and later print), and another, more recent one, that occurred after the introduction of electronic media. Below, I will discuss several of McLuhan's (1962, 1964) ideas that are related directly to literacy.

McLuhan (1962, 1964, 1988) was one of the pioneers in sketching an outline of a general framework for understanding the effects of phonetic literacy. Even though he did not thoroughly and systematically develop his ideas, he attributed to phonetic literacy such diverse phenomena as the rise of individualism, the dissolution of family, the emergence of linear thinking, the loss of dynamic/magical reality to the static/neutral one, the emergence of objective representation of space (Euclidean geometry) and linear representation of time, and the emergence of formal logic, all phenomena associated with the rise of Western culture[22].

McLuhan (1964) used various forms of explanation for the literacy effects, without again being systematic about explicating them or distinguishing among them[23]. First, he argued that different media led to the enhancement of different aspects of spacio-temporal experience, and that the ratio of sensory involvement that a medium fosters

[21] McLuhan (1964) defined the *medium* as the *extension of human senses*. Such a definition was very broad, as it included both symbolic (e.g., writing, telegraph, telephone) and non-symbolic technologies (e.g., wheel, money, car, airplane). McLuhan (1964) attempted to apply his medium theory to all technologies, claiming that "[a]ny extension, whether of skin, hand, or foot, affects the whole psychic and social complex" (p. 4). In contrast to such a broad definition, in the present thesis I apply the term *medium* to symbolic communication only, including non-technological symbolic systems (speaking, gesturing).

[22] The hypothesis that much of Western culture has been enabled by the technology of phonetic writing will be developed in more detail by other literacy theorists.

[23] Note that the very act of distinguishing among various explanations is an analytical manoeuvre aimed at clarifying the existing accounts of the literacy hypothesis. My hope is that such clarification will put to rest some of the controversies in this area of research. Of course, in the practice of communication, all the effects are at work simultaneously. And in a later chapter, I will elaborate a framework that encompasses relevant explanatory criteria.

creates different cognitive and cultural effects (McLuhan, 1964). In the case of literacy, McLuhan (1964) was best known for his "eye for ear" (p. 84) formula. Following James Joyce's focus on ear-eye differences, McLuhan (1964) argued that the alphabet acted to intensify the operation of vision and to suppress other senses, especially hearing. This emphasis on *perceptual modality* greatly resembled that of Vygotsky (1934/1986).

Further, even though he did not explicitly interpret his theory in structural terms, McLuhan (1964) made a very important contribution to the structural explanation I am developing in the present thesis. His thesis that the content of any medium "is always another medium" (McLuhan, 1964, p. 305), and his more specific thesis that "the content of writing is speech"

Figure 9: The content of a medium can be another medium.

(McLuhan, 1964, p. 8), directly suggested the structural framework for abstract/verbal signification I introduced in the previous chapter. Semiotic theories typically conceive the signified to be located at the level of the concrete. However, McLuhan's claim, if translated into a semiotic framework, such as in Figure 9, points out that the symbolic system itself can become an object of signification. In other words, with the introduction of writing, spoken words themselves can become objects of signification, thus creating a possibility for a purely verbal symbolic operation[24]. This point has not yet been examined by linguists or psychologists.

[24] Again, please note that for now I am using this simplified (individualistic-looking and decontextualized) view of symbolic communication for the purpose of communicative efficiency. The appropriate triadic interpersonal framework will be elaborated in Chapter 4.

The following quote from McLuhan (1964) captures both the *perceptual modality* and the *structural* forms of explanation for the alphabetic effects. Here McLuhan (1964) introduced the very important notion of *arbitrariness* of phonetic writing with regard to concrete phenomena.

> The phonetic alphabet is a unique technology. There have been many kinds of writing, pictographic and syllabic, but there is only one phonetic alphabet in which semantically meaningless letters are used to correspond to semantically meaningless signs. ... The phonetically written word sacrifices worlds of meaning and perception that were secured by forms like hieroglyph and the Chinese ideogram (p. 83).

This important notion of arbitrariness of phonetic writing, and the comparison between phonetic and non-phonetic forms of writing, is crucial for understanding the emergence of purely abstract, theoretical thought, both historically and developmentally. The notion will be further developed by others, especially Eric Havelock.

McLuhan (1964) further introduced the important notion of *medium-blindness*, that is a tendency to focus on the content of the medium and a corresponding lack of awareness of the medium itself: "Indeed it is only too typical that the 'content' of any medium blinds us to the character of the medium" (McLuhan, 1964, p. 9). Medium blindness is not a sloppy oversight,

Figure 10: Medium blindness.

but a phenomenon that results from the very nature of symbolic communication. Signs are used in communication, and under normal circumstances are perceptible and explicit. But signs are themselves meaningless, unless translated into the underlying intention they contain. The challenge of understanding is to reproduce the implicit

communicative intention, where the listener or reader typically focuses on deciphering the content of a message rather than examining the medium. A fluent writer or speaker will likewise focus on what she wants to convey rather than the manner in which it is conveyed (except of course in highly self-conscious discoursive situations, such as when giving a formal presentation, writing an academic paper, creative writing, etc). As I already discussed earlier, very limited awareness of the medium is especially true for preliterate subjects with regard to speaking. The introduction of literacy introduces the awareness of words themselves and thus enables linguistic reflection. Yet, it is important to note that the introduction of writing creates predominantly an awareness of *spoken* words, and that the static, visual nature of the *written* characters has an impact on the subject predominantly on a subconscious level, bringing about the cognitive changes I am discussing without the subject being medium-conscious[25]. The highlighted parts of the diagrams in Figure 10 reflect the fact that we are typically aware of the content of signification and not the medium of signification.

McLuhan (1962, 1964) also recognized that writing was a tool that extended our cognitive potential and memory. This *external storage* form of explanation was later best developed by Donald (1991, 2001), and I elaborate it in a later section of this chapter.

In summary, I believe that McLuhan's greatest contribution to the general medium framework includes his relentless emphasis on the need to study the medium itself, his stress that specific physical properties of the media result in specific cognitive effects, his emphasis that typically we are not aware of the medium itself, and his great ability to

[25] If it was otherwise, if psychologists and linguists were aware of the impact of the medium itself, the medium theory would not be as marginal as it is today. Also, as I will discuss later, if we were medium conscious, Western dualistic phenomena such as the Western god would never be granted the status of the real. I will elaborate this point throughout my thesis. However, the ultimate evidence for medium blindness would have to come from empirical studies examining specific changes in cognition with the introduction of a new medium, such as writing.

popularize his concepts. McLuhan's (1962, 1964) most important contributions to the literacy hypothesis was his recognition that phonetic characters codify spoken words only and are arbitrary with regard to the concrete image. He also directly attributed to literacy many cognitive developments associated with the emergence of Western forms of thought. McLuhan's (1962, 1964) major shortcomings has to do with his communicative style and lack of systematicity in the development of his claims. He was particularly famous for making absolute statements that were not always thoroughly thought through or researched. As a result, his slogans, appropriate in the context of his mass media appearances, were not well accepted in academia. He received particularly strong criticism for his misrepresentation of the workings of the central nervous system (Lapham, 1994).

3.2 Eric Havelock

Eric Havelock, a leading authority on ancient Greek culture, was born and educated in England, and later became a US citizen, accepting the position of a Professor of Classics and Chairman in the Classics Department at Yale University. Havelock was also a visiting scholar at the University of Toronto, and was thus also considered a part of the Toronto School.

Havelock's (1963, 1976, 1982, 1991) work focussed on ancient Greek culture, and the role of the alphabet in the development of the Western forms of thought. He pointed out that the Greeks were first to develop fairly universal levels of literacy.

> The civilization created by Greeks and Romans was the first on the earth's surface which was founded upon the activity of the common reader; the first to be equipped with the means of adequate expression in the inscribed word; the first to be able to place the inscribed word in

> general circulation; the first, in short, to become literate in the full meaning of that term (Havelock, 1982, p. 40)[26].

Havelock (1976) credited the early popularisation of literacy to the efficiency of the phonetic alphabet. Compared to syllabic and idio/pictographic writing systems, phonetic writing uses very few characters that exhaustively (letters or combination of letters coded all possible phonemes) and unambiguously (one and only one phoneme was used for any letter or combination of letters) can represent any spoken sounds. Havelock (1976) argued that a phonetic writing system was easier to learn than other writing systems.

Havelock (1963, 1986) described the slow process of transition from orality to literacy. Early Greek culture was entirely oral, and the oral habits of communication were deeply entrenched in the Greeks, who greatly relied on poetic verse (rhyme and rhythm), on memorization, and on recitation for the preservation and distribution of knowledge. Those highly developed oral habits did not change easily. Initially, the introduction of the alphabet made "little practical difference to the educational system or to the intellectual life of adults" (Havelock, 1963, p. 38). After the invention/adoption of the alphabet, it took the Greeks three hundred years to develop high levels of literacy and to create Western forms of thought (Havelock 1986).

Havelock (1963) argued that it was the time around Plato that marked "the great transition from oral to literate habits of communication" (Havelock, 1963, p. 97). In *Preface to Plato*, Havelock (1963) argued that Plato's *Republic* was predominantly a political text designed as an attack on the Greek oral Hesiodic and Homeric tradition. On moral grounds, Plato argued that Homeric verse taught the youth useless, vain, and dangerous things, like murder, malice, incest, cruelty, treachery, etc., and that the poets

[26] Note that Harris (1989) estimated that the levels of Greek literacy were lower than those claimed by Havelock (1963).

were to be blamed for social problems. However, Plato's criticism was directed not only at the content of Homeric verse, but also at the dramatic rhetoric of poetic delivery. He proposed that poets be excluded from Greek education, and that poetry, which was based on mere opinion, be replaced with *logos*, a more formal conceptual system. As an antidote to the poetic discourse, Plato introduced the theory of forms, to which he attributed the status of universals that underlie mere appearances and reach to a deeper truth that lies beyond subjective experience. This ideology essentially defined the philosophical pursuit of truth. Havelock (1963) argued that Plato's theory of forms marked the time of a transition between thinking in concrete images to thinking in abstract concepts. Through criticizing the poets, Havelock (1963) claimed, Plato criticised the foundation of the entire Greek oral tradition. Plato's *Republic* thus marked the beginning of the Western literate civilization.

Havelock's (1963) description of the process of transition from orality to literacy in ancient Greece showed that, at first, writing was used to merely transcribe speech ["script was simply placed at the service of preserving visually what had already been shaped for preservation orally" (Havelock, 1963, pp. 136-137)], and the written form conformed to the oral rules of expression. With time, gradually, written practice "modified itself in order to become a language of literacy" (Havelock, 1986, p. 90). These modifications included a release from some of the constraints of oral communication (such as a need for rhythm and rhyme) and the formalization of syntax.

Havelock (1963, 1986) directly related the alphabet to a number of major cognitive changes associated with the rise of the Western forms of thought, such as the emergence of objective thought, theoretical abstraction, propositional thought, and systematic categorization. Similarly to Vygotsky (1934/1986), he argued that verbal

information in oral cultures was structured as a narrative (story) that was motivated by practical concerns. Statements of knowledge in oral cultures were always situated in a discernible context. In contrast, the introduction of literacy resulted in the creation of a theoretic conceptual (i.e., metaphysical) level that could operate in separation from the concrete context.

Havelock (1963) provided further evidence that the emergence of metalinguistic awareness was a result of the introduction of writing. He argued that Plato explicitly propagated metalinguistic reflection and an analytical approach by encouraging people to think about what they say instead of saying things in a non-self-aware manner (Havelock, 1963). He also demonstrated that the Greeks were the first to attempt to define words systematically: Hesiod made the earliest known attempts to analyze various uses of words in the Homeric epics; Plato believed that words have abstract features that could be defined using formal language; and Aristotle stressed the importance of a correct definition (Havelock, 1963).

Much like McLuhan's, Havelock's (1976) primary explanation for the rise of Western-style abstraction incorporated both *perceptual modality* and *arbitrariness*.

> It was characteristic of the alphabet that the names of the Greek letters borrowed from the Phoenicians, for the first time became meaningless: *alpha*, *beta*, *gamma*, etc., constitutes simply a nursery chant designed to imprint the mechanical sound of the letters, by using what is called the acrophonic principle, in a fixed series on the child's brain, while simultaneously tightly correlating them with vision of a fixed series of shapes which he looks at as he pronounces the acoustic values (Havelock, 1976, p. 46).

Unlike other writing systems, phonetic letters were thus visually completely arbitrary with regard to the concrete image, while unambiguously codifying any speech sounds.

More specifically, Havelock (1976) postulated that it was the invention of consonants that was responsible for the emergence of a new level of abstraction in

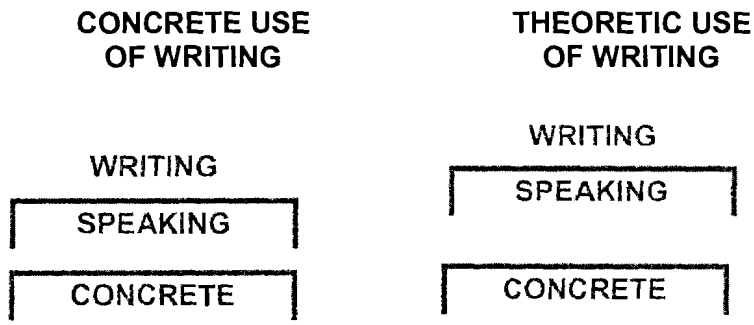
Greece. The syllabary is the most natural of the phonetic writing systems[27], as it graphically captures actual units of verbal sound. In contrast, consonants do not exist on their own in spoken language, but only exist to the extent that they are carried by vowels. According to Havelock (1976), the separation of consonants from vowels created an 'atomic' awareness of speech that went beyond the world of perception and into the world of conception. Phonetic writing enabled a visual dissection of oral language into abstract units, which were not found in the world of sound but only in the visual world of abstract graphemes (Havelock, 1976). Havelock (1976) thus postulated that the emergence of the abstract consonants created a corresponding emergence of abstract conceptual space that permitted Western forms of thought. "The consonant represented an object of thought, not sense, just as the atom did to those who first proposed its existence" (Havelock, 1976, p. 44).

In summary, Havelock (1963, 1976, 1982, 1991), like McLuhan, argued that the introduction of phonetic writing and the use of written records in Greece enabled the birth of Western civilization and Western forms of thought, specifically focussing on the rise of decontextualized abstraction. Havelock (1963, 1976) also resembled McLuhan in adopting the *perceptual modality* and *arbitrariness* forms of explanation for alphabetic effects, even though he developed these explanations to an even lesser extent than did McLuhan. Instead, he put the main emphasis on the emergence of an abstract consonant as a reason for the corresponding emergence of decontextualized abstract thought.

[27] At least three distinct forms of phonetic writing can be distinguished: 1) consonantal phonetic systems (such as used by the Hebrew after the exile from Egypt), which do not explicitly represent vowels but imply them; 2) syllabary phonetic systems (such as used by the Akkadians in Babylon), which use graphemes that represent syllables; and 3) alphabetic writing systems (such as used by the ancient Greeks), which contain separate graphemes for consonants and vowels.

In comparison to McLuhan (1963), Havelock (1963, 1976) was much more scholarly, careful, and systematic in his research and theory. His main contribution to the literacy hypothesis was the detailed examination of Ancient Greek culture, his ingenious reinterpretation of the works of Plato, and his strong stance with regard to the key role phonetic literacy played in the birth of the Western forms of thought.

Figure 11: Concrete and decontextualized use of writing.



The main shortcoming of Havelock's account, with regard to the thesis I am proposing here, is that he did not elaborate his *arbitrariness* form of explanation in terms of a structural semiotic framework. The model I am proposing is one small step away from Havelock's (1976) emphasis that learning to read/write requires making a link between the visual shape of abstract letters (words) and the sound of those letters (words). I argue that it is this abstract audio-visual association, devoid of any links to the concrete image, that created a corresponding conceptual space for decontextualized forms of abstract thought. Another way of stating this is to say that decontextualized abstraction was enabled by a purely verbal semiotic operation, where the signifying system of writing subsumed speech as its content. The gap in the right diagram in Figure 11 represents symbolic distance from the concrete enabling the birth of decontextualized concepts. However, it is important to note that writing, much like speaking, is most often

used to signify concrete events. Hence, the lack of gap in the left diagram in Figure 11 represents the concrete way of using writing. I believe that such a structural explanation is crucial for understanding the effects of phonetic literacy, and that Havelock's (1976) argument attributing the birth of abstraction to the emergence of consonants is at best secondary.

Further, Havelock did not explicate adequately the relationship between metalinguistic awareness and verbal abstraction. As I argued earlier in my interpretation of the work of Lev Vygotsky, decontextualized abstraction presupposes metalinguistic awareness. In other words, metalinguistic awareness is necessary for decontextualized abstraction. That metalinguistic awareness emerges early in the process of learning to read and write is evident both in the context of child development (Vygotsky, 1934/1986) and cultural evolution (Havelock, 1963). Hesiod began to analyze various uses of words (a metalinguistic activity) right after the introduction of literacy in Greece (circa 700 BC). In a similar manner, children acquire metalinguistic awareness right after they learn the basics of literacy (Vygotsky, 1934/1986). In contrast, in both contexts there is a *delay* in the achievement of decontextualized abstraction. It took the Greeks 300 years before phonetic literacy realized its potential for decontextualized abstraction (around 400 BC). And it takes children five or so years after they learn to read and write before they acquire the level of formal thought (Vygotsky, 1934/1986; Piaget, 1937/1955). While there are clear differences between cultural evolution of thought and individual development, the most important being that the child already grows in a culture structured by literate practices, this delay in the emergence of decontextualized abstraction is important for my current conceptualization. It is likely that the reason why it takes time to achieve decontextualized abstraction is that, despite the achievement of

metalinguistic awareness, the child's early use of written language (just as the Greek's early use of writing) is influenced by the already strongly established habits of oral discourse (i.e., the connection with the concrete). Both Vygotsky (1934/1986) and Havelock (1963) noted that early use of writing is a mere attempt to reproduce speech. It takes much practice with literacy to develop the level of decontextualized thought. Havelock (1963, 1976) did not adequately connect the emergence of metalinguistic reflection to the rise of abstraction.

Another important criticism that can be made of both McLuhan and Havelock is that they did not explicitly deal with the question of causality, hence leaving themselves open to easy criticism. The language used by Havelock and McLuhan frequently seems to imply that phonetic writing necessitated Western forms of abstraction (a sufficient cause). However, claims of sufficient cause not only are extremely difficult to warrant but also constitute a misrepresentation of the behaviour of complex systems, such as human beings. Only in very simple systems can one effectively make claims of sufficient causality; when dealing with complex systems, the multiple interdependencies and interactions among various elements do not permit such causal claims. The proper way to think about the effects of literacy is not in terms of a sufficient but in terms of a *necessary cause.* Such a view of literacy as an *enabling* factor was proposed by several other theorists (e.g., Gough, 1968; Oxenham, 1980), and it is a position I am endorsing in the present thesis. In other words, learning to write does not guarantee that one will be able to think in abstract theoretical terms, but it is necessary for the emergence of such thinking. In other words, there is no decontextualized theoretical thought without a technology that *enables* it, namely writing.

While the capacity for decontextualized abstraction exists in non-phonetic writing systems (because writing is an operation of words on words), phonetic writing has an added advantage of being arbitrary with regard to the concrete image, thus facilitating the rise of decontextualized abstraction. While necessary-cause arguments cannot be proven (because one can always argue that it is some correlative element that enabled the phenomenon in question), such arguments can be disproved. I am not aware of any research that would provide a challenge to my claims regarding literacy effects, if literacy is understood as a *necessary*, not *sufficient*, cause for the specific effects I am proposing. As I will discuss in more detail in sections to follow, both historical and developmental evidence suggests that decontextualized verbal thought completely removed from the level of the concrete can emerge only after the introduction of writing. I believe that Havelock's and McLuhan's failure to explicitly address questions of causality and their use of strong causal language are important factors that led to an overall weakening of the very valuable claims that these thinkers made.

3.3 Jack Goody and Ian Watt

Jack Goody was an anthropologist at Cambridge University, who carried out his fieldwork in the 1950's and early 1960's in West Africa. His interests in literacy led him to an association with Ian Watt, an English professor from Stanford University. In 1963 (republished in 1968), Goody and Watt published their most notable essay, entitled *The Consequences of Literacy*, in which they argued that the distinction between primitive

and civilized, or prelogical and logical, societies should be reconceptualized as a distinction between orality and literacy[28].

Goody and Watt's (1963/1968) general approach was consistent with that of Vygotsky, Havelock, and McLuhan in its emphasis on how the physical aspects of communication (particularly the medium of writing) affected the development of both social organization and cognition. Like Havelock, Goody and Watt (1963/1968) focussed much of their attention on Ancient Greece, arguing that the introduction of literacy in an otherwise stable culture made Greece an optimal context for studying the consequences of literacy.

Goody and Watt's (1963/1968) main explanations for the effects of literacy focussed on the *permanence* of the medium, which, according to them, served as an aid to memory and enabled a close scrutiny of a previously fluid oral narrative. In oral cultures, "the whole content of the social tradition, apart from the material inheritances, is held in memory" (p. 30) and, even though the appearance of consistency may be preserved, the narrative is constantly transformed by its interpreters (Goody & Watt, 1963/1968).

At first, literacy was used in service of oral communication, as a help to memory (Goody and Watt, 1963/1968). But as the previously oral content became stored in the new immutable medium, literacy began to foster its own function of "the articulation of inconsistency" (p. 325) in the verbal content (Goody & Watt, 1963/1968). Words that became *frozen* on the page could be read and reread, which awakened the awareness of contradictions and subjectivity of interpretation, simultaneously fostering a close scrutiny and critical analysis of the verbal content. Because "the written word suggests an ideal of definable truths which have an inherent autonomy and permanence quite

[28] They further argued that the field of anthropology should be understood as a study of oral cultures,

different from the phenomena of the temporal flux and of contradictory verbal usages" (Goody & Watt, 1963/1968, p. 53), the Greeks were "impelled to a much more conscious, comparative and critical attitude to the accepted world picture, and notably to the notions of god, the universe and the past" (Goody & Watt, 1963/1968, p. 48). Goody and Watt (1963/1968) argued that, while spoken language was well equipped to deal with the ambiguity and flux of everyday experience, writing enabled the birth of objective thought, and a corresponding distinction between appearance and reality, belief and truth, or myth and history, as well as the invention of formal logic as an objective way to resolve arguments. The Socratic method popularized by Plato, Plato's own distinction between truth and opinion, or Aristotle's analytical approach were all literate procedures that showed a high level of epistemological awareness that could not be possible without the *immutable* technology of writing (Goody & Watt, 1963/1968).

In addition to their emphasis on *permanence*, Goody and Watt (1963/1968) also hinted at the *semiotic/structural* explanation for literacy effects. In oral communication, they claimed,

> the meaning of each word is ratified in a succession of concrete situations, accompanied by vocal inflections and physical gestures, all of which combine to particularize both its specific denotation and its accepted connotative usages. This process of direct semantic ratification, of course, operates cumulatively; and as a result the totality of symbol-referent relationships is more immediately experienced by the individual in an exclusively oral culture (Goody & Watt, 1963/1968, p. 29).

In contrast,

> writing establishes a different kind of relationship between the word and its referent, a relationship that is more general and more abstract, and less closely connected with the particularities of person, place and time, than obtains in oral communication (Goody & Watt, 1963/1968, p. 44).

whereas the field of sociology should be responsible for the study of literate cultures.

Goody and Watt (1963/1968) thus recognized the nonmediative nature of speaking, and the distancing from the concrete context that is afforded by writing.

Goody and Watt (1963/1968) attributed a broad range of cultural and psychological changes in Greece to literacy, including the movement towards individualism and democracy, the emergence of logical and critical thought, the emergence of a written legal code, and the emergence of objective recording of history. As to the question of why it was phonetic writing and not previous writing systems, that led to the development of these Western forms of thought, Goody and Watt (1963/1968) predominantly emphasized the economical nature of the ABCs, pointing out that all previous writing systems, including the syllabary, were much more complex and took longer to learn. The Greek alphabet had a further advantage over its Semitic predecessor in that it included vowels, hence becoming potentially applicable to any language. Combined with the increased availability of papyrus in Greece, the alphabet brought about a wide dissemination of writing (Goody & Watt, 1963/1968).

In summary, much like McLuhan, and Havelock, Goody and Watt (1963/1968) emphasized the need for the examination of the physical properties of communication. Goody and Watt's (1963/1986) most unique contribution to understanding the effects of literacy was their focus on the *permanence* of writing. Freezing spoken utterances in a graphic form allowed for the comparison of present and past utterances, and thus for the verification of verbal information across time (Goody & Watt, 1963/1968). In his later work, Goody (1977) further developed the importance of the notion of visually scanning the written text as central to understanding the rise of objective thought. The repeatability of verbal content afforded by writing was clearly central to the rise of verbal objectivity and awareness of the interpretive nature of narrative.

The main problem with Goody and Watts' (1963/1968) account is their over reliance on the *permanence* form of explanation. Permanence or repeatability of written form may be appropriate to account for the rise of verbal objectivity. However, the main characteristic that distinguishes Western-style thought that emerged in Greece from thought found in other cultures is the decontextualized abstract nature of Western concepts. Non-phonetic cultures also used permanent scripts, yet they did not develop decontextualized theoretical abstract systems of thought (such as propositional logic or Platonic forms). Goody and Watt (1968) attempted to account for this difficulty by emphasizing that phonetic writing was easy to learn, and that, with the availability of papyrus, the introduction of phonetic script led to the popularization of writing. However, high levels of literacy and the availability of papyrus in the East still did not lead to the development of decontextualized forms of thought (Logan, 1996). As I argued earlier, I believe that the development of decontextualized abstraction was enabled by the fact that graphemes in phonetic writing (ABCs), unlike graphemes in other writing systems, are unique in that they are completely arbitrary with regard to the concrete image. I believe that a structural explanation, foregrounding the arbitrary nature of ABCs, is necessary for understanding decontextualized theoretical thought. Goody and Watt (1963/1968) hinted at the *structural* explanation I am proposing here, but they applied their semiotic considerations to the comparison between speaking and writing, rather than the comparison among different writing systems, hence failing to provide sufficient explanation for the emergence of abstract cognition.

Another common criticism directed toward Goody and Watt (1963/1968), as well as McLuhan and Havelock, concerned their strong deterministic tone with regard to literacy (Street, 1983). Goody and Watt's (1963/1968) technological determinism, say the critics

(Street, 1983) tends to paint literacy as an autonomous agent that necessitates social and cognitive change. Critics of such a view point out that the application of literacy occurs in a context infiltrated with goals and ideologies that makes literacy an instrument for those who use it (Street, 1983). As I already explained, I argue that understanding literacy as an *enabling* (i.e., necessary) rather than causal (i.e., sufficient) factor is very important for the accurate understanding of the workings of the medium. Seeing literacy as a *necessary* rather than *sufficient* cause allows for the accommodation of contextual factors[29]. If Goody and Watt (1963/1968) assumed and explicitly discussed their position on causality in the way I suggest, and if they were more careful with their use of causal language, the claims that they made would have been immune to critics from the 'contextual' camp. It is worth noting that in the introduction to the 1968 book, in which the 1963 article was reprinted, Goody (1968) himself acknowledged that the strong causative implication of the title of their article – *The consequences of literacy* – was an overstatement.

Another difficulty with Goody and Watt (1963/1968) was a relatively strong sentiment they showed in privileging phonetic writing over oral or non-phonetic forms of communication. Goody and Watt (1963/1968) stressed the advantages of written communication, and neglected to adequately examine the advantages of oral or non-Western forms of culture and thought. The rise of individualism, for example, threatens the coherence of the community, and an investment in objective thought may weaken the connection with the concrete phenomena, the context, and the natural environment. Goody and Watt (1963/1968) did not adequately question their value system.

[29] Note that later in this thesis I will elaborate the view of communication that stresses the activity of the subject-in-the-context as central to understanding the cognitive effects of communication.

3.4 Sylvia Scribner, Michael Cole, and Harvey Graff

The first three sections of this chapter discussed the pioneering work of McLuhan, Havelock, and Goody and Watt, which charted a new course in thinking about the effects that communicative media have on our culture and psyche. These thinkers put forth the particularly interesting thesis that the birth of Western civilization and Western forms of cognition was a result of the introduction of phonetic writing in Greece. This *strong literacy thesis* (Brockmeier, 2000) soon came under criticism from other literacy theorists.

The most notable and impactful critique of the strong literacy thesis was put forth by Sylvia Scribner (a developmental psychologist at City University in New York) and Michael Cole (a cultural psychologist at the University of California in San Diego) in their 1981 book *The Psychology of Literacy*. Scribner and Cole proposed a counter-thesis to the literacy hypothesis, arguing that it was the broadly conceived practice of *schooling*, rather than literacy per se, that resulted in the cognitive changes that Havelock, McLuhan, Goody and Watt and others attributed to literacy.

Scribner and Cole (1981) studied Vai, a small society in rural Liberia that was undergoing a cultural change. The setting was ideal in which to conduct a natural experiment about the effects of literacy as there were at least four different groups of Vai: 1) home schooled who used a Vai syllabary, primarily for writing letters; 2) schooled in English; 3) schooled in Arabic; and 4) non-literate. Scribner and Cole (1981) studied abstraction, classification, memory, and logic and concluded that schooling overall was the most powerful predictor of cognitive change. For example, replicating Luria's (1976) study on syllogistic reasoning, they found that, while children schooled in English were able to work with theoretical premises, unschooled children (non-literate as well as

Qur'anic and Vai literate) tended to refuse premises that were empirically improbable. They concluded that schooling rather than literacy predicted the developmental acquisition of metalinguistic skills[30].

Unfortunately, Scribner and Cole's (1981) work contributed significantly to the loss of popularity of the literacy thesis[31]. I argue that Scribner and Cole's (1981) work was largely misinterpreted, and that the main reason for this misinterpretation was that the notion of causality with regard to the effects of the medium was not adequately addressed and agreed on. It is of critical importance to point out that Scribner and Cole's (1981) critique is applicable only to the *strong literacy thesis*, which postulated that phonetic literacy was a *sufficient* causal factor in the emergence of literacy-specific forms of thought. Their argument loses its potency when applied to the view of literacy as a necessary enabling factor in cognitive change.

Analyzed in detail, Scribner and Cole's (1981) studies did not provide any evidence to disconfirm the literacy hypothesis *as proposed in the present thesis*; to the contrary, their studies provide much evidence to support my current claims. All literacy predictions derived from the work of previous literacy theorists were supported for the Vai English literates (Scribner and Cole, 1981). Scribner and Cole (1981) essentially replicated Luria's (1976) original study, showing that non-literate Vai, unlike children schooled in English, had great difficulties with formal syllogisms and metalinguistic concepts. The

[30] Other theorists also emphasized the importance of schooling. For example, Greenfield and Bruner (1969) stressed that many aspects of cognitive development were influenced by schooling. And Astington and Pelletier (1996) viewed schooling as a broad experience of socialization into literate ways of thinking, and specifically claimed that, aside from teaching children how to read and write, schooling provided some explicit instruction on metalinguistic awareness and metaphysical concepts.

[31] Like any cross-cultural comparative theme, the phonetic literacy hypothesis has always been a contentious and sensitive issue. After Scriber and Cole's (1981) book, opponents of literacy were quick to dismiss the thesis entirely. For example, Greenfield (1983) stated that Scribner and Cole's (1981) research "should rid us once and for all of the ethnocentric and arrogant view that a single technology suffices to create in its users a distinct, let alone superior, set of cognitive processes" (p. 219).

fact that those predictions were not true for the Arabic and Vai literates should be accounted for by differences in the scripts themselves and differences in the literacy practices among those groups. Scribner and Cole (1981) themselves point out that "literate practices among Vai are far more restricted than in technologically sophisticated societies" (p. 238). The home schooling that the Vai used had a practical purpose of letter writing, whereas children schooled in English received broader language instruction. One would expect that the use of literacy for letter writing (a practical activity) would have less effect on the development of metalinguistic and decontextualized thought than the use of literacy in the context of schooling, with its explicit study of grammar and theoretical concepts. Scribner and Cole's (1981) studies thus showed that being literate was a *necessary* (but not *sufficient*) prerequisite for theoretical abstraction. If literacy is used for practical purposes, such as for writing letters, it may not foster abstract thought. Their studies further showed that merely being a member of a literate culture and participating in its activities, without being literate, did not afford the emergence of abstract cognitive skills. Various literate practices and institutions surely have an effect on non-literate people living in literate cultures, but what Scribner and Cole's (1981) study showed was that one *needed to be literate* to acquire abstract forms of cognition, confirming my current hypothesis that literacy is a necessary factor in enabling decontextualized abstraction.

To further demonstrate how the nature of a script affected thought, Scribner and Cole (1981) showed that the Vai vocabulary itself was influenced by their syllabary script. The Vai script did not use spaces and hence did not segment language into word-like units, and correspondingly, the Vai did not have a concept for *word*. When asked to

explain what is *koali kule* (an expression that may be interpreted as *word*, *sentence*, or *phrase*), the Vai tended to talk about the whole verbal utterance, such as for example *my big brother*.

In their conclusion, Scribner and Cole (1981) claimed that their findings supported neither the "great divide" strong literacy hypothesis nor those positions that ignored the effect of cultural practices on cognition. Instead, they proposed a middle-of the road "*practice account of literacy*" (p. 235) framework that recognized that cognitive effects depended on the nature and use of the medium (Scribner and Cole, 1981).

> If uses of writing are few, the skills they require are likely to be limited. They may be used to accomplish only a narrow range of tasks in a few content domains. Such a pattern can be expected to give rise to specialized or specific literacy-related skills – the pattern we found in our studies. As the repertoire of function increases, existing practices may come to embrace more complex tasks or be extended to new content domains. ...
>
> Individuals engaged in a number of practices will have an opportunity to acquire this variety of skills. Under these conditions, the functional and general ability perspectives – which we have up to now presented as contrastive approaches – will converge in their predictions of intellectual outcomes. ...
>
> [A] framework which situates cognitive skills in culturally organized practices provides one way of moving beyond the antonymic terms that dominate much thinking about thinking. ...
>
> It appears ... that the concept of practice-based skill systems can help us achieve a balanced and informative way of characterizing the kind of difference that cultural differences make to individual thinking (Scribner & Cole, 1981, pp. 258-259).

Scribner and Cole (1981) thus supported what can generally be called a *contextual approach* to literacy, an approach that recognized that it is not literacy alone, but the kind of literacy and the way literacy is practiced that contributes to the emergence of literacy-specific skills.

I argue that, given the correct conception of causality (as an enabling rather than sufficient factor), Scribner and Cole's (1981) contextual approach should not be viewed as an argument against the literacy thesis, but as an elaboration of the literacy thesis. Other proponents of the literacy thesis also have embraced a contextual approach. Donald (1991) responded to Scribner and Cole (1981) by pointing out that schooling and literacy are not independent, as it is in the school where literacy is taught. Olson (1994) commented on Scribner and Cole's (1981) research stating that "Western literacy can no more be separated from schooling than Vai literacy can be distinguished from letter writing" (p.43). Both Goody (1987) and Olson (1994) criticized Scribner and Cole (1981) for adopting an artificial distinction between schooling and literacy. Brockmeier (2000) argued that "what we call writing stands for a symbolic reality, a 'universe of discourse,' which is difficult to separate from the reality of modern society itself" (Brockmeier, 2000, p. 46). In other words, Scribner and Cole's (1981) critique was very important in preventing the development of simplistic casual views of literacy as a sufficient factor in the emergence of abstract cognition. At the same time, from the point of view I am presenting here, criticism of their position should be viewed as a *red herring* based on the wrong assumption of causality. If properly understood, Scribner and Cole's (1981) studies actually support the literacy hypothesis.

A similar criticism from the *contextual camp*, directed against the *strong literacy thesis*, came from the work of Harvey Graff (1981, 1987), now a professor of History and English at the Ohio State University. Graff (1987) provided a detailed historical analysis of the development of literacy in various literate cultures, predominantly focussing on the transition from Middle Ages to Renaissance in different European countries, showing

that literacy alone was *not sufficient* to bring about the cognitive changes that the proponents of the strong literacy thesis attributed to the medium.

Graff (1987) is deeply concerned with broader political, economic, and cultural factors related to literacy, and he prefers to treat literacy as a *dependent* rather than independent factor in the developmental continuity of cultural and cognitive evolution. He showed that the shift in cultural and psychological forms was a long-term and gradual process rather than a paradigmic shift, and that institutional and economic factors played a great role in that shift. Graff (1987) claimed that "[w]riting *alone* is not an 'agent of change': its impact is determined by the manner in which human agency exploits it in a specific setting" (p. 4):

> More important that high rates or 'threshold levels' of literacy have been the educational levels and power relations of key persons, rather than of the many; the roles of capital accumulation, 'cultural capital,' technological innovations, and the ability to put them into practice; or the consumer demands and distribution-marketing-transportation-communication linkages" (Graff, 1987, p. 11).

Graff (1987) criticises "massive generalizations" (p. 386) of theorists such as McLuhan, claiming that "literacy can be understood *only* in terms of its historical development" (p. vii), and that "semi-autonomous views of literacy are the new wave – and a dangerous one" (Graff, 2005). He believes that the cure to simplistic, deterministic conceptions of literacy (the 'literacy myth') is the kind of theorizing that pays homage to broad dynamic, contextual factors.

> What is needed is a broader view of *reading* and *writing* that integrates and emphasizes the many human abilities in a context of a changing world that requires their development and use. Paths to learning individual literacy by the young must be made less rigid; more attention must be paid to different sequences and structures of learning; and more sensitivity must be shown toward cultural and class influences. New, empirical, and conceptual understanding of literacy must be gained, beyond the context of persisting inequalities and the dominance of the "literacy myth" (Graff, 1987, p. 397).

The critique I applied to Scribner and Cole (1981) is also applicable to the work of Graff (1987). One only needs to reconceptualize the notion of causality to accommodate the relevant contextual factors. Moreover, broadening the analysis by bringing in contextual factors does nothing to diminish the fact that literacy can still have its crucial role in bringing about the literacy-specific effects. Literacy can clearly be considered a dependent factor if one is interested in the study of how literacy came to be, or as one of the contingencies if one is to study how literacy interacts with other aspects of culture or psyche. However, it is an equally legitimate task to study the emergent forms enabled by literacy, in which case literacy should be treated as an independent variable, the way I do in the present thesis. Graff (1987) himself did not dispute that literacy had its contribution to the cultural and cognitive changes; he merely criticized those theorists (e.g. Goody and Watt; McLuhan) who made sweeping statements about the effects of literacy without an adequate mention of the roles of context and practice. Graff (1987) provided no evidence that the cognitive effects attributed to literacy were present before the introduction of literacy. Moreover, he himself expressed hope that an adequate framework of literacy studies would be developed. "Perhaps a genuine new literacy will be available, needed, and sought" (Graff, 1987, p. 398). "What is needed is a broader view of *reading* and *writing* that integrates and emphasizes the many human abilities in a context of a changing world that requires their development and use" (Graff, 1987, p. 397).

In summary, the most important contribution of the contextual approaches to literacy, as exemplified above with the work of Scribner and Cole (1981) and Graff (1987), is the realization that literacy always operates in context, and that its effects will depend on the conditions in which literacy practices occur, and the specific nature of

those practices. The type of literacy, the purpose of its use, the amount of its use in relation to other communicative practices, as well as the broadly conceived economic and political relations that structure the use of literacy, are all important for determining the cognitive effects of the use of the medium.

Put in other words, the arguments from the contextual camp necessitated a clear explication of the causal relationship between the medium of literacy and the effects of literacy. Even though they did not explicitly discuss this issue, the implication of Scribner and Cole's (1981) and Graff's (1987) research is that writing cannot be considered a *sufficient* causal factor in the creation of new psychological forms. Consequently, the use of strong causal language when discussing the literacy thesis is inappropriate.

It is important to note that the contextual camp provided no evidence against, and much evidence for, the literacy thesis, if such a thesis considers literacy as a *necessary* factor in the emergence of the literacy effects (Gough, 1968; Oxenham, 1980). That phonetic literacy, for instance, *enabled* decontextualized thought is a claim left unchallenged by Scribner and Cole (1981), Graff (1987), or other challengers of the literacy hypothesis (e.g., Feldman, 1991; Greenfield, 1983; Harris, 1989).

What the contextual camp objected to was an overly simplistic, deterministic portrayal of how the media work. Social and cognitive phenomena are by definition very complex, and the nature of any analytical or empirical approach always entails a degree of simplification. Simplification does not need to be a problem any more than excessive complication (Brandt & Clinton, 2002). The consideration of too many variables results in cognitive confusion, while finding a few variables that are central to the phenomenon in question brings clarity. Finding an optimal level of explanatory complexity is of course always a problematic issue, but once properly acknowledged, simplicity can be a very

useful tool, especially when it comes to variables that have significant explanatory power, which, I believe, is the case with literacy. My synthesis of the available research suggests that literacy is a necessary explanatory variable for understanding the emergence of specific cognitive forms. While clearly acknowledging the complexity of the context, my goal in the present thesis is to analyse the properties and the use of the medium of literacy itself, and to postulate the ways in which the specific properties of reading and writing *enable*, *not cause*, the emergence of new forms of thought. In other words, literacy should be seen as a point in cultural or individual development after which certain specific forms of thought are possible, but not guaranteed. Whether those cognitive forms come to being depends on the type and amount of literate practices a culture or an individual is engaged in.

Another problem (in addition to the confusion regarding causality) with the literacy debate to date has been a lack of clarity with regard to the so-called *literacy effects* themselves, and with regard to the *course of development* of such effects. How can one argue for or against a thesis when the thesis itself is not clear. Graff (1987) rightly criticises an array of theorists who make sweeping statements that attribute literacy to numerous phenomena, frequently creating radical dichotomies between the oral and literate cultures, providing no empirical evidence for their claims, and disregarding the intricacies of the development of such phenomena.

> Thus, literate persons, it is asserted, are more empathetic, innovative, achievement-oriented, cosmopolitan, media- and politically aware, identified with a nation, aspiring to schooling, urban in residence, and accepting of technology. Literacy is said to correlate with economic growth and industrialization, wealth and productivity, political stability and participatory democracy, urbanization, consumption, and contraception. Such claims are not well documented; nor are their relationships well specified or conceptualised. Any meaning that they retain has substance and credibility only in precisely delineated contexts. (Graff, 1987, p. 382)

To respond to this valid criticism, my current thesis is focussed both on specific literacy achievements and strives to delineate the possible mechanisms and course of development of such achievements. My synthesis of the literacy research suggests that what is enabled by writing is *metalinguistic awareness*, and what is enabled by phonetic writing is *decontextualized abstraction*. The process of cognitive changes in the users of the alphabetic script begins with an acquisition of metalinguistic awareness, in the very early stages of the mastery of literacy, and potentially, but not necessarily, leads to the achievement of decontextualized abstraction, in the more advance stages of the mastery of literacy[32]. Literacy does not guarantee the emergence of decontextualized abstraction, but it does make it possible. The emergence of decontextualized abstract cognition is likely a complex phenomenon, a relatively long organic process of cognitive restructuring. Yet, the introduction of complexity should not dilute the fact that writing per se is a *necessary* factor in the emergence of these forms of thought, and thus should not dissuade us from examining the explanatory potential of the medium approach. Graff (1987) himself does not argue the fact that literacy is especially relevant in explaining the emergence of abstract forms of thought ["... leading Inkeles to conclude that literacy is 'limited to those spheres where vicarious and abstract experience is especially meaningful'" (Graff, 1987, p. 386)] or metalinguistic awareness ["Scribner and Cole ...

[32] This explication also, at least partially, addresses Graff's (1987) concerns that cognitive and social change emerged *gradually*. When a new medium is introduced, the old modes of communication are still in operation. Those old modes may undergo some change as they are affected by the new medium, but they also retain some of their original form. For example, after over 2,000 years of phonetic literacy, we are still largely an oral culture, maintaining oral practices and oral conceptions of reality (e.g., the privileging of local, concrete thought). In a similar way, electronic media enable new forms of thought and affect literacy, displacing the reign of the abstract graphic sign and promoting their own grammar (e.g., the importance of concrete image, collapse of distance, communicative speed). However, this does not mean that we are losing literacy, as literacy clearly serves some functions (e.g., abstraction and grasp of complexity) that the electronic image-based media cannot serve. This issue is further complicated by the fact that many contemporary technologies create hybrids of various modes of communication. An adequate understanding of the effects of various new media would require a specific examination of the medium, its patterns of use, and its interactions with other experience.

found that analysing oral speech and giving clearer instructions were important skills, in which Vai literates did differ from non-literates" (Graff, 1987, p. 389)].

In short, the contextualist camp provides support for and potentially enriches the present thesis. However, in their criticism of overly broad and deterministic claims regarding literacy (literacy as a *sufficient* factor), Scribner and Cole (1981), Graff (1987), and others have contributed to a significant weakening of research interest in the area of the literacy hypothesis. The impact of such claims such as "we need to be wary of drawing overly firm lines between the oral and the literate" (Graff, 1987, p. 4), or "[o]ral thought and literate thought are, at best, analytically isolated extremes of one continuum, a continuum of discourse that underlies all our communication and cognition" (Brockemeier, 2000, p. 45), has been to lessen the efforts to continue examining the impact of literacy from the medium perspective, as is evident in the decline of such research after the 1980s. While I fully accept the great importance of contextual factors, the empirical and theoretical considerations I discuss above do not allow me to agree with conclusions that minimize the importance of the medium of writing. I believe that the literacy hypothesis deserves much more attention in theory and research than it is currently receiving.

3.5 Walter Ong

A second wave of literacy theorists emerged after the early 1980s criticism of the 1960s' wave of literacy theorizing. Among these new scholars, who produced a more thorough and systematic account of the literacy hypothesis, were Ong, Logan, and Olson, all associated with the *Toronto School*. Walter Ong, a Jesuit Priest and a professor of humanities at St. Louis University, was a student of McLuhan's and a

colleague of Havelock's. Ong's best-known work was his short 1982 book *Orality and Literacy* (reprinted five times thereafter), in which he synthesized and elaborated, in an accessible way, the work of the literacy theorists.

As the title of the book suggests, Ong's (1982) main task was a comparison between oral and literate cultures. Following the tradition established by McLuhan (1962, 1964), Havelock (1963, 1976, 1982), and Goody and Watt (1963/1968), Ong (1982) argued that the introduction of literacy brought about major cultural and psychological changes. Among numerous developments, Ong (1982) emphasized the emergence of the theoretical distance that literacy allowed. In oral cultures, he pointed out, thought was closely tied to the human and natural lifeworld, being situational rather than abstract, and empathic and participatory rather than objective (Ong, 1982). In contrast, writing allowed for the emergence of objective theoretical thought. Ong (1982) seconded Goody and Watt's (1963/1967) argument that the shifts from so-called *prelogical* to *rational thought* or from *savage mind* to *domesticated thought* (Levi-Strauss, 1966) "can be more economically and cogently explained as shifts from orality to literacy" (Ong, 1982, p. 29).

Ong (1982) used a mixture of *relational* (absent other), *permanence*, *externalization,* and *perceptual modality* (eye-for-ear) explanations to account for the emergent properties of writing. Because the analysis of the differences among different scripts was not Ong's (1982) primary task, he only mentioned the *arbitrariness* explanation with regard to uniqueness of phonetic writing.

Ong's (1982) most salient explanation for the literacy effects followed McLuhan's (1964) eye-for-ear formula: the emphasis on the shift from auditory to visual dominance in communication and thought. He argued that "writing tyrannically locks [words] into a

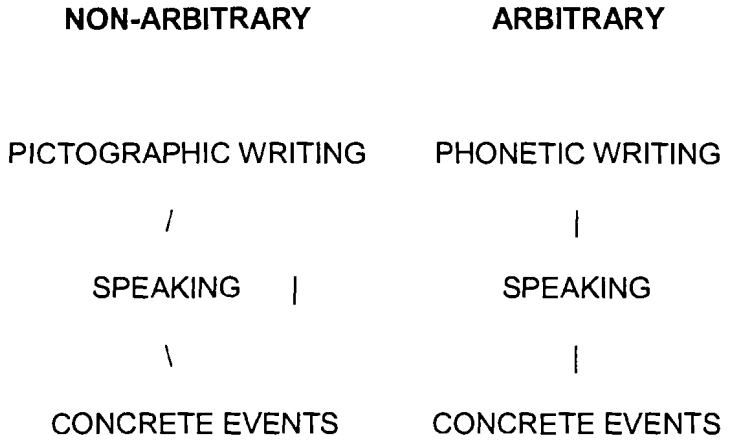
visual field [... so that] a literate person cannot fully recover a sense of what the word is to purely oral people" (Ong, 1982, p. 12). Typographic cultures, Ong (1982) claimed, show a tendency "to reduce all sensation and indeed all human experience to visual analogues" (Ong, 1982 p. 76). Following McLuhan (1964), Ong (1982) claimed that the ear was irreducibly dynamic and temporal in its ways of perceiving sound, whereas the eye was capable of perceiving static information. He claimed that the perceptual shift lessened the degree of immersion in physical space and accentuated temporal aspects of reality (Ong, 1982). Ong (1982) pointed out that the structure of oral narratives is very loose with regard to linear linking of historical events; in contrast, writing facilitates linear and sequential recording of events. Ong (1982) further claimed that the visual ideal is clarity and distinctness, or 'a taking apart,' whereas the auditory ideal is harmony, or 'a putting together.' The use of vision thus allows for precision and detail, which eventually led to the development of an analytical mind (Ong, 1982). Moreover, the shift from the ear to the eye resulted in the foregrounding of surfaces, and in a simultaneous weakening of our capacity to perceive the inner world of objects and the self (Ong, 1982).

Aside from the *perceptual modality* explanation, Ong (1982) also stressed that writing is a permanent, static medium, and that it allows for the distancing of the author and the receiver. Written discourse "cannot be directly questioned or contested as oral speech can be because written discourse has been detached from its author" (Ong, 1982, p. 78). Writing thus establishes context-free language, creating an illusion of objectivity. In contrast to oral discourse, "[t]here is no way directly to refute a text. After absolutely total and devastating refutation, it says exactly the same thing as before" (Ong, 1982, p. 79). Further, the external storage that writing provides changes

mnemonic requirements, no longer requiring ritualistic repetition, stereotypical characterization, or the use of oral mnemonic devices (rhythm, rhyme) that played a crucial role in the preservation of knowledge in oral cultures (Ong, 1982).

Finally, Ong (1982) briefly elaborated McLuhan's (1962) and Havelock's (1963) *arbitrariness* explanation with regard to the nature of the phonetic script. He explained that all

Figure 12: Arbitrariness of phonetic writing.



writing systems codify sound; however, as indicated in the left diagram in Figure 12, the ideo/pictographic characters retain their perceptual connection with the concrete world. In contrast, as shown in the right diagram in Figure 12, the alphabet codifies sound only, and is completely arbitrary with regard to the concrete (Ong, 1982). Ong (1982) then subordinated this *arbitrariness* explanation under his primary concern with *perceptual modality* explanation, claiming that writing becomes "the most adaptable of all writing systems in reducing sound to visible form" (Ong, 1982, p. 92).

In summary, I believe that Ong's (1982) greatest contribution in the context of the present thesis was his synthesis of the available literacy research and his elaboration and clarification of some major arguments. His non-technical writing style also greatly

contributed to the popularisation of the literacy hypothesis. I suggest that the main problem with Ong's (1982) book is the impression it leaves that the cognitive and cultural differences he discusses can be accounted for by differences between oral and literate cultures. Ong (1982) did discuss differences among different scripts, but he failed to systematically attribute specific cognitive effects to specific scripts, foregrounding his *perceptual modality* explanation that can be equally applied to all writing systems. I argue that, while some psychological effects discussed by Ong (1982) are correctly attributed to the overall difference between oral and literate communication, the emergence of theoretical, decontextualized abstract thought has to be explained in the context of phonetic literacy. The final shortcoming of Ong's book, not unlike all his predecessors, was a lack of explicit discussion of the nature of the causal relation between the medium and cognition.

3.6 Robert Logan

Robert Logan is a multidisciplinary communication theorist, currently a Professor of Physics at the University of Toronto and an Associate at the Toronto McLuhan Centre. In 1986, Logan wrote his book, *The Alphabet Effect*, in which he reviewed in detail the impact of literate practices on different cultures at the onset of Western civilization. Logan's (1986) book was specifically aimed at the systematic analysis of the unique impact of phonetic writing. He provided an in-depth historical and psychological analysis of phonetic cultures, adding important details to the overall claim that the emergence of uniquely Western forms of thought was enabled by the technology of phonetic writing. Importantly, Logan (1986) extended the analysis of phonetic writing beyond the Greek cultural revolution. [See Appendix for a detailed description of the evolution of writing.]

For the current purposes, Logan's (1986) depiction of the early evolution of phonetic writing can be reduced to three major steps. First was the invention of a system of codified laws after the emergence of the first *syllabary*. After conquering Sumar, Akkadians (who later founded Babylon) developed the first phonetic writing system, a syllabary, in which they used signs that were previously pictographs to represent syllables (units of spoken sound). The Akkadian syllabary was the first large-scale *arbitrary* system of phonetic writing[33], where written signs were used to represent speech only with no direct visual reference to concrete phenomena. This development followed the era of Hammurabi, around 18th century BC, which was the first great scientific era in the history of humanity (Logan, 1986). One of the most significant achievements of Hammurabi was a series of legal reforms which resulted in the creation of the first system of Western-style codified laws, in which acceptable tariffs, ways of dealing with conflict (e.g. restitution through compensation), laws regarding slavery, marriage, etc., were systematized. These laws were applied throughout the empire of Babylon, creating a sense of uniformity, absoluteness, and objectivity of rules. This was the beginning of the Western centralized, abstract, uniform notion of justice that shifted legal authority away from the local, more flexible context (Logan, 1986).

The second phase in the evolution of phonetic writing was the invention of a consonantal writing system by Hebrews after their exile from Egypt. Hebrews, who were uneducated workers, adopted the least complex forms of Egyptian writing, and around 1,500 BC, in Sinai and Canaan developed the first consonantal form of phonetic writing,

[33] Note that Egyptians used phonetic principles as a supplement to their pictographic script, predominantly to spell the names of foreigners; however, not only were the pictographs themselves infused with concrete meaning for their users, but also the phonetic use of pictographs in Egypt was very marginal (Logan, 1986).

and the first and only alphabet[34], quickly reaching fairly universal levels of literacy (Logan, 1986).

Logan (1986) pointed out that one of the expressions of the newly emerging abstract consciousness that followed the invention of the alphabet was the invention of a purely abstract, monotheistic god. The extreme abstract quality of the Jewish god was incomparable to any previously existing mythical figures or deities. Yahweh was radically disconnected from anything natural and concrete. He was not tied to any fixed geographical place or identified with any natural force. He was untouched by everyday whereabouts and earthy occurrences and unaffected by time and change. He was extra-sensory: conjuring up his image or pronouncing his name was not allowed. The concrete signification of Yahweh was thus forbidden, he was not to be looked for in the natural realm, and a leap of faith was required to grasp him. In short, Yahweh was to be regarded as a *concept* rather than a percept. Such extreme transcendence of nature was not found in any previous mythologies, and the emergence of such extraordinary, purely abstract ideation would not be possible if it were not for the persistence and arbitrariness of phonetic writing (Logan, 1986). Yahweh became a foundational figure for all Western religions: Judaism, Christianity, and Islam (Logan, 1986).

In addition to the invention of an intensely abstract god, Hebrews were also first to record history in an objective way (Logan, 1986). The Egyptians, for example, did not record their defeats but only their victories. In contrast, the Hebrews recorded both glory and shame (Logan, 1986).

[34] Note that many non-alphabetic scripts were created independently in different historical places and times [e.g., Mesopotamian cuneiform around 3500-3000 BC; Egyptian hieroglyphics around 3000 BC (with some influence from cuneiform); Minoan or Mycenaean 'Linear B' around 1200 BC; Indus Valley script around 3000-2400 BC; Chinese script around 1500 BC; Mayan script around 50 AD; Aztec script around 1400 AD]. However, the alphabet was invented only once by Semitic people around 1500 BC,

Logan (1986) continued his description of the evolution of phonetic writing with the introduction of the first fully phonetic writing system in Greece around 1,100-700 BC. He elaborated in more detail the earlier claims by McLuhan, Havelock, and Ong, arguing that the invention of fully phonetic literacy led to a full emergence of what we today consider Western forms of thought. "Within this short period, there appeared many of the elements of Western civilization – abstract science, formal logic, axiomatic geometry, rational philosophy, and representational art" (Logan, 1982, p. 100). Geometry, for example, was used in Egypt, but it was used exclusively for practical agricultural purposes to move plots of agricultural land further away from the Nile when the river flooded. The Egyptians never treated geometry theoretically. It was the Greeks who took interest in and developed abstract, axiom-based, geometry (Logan, 1986)[35]. The emergence of objective thought was evident not only in the Greek propensity to record historical events in an objective manner, but in the very distinction between *history* and *myth* that the Greeks invented (Logan, 1986). Further, the birth of decontextualized abstract thought was reflected in the Greek invention of numerous abstract terms that became the basic language of Western philosophy and science (e.g., *body, matter, essence, space, translation, time, motion, permanence, change, flux, quantity, quality, ratio*) (Logan, 1986).

Logan (1986) further argued that the alphabet greatly aided the systematization of knowledge because it provided an unambiguous cataloguing principle. The Greeks also

and any other existing alphabet, including the Korean alphabet, derives from this original development (Diringer, 1962 in Ong, 1982).

[35] Note that the Greeks did not develop sophisticated algebra, which was a major stumbling block for the Greek culture to develop a fully Western system of knowledge. The failure to develop sophisticated mathematics is attributed to the failure to develop a concept of zero, itself a result of Parmenides' logic that rejected the possibility of non-being. According to Logan (1986), "the Greeks were literally too inhibited by their logic to entertain or to conceive zero." One might postulate that perhaps the Hindus later invented zero because it was in line with their spiritual striving to attain non-being or Nirvana.

developed Western scientific systems of classification, one of the cornerstones of contemporary science (Logan, 1986). Categorizing and storing information in an external medium is useless unless there exists an efficient way of organizing and retrieving that information. It is the efficiency of manipulating and finding information that determines how useful external storage can be in extending biological attentional and mnemonic resources. Phonetic writing, Logan (1986) argues, has an advantage over other writing systems in that the unambiguous ordering of letters (B after A, C after B, etc) provides an easy way of cataloguing and retrieving information[36]. There is no easy way to catalogue ideographic or pictographic knowledge because these systems contain no ordering principle (Logan, 1986). Consequently, it is more difficult to create systematic knowledge in non-phonetic writing systems (Logan, 1986). Greek philosophers put great effort into systematizing knowledge by ordering it according to abstract principles (Logan, 1986).

McLuhan, Havelock and Ong argued that one of the reasons alphabetic literacy was successful was because of the ease afforded by the alphabet in learning to read and write, relative to pictographic scripts. However, Logan (1982) pointed out that schoolchildren in North America take just as long to learn to read and write as Chinese children despite the fact that they have to learn only twenty-six letters compared with the one thousand basic characters required to read Chinese.

> In both China and North America children begin school at age five and have learned how to read and write, more or less, by the time they are eight years old. Western children take the same time because along with reading and writing they are learning ... the intellectual by-products of the alphabet, such as abstraction, analysis, rationality, and classification, which form the essence of the alphabet effect and the basis for Western abstract scientific and logical thinking. The use of the phonetic alphabet

[36] Alphabetic ordering, of course, has became a universal principle for classifying information, and learning the order of the ABCs is now a first-graders' first task.

> helps to explain why Western and Chinese thinking are so different (abstract and theoretical for the West versus concrete and practical for the East) (Logan, 1986)

Hence, it is not so much the learning of the 26 letters and their various arrangements, as it is learning to map abstract arbitrary visual symbols to sound units that makes phonetic literacy difficult to learn.

Logan (1986) further provided an interesting explication of how the nature of speech influenced the development of different scripts. For example, phonetic writing would not work well for the Chinese, because their language has great phonetic redundancy. One sound in Chinese might mean ten different things, and Chinese speakers use context and inflection to communicate meaning. The use of ideo/pictographs is much more efficient in accurately communicating meaning in written form in such a language. In a similar manner, the Hebrews did not need vowels, as their language is readily deciphered by the arrangements of consonants. Greek, on the other hand, was much too ambiguous without the explicit notation for vowels. Hence, the Greeks added vowels when they adopted the Phoenician alphabet, thus creating a notational system that could be applied to utterances in any language (Logan, 1982).

In summary, I believe that Logan's (1986) most important contribution to the literacy thesis was his extension of the study of the phonetic alphabet beyond Ancient Greece, which provides more continuity with the ancient evolution of culture and thought. Logan (1982) also did not shy away from potentially politically charged cross-cultural comparisons of different writing systems, which some others (e.g., Ong, 1982) relegated to the margins of their theory, but which are of crucial importance if the nature of communicative media is to be understood. Logan's (1986) attention to the relationship

among old and new media is also an important aspect of the understanding of emergent cognition[37].

Logan (1986) stressed the uniqueness of the phonetic code in terms of its arbitrariness with regard to the concrete, and showed that the evolution of a phonetic alphabet preceded a parallel evolution in progressive abstraction of thought. For my present purposes, the most important inventions that exemplify decontextualized abstraction are the Jewish abstract god, Platonic forms, and propositional logic (Logan, 1986). Each of these phenomena is removed from the level of the concrete, and both Yahweh and propositional logic can be said to be purely verbal significations. Plato's forms are also perfect, supernatural phenomena that can exist only in an *ideal* world, with only imperfect replicas existing in nature. I might add here that the split between the natural and ideal after the introduction of phonetic writing (best exemplified by Plato's forms and the Jewish god) can be considered to be the beginning of a more general Western-style dualistic thinking (ontological separation between the material world of physical objects and the immaterial world of souls, spirits, thoughts, etc.), which I suggest is still very much a part of our reality[38].

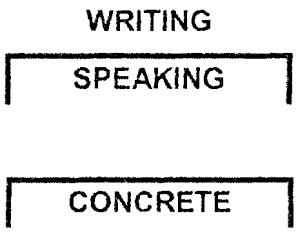
Logan (1986) further stressed that learning to read and write entailed simultaneous learning of the cognitive forms that the specific script facilitated. However, he did not provide a specific mechanism by which abstract cognition emerges. I argue that the

[37] How different spoken languages influence the emergence of different scripts is an example of the kind of investigation one could undertake in studying the historicity of literacy itself; as I already stated, such a task is beyond the scope of the present thesis.

[38] Note that Eastern metaphysics tend to be dialectical rather than dualistic (Logan, 1986); the spirit is never completely separate from the object. Abram (1996) further argued that in purely oral cultures, there is no separation between the spirit of the object and the object itself. Each object has its own unique spirit, which is its way of being.

structural/semiotic structure I am proposing (Figure 13) provides an explanatory framework for the understanding of the

Figure 13: Theoretic plane enabled by writing.



emergence of abstract cognition. Logan (1986) suggests that it is the arbitrariness of the ABCs, the abstract signification of spoken sound that makes learning to read and write so difficult. I suggest that it is that very association of abstract signs with spoken sounds, combined with the separation of the signs from the level of concrete reality, which gives a possibility for purely verbal, abstract, decontextualized signification; hence a possibility for the existence of the decontextualized abstract level of theoretical reality.

3.7 Merlin Donald

Merlin Donald is a professor of psychology at Queens University. His 1991 book, *Origins of the Modern Mind*, presented a theory about the nature of evolution of human culture and cognition, from prehistoric to modern times. On a general level, Donald (1991) argued that the increased complexity of cognition, and the development of higher cognitive functions, was a result of a parallel increase in complex forms of social interaction and communication. Donald (1991) claimed that the mind cannot be divorced from its cultural context. It is a product of both genetic and environmental, cultural forces.

The human brain is marked by increased flexibility and capacity to learn, and such flexibility is especially important in complex, quickly evolving cultures. Learning is important because human symbolic knowledge does not depend on biological but on cultural storage and transmission of knowledge.

Regarding specific claims with regard to the literacy hypothesis, Donald (1991), claimed the emergence of speaking (some 300,000 years ago) enabled what he called the 'mythic mind,' whereas the emergence of writing enabled the 'theoretic mind.' According to him, these two forms of thought are distinct in their characteristics, but they both play a part in the lives of contemporary humans.

The emergence of theoretic consciousness, according to Donald (1991), was enabled by the technology of writing because writing created a form of external working memory (*external symbolic storage*). Information in writing is stored outside the individual, ready to be accessed when necessary; one only needs to know some useful way of *indexing* the information, i.e., to remember where and how to find it. Hence emerged new mnemonic strategies, such as lists, that enabled new ways of systematic sorting, summarizing, and classifying of information (Donald, 1991). These practices eventually resulted in the emergence of systematic measurement and modern taxonomies. Storing information on the page 1) freed our attentional resources for more contemplative thought, and 2) connected individual minds with a larger distributed cultural symbolic system (Donald, 1991). The external extension and distribution of our limited working memory enabled the ability of critical examination, thus giving rise to *theoretic culture* (Donald, 1991).

Eskritt and Lee (in press a, in press b) and Eskritt, Lee, and Donald (2001) provided some experimental support for the claim that the medium of writing is used in the actual

storage of information, rather than as an instrument augmenting internal memory. For example, Eskritt, Lee, and Donald (in press) found that children in grades 5 and 7, in contrast to children in grades 1 and 3, not only used significantly more notations when playing a game that required memorization, but also made significantly more notations that were useful for their memories.

I suggest that Donald's (1991) most significant contribution to the present thesis was his elaboration of the materialist, ecological assumptions he shared with other media theorists. His emergent view of brain development portrayed humans as deeply implicated in their environments, and deeply shaped by their ongoing communicative action[39]. His more specific contribution consisted in elaborating the *externalization* explanation for the effects of literacy, and in providing some empirical support for his thesis. At the same time, I argue that Donald's (1991) singular focus on writing as an external medium weakened some of his arguments. For example, Donald's (1991) argument that the emergence of propositional logic could be explained by the external storage argument did not address the claim that logical abstract thought emerged in the specific context of phonetic writing.

3.8 David Olson

David Olson is a cognitive psychologist who devoted much of his career to the study of literacy. He is a part of the *Toronto School*, recently retiring from the position of Professor of Applied Cognitive Science at the Ontario Institute for Studies in Education. The majority of the literacy theorists I reviewed in this chapter focussed their attention on the historical implications of the introduction of writing, discussing the cognitive effects of

literacy predominantly in the historical context. Although Olson clearly belongs predominantly in this tradition, he also began to apply some of the literacy claims to child development.

Olson's most important work was his 1994 book *The world on paper.* Even though predominantly concerned with historical implications of writing, Olson did make some initial attempts to tie his *model theory of literacy* to specific cognitive developments in children, such as the development of metalinguistic awareness and the understanding of the nature of interpretation. In his other works (e.g., Homer & Olson, 1999; Torrance, Lee, & Olson, 1992), Olson (1996) elaborated some of his claims and provided some empirical evidence to support his thesis. Olson's (1994) explanation for the literacy effect can be classified as falling under the *permanence* and *structural* forms of explanation, even though he did not explicitly discuss semiotic considerations.

Olson's general standpoint recognizes the key role of the media in bringing about change in cognition.

> [T]he invention of certain notational artifacts involves the creation of new concepts and new knowledge, indeed a new consciousness. The invention of a notational system, it may be argued, involves the creation of a new conceptual scheme with new possibilities for thinking. ... [N]otational schemes can serve as new modes of thought (Olson, 2002, p. 155).

He argues against the predominant view that dominates main-stream research on literacy, which neutralizes the emergent properties of the medium by viewing writing as a mere transcription of speech. "For too long we have left unexamined the Saussurean legend that writing is not language but only a means of recording language" (Olson,

[39] See Bates (2005), Deacon (1997), Freeman (1995), or Oyama (2000) for other systems theorists who elaborate on emergent cognition and human deep embeddedness in our environments.

2002, p.164). He argues that literacy is more than a storage place or a cognitive computational device, but an agent of significant cognitive change.

> [I]nventing a writing system and learning to deal with a writing system is not just a matter of improved storage and communication of information but a new form of representation, thought, and consciousness (Olson, 2002, p. 155).

Like other media theorists, Olson (1994) thus reversed the more traditional focus on the properties of speaking.

> The mistake is in the assumption that writing is the transcription of the already known. On the contrary, the 'big' discovery about reading, made only in the recent past, is that the requisite knowledge about speech needed for reading, does not pre-exist learning to read. ... [L]earning to read is to an important extent a matter of learning how to analyze one's speech in a new way, a way compatible with the properties of the writing system.
>
> [W]riting systems provide concepts and categories for thinking about the structure of spoken language rather than the reverse. Awareness of linguistic structure is a product of a writing system not a precondition for its development (Olson, 1994, p. 68).

In order to derive a more general literacy principles applicable to all writing systems, Olson (1994) proposed what he called the *model theory of literacy*, arguing that writing provides a conceptual model for speech. Writing is not merely "the transcription of speech, but rather provides a conceptual model for that speech" (Olson, 1994, p. 89), which allows us to *quote speech*, turning speaking from something that is *used* to something that can be *mentioned* (Olson, 1994). Writing influences oral word awareness that develops as "children discover how written signs carve up the more continuous structures of speech" (Homer & Olson, 1999, p. 136)[40].

Olson (1996) focussed on the metalinguistic effects of writing, claiming that "writing is in principle metalinguistic" (Olson, 1994, p. 89). "To invent a writing system is, in part,

to discover something about speech" (Olson, 1994, p. 78). Or put in a different way, "learning to read is learning to hear speech in a new way" (Olson, 1994, p. 85).

> Since neither reading nor literacy are unitary phenomena, we cannot state a general rule relating literacy to cognition. As we have seen different scripts serve up different aspects of language to consciousness and different ways of reading the same script bring different aspects of meaning into consciousness. But by examining the diversity of scripts and the ways they are used and what they provide models of, we have been able to specify a set of relations between literacy and cognition. The relation was this: every script can be verbalized or read out, thus every script serves as a model for speech. *Ergo*, every script has cognitive implications (Olson, 1994, p. 275).

Olson (1994) showed that different scripts have different cognitive effects, as they bring to reflective focus different properties of speech: idiographic scripts, that use symbols for whole words, create awareness of word units, syllabary writing systems create awareness of syllables, and phonetic scripts create awareness of letters (Olson, 1994). For example, Chinese readers of traditional script could not detect individual phonetic segments in words, whereas those Chinese who used an alphabetic script (Pinyin) could do so (Read, Zang, Nie, & Ding, 1986; in Olson 1994). Metalinguistic awareness is thus contingent on writing, and the character of the medium will directly influence the nature of metalinguistic awareness.

In a parallel manner, Olson (1994) reminded us that preliterate children are more aware of the content of speech than of the precise verbal form. "[C]hildren's understanding of word as a unit of speech was predicted by their awareness of word as a piece of written text" (Homer & Olson, 1999, p. 113). When asked to repeat "exactly" what the other said, pre-literate children concentrated on the meaning of the utterance rather than the literal wording (Olson, 1994). Pre-literate children also failed to note the

[40] Homer and Olson's (1999) studies on children's understanding of words found that oral understanding of words was correlated with text based tasks.

difference between paraphrases (Torrance, Lee, & Olson, 1992; in Olson, 1994). As long as two paraphrases had the same content, children before the age of six typically asserted the identity of the statements when asked whether exactly the same thing was said. In contrast, early school children were typically good at distinguishing between paraphrasing and verbatim statements[41]. Homer and Olson (1999) reviewed a number of other studies that showed a clear shift in metalinguistic awareness at the onset of schooling. For example, Ferreiro (1997), Ferreiro and Vernon (1992), and Homer and Olson (1999) demonstrated that the explicit understanding of 'words' (e.g., the difference between common nouns and proper names) emerges after children learn to read and write. The judgment of which word was bigger (e.g. caterpillar or train) also significantly improved for grade one children as compared to kindergarten children (Bialystok, 1996).

Following Ferreiro (1986), Homer and Olson (1999) also demonstrated that another capacity that preliterate children lack is the ability to signify negation or absence. Pre-reading children refuse to 'write' statements such as 'No cats,' stating that it cannot be done. It is worth noting that negation or absence can only be represented by abstract, decontextualized symbols, and cannot be positively represented using concrete signs, such as drawing. Thus, only when they acquire the ability for verbal operation detached from the concrete reality, can children use purely abstract devices, such as the denotation for negation or absence. In other words, negation and absence are born within symbolic operations on words themselves.

Furthermore, Olson (1994) took the relatively well-established thesis – that writing enables metalinguistic awareness (e.g., Vygotsky, 1986) – one step further, applying his

[41] Preliterate children are also incapable of deleting phonemes from words (e.g., saying 'fish' without 'f') (Magnusson & Naucler, 1993). Children acquire this capacity around the age of six, at the time they begin to read and write.

medium framework to the emergence of children's understanding of intentional states and interpretation. Olson (1994) argued that the problematic of intention and interpretation emerged (both historically and developmentally) with the acquisition of metalinguistic awareness, itself a by-product of literacy. While he agreed that all communication involves interpretation, Olson (1994) recognized that there was a difference between the act of interpreting and the awareness of interpretation, the latter developing only after the acquisition of literacy.

Olson (1994) cited Rosaldo's (1982) and Duranti's (1985) studies in which they showed that oral cultures did not make a distinction between what was said and the underlying intentions, as evident in the lack of distinction between assertives (statements of fact) and declaratives (statements that purport to create truth), an absence of commissive speech acts (i.e., statements that directly express underlying intention – such as promises), and an absence of rebuttal of the other's interpretation on the basis of misunderstood intention ("This is not what I meant!"). Thus, in oral cultures, "what is true is what one can get another to accept, not an objective account of a pre-existing fact" (Olson, 1994, p. 103). In a similar manner, pre-Socratic Greeks did not have a conception of mind.

> The most striking feature of the Homeric conception of mind is that they had none. There is no evidence of a concept of mind as distinguished from the body and there is an absence of such terms as 'decided,' 'thought,' 'believed,' 'doubted,' or 'equivocated.' ... The Homeric vocabulary included terms for referring to talk and feelings but whereas for their literate descendants, the Classical Greeks, such terms refer to internal, mental events, for the Homeric Greeks they referred to external, bodily, objective events. For the Homeric Greeks, what we refer to as thinking is usually described as speaking, an activity originating in the organs of speaking, the lungs. ... Since thinking is an aspect of speaking to one's organs or hearing voices there is no notion of a separate domain of 'thoughts' or 'ideas.' Only later does the same root word come to be distinguished into two distinctive concepts, *ratio*, rationality, and *oratio*, speech (Olson, 1994, p. 238).

In a parallel manner, Olson's own study (Torrance & Olson, 1985) demonstrated that it was not before they reached early school years that children were able to "distinguish what the speaker 'should have said,' 'meant,' or 'wanted'" (Olson, 1994; p.125). Similarly, Olson (1994) noted that preschool children were incapable of properly understanding irony, sarcasm, understatements, or hyperboles, all of which required a grasp of an intention that was opposite or markedly different from the explicit verbal form (Olson, 1994).

Olson (1994) argued that "literacy, with its focus on precisely what was said, is related to an increased understanding of subjectivity, of precisely what was meant" (p. 130). The very awareness of the difference between intention and utterance emerges when speaking is objectified in writing.

> With a written text, interpretation can turn into a research enterprise with the preserved wording serving as one kind of evidence in the formation of a judgment (Olson, 1994, p.107).

Hence, after they learn to read and write, around the age of six or seven, children begin to understand that one may be mistaken in his verbal belief, i.e., that one may 'think that she knows' (Olson, 1994). This achievement is commonly known in psychology as the achievement of the interpretive understanding of mind (Carpendale & Chandler, 1996). Olson (1994) showed that the development of clear awareness of what originated in the text or speaker and what originated in one's act of interpretation continues to be a challenge throughout the school years, and frequently persists into adulthood. The tendency to identify interpretation with the text or the author remains a difficulty during early school years, and the degree of the difficulty greatly depends on the complexity of the task (Olson, 1994).

Another valuable contribution of Olson is his empirical elaboration of the early stages of literacy. Homer and Olson (1999) followed Piaget's (1929) studies on the development of the concept of *word*[42], and Ferreiro and Teberosky's (1982) studies on the stages through which children pass in their acquisition of literacy. To learn to write, children first have to grasp that writing represents speech (Homer & Olson, 1999). Ferreiro and Teberosky (1982) established that by the age of approximately four, children acquire the ability to distinguish between writing and other forms of graphic representation (e.g., drawing). Homer and Olson (1999) described this early period of literacy as beginning with a rudimentary differentiation between words and other token forms of visual representation (e.g., emblems). As Olson (1994) puts it, "when pre-reading children 'read' logos such as 'Coke' [...] it is unlikely that they take the emblem as a representation of a word rather than as an emblem of a thing" (p. 71). In other words, they begin to recognize that writing codifies speech sounds rather than perceived objects (the way drawing does). Children thus develop implicit awareness that writing codifies speaking long before they know how to write, and sometimes even before they know any letters (Homer & Olson, 1999). Once they have such a rudimentary sense, they can start learning to relate the written graphic signs to the spoken sounds.

Homer and Olson (1999) devised a series of studies to test children's early understanding of writing. In one study, they presented a picture of a boy with a caption 'Charlie,' instructed children that this is a picture of Charlie and that the caption says

[42] Piaget (1929) noted that early on words and objects are inseparable; a word is a part of a thing. In the second stage, children recognize the difference between things and signs, but fail to recognize that words are social conventions, instead viewing words as inherently linked to things. In the stage of formal operations (around the age of 11-12), the full understanding of interpretive process emerges at the same time as children come to understand the differences between 1) things and objects, 2) the internal and the external, and 3) matter and thought. Note that formal operational thought does not develop universally, and is subject to significant age and cultural variations (Piaget, 1972). In fact, much of adult thought operates on the pre-formal level (Piaget, 1972).

'Charlie,' and then asked whether this is a picture of a little boy; predictably, all children agreed. But if they were then asked whether the caption below says 'Little boy,' 4 or 5 year old children disagreed, indicating some rudimentary awareness that the word, unlike an emblem or a picture, preserved the verbal form (Olson, 1994). In contrast, younger children made an error, agreeing that the caption said 'Little boy,' thus focussing on the content rather than the literal form, treating words as pictures (Homer & Olson, 1999).

Hence, starting around the age of four, children acquire some rudimentary understanding that writing preserves the verbal form. However, before they learn to read and write children still employ the grammar of graphic representation when asked to 'read' or 'write.' For example, in another study, when children were asked to *write* the word 'cat,' they drew some letter-like strings, hence showing that they knew the difference between 'write' and 'draw' (Homer & Olson, 1999). However, when asked to write 'three cats,' children between the ages of four and six drew three such strings, confusing the grammar of drawing with the grammar of writing. In a similar way, when four to six year olds were shown a plate with 'Three little pigs' written on it, told what the plate said, and then, having one of the words covered, were asked to read the plate, they read it as 'Two little pigs,' committing the same mistake of treating the words as emblems of things (Homer & Olson, 1999). Hence the first stage of literacy consists of a gradual transition from treating written words as emblematic representations to treating them as words.

In summary, I believe that Olson's most significant contribution to the present thesis was his fairly strong, yet context-inclusive, position with regard to the literacy hypothesis. His clear assertion that the technology of writing itself has emergent properties that have

an impact on cognition is an important voice that keeps alive the marginalized medium hypothesis. The empirical studies Olson conducted were examples of but a few of many research areas that literacy hypothesis could stimulate. Sadly, Olson remains one of the very few contemporary psychologists utilizing a medium framework in theory and research.

Olson's more specific contributions included his elaboration of the early stages in children's development of literacy, his reasserting of the metalinguistic thesis[43], and his *model theory* that stressed that writing has an impact on not only thought but also our understanding of speech itself. Reflecting later on his 1994 book, Olson summarized the uniqueness of his contribution:

> He [Olson, 1994] argues that writing provides a model for reflecting on some properties of speech; it is responsible for bringing certain aspects of language into consciousness by providing the set of categories used to reflect on and analyze speech. Therefore, we become aware of the particular aspects of speech that are represented or codified by our culture's script (Homer & Olson, 1999, pp. 117-118).

Olson (1994) further applied his metalinguistic thesis to the development of children's understanding of intentional states and the nature of interpretation, providing a very promising way of applying his metalinguistic thesis in the context of child development.

I suggest that Olson's shortcomings include his oscillation between his sentiments to side with those literacy theorists who make grandiose statements about the effects of literacy, and actually asserting an overly narrow view of the literacy effects. On the one hand, Olson (1994) claimed that "[o]ur modern conception of the world and our modern conception of ourselves are, we may say, by-products of the invention of a world on

[43] The achievement of metalinguistic awareness is the most established aspect of the literacy hypothesis (e.g., Brockmeier, 2000; Harris, 1997; Vygotsky, 1934/1986).

paper" (p. 282), while, on the other hand, he narrowed his literacy effects mainly to the achievement of metalinguistic awareness.

A related shortcoming is Olson's lack of clear commitment regarding the causal link between literacy and literacy-specific cognitive achievements. Occasionally, Olson implies an inappropriately strong casual position; for example, discussing the absence of the concept of word in oral cultures, Homer and Olson (1999) stated that "it seems fair to conclude that writing is a causal factor in acquiring a concept of word" (p. 135). At other times Olson uses a language that evades the issue all together (e.g., "... invention of certain notational artefacts *involves* the creation of new concepts and new knowledge" (Olson, 2002, p. 155, emphasis added).

Further, Olson's predominant explanation for the literacy effects, his *model theory of literacy*, made an implicit use of semiotic considerations, that is of the fact that writing codifies speaking. However, Olson makes no reference to semiotics, and hence failed to develop an explicit structural framework that I have argued throughout this thesis is necessary for a more complete understanding the literacy effects.

Olson (1994) also seems to have made a specific conceptual error in conflating the child's *false belief* understanding with the child's *interpretive understanding of mind*. In his 1994 book, Olson applies his literacy thesis beyond the *interpretive understanding of mind* to include children's earlier acquisition of *false belief understanding*.

> Children's discovery of the distinction between what was said and what was meant builds upon the rather pervasive set of distinctions that children acquire when they begin to understand intentional mental states at about four or five years of age. ... They begin to understand the very possibility that someone could believe something false. They begin to ascribe thoughts to themselves and others, they begin to understand tricks and surprises and they begin to distinguish accidental from intentional actions. ... At about the same time that they grasp the idea that a belief could be false, they also grasp the parallel idea that an

> utterance could be false and that they thus begin to understand such notions as lies and secrets (Olson, 1994, p. 127).

The attribution of false belief understanding to literacy appears to have been a conceptual mistake on the part of Olson (1994). False belief understanding emerges at the age of about four (Carpendale & Chandler, 1996), before children learn to read and write. False belief understanding is also found in oral cultures (Avis & Harris, 1991; Vinden, 1999)[44]. Hence, it appears unlikely that literacy plays a role in the emergence of this cognitive form. In his later work (e.g., Home & Olson, 1999), Olson no longer mentions the issue of false belief, perhaps realizing that his argument in this respect was not specific enough.

I also argue that a similar lack of adequate elaboration is shown in Olson's failure to delineate the relationship between metalinguistic awareness and abstract thought. While mentioning numerous times the development of abstract cognitive forms, Olson (1994) did not provide a systematic account of the development of abstract cognition, or elaborate the developmental relationship between metalinguistic awareness and abstract decontextualized thought. Decontextualized thought appears to be a secondary consideration for Olson, but his cursory treatment of the issue appears to conflate abstraction with metalinguistic awareness.

[44] Vinden (1999) showed that cultural differences do affect the emergence of false belief understanding. However, clear evidence for the existence of false belief understanding in preliterate children and oral cultures precludes the attribution of literacy as an enabling factor in the development of false belief understanding.

Chapter 4
The literacy hypothesis

The aim of this chapter is to synthesize the existing evidence for the literacy hypothesis, to provide a brief statement of my view of the most useful aspects of the hypothesis, and to elaborate on the broader theoretical framework that can adequately embrace the medium approach in general, and the literacy hypothesis in particular.

4.1 Literacy effects and explanations for literacy effects

The theorists I reviewed in Chapters 2 and 3 (Donald, 1991; Goody & Watt, 1963/1968; Havelock, 1963, 1976; Luria, 1976/1978; McLuhan, 1962; 1964; Logan, 1986; Ong, 1982; Olson, 1994; Scribner & Cole 1981; Vygotsky, 1934/1986) share the assumption that communicative conditions affect cognition. Thought, especially symbolic thought, is born within and structured by acts of communication. Specific observable, external characteristics of the symbolic media enable specific internal, cognitive effects[45].

More specifically, these theorists focus on the cognitive effects of literacy, speculating on both the literacy effects and the explanations for the literacy effects. As is evident from the previous chapter, while there are some overlaps among the theorists with regard to what literacy enables and how it enables it, there also exist discrepancies

with respect to these questions. This section is an attempt to synthesize some of the existing research on the ways literacy restructures thought. My discussion here draws predominantly on the theorists reviewed in Chapters 2 and 3, but it is not limited to them. I begin this section with a discussion of the cognitive effects that literacy enables, then proceed to a discussion of the existing explanations for literacy effects.

4.1.1 Cognitive effects of literacy

I use the term *cognitive effects* to denote the forms of thought that are enabled by the medium of literacy. Several points of clarification are in order. First, as is evident from my discussion so far, the causal stance I adopt purports that the use of the medium does not necessitate the associated effects, but the medium needs to be used for the effects to be present. In other words, the medium is a *necessary* but *not sufficient* condition for its effects; the medium is an *enabler* for its effects. Second, as is evident from previous chapters, numerous cognitive effects have been attributed to literacy. Listing all these effects would be difficult; hence, in this section I focus on selected emergent cognitive forms that have been attributed to literacy. Third, there is a scarcity of direct research considering the effects of the medium of literacy on child development (e.g., Olson, 1994; Scribner & Cole 1981; Vygotsky, 1934/1986). Most research considering the literacy hypothesis comes from historical analysis of the emergence of Western psychological phenomena (e.g., Donald, 1991; Goody & Watt, 1963/1968; Havelock, 1963, 1976; Logan, 1982; Ong, 1982; Olson, 1994). Some literacy research

[45] The lack of one-to-one causal correspondence between the features of a medium and its psychological effects stems from the fact that it is not merely the availability of the medium but rather how it is used that determines the cognitive effects that the medium creates (Graff, 1987; Scribner & Cole, 1981). There exists a great variability in how any given medium can be utilized in communication as well as how much it is used. The discussion of this variance goes beyond the scope of this paper in which I focus only on the most general characteristics of phonetic literacy.

has also been done with adults, predominantly in a cross-cultural context (e.g., Donald, 1991; Goody & Watt, 1963/1968; Luria, 1976/1978; Ong, 1982; Scribner & Cole 1981). Fourth, an important task in this section is to make explicit which cognitive changes are enabled by any form of visual persisting technology, which are enabled by all forms of writing, and which are unique to phonetic writing. Literacy theorists are frequently less than precise on this point. My discussion will proceed from the former to the latter. I will take special care to emphasize which effects follow from which technologies, as well as how writing or phonetic writing enhances the effects that are enabled by earlier representational technologies. My fifth and last qualification is that all the effects I am discussing in this section are intimately related to one another. I attempted to arrange the flow of presentation to show how one effect builds upon other effects. My goal was to give a sense of one unified literacy *complex* rather than a list of distinct effects. The task of analytically separating different effects of literacy was difficult; yet it was necessary in order to avoid the medium misattributions that are frequently found in literacy research.

4.1.1.1 Temporal reflection

Literacy is a persisting visual technology. Hence, as a prelude to discussing specific literacy effects, it is worth pondering the very nature of all persisting visual symbolic media, specifically on their relationship to temporality.

Natural modes of symbolic communication, such as gesturing and speaking, occur in *real-time*. The sound of spoken words and the images of gestural language go in and out of existence as they are expressed and received. As such, non-technological communication is not unlike other ever changing natural phenomena. The psyche of a purely oral human reflects these temporal, dynamic modes of communication. Abram (1996), in *The spell of the sensuous*, speaks about the state of synaesthesia – that is

temporal and un-self-conscious immersion in the environment – that purely oral people experience.

Is it possible then that the birth of visual symbolic technologies (such as cave paintings) introduced something very new, by superimposing a static, unchanging picture on the ever changing reality. Might it be the case that with the introduction of static visual technologies, humans for the first time had to deal with reconciling the fact that, on the one hand, the phenomena change in time, whereas on the other hand, their representations persist. I believe it reasonable to assume that consciousness of temporality requires that change be symbolically 'frozen', and thus that it was the static representation that created the capacity for temporal reflection. Verbal or gestural communication is inescapably trapped in time and thus could not afford such reflection. On the other hand, the emergence of visual persisting symbols should have provided early humans with a medium that portrayed the otherwise dynamic world in a seemingly[46] unchanging fashion. Is it reasonable to argue that it was such a static representation that enabled the imagination of persistence and the corresponding reflection on impermanence? In other words, visual, persisting media enabled psychological identification with the static image, and such psychological identification might have created a longing for persistence or immortality and a corresponding fear of death. In other words, it might be the case that the emergence of the symbolic consciousness of impermanence, and the emergence of the awareness of temporality were complementary phenomena enabled by the use of the first persisting representational technologies. Anthropological evidence suggests that the first burial

[46] Of course impermanence of visual representation is itself an illusion. Paintings or printed word change like everything else; however, these symbolic representations change *slowly* (almost imperceptibly for all practical purposes), thus providing an illusion of impermanence.

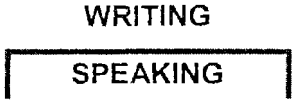
ceremonies, which can be taken as evidence for the awareness of mortality, took place during the era of the early Homo Sapiens. And it was early Homo Sapiens who also developed the first forms of symbolic visual art (Haviland, 1991)[47].

Unlike animals, humans are deeply self-aware and temporal, and the medium approach, once appropriately developed, might provide some insights into the origins of our temporal awareness. If early visual representational technologies 'froze' the dynamic reality, thus enabling the birth of temporal awareness, one would expect that the introduction of writing would further enhance temporal awareness because writing 'freezes' the narrative itself, thus turning words themselves into objects of reflection.

4.1.1.2 Metalinguistic Awareness

Metalinguistic awareness is the most consistently postulated and the most solidly developed and documented effect of writing (Goody & Watt, 1963/1968; Harris, 1989; Havelock, 1963, 1876; Logan, 1982; Ong, 1982; Olson, 1994; Scribner & Cole, 1981; Vygotsky, 1934/1986). Despite the differences between different accounts, the various metalinguistic theses postulated by different theorists are all variations of the more general theme that

Figure 14: Writing as a metalanguage.



[47] The science of early cultures is imprecise; the estimate of first burials ranges from 240.000 to 40.000 BC (Haviland, 1991).

metalinguistic awareness is brought about because writing codifies spoken words, hence turning the narrative itself into an object of reflection. Language is no longer just used to signify actions and objects, but now language itself becomes the object of signification. Hence, as shown in Figure 14, writing enables a structure for metalinguistic symbolization. Having words as its objects of codification, writing becomes the first language that objectifies language itself; in other words, structurally, writing is the language of a language[48].

There exist various accounts of literacy that capitalize on the metalinguistic hypothesis. For example, Vygotsky (1934/1986) and Luria (1974/1976) claim that writing is a symbolic activity that turns words into objects of consciousness. Goody and Watt (1968) argue that writing objectifies words and makes them available to conscious scrutiny. Olson (1994) argues that writing creates a *model of speech*, or a medium that allows us to *quote speech*, turning speaking from something that is *used* to something that can be *mentioned*. Brockmeier (2000) states that literacy has created a universal symbolic space in which we engage in metalinguistic practices, as reading and writing create awareness of phonemic, orthographic, and poetic features of language.

There exists a significant amount of historical and cross-cultural research supporting the thesis that metalinguistic awareness is a consequence of literacy. Levy-Bruhl (1923), in his concept of *metonomy,* shows that oral cultures are not aware of the representational nature of speaking, perceiving words as carrying within themselves the properties of objects they represent. Finnegan (1979) demonstrates that for non-literate people the concept of *the same* is applied to concrete reality not to words; the task of

[48] Note that this claim resonates with the phenomenon of *second-degree symbolization*, something that both Vygotsky (1934/1986) and Inhelder and Piaget (1958) suggested occurs in the context of metalinguistic awareness and decontextualized thought.

exactly repeating a verbal utterance is difficult to understand for a preliterate subject. A Western explorer Livingston (1865, in Eskritt & Lee, in press b) wrote about how difficult it was for non-literate people to imagine that the page contains content: "It seems to them supernatural that we see in a book things taking place, or having occurred at a distance. No amount of explanation conveys the idea unless they learn to read" (p. 189). Levy-Bruhl (1923) also observed that preliterate people believe that writing speaks to the reader, and that he/she must possess some special powers to be able to *hear* the words. Bakhtin (1981, 1986) even writes about examples of non-literate polyglots, who are able to move with ease between languages, yet have no metalinguistic awareness. Malinowski (1923) reported that, in oral cultures, words are never perceived as static entities but as actions. Luria (1976) showed that oral people are not interested in the question of definition, and Havelock (1963, 1976) demonstrated that the Greeks were first to attempt to define words systematically: Hesiod was the first known thinker to attempt to define words, Plato believed that words have abstract features that can be defined using formal language, and Aristotle stressed the importance of right definition.

Writing by definition codifies the spoken word, and thus I argue metalinguistic awareness is structurally enabled by any writing system. However, it is possible that metalinguistic awareness is more pronounced for phonetic writing because of its arbitrariness with respect to the visual image, and its one to one correspondence with speech. These two simultaneous features of phonetic writing should logically allow a greater distance from the concrete and thus more attention to the verbal content. I am not aware of any cross-cultural research addressing this hypothesis, but there exists some historical evidence suggesting that such an assertion might be correct. The earliest recorded attempts to create verbal definitions of words were made by Hesiod in

ancient Greece (soon after the introduction of first fully phonetic writing system[49]), who analyzed various uses of words in Homeric epics (Havelock, 1963). Heightened metalinguistic awareness that followed the introduction of phonetic writing was also manifested in the increase in authority that was given to the written text and quotation in classical Greece (Harris, 1989). Such highly metalinguistic practices as propositional logic and epistemology were also invented in Greece. Lloyd (1979, 1990) points out that the Greeks did not invent argument or knowledge but *epistemology*, i.e., a method of reflecting on argument or knowledge.

4.1.1.3 Verbal abstraction and abstract classification

I further argue that metalinguistic awareness is intimately linked to the emergence of verbal abstraction. Any form of symbolic representation, technological or natural, entails a degree of abstraction or *simplification*. Gestures or words, for instance, are used to simplify experience by collapsing specific instances into more general, and thus communicable, categories. Abstraction can be understood as a symbolic delineation of the most important features of the signified terrain, or as *generalization* or *categorization*, that is a conventional use of a sign to stand for a group of similar and/or related events or objects. In fact, it appears that the very process of abstraction never occurs without simultaneous *signification*. For example, Gopnik and Meltzoff (1992) showed that the categorization of objects by 18-month-old children was closely associated with object naming. Choi (1990) found that children with less exposure to names experienced a delay in the development of their ability to categorize. It might thus be the symbol that

[49] As I discussed earlier, the Greeks developed the first fully phonetic writing system that allowed for a one to one correspondence between spoken words and written signs, a correspondence that was completely arbitrary with regard to the concrete (Havelock, 1963).

stands for a pattern that allows the extraction of the pattern from the concrete reality. Hence the concept of *abstraction* can be said to be very intimately related to the concept of *classification.*

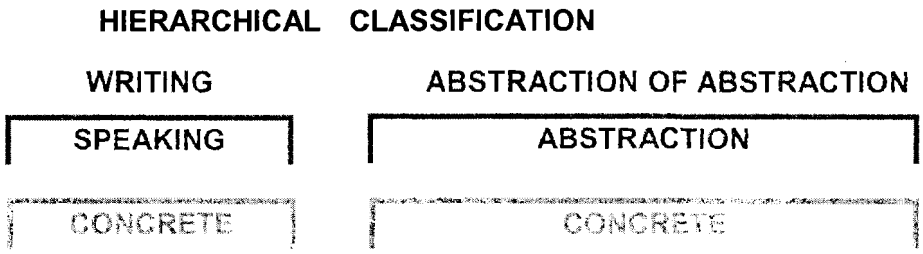
Speaking is the most sophisticated non-technological symbolic mode. Spoken words generalize instances of events (e.g., the same verb *play* can refer to a variety of actions) and are thus forms of abstraction. However, as discussed earlier, spoken abstraction is inescapably tied to concrete reality. Havelock (1963) reported that statements of knowledge in oral traditions are made in context, in real-time and real-space. Luria (1976) showed that non-literate subjects do not assign abstract names to geometrical figures but use names of concrete objects. A circle is *a sieve*, *a plate*, or *a bucket.* He provided many examples of non-literate peasants refusing to use abstract categories; even when explicitly encouraged to do so, they prefer to think in practical terms. Levi-Strauss (1966) showed that preliterate cultures use elaborate classification schema, but that these are based on empirical observation (i.e., they practice a form of concrete science). The information is typically organized in ways that are useful for everyday concerns. Similarly, as I already discussed Luria (1976) demonstrated that illiterate peasants classify information according to practical demands. Information in oral traditions is organized in a narrative, and narratives are governed by practical concerns (Havelock, 1963; Levi-Strauss, 1966). Such ways of classifying information are most useful in the local practical context, which of course does not foster the development of systematic abstract knowledge.

I argue that this changes when writing is introduced, as writing codifies speaking, thus

Figure 15: Verbal operation.

creating the symbolic possibility of verbal operation (where words themselves become objects of signification), as highlighted in Figure 15. The fact that written characters physically codify spoken words creates the possibility for the similar cognitive verbal operation, i.e., cognitive manipulation of words themselves. Such a verbal operation has the potential to symbolically free itself from concrete reality. It seems reasonable to postulate that, in doing so, written signification presents a possibility for *hierarchical classification*, something that also appears only after one reads to read and write (Inhelder & Piaget, 1958; Vygotsky, 1934/1986). As shown in Figure 16, in speaking, the concrete details of phenomena are condensed into first level

Figure 16: The structure of hierarchical classification.



abstract signs, and then in writing these abstract signs can be further abstracted into higher-level categories, thus opening up possibilities for multiple level classificatory

hierarchies[50]. This view of hierarchical classification is closely tied to my metalinguistic claim that writing enables the emergence of a language of a language, or in words of Inhelder and Piaget (1958) and Vygotsky (1934/1958) *second degree symbolization.*

Human attentional resources are limited at any point in time, and hierarchical abstraction, by systematically eliminating the less important context, and foregrounding more and more global patterns, allows for the manipulation of global and complex information that can cover a large conceptual territory. Conceptual complexity can be further enhanced by the fact that writing is an external medium capable of storing information, thus enhancing our biological memory (Donald, 1991). The speed and efficiency of scanning back and forth a written text is also likely a significant factor in the conceptual capacities that literacy enables (Goody & Watt, 1963/1968).

It appears that the potential for verbal abstraction and hierarchical classification are inherent in all writing systems, as evidence of abstract verbal thought and complex systems of classification exists in all literate cultures (Logan, 1986). However, again, phonetic writing, because of its arbitrariness with regard to the concrete, is likely to enhance the capacity for hierarchical classification (Logan, 1986). Moreover, Logan (1986) argues that the alphabet greatly aided the systematization of knowledge because, unlike other writing systems, it provided an unambiguous cataloguing principle (A, B, C, etc), thus making the storage and retrieval of information very easy.

Historical evidence suggests that the cultures that used predominantly non-phonetic writing systems (pictographic or ideographic) did not develop elaborate systems of abstract knowledge as did the Western cultures (Logan, 1986). In contrast, the emergence of phonetic writing enabled an unprecedented development of systematized

[50] This conceptualization of the origins of hierarchical classification has not been tested experimentally.

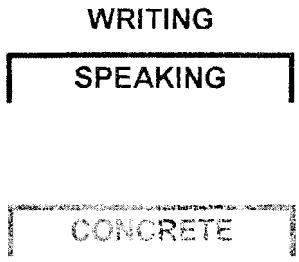
abstract knowledge (Logan, 1986). The development of Western scientific systems of classification in Greece, after the introduction of the first fully phonetic writing system, became one of the cornerstones of contemporary science (Havelock, 1963, 1976; Logan, 1986; Ong, 1982). Greek philosophers put great effort into systematizing knowledge by ordering it according to abstract principles (Havelock, 1976; Logan, 1986; Ong, 1982).

4.1.1.4 Decontextualized abstraction

It is one small step to move from verbal abstraction and abstract classification to decontextualized abstraction. *Decontextualized abstraction* is a form of thinking that operates outside the concrete context, independent of specific examples, in a purely conceptual space. The gap in Figure 17 represents the distance that abstract concepts have from the level of the concrete.

I argue that decontextualized thought is a potential inherent in any writing system,

Figure 17: Purely conceptual plane.



simply because writing codifies speaking, hence enabling a cognitive operation on words. However, decontextualization of thought, I argue, requires that such verbal symbolic operations be differentiated from the level of the concrete, that it becomes an independent semiotic function. I argue that because non-phonetic writing retains its

perceptual connection with the concrete image it represents, it does not foster such a cognitive break from the concrete. In contrast, I suggest, phonetic writing fosters a symbolic distantiation from the concrete and thus potentially enables the birth and proliferation of a purely conceptual cognitive level. Havelock (1976), McLuhan (1964), Ong (1982), and Logan (1986) all have contributed to such a conceptualisation of the birth of theoretic thought. They all demonstrate that the introduction of phonetic writing, and the increase in the use of written records, enabled the birth of highly abstract uniquely Western forms of thought[51].

As I have discussed in the section on Logan, a number of unprecedented, decontextualized cognitive phenomena emerged after, and only after, the introduction of phonetic writing. These include the invention of the Western god, abstract geometry, Platonic forms, propositional logic, and abstract vocabulary (Logan, 1986). All these conceptual inventions share their independence from concrete context. Abstract geometry is axiom-based. Platonic *forms* are ideals that have no replicas in nature, Yahweh is not tied to any geographical location, his name cannot be pronounced, or his image conjured up. Propositional logic relies on a set of rules to combine propositions, and the content of the propositions is secondary.

One can notice the striking resemblance between Platonic forms and Yahweh, both being idealized, decontextualized, supernatural, and extra-sensory. What the Israelites did in the realm of religion, the Greeks extended to the realm of secular philosophy. Further, both propositional logic and axiomatic geometry are decontextualized operations that promote the disconnection from the level of the concrete. It might be

[51] Harris (1989) also proposed an interesting hypothesis that "a conceptual gap between sentence and utterance [... resulted in the creation of an] 'autoglottic' space; and it is into this autoglottic space that the syllogism is inserted in the Western tradition" (p. 104).

reasonable to argue that all these highly abstract decontextualized developments originated because phonetic writing provided a possibility for a radically different representation of reality. Yahweh, Platonic forms, abstract geometry, or propositional logic mirror in their nature the arbitrary and persistent structure of phonetic writing. Thus, it is conceivable that such abstract creations could have been conceived only by someone who had been affected by the grammar of an imperishable and arbitrary medium[52].

If the emergence of highly abstract, decontextualized, theoretical thought is unique to cultures that use phonetic writing, then what can be said about oral cultures or cultures that use non-phonetic writing systems? While a thorough examination of these issues is beyond the scope of this thesis, it is worth noting that evidence suggests that in purely oral cultures there is no mind-body distinction. Purely oral people perceive all matter as *animated* (Cassirer, 1946). Everything possesses a spirit or soul; spirit is a part of the thing, never separate from it (Abram, 1996). In other words, spirit is the very fact of animation, the fact that things move and transform. This lack of distinction between the physical and *meta*physical is to a great extent present even in highly developed oral cultures, such as for example Homeric/Hesodic Greece. Olson claims:

> The most striking feature of the Homeric conception of mind is that they had none. There is no evidence of the conception of mind as distinguished from the body, and there is absence of such terms as 'decided,' 'thought,' 'believed,' 'doubted' or 'equivocated' (Olson, 1994, p. 238).

Feelings and emotions in pre-Socratic Greece were referred to in physical rather than psychological terms (Olson, 1994). One only needs to look around to see that this sense

[52] One natural extension of the medium framework is a claim that the planes of human imagination are limited to the experience that we engage in. Extensions of human senses and modification of our ways of acting enable corresponding extension and modification of human imagination (McLuhan, 1964).

of animation and unity is largely lost in literate cultures, and I argue that it is largely due to the fact that writing fosters metaphysical concepts (verbal abstractions), thus gradually sublimating our consciousness to the level of metaphysical. This claim of course would require another thesis to elaborate, but I believe it is important to note the possible connections.

All cultures that use writing are saturated with metaphysical concepts. But there appears to be a difference between the systems of thought derived in phonetic literate cultures and non-phonetic literate cultures (the former often referred to as Western whereas the latter as Eastern cultures). To risk a simplification, the Eastern systems of thought can be said to be *dialectical*[53], whereas the Western systems of thought can be said to be *dualistic*[54], at least traditionally[55]. Eastern cultures use abstract concepts but do not decontextualize their abstraction to the extent found in Western cultures; Eastern concepts are dialectical compounds of complementary forces. The elements in Eastern philosophies are placed in a dynamic, interdependent relationship; they are not separate or independent entities. The relationship between complementary forces is that of an interchanging figure and ground. At each point of time, one facet dominates, without destroying the other (Logan, 1986). One might say that Eastern metaphysical thought, just as Eastern writing systems, did not lose its ties with the concrete. Although not

[53] In Ogden's (1994) words, "Dialectic is a process in which opposing elements each create, preserve, and negate the other; each stands in a dynamic, ever-changing relationship to the other. ... That which is generated dialectically is continuously in motion, perpetually in the process of being created and negated, perpetually in the process of being decentered from static self-evidence. ... In addition, dialectical thinking involves a conception of the interdependence of subject and object ... One cannot begin to comprehend either subject or object in isolation form one another" (p. 14).

[54] Dualism may be defined as a belief that the world is composed of two very different, relatively independent substances, physical bodies and immaterial souls/spirit/ideas.

[55] Note, because of the diversity within Western and Eastern cultures, this generalization has to be treated with caution. Further, because of the 20th century cultural globalization and cross-cultural influence, the issues discussed here are likely much less clear cut today.

attributing it directly to writing systems, Chapman (1988), following Northrop (1946/1979), stresses this point.

> The high cultures of the Orient have sought the aesthetic acquaintance with the deeper layers of experienced phenomena, and Western civilization since the Greeks has pursued a theoretic comprehension of a reality believed to underlie and explain 'mere appearances' (p. 101).

As a consequence of their general metaphysical commitments, Easterners tend to value the certainty of perception and use more *inductive reasoning* (i.e., reasoning from the concrete to the abstract or from the particular to the general), whereas Westerners put more stock in the certainty of conception and use more *deductive reasoning* (i.e., thinking from the abstract to the concrete or from the general to the particular) (Katsura, 1996; Ong, 1982). Non-phonetic writing systems thus tend to foster contextualized, temporal[56] abstractions that do not lose touch with concrete reality. As a result, non-phonetic cultures never developed independently the kind of decontextualized systems of knowledge that were developed in the West. Again, these claims are very general and far from exhaust this vast topic. However, I believe a mention of them is important for the elaboration of the issue of decontextualization of thought.

4.1.2 Five explanations for the literacy effects

While there is a range of cognitive effects that have been enabled by literacy, I argue that all the existing explanations for the literacy effects can be placed within one or

[56] Is it possible that a parsimonious explanation of the nature of Western decontextualized concepts would be *the removal of time from the conceptual space*? Everything that exists is temporal, and speech captures temporality in a dynamic narrative. Oral communication does not persist and so it creates dynamic, real-time, contextual, embodied, in short *temporal*, ways of representing reality. Eastern dialectical thought introduces the static concepts, but it remains inclusive with regard to temporality and change, stressing the movement and impermanence of objects and activities, the need for balance and rhythm, and the danger of extremes. The Tao, or *the way things are*, is ultimately indescribable and indefinable precisely because everything always transforms. In contrast, Western thought, enabled by the arbitrariness and persistence of phonetic writing, has created a radically atemporal conceptual space.

more of the following five categories: *perceptual modality explanation*, *persistence explanation*, *external storage explanation*, *arbitrariness explanation*, and *relational explanation*. Table 1 shows a comparison between oral and literate modes of communication using these five categories.

Table 1: A summary of the existing accounts of the differences between speaking and writing.

(NON-LITERATE) SPEAKING		PHONETIC WRITING	
PERCEPTUAL MODALITY EXPLANATION			
AUDITORY	*multisensory* *irreducibly dynamic and temporal* *comes from all directions* *can perceive interiority*	VISUAL	*graphic* *static and spatial* *focussed* *perceives surface*
PERSISTANCE EXPLANATION			
REAL-TIME	*dynamic and temporal* *practical*	PERSISTING	*static and atemporal* *allows verbal objectivity*
EXTERNAL STORAGE EXPLANATION			
EMBODIED	*internal cognition/memory* *knowledge is local*	EXTERNAL	*extends cognition/memory* *information can be indexed* *allows for large distributed systems of knowledge/laws*
ARBITRARINESS EXPLANATION			
CONCRETE	*necessarily represents the concrete world of experience*	ARBITRARY	*represents speaking arbitrary with regard to concrete experience*
RELATIONAL EXPLANATION			
OTHER PRESENT	*efficient turn-taking* *bidirectional* *connection* *community*	OTHER ABSENT	*slow rate of turn-taking* *unidirectional* *distance* *individuality*

My use of these five categories is an analytical manoeuvre aimed at organizing and clarifying the various existing explanations for the literacy hypothesis. It is important to keep in mind that these explanations are overlapping and closely related to one another. Most often, literacy theorists capitalize on one or two of these five explanations, but a complete understanding of the alphabetic effects requires an integration of all five accounts.

Further, one of the significant problems with some literacy theorists is that they occasionally attempt to account for the unique effects of phonetic literacy using explanations that are also applicable to other media. In fact, four of the five of the above explanations (the exception being the arbitrariness explanation) apply to all forms of writing, and to some extent to any visual, persisting symbolic medium (e.g., notches, tokens, tablets, pictures, paintings). Hence, these four explanations are necessary but not sufficient in explaining the specific effects of phonetic writing. I argue that it is the arbitrariness argument that is necessary to complete the explanation of the uniqueness of the alphabetic effect. The existing accounts of the literacy hypothesis have not been systematically clear on this point.

The following paragraphs present a brief summary of the existing explanations for the literacy hypothesis, attempting to clarify which explanation belongs to which medium. I order the explanations in the way that they built upon each other to form a complex explanatory framework for the phonetic literacy effects.

4.1.2.1 Perceptual Modality explanation

Numerous theorists (e.g., McLuhan, 1962, 1964, 1988; Olson, 1994; Ong, 1982; Vygotsky, 1934/1986) focus on the role of sensory modality – that is the shift from the dominance of auditory to the dominance of visual perception – in explaining the

alphabetic effects. For example, McLuhan (1962, 1964) proposes his *eye for ear* formula, arguing that the alphabet acts to intensify the operation of vision and to suppress other senses, especially hearing. He argues that, generally speaking, the ratio of sensory involvement that a medium elicits has implications for what information will be received and how it will affect cognition. Similarly, Ong (1982) argues that "writing tyrannically locks [words] into a visual field ... [so that] a literate person cannot fully recover a sense of what the word is to purely oral people" (p. 12), and that typographic cultures show a tendency "to reduce all sensation and indeed all human experience to visual analogues" (Ong, 1967, p. 76). Neurophysiological evidence does suggest that our senses do specialize in perceiving unique information that is not shared with other senses (Freeman, 1995). According to the *modality* thinkers, the use of writing has effected a generalized shift from the dominance of the ear in oral cultures to the dominance of the eye in literate cultures. Such a shift resulted in a dramatic change in the perception of the self and the world.

I suggest that there exist four closely related ways to distinguish sound from vision. First, sound is irreducibly *dynamic* and *temporal* in nature. It is perceivable only as it goes out of physical existence (McLuhan, 1962, 1964; Ong, 1964). In contrast, the eye is capable of perceiving static information. According to McLuhan (1962, 1964), Levin (1989), or Ong (1982), writing, a predominantly visual medium, creates emphasis on the spatial aspects of reality, whereas speaking, a predominantly auditory medium, creates emphasis on temporal aspects of reality. The same idea was already expressed by Nietzsche: "From the eye we can never reach a representation of time, and from the ear we can never reach a representation of space" (in Levin, 1989, p. 275).

Second, some phenomenologists have pointed out that *sound comes from all directions* and envelops the subject in the total context, whereas vision dissects and separates the subject from the context (Merleau-Ponty, 1962). Dewey (1927) claims that vision provides spectacles whereas hearing enables participation. The observant nature of vision allows detachment from full involvement and a more analytical experience of the environment and the self. Ong (1967) claims that the visual ideal is clarity and distinctness, or 'a taking apart,' whereas the auditory ideal is harmony, or 'a putting together.' Aristotle (350 B.C./1946) much earlier already had appreciated this analytical capacity of vision: "Above all we value sight ... because sight is the principal source of knowledge and reveals many differences between one object and another." Levin (1989) argues: "Metaphysics has been dominated by vision; our ontology is an optical projection. Listening, more sensitive to the passage of time ... may alone provide the channels for a different historical life" (p. 275).

Third, some theorists also point out that only sound can directly *perceive interiority* (Ong, 1967). Ong (1967) argues that the shift from the ear to the eye, brought by literacy, resulted in more attention paid to the world of surfaces, and weakened our capacity to perceive the inner world of objects and the self[57].

Fourth, sound perception creates perceptible *physical effects* in the body, whereas light perception is physically very subtle. In its physicality, sound is much more akin to

[57] Levin (1989) argues that listening "may alone provide the channels for a different historical life" (p. 275). From this perspective, the modern hermeneutic call to dialogue (Gadamer, 1992; 1960; Martin & Sugarman, 1999b; Levin, 1989) can be seen as a means to restore a 'deeper' understanding of one another and reality.

touch than is vision (McLuhan, 1962). The result of this is that purely visual perception creates a sense of detachment from the environment and the body[58].

I argue that these four perceptual modality explanations are very important for understanding alphabetic effects, but that the main shortcomings of all these accounts stem from 1) the tendency to assume an absolute distinction between vision and hearing, and 2) the tendency to focus on the perceptual modality per se rather than on how the senses are specifically utilized in speaking or writing. First, while it is true that auditory perception is irreducibly temporal and dynamic, visual information does not need to be static, and much of it is dynamic. Vision is quite fluent in perceiving dynamic, temporal information, and it is *specifically* the static nature of writing that does not make use of this capacity. In the same way, both auditory and visual fields can be said to envelop the perceiving subject. And even though it is true that the eye is much more dexterous than the ear in understanding the three-dimensionality of space, the ear also has some capacity to localize or focus spatially. Hence, I argue that it is not the absolute difference between the ear and the eye, but rather *how the eye is utilized in writing* that contributes to the alphabetic effects. With this qualification, I believe that all the above perceptual modality accounts are crucial for understanding the literacy effects.

4.1.2.2 Persistence explanation

In the context of writing, the persistence explanation is very closely related to the modality explanation. The reason I discuss persistence separately from the modality

[58] This dual nature of vision has been captured by various theorists. For example, although not explicitly relating it to the medium of writing, Levin (1989) proposes a notion of 'oculocentrism,' "a paradigm based on the dual nature of the Gaze, the one practical and aggressively active, the other theoretical and contemplative, panoramic, stationary, unmoved, dispassionate, disembodied, outside time and space" (p. 30). Note that Levin did not explicitly tie the latter to the external, persisting modes of representation.

explanation is that not all visual media are persistent. For example, gesturing occurs in real-time, whereas film is a combination of real-time and persistence (because it is recorded and can be replayed). Another reason to differentiate between these two explanations is that not all persistent symbols are visual. Braille for example is a persisting tactile symbolic mode.

Unlike speaking, which is a real-time mode, writing is a persisting technology. In speaking words come and go, and have to be re-uttered anew in each new interaction. In contrast, written symbols remain perceptually unchanged with the passage of time, which allows repetition of the same. Persistence thus allows literal repeatability. Among other things, this allows for the comparison of present and past utterances, and thus for the verification of verbal information across time (Goody & Watt, 1968). Goody (1977) focuses on readers' capacity to visually scan the written text as crucial to the understanding of the effects of writing. The sequential medium of speaking is limited in cross-temporal comparison, and hence speaking creates memory that does not allow for verbal objectivity.

In oral cultures the stories change as the context changes. Stories and truths are subservient to practical situational demands (e.g., Luria, 1976; Malinowski, 1923), and speaking is a mode of action rather than a vehicle to carry truth (Malinowski, 1923). The Hebrew term *dabar* signifies both *word* and *event* (Ong, 1982). The dynamic nature and fluidity of verbal representation is not a problem for an oral person. In contrast, the persistence of writing appears to give a potential to create static and atemporal conceptions of meaning or truth. "Deeply typographic folk forget to think of words as primary oral, as events [... ;] words tend rather to be assimilated to things, 'out there' on a flat surface" (Ong, 1982, pp. 32-33). As a result, literal meaning becomes important in

literate cultures, and truth or evidence is often considered to be a literal repetition of past utterances. The importance of citation in academia may be but one sign of the importance of the literal. According to Levin (1989),

> the temporality of sounds never lets us forget impermanence and never allows us a total grasp and possession, whereas the written or printed text always tempts us to see a total survey of words that are more permanently recorded and unchanging. Thus it would seem that writing would do more to encourage traditional ontology than speaking (Levin, 1989, p. 28).

I suggest that the persistence explanation for the effects of literacy is very important, but again only if appropriately qualified. One problem with the persistence thesis comes from its use as the sole explanation for the alphabetic effect (e.g., Goody & Watt, 1968). A related problem stems from a lack of recognition that the persistence explanation applies to all forms of visual persisting representation. Writing is far from being the first form of visual persisting representation, and some rudimentary notion of the importance of the repetition of symbols was likely born with the emergence of any persisting visual symbolic technology, such as notches, tokens, tablets, drawings, or paintings, as all these media perceptually persevere. The persistence explanation has to be applied broadly, in order to explain the fact that literal repeatability can already be found in oral cultures, in practices such as poetry, etc. Oral poets rely on rhythm and rhyme to remember the literal form of utterances. How symbolic persistence has changed our relationship to temporality is likely to have a complex history and would require a more detailed examination of the evolution of cognition with the emergence of various forms of

persisting representational technologies, a task that goes beyond the scope of the present thesis[59].

At the same time, I argue, it is important to note that in the world dominated by quite effective dynamic forms of symbolic communication, such as gesturing and speaking, the early persisting visual technologies likely had limited symbolic utility, and hence they were likely to result in less significant cognitive changes than was the introduction of writing. In fact, Ong (1982) points out that the only way to check for the correctness of oral repetition would be to use simultaneous recitation, a practice that was not developed in oral cultures (Ong, 1982). Hence the influence of the early persisting technologies was likely much less significant than that of writing. Writing introduces a more radical shift with respect to temporality, because unlike previous visual technologies it *codifies the narrative itself*. Speaking is a dominant symbolic mode in an oral culture, and its transcription into an atemporal, persisting form introduced a very significant change in the mode of symbolic exchange, which then enabled a corresponding change in cognition.

4.1.2.3 External Storage explanation

The external storage explanation is closely related to both the modality and persistence explanations. Note that for a symbol to persist temporarily, it must be external. Yet, not all external media utilize persisting symbols. For example, while television or radio are external, they are also dynamic media.

[59] For example, as I already suggested, an interesting hypothesis to test for a cultural anthropologist who works within a medium framework would be whether human awareness of temporality and death (as evident in the emergence of burial ceremonies) has been enabled by some forms of persistent symbolic representation (e.g., cave paintings). Static representation of image superimposed on the transitory nature of actual phenomena could logically allow for heightened temporal awareness.

Some literacy theorists focus on the fact that, unlike speaking, writing is an external medium, that is a communicative technology (Donald, 1991; Eskritt & Lee, in press a & in press b; McLuhan, 1962, 1988; Ong, 1982). Unlike speaking, writing requires the use of tools (e.g., pen and paper). In writing, the information presented does not need to be remembered, as it does in speaking, but can be stored on the page. In oral cultures the information has to be rehearsed in communicative practices in order to survive temporal decay. In contrast, the subject of writing does not need to remember or rehearse information, because the medium of writing provides unlimited storage space.

The written page thus creates an extension of our memory (e.g., McLuhan, 1962), which has the potential to enlarge the human cognitive repertoire by freeing up attentional resources. The external storage of writing itself also provides a space that can be utilized to create complex forms of understanding. Donald (1991) examines the evolution of cognition in the context of tool use and focuses on external media as a form of external working memory ("External Symbolic Storage"). He shows that by using external memory storage, individual minds become part of a larger distributed system, and that the use of external symbolic technologies frees the subject for more contemplative thought. Donald (1991) also demonstrates that new mnemonic strategies (*literacy skills*) emerged with writing. For example, the use of lists, which is very limited in oral cultures, enables new ways of systematic sorting, summarizing, and classifying of information. I suggest that one very useful skill in a literate culture is the capacity to *index* information, i.e., to remember where and how to find it.

It appears that a trade-off for relegating remembering to the external medium is that it may impede the depth of processing of knowledge on a personal level. In *The Republic* Plato (1937) already stated that literacy can create a certain laziness and

forgetfulness in readers. I suggest that the externalization of memory may create a subjective sense of disconnection from knowledge, a projection of knowledge outside of one's immediate experience, and a relegation of knowledge authority onto those who are most skilled in literacy. 'Cognitive laziness' is further reinforced in the current era of specialization by the great amount of existing specialist knowledge that far exceeds the grasp of any individual.

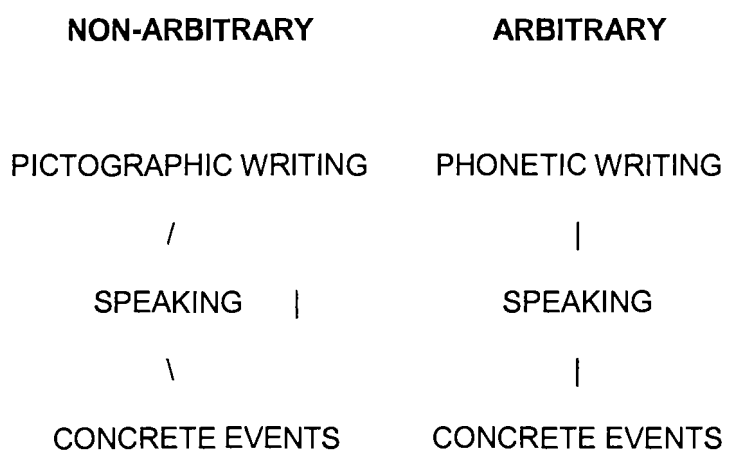
I argue that, overall, the external storage explanation is a solid one. The only problem with this thesis, again, is when it is used as a sole factor to account for the alphabetic effects. For example, Donald (1991) argues that the emergence of propositional logic can be explained by the external storage argument. I argue that the external storage explanation is a necessary enrichment of the overall literacy hypothesis, but that on its own it cannot account for the literacy effects.

4.1.2.4 Arbitrariness explanation

I argue that the *visual modality, persistence, and external storage* explanations apply to all writing systems. In fact, to some extent, these explanations apply to all visual persisting symbolic media. In contrast, the arbitrariness explanation (Havelock, 1963, 1982; McLuhan, 1962; Logan, 1986) is uniquely applicable to an explanation of the alphabetic effects, such as the capacity for decontextualized abstraction.

As discussed earlier, by definition, writing is a medium that codifies spoken utterances into graphic images. Written characters are visual signs that stand for spoken sounds. All writing systems codify

Figure 18: Arbitrariness of phonetic writing.

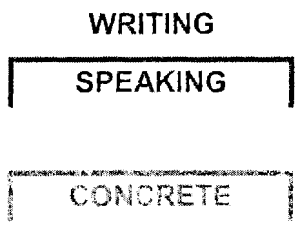


spoken utterances. However, as shown in the left side of the diagram in Figure 18, pictographic or ideographic written signs retain perceptual connection with the concrete world. Physically, these writing systems codify, in an abstracted manner, concrete perceptual objects and events at the same time that they codify spoken utterances. In fact, the codification of concrete images or events is in some ways primary in the early writing technologies. For example, Chinese characters signify the same events even when the spoken signification of those events differs, such as for the different Chinese dialects. Chinese speakers of different dialects can thus communicate through a shared writing system, even if they do not understand their spoken languages (Ong, 1982). There is no standard way of pronouncing Chinese characters. Hence I suggest that the primary symbolic link in Chinese writing is to the concrete images/actions; the link between the graphemes and spoken utterances is secondary.

In contrast, as shown in the right side of the diagram in Figure 18, phonetic characters unambiguously codify speech sounds and are completely arbitrary with regard to the concrete. A letter 'a' stands for the speech sound 'a' and not directly for any concrete event, creating an unprecedented division between the signifying system

and the concrete world (Havelock, 1963/1968; McLuhan, 1962, 1964; Logan, 1986). I have argued throughout this thesis that the emergence of this first perceptually arbitrary system of

Figure 19:
Decontextualized abstraction.



representation created a possibility for the emergence of meaning that is devoid of any direct ties to concrete reality (Havelock, 1963/1968; McLuhan, 1962, 1964; Logan, 1986). As highlighted in Figure 19, the phonetic codification of speech in writing enabled conceptual forms in which both the signifying system and the signified were words, and thus a creation of a new cognitive plane that was devoid of concrete context. My review of research suggests that the consequences of this point and its implications for cognitive development have so far been largely unexplored by psychologists, linguists, and philosophers of language. I argue that the arbitrariness explanation lies at the heart of the phonetic literacy hypothesis.

4.1.2.5 Relational explanation

Symbolic communication is irreducibly interpersonal. New members of a culture have to learn how to use symbolic modes from others, and the very sustenance of symbolic knowledge relies on individuals who use the symbolic media. The relational

explanation (Ong, 1982; Vygotsky, 1934/1986) is concerned with how the medium is used in interpersonal communication. Writing is an external medium that allows for communication in the absence of the other (Ong, 1982; Vygotsky, 1934/1986). All non-technological modes of communication (e.g., speaking, gesturing, touching) and some technological modes (e.g., telephone, chat-lines) require the real-time presence of the other. In contrast, writing and reading are solitary activities.

I suggest that the absence of others limits the *richness of communicative exchange.* In real-time exchanges, communicators have a wide gamut of information available to them (vocal, visual/gestural, and in more intimate encounters, tactile, olfactory, or gustatory). In contrast, in writing all information is presented in a visual graphic form (Olson, 1994). Furthermore, communicating is a turn-taking event (Turnbull & Carpendale, 1999) during which some meaning is expressed and negotiated. I argue that while the natural modes of communication, as well as some technological modes (e.g., telephone), provide a possibility for a fast rate of reception/expression turn taking, writing is typically slow in this respect.

I postulate that the absence of the other, the sensory impoverishment of information, and the slowing of the rate of turn taking have implications for both the *efficiency* with which meaning gets negotiated and the degree of interpersonal *connectedness.* Reaching a shared understanding is typically done more efficiently with greater frequency of exchange. Reaching agreement is also a way of connecting with the other (finding oneself in the other and the other in oneself), and this too is typically facilitated by greater frequency of exchange and the involvement of multiple sensory channels. I suggest that it is through these mechanisms that the absence of the other and the slow

rate of communicative exchange in writing foster the emergence of more individualistic forms of cognition.

I argue that another relational feature has to do with the *ratio of expression to reception*. All natural media and many technological media (e.g., email, telephone) have a potential for balanced reciprocal communication. The degree of reciprocity will be determined by the nature of the relationship between the communicators as well as the purpose for which the medium is used. For example, some technological media (e.g., television, radio, internet), as well as some natural communicative customs (e.g., a mass or a speech), do not provide any opportunity for bi-directional exchange. They create a one-way flow of information. The degree of reciprocity in writing also depends on the specific use of writing. For example, letter writing is a reciprocal form, whereas books or newspapers create a more unidirectional flow of information[60]. I suggest that the ratio of expression to reception will have implications for the *power dynamics*[61] in relationships, both on a personal and broader societal level. Specific uses of literacy greatly affect the distribution of knowledge in literate cultures, and thus have great impact on power relations. In fact, assuming that the expressed signals are being received, I suggest that the balance of power in relationships could be measured as a ratio of expression to reception in communication.

It needs to be noted that the relational explanation is most relevant to the consideration of issues such as individualism, agency, or selfhood, and is thus somewhat marginal for the present thesis. The relational explanation will be much more useful in further contextualization of literacy, that is in the connecting of the current

[60] Some forms of critique and negotiation of meaning do occur within the elite communities responsible for the production of such materials, but the common recipient generally has no input regarding the content of these texts.

cognitive framework with broader social, political, and phenomenological considerations. This I believe is best done after theorists agree on the cognitive implications of the use of literacy.

4.2 The literacy hypothesis reconsidered

When considering the refinement of the literacy hypothesis, one first needs to be clear that the literacy effects will differ for different *kinds* of literacy and different *usages* of literacy (Graff, 1987). Different scripts will have a potential to enable different script-specific effects that depend on the kind of cognitive engagement that is fostered by the physical characteristics of the script. How the script is used, how much it is used in relationship to other modes of communication, what purposes it is used for, will all have an effect on the cognitive forms that literacy will foster. Individual predispositions are also likely to play a role in the cognitive shifts that occur with the use of writing. In short, I suggest that the medium never straightforwardly *causes* any cognitive effects. It is the nature of the active engagement of the subject who uses the medium that will bring to life the cognitive potential implicit in the medium.

However, at the same time that there are great cross-cultural, regional, and individual differences in the forms of literacy and in how literacy is used, there is also a significant degree of invariance in these respects. Hence it is a reasonable task to search out those cognitive effects that the medium literacy fosters. Historical and developmental evidence very strongly suggests that certain forms of cognition *do not* exist in subjects who do not use literacy. Hence, unless shown otherwise, I assume that

[61] *Power* can be defined here as a capacity to influence the other.

literacy is *necessary* in bringing about those changes. In other words, I consider literacy as an *enabling* role for the literacy-specific cognitive changes.

As should be evident from my discussion so far, there is a spectrum of cognitive effects that are attributable to literacy, and one could further the exploration of the literacy argument in many different directions, physiologically, psychologically, or culturally. However, the purpose of the present thesis is to apply the literacy hypothesis to *child cognitive* development, and I believe that the most parsimonious way to focus the literacy thesis in the developmental context is to consider two principle unique achievements related to literacy: *metalinguistic awareness* and *decontextualized abstraction*[62].

Metalinguistic awareness is a capacity to be reflectively aware of language, and I have argued that it is enabled by the fact that writing codifies speaking, hence providing a medium that translates spoken words into a graphic form. Performing the very act of translation (i.e., the action of reading and writing) itself requires that words be brought to conscious awareness. With literacy, language is no longer only used unreflectively as a signifying system, as is the case in pre-literate speaking, but the narrative itself is turned into an object of signification. As I discussed earlier, such a metalinguistic thesis, in various forms, has been well developed and supported (Harris, 1989; Havelock, 1963, 1976; Olson, 1994; Ong, 1982; Vygotsky, 1934/1986).

[62] The selection of these two aspects has to do with finding those aspects of literacy that are still relevant in today's world. Phenomena such as dualistic thought, while historically enabled by literacy, do not necessary have to be enabled by literacy in today's context, because of the proliferation of electronic, image based media (McLuhan, 1964) that do not foster dualistic separation. From my observation, younger generations today naturally think in ways that are non-dualistic, and one would expect that such a propensity must have to do with the dominance of the new media, that overrides the dualistic split that phonetic literacy fosters. Empirical exploration of these issues would make for a very interesting study. One could approach these questions from a cross-cultural or individual view-point, using the relative use of literacy versus new media as independent variables, and the degree of dualistic belief as a dependent variable.

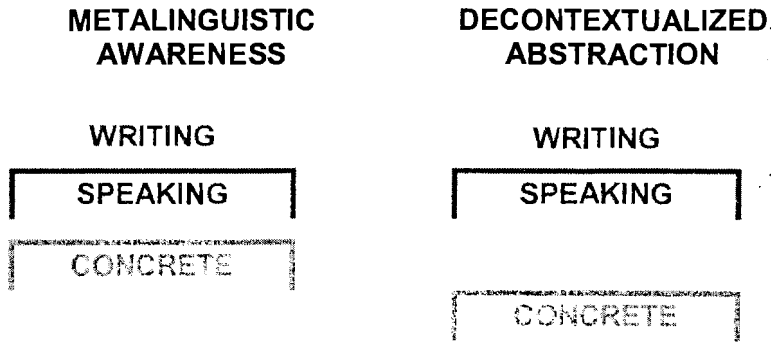
I suggest that there are two points on which proponents of metalinguistic thesis are not clear. First, the capacity for metalinguistic awareness is implicit in all writing systems, as all writing systems codify speech[63]. Second, both developmental (e.g., Vygotsky, 1934/1986) and historical (e.g., Havelock, 1963) evidence suggests that metalinguistic awareness emerges in the *early stages* of learning to read and write (in contrast to the later achievement of decontextualized thought). Perhaps the reason for this early achievement of metalinguistic awareness is that learning to read and write, from its inception, requires explicit and extensive metalinguistic effort.

The emergence of decontextualized abstract forms of thought has also been attributed to literacy (McLuhan, 1964; Logan, 1986; Luria, 1976/1978; Vygotsky, 1934/1986), even though it is an area that is less developed than metalinguistic awareness. One reason for this might be that there exist a temporal delay between learning to read and write and the achievement of decontextualized abstraction. It takes some time for a literate subject or culture to develop a capacity to think outside the concrete context (Logan, 1986). In the case of children, the achievement of decontextualized thought can be equated with the achievement of formal operational thought, which occurs around the age of 11-12, five or so years after children begin to read and write. In the case of the cultural evolution of thought, it took the Greeks about 300 years after the introduction of phonetic writing to develop decontextualized forms of thought. This delay (the gap in timing between the emergence of metalinguistic awareness and decontextualized thought) has not been explicitly explored by the literacy theorists. I argue that providing the developmental mechanisms for this delay is key for the 'health' of the literacy hypothesis.

[63] Whether phonetic writing, because of its *phonetic* focus, fosters metalinguistic awareness more than other

At this point, I believe that the most plausible explanation for the delay in the emergence of decontextualized abstraction is that the thinking of an oral subject is intimately tied to concrete experiential reality. It is reasonable to hypothesize that it requires a degree of linguistic programming to develop a cognitive level that allows for cognitive operations that are distant from concrete reality. Semiotically

Figure 20: Decontextualized abstraction as requiring a context independent verbal signification.



speaking, as represented in the right side of the diagram in Figure 20, such a decontextualized plane is enabled by purely verbal symbolic operations, that is operations on words without reference to concrete reality. Metalinguistic awareness is also an operation on words; however, as shown in the left side of the diagram in Figure 20, it does not require a distancing from concrete reality. In other words, metalinguistic awareness can be achieved with concrete words, not necessary abstract words.

As described by Vygotsky (1934/1986) in the context of the emergence of spontaneous and scientific concepts, the lifting of the verbal symbolic operation away from the level of the concrete, portrayed in the right side of Figure 20, takes time. In other words, writing and speaking can form a semiotic relationship that enables metalinguistic awareness early on in the process of learning to read and write, and such

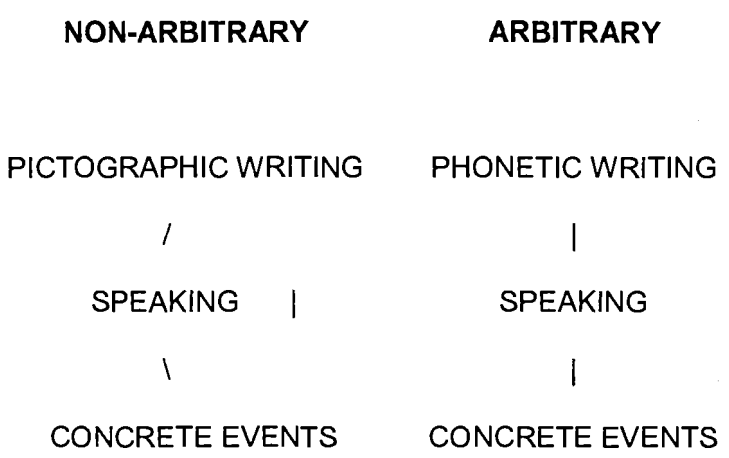
writing systems remains an unexplored territory at this point.

verbal symbolic space can (but does not have to) eventually become an independent cognitive level in which theoretical abstractions are created, communicated, and manipulated. However, I argue that before the conceptual level acquires an independent life, it needs to detach itself from the level of the concrete, a task that takes time because of the already strongly developed oral habits of concrete representation.

As I discussed in Chapter 2, Vygotsky's (1934/1986) description of the gradual process of development of decontextualized verbal thought in school children showed that initially children rely on the memorization of definitions. The semiotic pairing of abstract concepts and their corresponding verbal definitions can be seen as an initiation into a new cognitive plane of decontextualized thought. Initially, that plane is a somewhat artificial and unnatural form for the child, and it takes some practice before the child can operate on this level independently, thus acquiring the capacity for decontextualized abstract signification.

As already discussed, the potential for decontextualized abstraction might be

Figure 21: Arbitrariness of phonetic writing.



inherent in all writing systems. However, phonetic writing has proven to be the agent of the distantiation from the concrete because, unlike other writing systems, phonetic

characters bear no perceptual ties with concrete objects and events. The ABCs codify only spoken sounds, and are completely arbitrary with regard to concrete reality; this is again portrayed in the right side of Figure 21. In contrast, as shown in the left side of Figure 21, the characters in non-phonetic writing systems perceptually retain their affinity with the concrete phenomena. This *arbitrariness* explanation is crucial for the understanding of the emergence of decontextualized abstraction.

In summary, I suggest that metalinguistic awareness would be a cognitive capacity enabled by any writing system, whereas decontextualized abstract thought, while possible with all writing systems, is significantly fostered by phonetic writing[64]. Further, metalinguistic awareness emerges early on during the early stages of learning to read and write, whereas decontextualized thought is a markedly later achievement.

I suggest that other explanations for literacy effects (*perceptual modality, persistence, and external storage explanations*), that apply to all writing systems, are also important in the understanding of metalinguistic awareness and decontextualized abstraction. In addition to the separation from concrete reality, theoretical concepts may transcend the temporality of the ever-changing natural world. Theoretical axioms are immutable. The nature of the theoretical search is a search for atemporal truths. Hence, I believe that to understand the rise of decontextualized abstraction one also needs to consider the radical difference between the dynamic, auditory world of speaking, and the static, persisting, visual world of writing. It is not only that writing codifies speaking, but also that it codifies it in a dramatically different way (as a visual, persisting, external

[64] This is certainly true historically. Differences in the contemporary globalized world in this respect would require more cross-cultural analysis of education and psychological development. One could speculate, for instance, that the educational systems in cultures with non-phonetic writing might create compensatory mechanisms to foster decontextualized forms of thought (e.g., extra emphasis on mathematics).

system of signs) that enables the kind of conceptual space that enabled decontextualized thought. Hence, the separate explanations for the literacy hypothesis need to be considered as one explanatory *complex* in understanding the origins of literacy specific cognitive forms[65].

4.3 Theoretical foundations for the literacy hypothesis

I believe that one of the major problems with the contemporary rather marginalized state of the literacy hypothesis is that various literacy accounts are lacking broader theoretical grounding, especially grounding in cognitive sciences and biology. Most literacy theorists operate within a socio-cultural psychological theoretical framework and are much less concerned with grounding their psychology in biological or natural sciences (e.g., Havelock, 1963; Logan, 1986; Ong, 1982). Even though Vygotsky (1934/1986), Luria (1976/1978), McLuhan (1962, 1964), and Olson (1994) did attempt to provide a more or less tenuous link with biology, none of these theorists linked the literacy hypothesis with a broader communication framework compatible with yet more encompassing systems theory, the direction that I believe necessary for the advancement of the psychological aspects of the literacy hypothesis and the medium framework in general. In the following paragraphs, I attempt to sketch broad outlines of a theoretical framework that would be capable of accommodating medium theorizing and the literacy hypothesis. This section also constitutes a theoretical preparation to apply the insights gained from literacy research to child development.

Because one of the goals of the literacy hypothesis is to explain the historicity of dualistic thought, the theory of literacy itself has to be non-dualistic. Hence it is important

[65] Note that the *relational explanation* is more applicable to issues such as individualism, authority, power,

that such a framework provides a bridge between natural/biological and social/cultural sciences. To achieve this goal, the medium framework I am proposing is grounded in an *emergentist* ontological framework that recognizes different levels of reality as emergently nested within each other. Such framework was proposed by Martin (2003; also Martin & Sugarman, 1999b), who elaborated "a *levels of reality* ontology that captures relationships among its constitutive levels" (Martin, 2005), such as biophysical, sociocultural, or personal levels.

This section is particularly important to prevent misinterpretations regarding the broad theoretical commitments that motivate my thesis. Not unlike some other literacy theorists, my use of semiotic language and individualistic-looking structural diagrams so far, motivated by reasons of simplicity and communicative efficiency, might have painted a misleading picture with regard to the broader theoretical commitments to which I subscribe. In this section I will elaborate a model that more adequately reflects the complexity of communication, clearly asserting that all communication is *irreducibly interpersonal* and *temporal*, and that the psychological is always a result of the subject's *active construction* of her ongoing interactions with the environment. Note that I proceed from the general to the specific in building up the outlines of a medium framework.

4.3.1 General systems theory

The central problem that a medium theory has to address is the issue of the *emergence* of new cognitive forms. A promising contemporary framework capable of addressing the issue of emergence is developmental systems theory (e.g., Gottlieb,

etc., issues that I do not develop in the present thesis.

1991, 1997), an offshoot of general systems theory (Ludwig von Bertalanffy, 1968)[66]. After the failure of logical positivism, systems theory emerged as one of the most serious contenders to deliver a general theory capable of unifying scientific investigation on all levels (Ludwig von Bertalanffy, 1968).

In a general sense, systems theory understands all phenomena to be organized as a complex hierarchy of interacting systems. Smaller systems are nested within larger systems from the smallest level to the universe as we know it. The interaction among the levels as well as within each level is always bi-directional, and has a nature of mutual dependency and influence. Importantly, an event is located not in any isolated unit but in the relationship between the interacting elements (Gottlieb, 1991, 1997). While different levels of investigation necessarily require different methodologies and even ontologies[67], there exist some abstract principles of organization and communication that can be described by concepts and principles that are independent of any specific domain.

Unlike the more traditional analytical method that assumes the stability of behaviour over time, the systemic approach is irreducibly dynamic and temporal, and thus at heart concerned with the very fact of change and emergence. Systems are conceived not as stable entities but as fields of activity. While persisting by virtue of conservative self-organization, systems are always open in their active, ongoing relationship with their environments. Systems are both dependent on their environments and shaped by them (Gottlieb, 1991, 1997).

[66] It is remarkable how many theorists I discuss in this thesis are either Canadian or have close ties with Canada. Bertalanffy is no exception. He was born in Austria but emigrated to Canada in 1949, and taught at a number of Canadian Universities.

[67] For example, quantum physics or superstring theory paints the world that defies our common conception of reality. Armed only with a limited human perceptual endowments, we cannot concretely grasp these unfamiliar levels of reality other than through conceptual means, such as mathematical equations.

Further, the behaviour of complex systems cannot be reduced to the linear interaction among their parts, as is done within the analytic method. The systems approach studies the behaviour of the whole system in its context, and employs non-linear modelling to predict discontinuities in behaviour or the conditions for the emergence of new forms within the system. Such a holistic approach, while loosing some of the certainty promised (but not always delivered) by positivist analytical methods, has proven much more powerful than linear part-to-whole modelling in predicting the behaviour of complex systems (Gottlieb, 1991, 1997).

4.3.2 Systems theory and human development

I argue that much of 20th century developmental psychology has been influenced by positivist methodology. The general trend towards specialization privileges the analysis of the parts at the relative expanse of understanding the whole human being as a complex biological and psychological system living in a complex physical and socio-cultural environment. Especially neglected in psychology has been the impact of cultural and symbolic practices on cognitive development (Martin, 2003). Fortunately, this trend has been gradually changing as the systems framework has recently been gaining popularity in the study of human development.

Some of the most exciting recent systemic insights are concerned with changing views of the nature of interaction between the organism and the environment in the process of growth. Traditionally the question of nature versus nature has been posed in a dualistic either-or manner. However, recent discoveries in the field of evolution, genetics, and neurobiology clearly show that the split between nature and nature, while possibly meaningful as a statistical abstraction, greatly distorts the picture of the

processes involved in development (Deacon, 1997; Gottlieb, 1991, 1997; Oyama, 2000). Gottlieb (1991; also see Oyama, 2000) explains that human development proceeds through bi-directional interaction within and among multiple levels of influences. Genes, cells, organs, organ systems, organism, and environment all interact (or 'coact') to create an expression (Gottlieb, 1991).

The modern systems approach especially stresses the importance of neglected top-down influences on ontogenesis. For example, genes do not develop into anything without input from the environment (Oyama, 2000). Genetic expression tends to be conservative only because the environmental parameters we live in are stable and predictable. Were the environment to change drastically, the phenotypic expression would also change (Oyama, 2000)[68]. Moreover, when subjected to a significant environmental stress (deviation from the norm), the gene pool itself might mutate permanently *during the life of an individual* (Gottlieb, 1991). Interestingly, in these ways, modern evolutionary theory has had to revisit some of Lamark's original insights that were once considered completely outdated.

In an analogous way, the great evolutionary achievement of very complex systems, such as humans, is not so much an accumulation of cognitive tools (as is held by the traditional views of evolution and neurobiology), as the development of greater adaptive flexibility (Deacon, 1997). The human child is more dependent on other humans for survival than any other living form, and the long period of social dependency allows for the transfer of knowledge that has accumulated in rapidly evolving human cultural practices (Edelman, 1987). Genetic mutation is very slow, and individual adaptation to today's complex social and technological environments has to rely almost entirely on the

cultural transmission of knowledge. Hence, modern cognition, while clearly enabled by our biological constitution, is a product of the cultural practices an individual actively engages in.

4.3.3 Systems theory and constructivism

It is a theoretically exciting time when the language of biologists can sound compatible with the language of philosophers of social science. An example of such synchronicity can be found in the similarities between systems theory and constructivism. Constructivists view cognition not as pre-given, the way some positivist, essentialist thinkers might, but rather as unfolding within the interactivity of individuals and environments. Social constructivists further stress the importance of social, symbolic practices in cognitive development[69].

In the systems approach to neurobiology, constructivism has been explicitly elaborated by Maturana and Varela (1992), but other systemic thinkers adopt a relational approach to self-organization, as dependent on the ongoing active processing of environmental contingencies, that can be considered compatible with constructivist assumptions (e.g., Freeman, 1995; Oyama, 2000; Piaget, 1936/1953, 1937/1955).

[68] For instance, a change in gravitational force would have significant impact on the physical parameters of the organism.

[69] Constructivism is not a unified theoretical approach. As explicated by Martin & Sugarman (1999), the term 'constructivism' has been used by various thinkers that range in their degree of emphasis on the role of subjective activity in constructing knowledge and the role of cultural context in constructing individual subjects. The extreme of the latter approach (e.g., Gergen, 1994) has been relabelled as 'constructionism', and criticised for not being adequately inclusive of the subjective activity in the construction of knowledge, whereas the extreme of the former approaches have been criticised for being overly individualistic (Carpendale, 1997; Carpendale & Müller, 2004; Martin, 2003). Thinkers such as Chapman (1988a), Martin (2003), or Carpendale and Müller (2004) conceive of constructivism in an inclusive way, emphasizing the role of ongoing dynamic activity of the individual, grounded in biological constitution, within a broader cultural context. Such an approach might be referred to as a 'social interactional constructivist approach' (Martin, 2005).

Constructivism and the systems approach share the assumption that internal organizations are the result of the experiential histories of action and communication.

In social sciences, Martin (2003) emphasizes the active role of the subject and postulates that the person is shaped by the history of the relationship between the organism and the environment. While not directly referring to systems theory, Martin (2003) proposes a hermeneutically inspired, constructivist ontological framework of personhood that adopts many of the principles of systemic thought discussed above. The principles of emergence or non-reductionism, historicity, interactionism or bi-directionality, and hierarchical nestedness are all present in both systemic thought and Martin's ontology.

Like systemic thinkers, Martin (2003; Martin & Sugarman, 1999) adopts a temporal, relational framework in which an event is an interaction and not a static entity. He also proposes a multilevel view of personhood that closely resembles the systemic hierarchy of Gottlieb (1991) discussed above. Martin's (2003) personhood consists of "a psychological/personal level of reality nested at the intersection of dynamically interacting biological and sociocultural levels of reality within the physical and chemical world" (Martin, 2003, p. 96).

Martin (2003) further calls for a non-reductionist framework that does not purport to fully explain the emergent forms by the conditions of their origin (or the nature of the whole by the analysis of its parts). Claiming that persons are 'underdetermined' by biology and culture, Martin, Sugarman, and Thomson (2003) also emphasize human agency and activity in shaping the environment and biology in which humans are immersed. Martin's ontology complements well the systems theory, providing an all-encompassing philosophical framework that can be applied to the study of different

aspects of human development. I suggest that the stress on emergence makes Martin's framework especially useful for addressing the question of the origins of new forms of cognition, and his emphasis on the primacy of the social provides an appropriate grounding for the consideration of the specific material conditions that contribute to the birth of new psychological forms.

4.3.4 Constructivism, systems theory, and cognitive development

The first developmental psychologist who can be considered both a constructivist and systemic thinker was Jean Piaget. Piaget (Inhelder & Piaget, 1958; Piaget, 1953, 1955, 1972; Piaget & Inhelder, 1964, 1969) studied the laws of cognitive growth and the stages through which a child passes while actively constructing her cognitive model of the world. In line with systemic principles, Piaget emphasized the active character of knowledge construction, and claimed that the internalization of thought results from the transformation of the field of activity. The inner for Piaget is itself an ongoing emergent process greatly contingent on the transformation of past actions. The environment and culture do not influence the individual in a way other than through ongoing, individual construction of experience. Piaget transcends the dichotomy between the intra-individual versus inter-personal origin of thought by introducing the centrality of individual activity in the context. When discussing the role of the environment versus maturation on cognitive growth, Inhelder and Piaget (1958) argue that "between the nervous system and society there is individual activity – i.e., the sum of experience of an individual in learning to adapt to both physical and social worlds" (p. 338). In Carpendale and Müller's (2004) words, "cultural tools only contain information, and this information does not constitute knowledge or meaning. Knowledge or meaning result from the individual's constructive

activity" (p. 11). The course of such construction "follows the developmental logic that leads through the differentiation and integration of knowledge structures from less complex to more complex forms of knowledge" (Carpendale & Müller, 2004, p. 11).

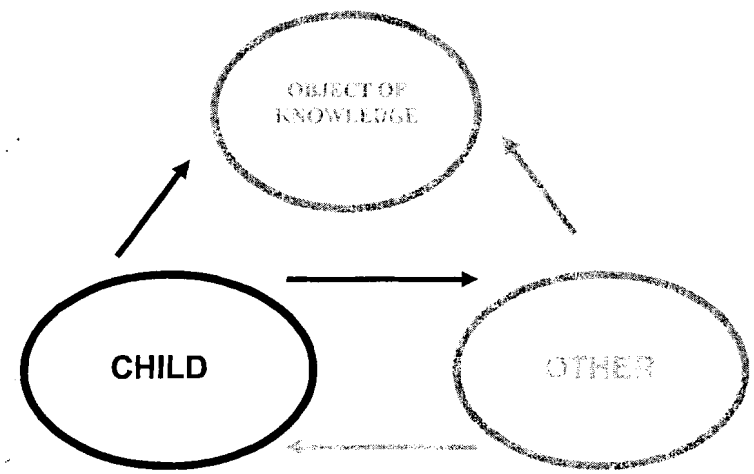
Reconciling these claims with the systemic emergentist framework, one can say that within the range that is enabled and constrained by genetic constitution, the state of the organism at any point in development depends on the ongoing cognitive transformations of external interactions as well as on the self-organizing internal cognitive activity. Such a dynamic framework conceives any present activity (including perception and anticipation) as essentially contingent on the history of activity, but also as being open, thus having constant potential for new learning. In line with systemic principles, Piaget (1970/1973) further adhered to a relational position, viewing "systems of interactions and transformations as the primary reality and hence subordinating the elements from the outset to the relationships surrounding them" (p. 22). Piaget's recognition of both human agency and environmental contingency is evident when he says that "man can transform himself by transforming the world and can structure himself by constructing structures" (p. 118). Piaget thus is a key thinker in stressing the active, dynamic nature of psychological construction.

Piaget clearly appreciated the importance of social influences on child development, and his earlier work was concerned with symbolic communication and social influences (Piaget, 1962, 1977/1995). However, Piaget failed to integrate his earlier relational work with his cognitive theory of operative action (Chapman, 1991)[70]. In contrast, Vygotsky (1978, 1986) continued to remain deeply concerned with the effects of symbolic

[70] Amin & Valsiner (2004) argue that one of the reasons Piaget's social dimension of development is frequently overlooked is because Piaget was predominantly concerned with formal aspects of social interaction, and that, unlike Vygotsky, he was less concerned with the specific contextual differences.

practices on child cognitive development. He especially viewed the emergence of higher forms of cognition as contingent on social symbolic practices. Chapman (1988a, 1991, 1999) integrated the work of Piaget and Vygotsky within a constructivist, pragmatic framework. As show in Figure 22, Chapman (1991) proposed a triadic model for cognitive development that integrated individual action with symbolic communication. His model includes the active subject, the other, and the object of

Figure 22: Triadic model of operative interaction.



knowledge, and stresses the role of joint attention in the development of symbolic action. Chapman (1991) thus stressed both the active role of the child in the creation of knowledge, starting from the earliest sensorimotor period, and recognized the central role of the other (and the symbolic mediation of action) for cognitive development.

Marrying Vygotsky's symbolic communication with Piaget's dynamic activity turns out to be very fruitful in the understanding of the development of higher forms of cognition. Assimilation, according to Piaget (1937/1955), is the child's application of the already developed action or cognitive scheme to the objects in the world. It is essentially repetition of the already known. Accommodation, on the other hand, is learning

something new, as the child makes an adaptive shift to accommodate the uniqueness of a new situation. These two dialectical movements form the view of symbolic knowledge as passed on to the child through her involvement in cultural practices and artifacts. This knowledge is not transmitted passively, but involves ongoing active involvement on the part of the child[71]. However, the question that one needs to ask is why would the child at times merely repeat the same action, whereas at other times transform it into a different action. From Piaget's point of view, accommodation happens because children are goal-directed, and they actively engage in a trial-and-error process to search for ways to best accomplish their aims. This answer is satisfactory when it comes to a child's solitary action on physical objects, but it de-emphasizes the role of the other. It is clear that other people can make the process of learning much more efficient. The child does not need to learn everything by experimenting with objects and words, but instead, through her engagement in symbolic exchange with others, can take advantage of the fact that adults already know better how to deal with things. The child's motivation to master her physical surroundings, emphasized by Piaget, may thus itself provide extra impetus to engage in interpersonal communication (which is not to suggest that the mastery of the physical environment is more important then the mastery of the interpersonal world). Moreover, much of what the child has to learn is inherently stored in cultural practices and artifacts and thus has to be learned from others.

Chapman's (1991, 1999) triadic model of cognitive development can thus be applied equally to the elaboration of action on physical objects as well as to the development of

[71] Lawrence and Valsiner (1993) distinguish between two views of internalization, criticizing the simplistic 'transmission' approaches to cognitive development (a view that asserts a passive transmission of knowledge from adults), and asserting 'transformation' approaches that emphasize the child's active role in the reception of knowledge. Lawrence and Valsiner (1993) claim that the former perspective is typical of the 'socialization' approaches' whereas the latter lies at the heart of constructivism.

symbolic activity. According to Chapman (1999), "children construct a new conception of reality by coordinating their object-oriented operative interactions with those of other people, by means of their communicative interactions with the individuals in question" (p. 34). Hence, it is not only others but also pre-symbolic action that play crucial roles in the emergence of symbolic understanding. This triadic framework has recently been elaborated and applied in the study of the child's social, cognitive, and moral development (Carpendale & Müller, 2004; Carpendale & Lewis, 2004).

The constructivist/systemic framework I adopt in this thesis goes beyond the either-or logic of the traditional and outdated person versus environment or nature versus nature debates (Carpendale & Müller, 2004; Overton, 1994), as it postulates that individual cognition is a result of activity embedded in the physical and socio-cultural world, stressing the importance of adaptation on the development of cognitive forms. From this perspective, contextual contingencies and the types of activities one engages in play a crucial role in cognitive development. Chapman (1991) proposes that the directionality of cognitive development is significantly influenced by socio-cultural context.

Constructivist thinkers (e.g., Bickhard, 1999; Carpendale & Lewis, 2004; Chapman, 1988b, 1991; Martin, 2003) further argue against the traditional correspondence view of knowledge, or the inadequacy of a purely representational approach to knowledge verification. The traditional analytical approach to the verification of knowledge stresses the correspondence between the subject matter and its representation as a criterion for truth. However, because all knowledge is a result of ongoing active cognitive transformation, the question of comparison between reality and the cognitive model the subject has constructed becomes meaningless within the constructivist framework

(Carpendale & Lewis, 2003; Martin, 2003). In order to avoid relativism, constructivist thinkers have to rely on other criteria for evaluating knowledge. On the personal level, the principle of coherence emphasizes the fit of the pattern into the subject's overall understanding. On the interpersonal level, the principle of consensus seeks agreement among different actors (Chapman, 1999)[72]. Most importantly, both the achievement of coherent internal cognitive organization or the interpersonal consensus occurs in ongoing socially mediated symbolic activity, activity that also needs to function within the constraints and requirements imposed by biophysical bodies and the world (Martin, 2003).

4.3.5 Symbolic communication

I have used the language of semiotics throughout my thesis because the discipline of semiotics (the study of signs) has been devoted to the understanding of symbolic communication. I argue that it is important to consider how several insights from semiotics might fit within, and enrich, the triadic model described above. It is especially important to incorporate semiotics within the triadic model in order to account for how literacy creates its cognitive effects such as the capacity for decontextualized thought.

The key development in the study of semiotics has been the realization of the inseparably dual nature of symbols. This distinction, depicted in Figure 23, was first coined as the distinction

[72] Kitchener (2004) provides an interesting explication in which he locates the objectivity and validity of knowledge in social interaction itself. Claiming that "[t]he social is the rational: Objectivity is social," Kitchener (2004, p. 62) guards against relativistic approaches to social construction of knowledge.

Figure 23: Semiotic model of symbols.

SIGNIFYING SYSTEM

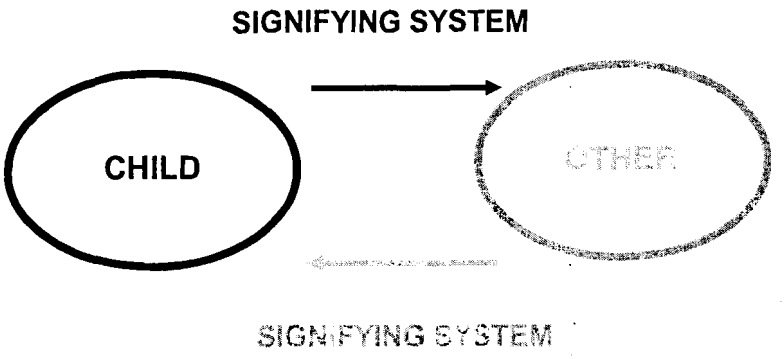
SIGNIFIED

between the signifier and the signified (Korzybski, 1959/1920; Saussure, 1959/1916), and later took other forms such as signifying system and meaning, or signs and intentions. This split follows a realization that more often than not there is nothing about the symbols that inherently provides a link to what they represent, yet there is no symbolic activity without the difference between the symbols and what they signify being present. The difference between signs and meanings thus forms the very condition of symbolic communication. A popular metaphor used to denote the arbitrariness of the sign/meaning link is that of a map and territory: The map is not a territory but the means to represent it. This realization was an important step away from the positivist tendency to conflate the representational system with meaning[73].

While initially the study of semiotics had a somewhat individualistic flavour (Korzybski, 1959/1920; Saussure, 1959/1916), other developments firmly placed symbolic communication

[73] Analogously, the early aim of the discipline of hermeneutics, that is the study of interpretation, was to find the right way to interpret the Holy Script, whereas modern hermeneutics is concerned with the phenomenon of interpretation itself.

Figure 24: Dyadic model of communciation.

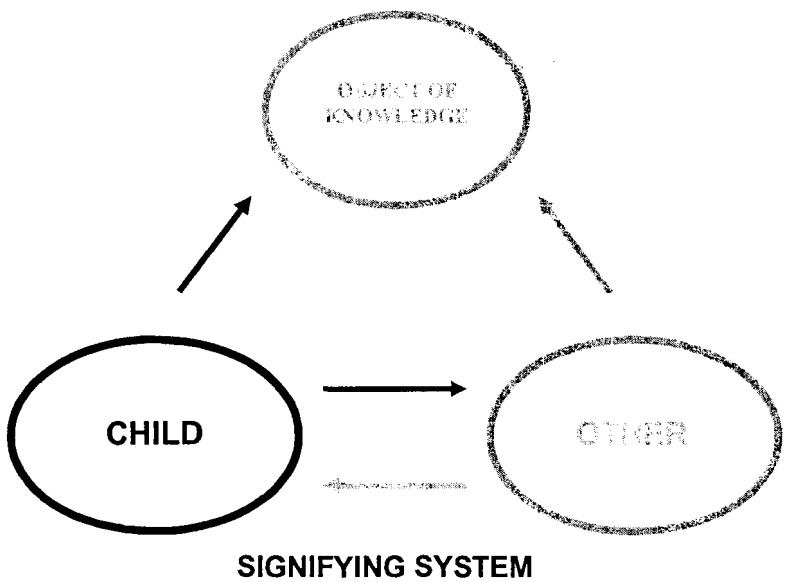


within the interpersonal context (e.g., Bateson, 1968; Lotman, 1977). Figure 24 shows my view of how the individualistic semiotic framework (depicted in Figure 24) can be incorporated into an interpersonal communicative framework. Viewing symbolic communication in this way, stresses the fact that the original space for symbolic communication is interpersonal interaction, and that the same structure of communication is later internalized to serve as a cognitive plane of thought. Such an interpersonal model of communication thus adds a *dynamic* and *interpersonal* component to the static and individualistic-looking semiotic diagram (such as in Figure 23), while at the same time retaining the most crucial insight coming from the study of semiotics: the symbolic system does not correspond to what it represents in any straightforward way, and thus the rules of translation from the signified to the signifier and vice-versa cannot be easily specified. From the point of view of the *dyadic* semiotic diagram (Figure 24), a communicative event is thus considered as residing in the *activity of translation* from some implicit intention to the explicit sign during an act of expression, and from the explicit symbols to the imagined intention of the other in the act of reception

(Lotman, 1977). This dyadic model thus is useful in correcting the inappropriately simplistic, individualistic, and static conceptions of symbolic communication implied by early semiotics theories (e.g., Korzybski, 1959/1920; Saussure, 1959/1916).

At the same time, while the dyadic model is a very useful elaboration of the individualistic view of symbols, it does not account adequately for how symbolic knowledge is acquired in development. The question can be posed in the following way: If the rules of codification are arbitrary, how do we construct symbolic systems that work? What are the mechanisms by which we agree that certain symbols will have certain functions? At least a partial answer to this question is that we learn the meaning of symbols (e.g. words) when we successfully coordinate actions. Hence, in understanding the development of symbolic

Figure 25: Triadic model of communication.



communication/knowledge, one cannot neglect the role of joint activity on the physical environment. Our initial symbolic interactions (when the child learns effective gesturing and speaking) include object-oriented operative-interactions (Chapman, 1999). In other words, the initial development of symbolic knowledge involves direct other-related communicative activity as well as object-directed physical activity. The triadic model of communication, graphically represented in Figure 25, constitutes a further elaboration of a dyadic semiotic model, incorporating the child's activity (an aspect neglected by the dyadic model) into the heart of symbolic development[74].

I suggest that once the child learns how to use symbols, symbolic communication can function without direct action on objects, but merely with *imaginary* action. For example, while at first the action has to be performed simultaneously with the instruction, later on the child may simply ask for an instruction instead of requiring direct demonstration. Furthermore, once the symbolic interaction becomes internalized, the child can manipulate symbols internally, thus acquiring the ability for symbolic thought.

My goal in this section has been to show that the certain important insights from semiotics, communication theory, and contemporary pragmatic model are reconcilable. More specifically, I briefly demonstrated how the simple semiotic model can be nested within an interpersonal dyadic model of communication, which in turn can be nested in a triadic model that brings together symbolic communication and physical action on objects, each subsequent level adding complexity to the view of communication. Debates such as *correspondence*, versus *coherence*, versus *consensus* theories of

[74] Within the philosophical tradition, a triadic view of symbolic communication was already proposed by Peirce (1923), a semiotician who early on reframed the problem of mind as a problem of communication. Peirce (1923) retained the centrality of the semiotic distinction between the signs and meaning, but he emphasized that the formal properties of symbols are only manifested in concrete interpretive action, an emphasis that supports Piaget's and Chapman's stress on activity.

knowledge, that bear some relationship to the models I discussed above, are generally based on a mistaken *either-or* assumption with regard to what is a proper explanatory framework for symbolic communication. However, once this either-or conceptual attitude is relaxed, it is possible to focus on compatible elements of the three models, hence opening a possibility for these models to enrich each other. I believe that the most complete model of symbolic communication is the triadic model. However, the proponents of the triadic model can also benefit from some elaboration of semiotic considerations typically done within simpler models. For example, it is important to note that symbols do have a dual nature as they *stand for* something beyond themselves (as argued by the semioticians). However, the *referentiality* of symbols is not a matter of simple correspondence between the symbols and what they represent, but is a matter of an active reconstruction of reality in the interpersonal communicative and active context. Symbols exists only in ongoing symbolic activity with others, jointly[75] focussed on some external or later internal objects or events.

One of the basic assumptions of the materialist systemic framework is that the inner symbolic structures are *enabled* by external symbolic activity. In other words, in the structure of thought one can find the original, albeit transformed, communicative structures that enabled the new forms of thought. Hence, the diagrams that I use to describe external symbolic conditions, to some extent, can also be used to describe

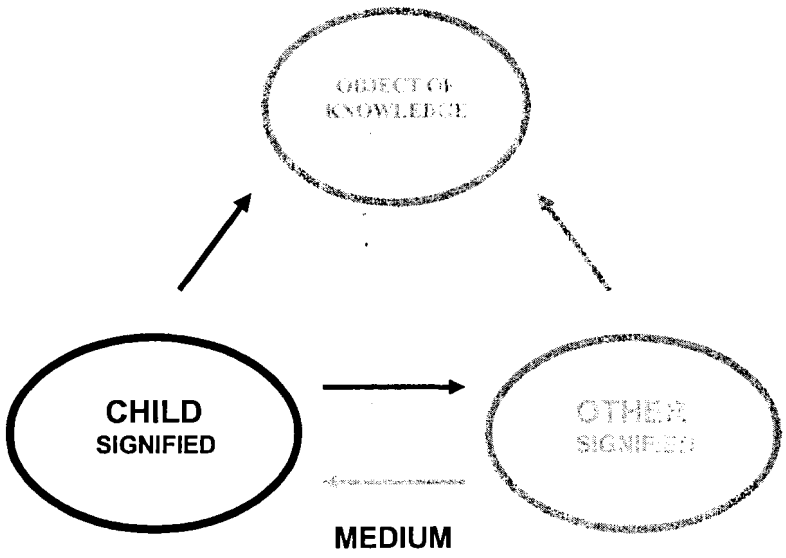
[75] With literacy, the activity of joint attention is itself imaginary, as the other is typically absent in the acts of reading and writing.

internal psychological structures resulting from the internalization of communication[76]. The elaboration of this point is beyond the scope of the present thesis.

4.3.6 The medium and child development

My goal in the remainder of this current thesis is to further expand the triadic theoretical framework described above, by elaborating the impact communicative media have on cognitive development. The *medium*, a term equivalent to the term *signifying system*, which can be defined as a *mode that mediates symbolic action*, initially influences external communication

Figure 26: The place of the medium in the triadic model.



[76] At the same time it is important not to conflate completely the process by which a cognitive form arises with the cognitive product itself (Martin, 2005). As I stressed earlier, the inner is a result of ongoing *constructed* interactions with the environment. The immense complexity of human constitution leaves much to the ongoing processes of *self*-organization.

and later influences symbolic thought. I argue that the introduction of the medium into the triadic framework is of key importance. Currently, even those theorists who clearly acknowledge the importance of external, social influences on cognitive development (e.g., Chapman, 1991) usually consider symbolic communication in a generally undifferentiated manner. Such terms as *symbolic communication* or *language* are frequently evoked without considering the fact that *different forms of symbolic communication involve people in very different ways.* The introduction of the emphasis on the medium, as portrayed in Figure 26, is designed to stress the *medium contingency of symbolic communication and symbolic thought.*

If it is clearly established that cognitive growth is greatly contingent on activity, especially symbolic activity, one would expect *different forms of symbolic activity to have different effects on cognitive development.* Yet, generally, theorists are more likely to focus on developmental continuities among such modes as gesturing, speaking, or writing rather than on *differences* in the way these modes engage the active subject. I argue that the price of such a generalization is a loss of precision in detailing differential effects of different forms of symbolic activity, and a corresponding loss of explanatory power with respect to newly emergent cognitive forms.

In his famous pronouncement that "the medium is the message" McLuhan (1964) brings attention to the importance of the way in which symbolic action is mediated. Media are conduits of symbolic activity, and by modifying the way people interact, the introduction of a new communicative technology can have profound effects on the structure of both the society and the psyche. McLuhan's (1964) theorizing might at times appear overly unidimensional in his fixation on the medium itself and his relative neglect or misinterpretation of other levels of human systems, but he was one of the first thinkers

who popularized the notion that the medium has an impact on cognitive development. A crucial aspect of the medium framework is to point to the *concreteness* of the origins of *all* forms of representation, that is to study how cognitive forms are born within communicative action, or to study concrete communicative conditions that give rise to their corresponding forms of thought. Developmental psychologists have yet to incorporate McLuhan's and other medium theorists' (e.g. Havelock, 1963; Ong, 1982) insights regarding this issue. One exception to date has been the work of Olson (1994) who began to apply the medium framework to the understanding of the developmental effects of literacy.

In this conceptualisation, I adopt Piaget's view that abstract cognitive structures have their origins in concrete action on objects, and that the development of language itself to some extent mirrors in its structure concrete schemes that can already be found in physical action on objects and pre-verbal interaction with others (Inhelder & Piaget, 1958)[77]. Piaget provides a detailed account of the way various action schemes are gradually transformed into operational schemes (Inhelder & Piaget, 1964), and how those basic operational schemes are gradually coordinated to reach a formal operational level (Inhelder & Piaget, 1958), all along emphasizing the continuity of cognitive growth. My task is not to deny the existence of continuities, but I argue that at the same time that new modes of communication emerge, they introduce their own unique emergent properties that then enable the emergence of new forms of communicative action, and thus affect cognition. Language emerges from action but it also changes action as it

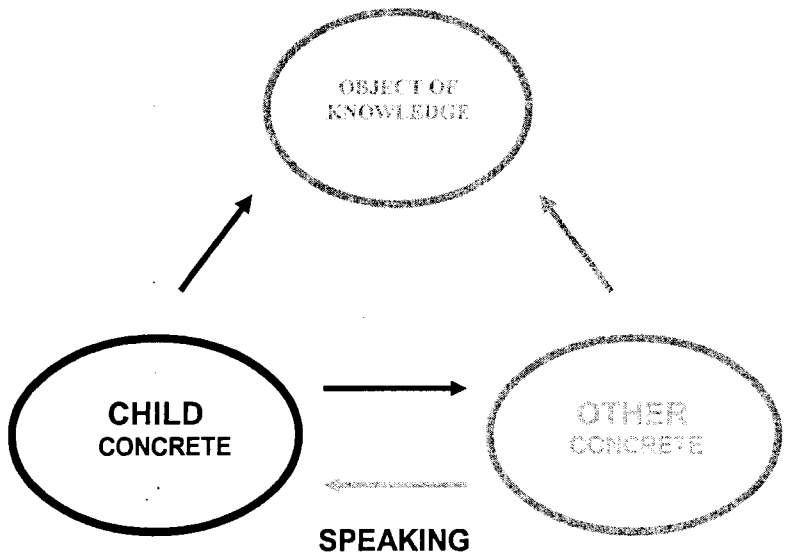
[77] In the same way, the structure of writing clearly owes much to spoken language and numerous other contextual historical variables.

introduces its unique properties to the communicative context[78]. It is these emergent properties that I focus on in this thesis. In other words, I do position the medium within a continuum of cognitive development, and by no means am I willing to diminish the importance of the history of a medium itself; within a systemic/constructivist framework, the medium can be treated as either a dependent or an independent variable. However, the examination of the development of the medium itself and its contextual variations is beyond the scope of this thesis, as I focus on examination of the invariant properties of media, and thus, for the purpose of this thesis, treat media as independent variables.

I argue that the communicative medium is particularly relevant to predicting cognitive effects at times of major cognitive transformations. The emergence of radically new cognitive

[78] As I discussed earlier, critics of an overly technologically deterministic approaches to media studies (such as Graff, 1987), argue that literacy needs to be considered as a dependent rather then independent variable. I argue that the constructivist framework as described here is neither simplistic nor overly deterministic, yet it calls for a more serious consideration of the effects of literacy (as an independent variable in a methodological not ontological sense) for child development.

Figure 27: Concrete symbolic signification in speaking.



forms, I argue, while clearly contingent on other factors, including the supporting biological constitution and the broader cultural context, is enabled by the child's engagement in a new form of communication. In other words, while not sufficient, communicative media are necessary for the emergence of their corresponding medium-related forms of cognition[79].

Specifically, I have focussed on the cognitive consequences of the use of speaking and writing. Figure 27 shows the structure of a communicative situation when a child is engaged in speaking on the concrete level, such as during the coordination of operative actions. Figure 27 shows that as a result of ongoing communicative efforts, jointly

[79] Note that once internalized, new forms of cognition cannot be reduced to their original enabling factors (Martin, 2003), and are thus no longer contingent on actual engagement with the medium they originated within. At the same time an ongoing engagement with, and mastery of, the medium will strengthen the medium-specific cognitive forms.

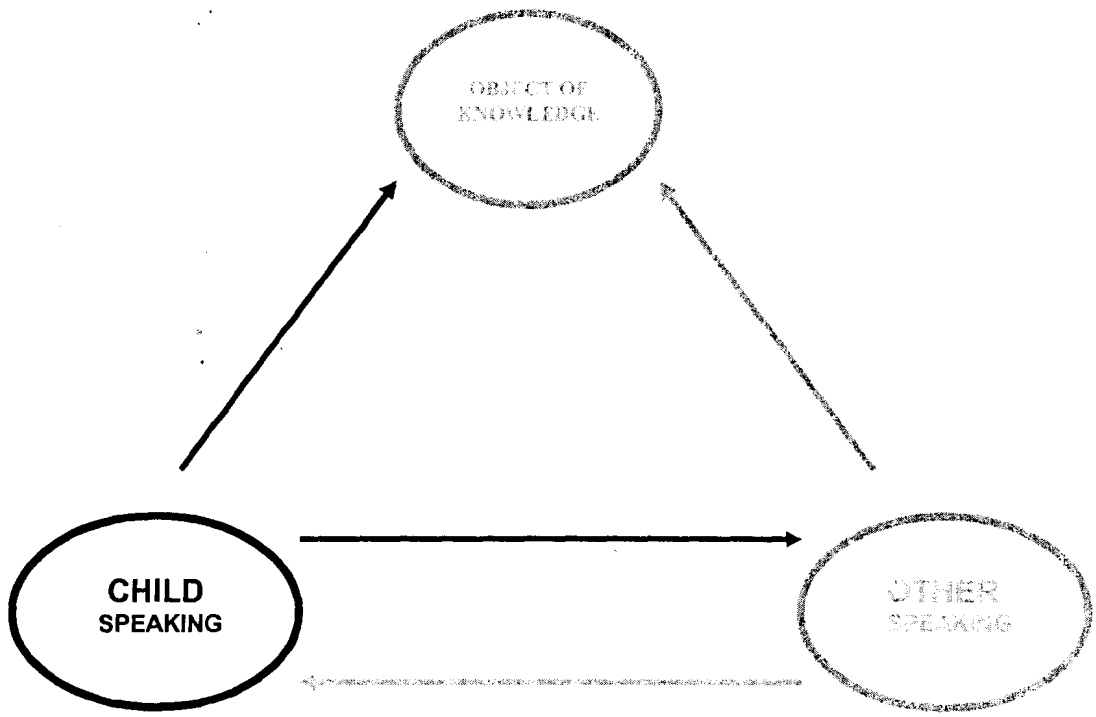
focussed on an action on some objects, the child develops the cognitive level of concrete representation. Once such representation is developed, the actual action on objects does not have to be directly performed, and the child can understand the meaning of words by imagining the activity. In other words, the child internalizes both the symbolic interaction and the associated operative action, which gives rise to a concrete representational cognitive level. Of course, this process of internalization entails a great deal of cognitive transformation, refinement, abstraction, simplification, or abbreviation (Vygotsky, 1934/1986), all in order to increase the efficiency of information processing and the corresponding efficiency in symbolic communication[80]; hence, the psychological, while retaining the basic symbolic structure enabled by the communicative condition (the medium) is never a one-to-one reflection of the external communicative condition.

I argue that when the medium of writing is introduced into communication, the distance between the child and the other significantly increases because writing typically is a solitary activity. (See my *relational* explanation earlier in this chapter for an elaboration of this point.) Further, with writing, words themselves become objects of signification or reflection, which can create distance from the concrete reality of physical objects. With metalinguistic theoretical practice, the child can eventually act and think within a theoretic cognitive plane that is contingent on purely verbal operations and removed from the concrete. The distance from the other and the distance from the concrete that is achieved with a *theoretical* use of writing is represented in Figure 28 by

[80] Mastery of language requires a great deal of abbreviation of concrete actions sequences, events, etc. that are represented symbolically, a process that the child learns from the local context which provides already established ways for the acceptable use of a language [such as described by Wittgenstein (1953) in his notion of *language games*].

arrows that are longer than those in Figure 27[81]. I suggest that the objects of the child's conscious reflection with the theoretic use of writing are words themselves, as indicated by speaking being placed inside the circles in Figure 28. In comparison, the objects of reflection or attention during acts of spoken communication are concrete objects and events (as depicted in the insides of the circles in Figure 27). Hence, as I have argued throughout this thesis, written communication enables the emergence of a new cognitive level that can operate outside the concrete context.

Figure 28: Abstract symbolic signification in writing.



In the following chapter, I apply the medium framework I have elaborated up to this point to explain the emergence of metalinguistic awareness and decontextualized abstraction

[81] Note that the distance from the other is not a necessity, as one can read with the other present. In a similar way, the distance from the concrete is not a necessity as writing can, and in most cases does,

in children. However, I believe that this medium framework, once properly elaborated and accepted, can be applied to the understanding of the cognitive impact of any mode of communication, including the effects of new media.

represent concrete objects.

Chapter 5
The literacy hypothesis and child development

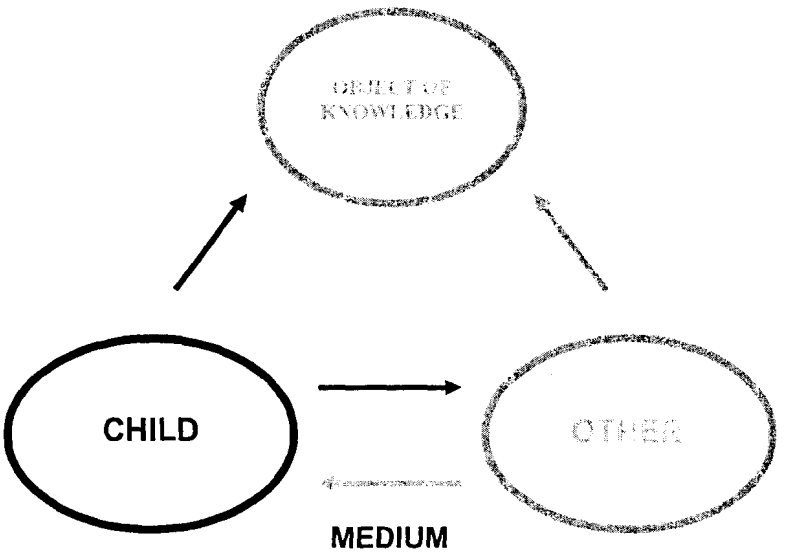
During child development there emerge new cognitive capacities that are qualitatively different from those that come before, and one of the tasks of developmental theorists is to explain how these new psychological forms emerge. During the recent decades, developmental psychology has been dominated by *cognitivist* approaches that focus on the development of internal cognitive structures, attributing at best secondary importance to the external influences on cognition, and especially neglecting the impact of symbolic communication on cognition[82].

The more recent proliferation of various developmental theories that follow the work of Jean Piaget and Lev Vygotsky has resulted in much more attention being paid not only to external conditions, with an emphasis on both symbolic communication (á la Vygotsky) and the dynamic, active nature of individual knowledge construction (á la Piaget). The integration of these two psychologists has initiated a very promising picture of development that conceives of cognition as a result of the child's ongoing active construction of her interactions with the environment, particularly her interpersonal, symbolic exchanges (e.g., Carpendale & Müller, 2004; Chapman, 1991, 1999). As I discussed in Chapter 4, Chapman (1991) recently proposed a *triadic* model that captures the interrelatedness of the child's physical action on objects and his

interpersonal symbolic communication (object-oriented operative-interactions). Such a model provides a very promising general framework for the understanding of both the development of physical action in the context of symbolic communication and the development of symbolic communication in the context of physical action. However, not unlike other existing developmental theories, the triadic model does not explicitly address the impact that the different modes of symbolic communication (media) might have on the child's cognitive development.

In the previous chapter, I suggested that the triadic framework could be expanded to

Figure 29: The medium and the triadic model.



accommodate the impact of symbolic communication on the development of symbolic cognition. More specifically, as shown in Figure 29, I proposed that the communicative

[82] For example, Gopnik and Wellman's (1992) 'theory-theory of mind,' Leslie's (1987) 'modularity theory of mind,' Harris's (1991) 'simulation theory of mind,' Braine and Rumain's (1983) 'mental logic theory of

medium be inserted between the child and the other, and that the impact of the medium on cognitive development be explicitly considered. I further suggest that such a medium framework might have particularly significant explanatory power during major shifts in cognition, and that the emergence of radically new cognitive forms might typically be best explained by examining the nature of the child's immersion in a new communicative medium.

To exemplify this general medium argument, I have focussed on the transition from orality to literacy[83]. In my previous chapters, I overview and clarify several existing accounts of the literacy hypothesis, most of which were developed predominantly in the historical context. I have responded to some of the critics of the literacy hypothesis, arguing that, given an appropriate position on the issue of causality, and given specificity with regard to the cognitive factors attributable to literacy, there exists no evidence disconfirming the literacy hypothesis. With regard to causality, I have argued that the practice of reading/writing should *not* be considered as a *sufficient* cause, but rather as a *necessary* (*enabling*) factor in the emergence of literacy specific forms of cognition. In other words, the achievement of literacy is a mark after which, and only after which, the achievement of literacy-specific cognitive forms is possible, but not necessary. I argue that much of the criticisms and confusion about the literacy hypothesis stems from an inadequate treatment of the causal link between the medium of literacy and the corresponding cognitive forms enabled by literacy. With regard to specific cognitive factors enabled by literacy, I conclude that some of the most salient general cognitive effects attributable to literacy are *metalinguistic awareness* and *decontextualized*

reasoning,' or Johnson-Laird's (1983) 'mental models theory of reasoning,' all fail to pay adequate attention to the role symbolic interactions play in cognitive development.

abstract thought. I then attempt a classification of the existing explanations for the literacy hypothesis, arguing that the *literacy explanatory complex* consisting of the *perceptual modality* explanation (writing is a visual modality), the *persistence* explanation (written characters persist in time), the *externalization* explanation (written characters physically reside outside the body), and the *arbitrariness* explanation (ABCs codify spoken sounds only and are arbitrary with regard to the concrete image) is a salient candidate to account for the emergence of metalinguistic awareness shortly after one begins to learn to read and write, and for the emergence of decontextualized thought in the later stage of literacy. I have argued that the *arbitrariness* (structural) explanation is particularly crucial for understanding the literacy effects. Finally, I postulate a theoretical background capable of accommodating the literacy hypothesis (the aforementioned triadic model).

In the present chapter, I elaborate the hypothesis that the specific effects that literacy, or phonetic literacy[84], enabled in the historical context also emerge in child development[85]. Despite some significant arguments made by literacy theorists (e.g., Goody & Watt, 1968; Havelock, 1963; McLuhan, 1962; Olson, 1994; Ong, 1982),

[83] Of course, the medium framework can be applied to other communicative modes, such as speaking or various electronic media.

[84] Note that most claims postulated in this chapter, as well as the research evidence I review, are limited to phonetic literacy. One could expect that some of these claims might generalize beyond alphabetic literacy (especially with regard to concrete operations), while others might be more specific to phonetic writing (especially related to formal operations), but the examination of the differences between phonetic and non-phonetic writing systems is beyond the scope of my present thesis.

[85] Note that one major difference between historical and individual development with regard to the medium lies in the fact that children, unlike most oral people, already grow up in a literate culture that is greatly influenced by literate customs, artefacts, and forms of communication. Children are exposed to cultural practices that have been shaped by literacy even before they themselves become fluent with the use of the medium of writing. One might thus postulate that children will acquire literate forms of thought because of their participation in literate practices, regardless of whether or not they themselves are literate. My argument in this respect, supported by the existing data, is that it is not sufficient for a child (or, as we have seen in previous chapters, for an illiterate subject) to be a part of a literate culture in order to acquire literate forms of thinking. Actually learning to read and write is *necessary* for the acquisition of literate forms of cognition.

consideration of the differences between speaking and writing remains extremely marginal in most developmental theories. I argue that the existing, albeit mostly indirect, data suggest that when children learn to read and write, they acquire new literacy-specific cognitive skills[86] that share similarities with the cognitive achievements that the Western culture acquired after the introduction of phonetic writing.

I postulate that literacy affects cognition in the context of child development in two main stages[87]. As has been the case in the historical context, in the early stages of learning to read and write (six to seven years of age) the child acquires metalinguistic awareness. I further argue that the achievement of *verbal introspection* as well as *verbal objectivity* around the same age is essentially predicated on the ability for metalinguistic awareness. Finally, I argue that the onset of *concrete operational thought* around the same age is also enabled by literacy; hence I attempt a reinterpretation of Piaget's theory of operational thinking in light of the medium hypothesis. In short, I reconsider the rise of metalinguistic awareness, verbal introspection, verbal objectivity, and concrete operations as phenomena that are enabled in the early stages of a child's engagement in literary practices.

I hypothesize that the second transition enabled by literacy occurs on average about five years later (eleven to twelve years of age), and is marked by the achievement of formal operational thought. I argue that formal operations are essentially synonymous with decontextualized abstraction, and that the capacity for decontextualized thought is enabled by literacy. I argue that the reason it takes some time after children learn to read and write to achieve formal operations is that the achievement of decontextualized

[86] Note that this chapter is not an attempt to provide an exhaustive account of developmental literacy effects. I selected those effects that I think are the best starting points in attributing cognitive growth to literacy.

thought is predicated on the differentiation and integration of the *verbal* symbolic system that with time becomes free from the constraints of concrete reality. The world of concrete perception and practical action frequently demands a logic that is different from formal logic (Merleau-Ponty, 1962; Vygotsky, 1934/1986), and because we are deeply implicated in concrete reality and used to concrete modes of signification and understanding (e.g., spoken narrative), the achievement of formal/decontextualized thought takes time and is a much less universal phenomenon than the early cognitive achievements related to literacy.

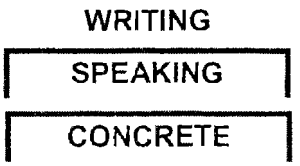
Regarding my reinterpretation of Piaget's progressive achievement of formal operational structures (Inhelder & Piaget, 1958, 1964), I propose the following rational. During concrete operations, the child learns to *abstract* numerous variables that govern the laws of physics and logic, and begins to use these variables in a consistent manner (Inhelder & Piaget, 1958, 1964). This consistency, I argue, is enabled by the fact that writing brings to awareness words that serve as the carriers of abstract concepts. In other words, metalinguistic awareness enabled by writing has implications also for the rise of concrete operations. Further, I postulate that during concrete operations, as a result of a gradual decontextualization of thought, enabled by the structure of writing, all the variables that the child has been abstracting become gradually coordinated into a reversible system that guards against contradictory applications of those logical and physical principles, which leads to the emergence of formal logic and hypothetical-deductive thought (Inhelder & Piaget, 1958). In other words, I do not deny the constructive and gradual nature of the emergence of operational thought, but merely

[87] Note that none of the literacy theorists were as specific as I am here in postulating a two-step view of the impact that literacy has on cognition.

argue for the addition of the medium as a necessary factor enabling this constructive process.

The structure of the present chapter follows the hypothetical stages through which the child goes in her achievement of literacy-enabled cognitive forms. For the purpose of this thesis, I coin these stages: *pre-literacy, recognition of structure, elaboration of structure,* and *integration of structure.* The word *structure* refers to the semiotic

Figure 30: Semiotic structure of writing.



relationship among the concrete context, speaking, and writing that I have been elaborating in this thesis, arguing that an understanding of this structural/semiotic relation is crucial for the understanding of the effects of literacy (see Figure 30 for a simplified version of the semiotic structure of writing, and see preceding chapters for an elaboration of the structural explanation for the effects of literacy).

Table 2 shows the three main transition points between the hypothesized stages of the child's mastery of literacy, as well as the cognitive achievements corresponding to these stages. These transitional points in cognitive growth are designed to mark the most pronounced qualitative leaps in cognition, and within each stage there occurs a number of more gradual transitions. The ages indicated in Table 2 are approximate and

individual variation is expected; the achievement of each stage is marked not so much by age as by the child's level of literacy[88].

Table 2: The stages of literacy and literacy specific cognitive achievements.

STAGE OF LITERACY	COGNITIVE ACHIEVEMENTS	AGE
Pre-literacy		- 4
Recognition of structure	**Emerging metalinguistic awareness**	4 - 6
Elaboration of structure	**Metalinguistic awareness achieved** Verbal introspection Verbal objectivity Concrete operational thought **Emerging decontextualized abstraction**	6 - 11
Integration of structure	**Decontextualized abstraction achieved** Formal operational thought	11 -

Throughout this chapter, I strive for specificity with regard to both the *criteria* marking transitions between the stages of literacy and the *achievements* resulting from each transition. Because of my view that literacy is an enabling (and not sufficient) factor, it is not expected that all literacy-enabled cognitive achievements will emerge at the time a certain level of literacy is achieved. The only prediction that can logically stem from my position is that these achievements will *not* be present before a mastery of a corresponding level literacy. The existence of *horizontal decalage* (the fact that not all specific cognitive achievements that represent a mastery of a more general cognitive level are reached at the same time) is thus consistent with my present position. With Piaget, Chapman, Carpendale and other constructivists, I argue that the specific cognitive achievements will be determined not only by individual predispositions, but

[88] Literacy thus should be treated as the independent variable in all studies that wish to examine the

also by the nature and amount of child's engagement in specific activities. Just as the child who plays more with clay might reach the conservation of mass earlier than the child who does not, the child who reads more abstract texts will reach decontextualized understanding earlier than the child who engages in more narrative forms of text. Importantly, this position also provides space to accommodate other contextual complexities of cognitive development called for by such theorists as Graff or Sribner and Cole. Graff (1987) rightly argues that "[w]riting alone is not an 'agent of change': its impact is determined by the manner in which human agency exploits it in a specific setting" (p. 4). Even though it is beyond the scope of this thesis to elaborate on specific contextual variances, it needs to be clearly stated that the content and context of literate practices matters as much as does the structure of the medium itself. To add to McLuhan, I would say that the medium is not the only message. Yet the focus of this thesis is on the medium, and the emphasis I place on the structure of literacy and the ways literacy engages the child is an attempt to bring attention to this neglected area of study.

To support my claims, throughout this chapter I draw on available empirical research, even when such research requires a reinterpretation in light of the medium framework. Because of the scarcity of specific research on the effects of literacy[89], whenever possible I propose specific research hypotheses that might be used to further assess the validity of the present framework.

plausibility of the current framework.

[89] Note that there are very few developmental studies that have directly tested the literacy hypothesis.

5.1 Pre-literacy

Before the age of about three to four, the already speaking child has no understanding of written words as words. In other words, the child does not differentiate between written words and other emblematic images. As Olson (1994) puts it, "when pre-reading children 'read' logos such as 'Coke' ... it is unlikely that they take the emblem as a representation of a word rather than as an emblem of a thing" (p. 71). "[Y]oung children think of written symbols as tokens for objects rather than as representations of words" (Olson, 1992, p.160). Even though the child is enveloped in a literate culture and its practices from the beginning of her life, and is thus exposed to various literate objects and customs, he himself does not know how to use the literacy tools and hence remains cognitively unaffected by the medium of writing in a direct way. Hence, at this stage, there is no evidence for any cognitive effects that are uniquely enabled by writing.

5.1.1 Metalinguistic awareness

Numerous researchers showed that pre-literate children lack metalinguistic awareness; they use words but do not reflect on words. As Luria (1946; cited in Olson, 1994) puts it, "a word may be used but not noticed by the child, and it frequently seems like a glass window through which the child looks at the surrounding world without making the word itself an object of his consciousness and without suspecting that it has its own existence, its own structural features" (p. 34). In other words, children see words as being the qualities of objects rather than separate objects themselves (Vygotsky, 1934/1986).

> Names are attached physically to things; [and] thought is a kind of voice ('the mouth in the back of my head that talks to the mouth in front').

> Animism springs from the same kind of differentiation [...]: everything that is in movement is alive and conscious, the wind knows that it blows, the sun that it moves, etc." (p. 100).

According to Piaget and Inhelder (1969), children's inflexibility in arbitrary word substitution is also a reflection of their lack of metalinguistic awareness. Children's understanding of concepts such as *letter*, *word*, or *sentence* comes about only later when they learn some basics of reading and writing (Francis, 1975).

5.1.2 Abstraction

There are two meanings of the term 'abstract' that are applicable to my current considerations. The first meaning has to do with something that is "existing in thought rather than matter, or in theory rather than practice," while the second has to do with extracting, removing, taking out of (Thompson, 1995, p. 6). The first meaning is what I call *decontextualized abstraction,* to avoid its conflation with the second meaning that merely requires systematic extraction of a quality or feature from the concrete context. The second meaning of abstraction does not necessitate decontextualization, and such forms of abstraction can be found in the most rudimentary acts of pattern recognition or memory, all relying essentially on the extraction of invariance. Symbolic communication provides the child with especially powerful tools for abstracting meaning from the environment, and abstract thought, in the second meaning of the term, is clearly not contingent on literacy (e.g., Inhelder & Piaget, 1964).

The gradual emergence of decontextualized abstraction, which I argue is contingent on writing, will be discussed in further sections of this chapter. At this point it suffices to say that pre-literate children are unable to understand abstract concepts that are devoid of a connection with concrete images, action sequences, or feelings (e.g., Inhelder & Piaget, 1964; Vygotsky, 1934/1986). I will later propose that metalinguistic awareness is

a prerequisite for the emergence of decontextualized abstract concepts. Lacking metalinguistic awareness, pre-literate children's cognitive system is bound to concrete reality.

Classification itself can be said to be a form of abstraction (in the second meaning of the term) as it entails grouping objects, events, or actions together according to a chosen criterion extracted from the overall experiential context. As such, classification is not contingent on writing, but is rather an inherent feature of any symbolic system, and certainly speaking plays a very important role in the development of classification (Inhelder & Piaget, 1964; Piaget & Inhelder, 1969)[90]. Children before the age of four certainly can classify objects. Ciancio, Sadovsky, Malabonga, Trueblood, and Pasnak (1999), showed that the ability to classify and seriate improves significantly with repeated practice and explicit teaching for children as young as three and a half years. Hence young children can classify, but early forms of classification show low levels of abstraction, are always directly tied to concrete action, and lack of consistency in the application of classificatory principles (Inhelder & Piaget, 1964).

5.2 Recognition of structure

The first, very rudimentary, stage of literacy, which I call *recognition of structure,* typically begins around the age of four (Ferreiro & Teberosky, 1982; Homer & Olson, 1999) and continues until the age of around six to seven. Ferreiro and Teberosky

[90] If the capacity for classification is defined very broadly, any action can be said to involve a decision that presupposes some form of classification. Piaget points out that even before speaking, children engage in practical forms of classification. For example, familiar objects can be assimilated into habitual schemes of rocking, shaking, etc, and new objects can be explored with a series of familiar schemes (Inhelder & Piaget, 1964).

(1982)[91] observed that around the age of four, long before they learn to read and write, children acquire the most rudimentary, implicit[92] understanding of the difference between literacy and pictorial forms of visual representation (e.g., emblems). In other words, children begin to realize that *written words codify spoken sounds* rather than concrete reality. The first recognition of the nature of the written word pertains to nouns, and later children apply the same knowledge to verbs, adjectives, etc. (Ferreiro & Teberosky, 1982). With this rudimentary recognition, the child begins to learn the first letters by associating phonetic graphic signs with the phonemes that they represent. Hence the child begins a new symbolic journey during which she learns to use *visual*, *persisting*, and *external* signs to codify spoken words. Later in this stage the child may also be able to read some simple words.

> Discovering that written words can be seen as representing constituents of speech is one of their most important discoveries. More precisely, the claim is that children's important discovery is that their own and others' more or less continuous speech may be thought of as a sequence of lexical items or "words." (Olson, 2002, p.158)

During the *recognition* stage, the child 1) acquires the first glimpse of the distinction between drawing and writing, but 2) does not yet grasp the basics of the 'syntax' of writing as a codification of the narrative (Homer & Olson, 1999; Olson, 1994). For example, as I discussed earlier, when shown a picture of a boy with a caption *Charlie*, instructed that this is a picture of Charlie and that the caption says *Charlie*, and then asked whether this is a picture of a little boy, children will appropriately agree. But if they

[91] Ferreiro and Teberosky (1982) are constructivist cognitive theorists who argued that when children engage in literacy practices, their cognition evolves as they actively test and modify their 'theories' of literacy.

[92] The first awareness of the nature of writing is implicit, and it takes children some time before they become reflectively aware of the representational structure of writing. Even after children learn to read and write, they have difficulties grasping the semiotic fact that written words codify spoken words. This achievement is typically completed at around the age of eleven or twelve (Olson, 1994), when I argue children differentiate and integrate the symbolic structure of writing.

are then asked whether the caption below says *Little boy*, four or five year old children will disagree, indicating some rudimentary awareness that the word, unlike an emblem or a picture, preserves the verbal form (Olson, 1994). However, during this stage, children still employ the 'syntax' *of graphic representation* when asked to *read* or *write*. For example, when a child is asked to write the word *cat*, she may draw some letter-like strings, hence showing that she knows the difference between *write* and *draw*. However, if she is asked to write *three cats*, she will draw three such strings (Olson, 1994), thus confusing the 'syntax' of drawing with the 'syntax' of writing. Similarly, if the same child is shown a plate with *Three little pigs* written on it, told what the plate said, and then, having one of the words covered, is asked to read the plate, she will read it as *Two little pigs*, committing the same mistake of treating the words as emblems of things (Olson, 1994). Children do not pass these tasks before the onset of what I call *elaboration* phase (around the age of six).

Hence, during the *recognition* phase children 1) begin to *understand written words as representations of speech* (and not concrete objects), while 2) *remaining bound by the concrete 'syntax' of drawing* in their first attempts at 'writing.' The *recognition* phase appears to consist of a gradual transition from treating written words as emblematic representations to treating them as words, and it is not before the onset of the next stage that there occurs a shift in the adoption of the narrative 'syntax' of writing in place of the concrete 'syntax' of drawing.

Learning to encode spoken language in a written form is a difficult task in phonetic languages. The name *phonetic* implies a correspondence between the spoken phonemes and written letters. Graphically codifying spoken sound is an entirely new task for the child, a task that is further complicated by the fact that alphabetic scripts do not

provide a natural system of one to one translation from sounds to graphemes. Consonants always require vowels to be sounded out; hence, the natural auditory unit of spoken word is a syllable and not a letter. In fact, research shows that children naturally acquire syllabic sensitivity before they acquire sensitivity to phonemes (Whitehurst & Lonigan, 1998). Hence, it is only the rarely used syllabary that has a potential to be a fully phonetic system. But because syllabaries require many characters, the great majority of phonetic scripts today are alphabetic, using separate graphical representations for vowels and consonants[93]. The recitation of the ABCs – a major component of pre-school children's education – attests to the centrality of learning to dissect speech into phonemes[94]. From the point of view of literacy, learning the phonemic sensitivity and letter differentiation can be argued to be the child's main task in the *recognition*, or pre-school, stage.

Because writing, in comparison with other modes of symbolic action, plays a very insignificant role in child's life during the *recognition* stage, for most purposes the recognition stage might still be treated as a pre-literacy stage, dominated by speaking in

[93] Learning phonemic sensitivity might further be complicated by how written words are pronounced. Each written language employs its unique graphic and phonemic conventions. The correspondence or discrepancy between spoken phonemes and written signs varies for different phonetic languages. Latin languages typically show more correspondence between the graphemes and their pronunciations, whereas English employs slightly more arbitrary rules in this respect. The sound of ABCs in English can hardly be applied to reading actual words. One would expect that each written convention might thus have its own unique emergent properties that have specific cognitive effects on its users.

[94] There still exists some controversy regarding the process through which the learning of writing and reading takes place, a controversy between *phonics* and *whole-word* approach methods. The whole-word ideology challenges the more traditional ways of teaching literacy through phonics, and postulates that meaning-based learning of whole words and the intuitive/contextual ways of decoding text are more effective than learning from bottom up, i.e., initially learning single letters, etc. The proponents of the whole language approach to learning to read and write assume that there is a similarity in learning to speak and learning to write, and believe that the acquisition of letters and words is greatly aided when the meaning of the text is emphasized. Children would then be involved in a sort of a guessing game as to what the word is. While this approach has been shown to be a useful addition to more traditional instructions (e.g., phonics), it has generally failed empirical scrutiny (Whitehurst & Lonigan, 1998). In fact it is phonological sensitivity that is the best predictor of reading skill acquisition (Whitehurst & Lonigan, 1998).

terms of symbolic development. Inhelder and Piaget (1964) consider ages one-and-a-half or two till seven to be a period of the development of what they call a *semiotic function.* During these years, "actions are internalized by means of the semiotic function" (Piaget & Inhelder, 1969, p. 93). "The semiotic function detaches thought from action and is the source of representation" (Piaget & Inhelder, 1969, p. 86). Inhelder & Piaget (1964) recognize the centrality of language in the development of the symbolic representational understanding; however, they do not differentiate between speaking and writing, or consider the implication of the use of written language on cognition. From the medium point of view, it seems that speaking becomes greatly elaborated during preschool years, and it is likely in the examination of how speaking modifies the context of child's activity (e.g., Vygotsky, 1986) that many answers to the emergence of new cognitive forms during pre-literacy stage should be sought, something that is beyond the scope of the present thesis.

5.2.1 Metalinguistic awareness

Structurally speaking, during the *recognition* phase, speaking for the first time becomes an object of child reflection, even if in the most rudimentary way. Hence, one would expect that this stage would bring about first rudimentary signs of metalinguistic awareness. And this in fact appears to be the case. During the ages of four to six, children typically acquire first glimpses of phonemic awareness, leading to the awareness of words as units of speech (Homer & Olson, 1999). Homer (2000) found that four to six years old children's understanding of *word* as a unit of written text predicted their understanding of *word* as a unit of speech. Moreover, Western children who did not understand the concept of *word* as a part of written text could not understand the

concept of *word* as a unit of speech (Homer, 2000). Moreover, children in different cultures become aware of the linguistic concepts that are foregrounded by their corresponding scripts (Homer, 2000)[95]. These findings are consistent with the general claim that metalinguistic awareness is *enabled* by writing.

The level of literacy during the recognition stage is rudimentary, consisting of the coding of first letters, and later perhaps simple words. Hence, one would expect that the corresponding levels of metalinguistic awareness at this stage would also be rudimentary. And this appears to be the case, as preschool children continue using speech in a way that shows little awareness of words themselves, and focus attention on the *content* of their spoken significations (Luria, 1976; Olson, 1994; Vygotsky, 1934/1986). One can argue that metalinguistic awareness proper requires some understanding of speaking as a narrative form with its unique 'syntactic' properties, and such an understanding is clearly limited in preschool children (Homer, 2000; Homer & Olson, 1999; Luria, 1976; Olson, 1994). I argue, from the point of view of the literacy hypothesis, that the *recognition* stage is best understood in terms of the gradual progressive development of metalinguistic awareness, an achievement that is reached at the onset of the *elaboration* phase.

5.2.2 Abstraction

If it can be assumed that the symbolic cognition of children in the *recognition* phase is dominated by oral communication, with words being inseparably tied to concrete reality, one would expect that their abstractions be also inescapably tied to the concrete.

[95] Homer's (2000) research is an example of how to construct empirical tests for the present hypothesis. The origins of metalinguistic awareness can be studied by the analysis of the awareness of spoken versus written signification. For example, the present framework would predict that the awareness of specific spoken sounds *follows* the awareness of written letters.

And this appears to be the case. Both Vygotsky (1934/1986) and Piaget and Inhelder (1964) show that words for preschool children signify concrete reality, and that abstract concepts can be understood only to the extent that they represent concrete examples. There are several lines of research evidence that converge to corroborate this point.

As demonstrated in the work of Vygotsky (1934/1986) and Inhelder and Piaget (1964), there exists a gradual increase in the sophistication of abstract classification during what I call the *recognition* stage. Piaget demonstrated that pre-operatory classifications and seriation[96] are still based on experimentation rather than on an a priori systematic application of an abstract principle (Inhelder & Piaget, 1964). Preschool children classify objects predominantly according to their concrete *perceptual* qualities, rather than words that denote a classificatory criterion. For example, they have difficulties deciding whether 'wind' from a fan is the same as 'wind' in the trees (Inhelder & Piaget, 1964). Moreover, pre-school children lack the ability for hierarchical classification (class inclusion). It is the achievement of hierarchical classification that Inhelder and Piaget (1964) consider to mark the operatory level of classification (I will discuss the issue of hierarchical classification in more detail in the upcoming section).

In Chapter 1, I discussed Vygotsky's (1934/1986) experiments using a *blocks and nonsense-word* design in which he describes the formation of categorization in children and the role of words in this task. His experiments mirror Piaget's findings. Vygotsky (1934/1986) demonstrates that preschool children use what he calls 'thinking in complexes' (p. 112) when sorting objects into categories. In other words, they already apply some classificatory principles, but these principles can change at any point. Like Piaget, Vygotsky (1934/1986) shows that one feature of grouping into complexes is that

children do not apply any rules of hierarchical classification (class inclusion) in their groupings. Vygotsky (1934/1986) further describes thinking in complexes as "*concrete and factual* rather than abstract and logical" (p. 113). According to him, the "child incorporates different things into a group on the basis of concrete imagery" (Vygotsky, 1934/1986, p. 132). "The child's framework is purely situational, with the word tied to something concrete, whereas the adult's framework is conceptual" (p. 133). Similarly to Piaget's finding of the secondary role of word-concepts in pre-school classification, Vygotsky shows that it is only during the school years that "[i]n the contest between the concept and the image that gave birth to the name, the image gradually loses out" (p. 132)[97].

Language utilized in preschool education and literature reflects the implicit understanding that pre-operative children do not understand decontextualized abstract concepts. For example, Corson (1985), who studied the presence of Greeko-Latin content (words that typically signify abstract concepts) in various literary forms in the English language, found that in comparison to an estimated 40% of Greeko-Latin words in philosophical texts, children's fiction contained 0% of Greeko-Latin words.

I interpret this data as suggesting that my argument regarding the relationship between abstraction and literacy during the *pre-literacy* phase (section 5.1.2) can also be applied to the recognition phase: the progressive development of abstraction during the recognition stage is not predicated on writing. I argue that the concrete nature of

[96] Seriation poses very similar requirements on the child as classification, as the objects are to be arranged in a series according to a criterion (e.g., systematically increasing size).

abstraction, classification, and seriation for pre-school children is contingent on other symbolic tools children use, most significantly speaking, but also on drawing and other forms of play. None of those symbolic tools fosters symbolic separation from concrete reality. I argue that it is not before they learn to signify words by words that children will be able to employ abstract principles in a decontextualized way more independent of perceptual contingencies.

One of the most significant aspects of pre-operatory thought is an absence of the notion of what Piaget calls *conservation*, which he again interprets as resulting from child's centeredness on perceptual qualities of objects and events (Inhelder & Piaget, 1964). Conservation is intimately related to the nature of abstraction, classification, etc. In the next section, I propose a hypothesis that the development of the notion of conservation, while clearly stemming from child's physical action on objects, is actualised only after the child learns to read and write. More specifically, I will argue that the capacity for conservation is predicated on the emergent capacity for metalinguistic awareness and verbal objectivity afforded by writing.

Overall, thus, in light of the cognitive criteria I set out to examine (metalinguistic awareness and decontextualized abstraction), the *recognition* stage does not yet enable literacy-specific cognitive forms, with the exception of the rudimentary beginnings of metalinguistic awareness. In this respect, the *recognition* stage is not dissimilar to the *pre-literacy* stage as far as the literacy hypothesis is concerned, and for all practical purposes should perhaps be considered a later phase of pre-literacy. Perhaps there are

[97] Vygotsky (1934/1986) further compares children's concrete classification to that found in non-literate cultures. "Primitive people think in complexes, and consequently the word in their languages does not function as a carrier of the concept, but rather as a family name for a group of concrete objects belonging together, not logically, but factually" (p. 129). He thus draws a parallel between cultural evolution and individual development. "If we trace the history of a word in any language, we shall see,

some subtle changes in cognition that writing enables during the *recognition* stage, but more likely the use of the medium of writing is so insignificant compared to the use of other media (speaking, drawing) during this stage that its effects on cognitive development are negligible. Like many others, this question requires further empirical examination at this point.

5.3 Elaboration of structure

So far I have argued that during the *recognition* stage the child acquires the first glimpses into the world of literacy, but the use of literacy remains insignificant in comparison with other modes of communication. This appears to change radically during the *elaboration* stage (which on average begins around the age six to seven), when learning to read and write begin to play a significant role in the child's life. At this stage, children begin to map whole written words to spoken words and gradually develop the mastery of sentences and the written narrative. This process continues until approximately eleven to twelve years of age, the time that typically marks a certain level of mastery of writing and reading, which I argue results in a differentiation and integration of the symbolic structure[98].

In line with the assumptions of medium theorizing, one would expect that the introduction of the new medium of literacy into the child's symbolic life would enable some medium-specific cognitive effects. I argue that there exist significant enough

however surprising this may seem at first brush, that its meanings change just as in the child's thinking" (Vygotsky, 1934/1986, p. 131).

[98] Note that there are great individual differences in the progression of the mastery of literacy, and some people never fully achieve the level I call *integration of structure*. This parallels the individual and cross-cultural variability in the achievement of formal operations (Piaget, 1972).

theoretical reasons and empirical evidence to re-examine the role of literacy[99] as an enabling factor for many major cognitive changes that occur around the onset of schooling. Although there is a scarcity of empirical evidence directly tying literacy to those changes, I argue that some existing research evidence can be reinterpreted within the current medium framework to support my claims. A number of theorists have attributed the emergence of metalinguistic awareness, and less directly verbal objectivity and verbal introspection, to literacy (Harris, 1989; Havelock, 1963, 1976; Olson, 1994; Ong, 1982; Vygotsky, 1934/1986). However, as far as I know, no one so far has postulated that concrete operations in general are also enabled by the child engagement in the medium of writing, a claim that I elaborate in the present section[100].

What the mechanisms are that enable "the remarkable changes which occur about the age of 7-8" (Inhelder & Piaget, 1964) remains an open question at this point. The medium argument is a proposal for the inadequacy of at least two alternative lines of explanation dominating psychological thinking on this issue today, one that stresses brain maturation itself and one that emphasizes the multifaceted influences of schooling. Brain researchers frequently imply that the achievement of new cognitive functions is a direct result of brain maturation (e.g., Jankowski & Carper, 1996). As I discussed earlier, such a reductionist, internalist hypothesis has recently been challenged, on a general level, by those theorists who point out that environment plays an irreducible role in any aspects of cognitive growth (e.g., Deacon, 1997; Oyama, 2000). It is clear that a certain

[99] It is important to point out that the achievements of the recognition stage are not limited to phonetic literacy, but are potentially a consequence of using any writing system, as any writing system by definition codifies spoken language. However, in this section, I predominantly focus my explanation on the structure of phonetic writing. The discussion of detailed mechanisms by which cognitive forms emerge when other writing systems are used is beyond the scope of this thesis.

[100] One way to reject this hypothesis would be to find completely illiterate children that can function on concrete operational level. I am presently not aware of the existence of such evidence.

level of brain maturation is required for complex cognitive tasks[101], otherwise other animals would be able to learn complex symbolic tasks that only humans are capable of performing. But the question that remains largely unexamined is to what extent the remarkable transformations in neurophysiology are themselves fostered by the child's engagement in the medium of writing. I consider a hypothesis that the engagement in the medium of writing is necessary for the cognitive achievements of this age[102].

In a different vein, Scribner and Cole (1981) argued that it is the general experience of schooling that plays the crucial role in the cognitive changes at this time[103]. And again, as I argued earlier, it is clear that it is in school where most children learn literacy and related forms of abstract thought. But the question that remains is what is it specifically about schooling that enables the great cognitive achievements of this stage. My

[101] The onset of the *elaboration* stage is correlated with significant changes in neurophysiological functioning. Jankowski and Carper (1996) show that there occurs a significant shift in brain physiology between the ages of five and seven. They report that "the early school-age years are a time of connective and synaptic exuberance ... a time of the greatest availability of neural hardware in one's lifetime" (p. 44). This activity occurs predominantly in the association cortex in the frontal lobe that is regarded as serving executive (Jankowsky & Carper, 1996) or regulatory (Baddeley, 1986) functions. The five-to-seven year shift is qualitative, and has to do with the emergence of higher level metacognitive processing (Jankowsky & Carper, 1996). There also occurs a shift in mnemonic competence and event recall at the same age, and Jankowsky and Carper (1996) postulate that this increased capacity for event recall is due to the emergence of metamemory, i.e. a capacity to reflect on one's own memory. These researchers do not consider the further hypothesis that the emergence of metamemory might be a direct effect of the introduction of writing. In a similar vein, Janowski and Carper (1996) suggest that the earlier cortical neural changes that occur around the age of 4 to 5 years reflect a shift of dominance from the right to the left hemisphere. Might it be possible that this earlier shift itself is a result of the child's use of the right hand (thus the left hemisphere) in learning to draw and write? In left handed children, the lateralization is much less pronounced. Is it possible that the written language develops in the right hemisphere in left-handers? An interesting finding supporting such a hypothesis is that a *left-handed* patient, following an ischaemic lesion in the temporal parietal region of the *left* hemisphere, developed impaired comprehension of spoken but not written language (Silveri & Cappa, 2003). Is it possible that neurophysiologists who largely neglect the possible impact of concrete aspects of symbolic experience miss some simple insights into the ways symbolic experience affects brain maturation?

[102] To assess this hypothesis empirically, one could conduct a controlled experiment in which one increases the level of literacy training in one group of subjects prior to the onset of concrete operations (e.g., four to five year olds), and then follow this group as well as a comparison group longitudinally, observing the patterns of brain maturation. A significant difference between the two groups would indicate the effect of the use of the medium itself.

argument is that the child's engagement in literacy is central for understanding the cognitive transitions of the *elaboration* stage. My goal is not to deny the complexity of cognitive growth, and that other symbolic experiences also have a significant impact on cognition, but to examine the explanatory potential implicit in the significantly marginalized literacy hypothesis[104].

5.3.1 Metalinguistic awareness

It is important to note that the term *metalinguistic awareness* denotes an explicit, reflective awareness of language. Implicit understanding of how words function can be found in children as soon as they learn how to speak. Such awareness is evident in children's communicative action, as they, after all, can communicate effectively[105]. However, the evidence suggests that it is not until they acquire literacy that children can consciously reflect on words. Research has demonstrated that the explicit understanding of *words* (e.g., the difference between common nouns and proper names) emerges after children learn to read and write (e.g., Ferreiro, 1997; Ferreiro & Vernon, 1992; Homer & Olson, 1999). Moreover, when asked to repeat *exactly* what the other has said, pre-literate children concentrate on the meaning of the utterance rather than the literal wording (Olson, 1994). Pre-literate children fail to notice the difference between

[103] As I discussed earlier, Scribner and Cole (1981) did not provide any evidence disconfirming the literacy hypothesis as it is outlined in the present thesis, but only evidence against the *strong* literacy hypothesis that considers literacy to be a *sufficient* factor in the emergence of the literacy-related forms of thought.

[104] If the predictions of the literacy framework are correct, one would expect that schooling, unlike literacy, is not a necessary condition for the emergence of concrete operations. To assess this controversy empirically, one would need to study the differential effects of the level of literacy versus schooling on cognitive operational change. If my current hypothesis is correct, reading/writing levels would account for most variance in the prediction of the cognitive achievement of the *elaboration* stage, whereas schooling would account for very little or no such a variance over the effects accounted for by reading/writing levels. In particular, one would expect to find *operational children among early preschool readers*, and *non-operational children among late school readers*. If this was the case, schooling might need to be considered an accelerating, but not a necessary condition for operational thought.

paraphrases; as long as two paraphrases have the same content, children before the age of six typically assert the identity of statements when asked whether exactly the same thing was said (Olson, 1994). In contrast, school children are good at distinguishing between paraphrasing and verbatim statements (Olson, 1994). This research suggests that metalinguistic awareness stems directly from the utilization of literacy.

Further, I suggest that the type of literacy seems to directly influence the nature of metalinguistic awareness. For example, people who are familiar with the alphabet perceive spoken words as consisting of letters (segment words into letters), but those who are fluent in non-phonetic forms of literacy do not do this (Olson, 1994). In a similar manner, as I discussed earlier, preliterate children are also incapable of deleting phonemes from words (e.g., saying *fish* without *f*) (Magnusson & Naucler, 1993). Western children acquire this capacity around the age of six, at the time they begin to read and write (Magnusson & Naucler, 1993). In a similar manner, Chinese readers of traditional script are unable to detect individual phonetic segments in words, whereas those Chinese who used an alphabetic script (Pinyin) could do so (Read, Zang, Nie, & Ding, 1986).

5.3.2 Verbal introspection

The capacity for verbal introspection[106] (as applied to self and others) is very closely related to the achievement of metalinguistic awareness. It is important to note that understanding the intentional states of others is very basic to human beings and

[105] Macnamara (1982) demonstrated that children as young as 17 months could implicitly differentiate between common versus proper names.

emerges early on in development. Certainly by the age of two, children's actions show a rudimentary understanding that others have an internal life of their own (e.g., Brown & Dunn, 1991). By the age of four, children are even capable of appreciating that another's experiential history will affect his beliefs, as shown in the achievement of *false belief* understanding (e.g., Carpendale & Chandler, 1996).

However, the conscious realization of one's own and others' *internal narration* does not appear before the school age. For example, when asked whether an experimenter (who was sitting and doing nothing) had some thoughts, a great majority of preschool children stated that she did not; this changes radically for six to seven year old children, most of whom can appreciate that others have thoughts even in the absence of any overt activity (Flavell, Green, & Flavell, 1993). The same applies to understanding one's own verbal thoughts. According to Vygotsky (1934/1986), "the schoolchild passes from unformulated to verbalized introspection" (p. 170).

Further, early school-age children develop a capacity to understand explicitly that the same situations, especially if they are ambiguous, can result in different verbal interpretations across different people, a capacity highlighted in the *interpretive understanding of mind* (Carpendale & Chandler, 1996). I believe that the phenomenon of the interpretive understanding of mind is predicated on or virtually synonymous with the ability for verbal introspection and metalinguistic awareness. With the achievement of an interpretive understanding of mind, children acquire the first implicit[107] sense that language is an interpretive process; hence they begin to understand that verbal

[106] I use the term *verbal introspection* to denote conscious awareness of both one's own and others' verbal thought.

[107] In fact, it appears that many adults never reach an explicit understanding of interpretation. Dogmatism, ideological rigidity, and lack of openness to dialogue, can all be said to be predicated on an inability to grasp the basic structure of communication as an *interpretive* activity.

accounts can justifiably differ across persons, especially when the stimuli are ambiguous (Carpendale & Chandler, 1996).

Lacking the capacity for verbal introspection and interpretive understanding of mind, pre-school children are also incapable of differentiating between what is said and what is meant. For example, when preschool children make a request that is not specific enough, and as a result receive the wrong object (compatible with how the request was stated but incompatible with the intention of the child), they tend to blame the speaker and, if asked, insist that they requested the right thing (Olson, 1994). In contrast, around the age of seven children become capable of distinguishing between the wording of a statement and the intention behind the statement, and thus they catch discrepancies between the two (Olson, 1994). Hence, at the age of six or seven children begin to understand that one may be mistaken in his verbal belief, i.e., that one may 'think that she knows' (Olson, 1994). Again, I argue that this new ability to distinguish between expression and intention is very intimately tied to the achievement of the interpretive understanding of mind and metalinguistic awareness.

The ability to recognize the inner dialogue in others is correlated with verbal *self*-understanding. Flavell and colleagues (Flavell, Green, & Flavell, 1993) present a number of studies to demonstrate that preschoolers are limited in their introspective ability, and largely unaware of their ongoing inner speech. There occurs a striking shift in the ability to introspect around the age of six to seven (Flavell, Green, & Flavell, 1993). For example, Flavell, Green, and Flavell (1998) showed that, in contrast to a great majority of school children, only half of five-year-olds can appreciate the fact that one might not be able to stop thinking when desiring to do so. School children have no problem with this task. Similarly, when asked whether they had any thoughts over the period of the

last 20 seconds, only a few five-year olds stated that they did (Flavell, Green, & Flavell, 1998).

There exist significant amount of other research on phenomena such as humour, ambiguity, or referential communication (see Carpendale & Chandler, 1996) that could be related to the emergence of metalinguistic awareness. These phenomena are typically related to the child's achievement of the earlier discussed interpretive understanding of mind (Carpendale & Chandler, 1996). Some researchers conflate the emergence of the understanding of interpretation with an earlier achievement that is referred to as false-belief understanding, thus suggesting that the capacity for interpretation emerges in preschoolers, which would pose a challenge to my present hypothesis. However, Carpendale and Chandler (1996) provide a critique of a body of research on perspective taking and ambiguity, pointing out the conceptual error in this research, and concluding that an interpretive understanding does not emerge before the age of six or seven. They argue that those researchers who claim that the capacity for interpretation emerges earlier misinterpret the meaning of *interpretation*, and thus adopt inappropriate methodologies for studying interpretive understanding. Carpendale and Chandler (1996) define interpretation as an ability to conceive that "the same object or event can sometimes afford multiple meanings that are *equally legitimate*" (p. 1687), and they distinguish it from understanding that "representations can be false with respect to real objects or events" (p. 1687). Knowing that given inadequate experiential information one can hold a faulty belief about an event (i.e., false belief understanding) is not the same as understanding the arbitrariness of the interpretive process. False belief understanding entails different beliefs about different information, whereas interpretive understanding entails the recognition that the same, albeit often ambiguous, stimulus

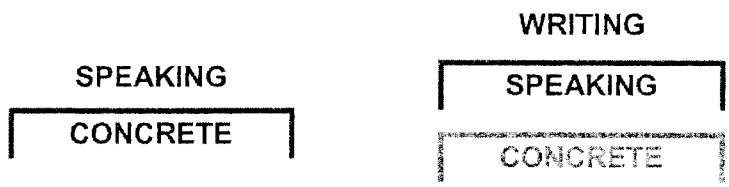
can legitimately be interpreted in different ways. Carpendale and Chandler (1996) claim that the research on perspective taking and ambiguity that attributes genuine interpretive or constructive understanding to preschoolers, was based on a lack of distinction regarding these two different achievements, and that essentially all tasks used in the studies that claimed interpretive understanding before the school years were various versions of false belief tasks. Carpendale and Chandler (1996) conclude that false belief understanding is an earlier achievement (around four years of age), whereas interpretive understanding does not emerge before school age.

Elizabeth Robinson presents several studies that corroborate Carpendale and Chandler's (1996) argument. Apperly and Robinson (2003) conducted a series of studies with preschoolers demonstrating that "[c]orrect reasoning about beliefs and reports of beliefs that misrepresent the object does not imply mastery of the fact that beliefs represent an object in a particular way" (p. 297). Studying children's ability to handle two labels for one object, Apperly and Robinson (2002) found that preschoolers had a limited metalinguistic awareness: "These children lacked metalinguistic awareness of words as entities that both refer and describe" (Apperly & Robinson, 2002, p. 53). Further, specifically studying the use of written words, Collin and Robinson (2005) found that three to five year old prereaders frequently assumed that the meaning of a word changed when it was attached to a different object (e.g., such as when the word dog was moved from the picture of the dog to the picture of a boat). This is another example of preschoolers limited understanding of how the words function, i.e. their propensity to conflate words with objects they represent, giving primacy to concrete objects (Inhelder & Piaget, 1958).

The findings discussed in this section converge to provide further support for the thesis that metalinguistic awareness and its different variants (verbal introspection, interpretive understanding of mind, referential communication) emerges briefly after children learn to read and write[108]. In fact, the attribution of the rise of metalinguistic awareness to writing has been so far the most established link between literacy and cognitive development, both historically (Havelock, 1963, 1976; Olson, 1994; Ong, 1982; Luria, 1976) and developmentally (Harris, 1989; Olson, 1994; Vygotsky, 1934/1986).

I argue that all the phenomena discussed above can be explained within the semiotic/structural model I have proposed. As I argued earlier,

Figure 31: Literacy as an enabler of verbal awareness.



according to the model presented in Figure 31, the introduction of writing into the child's symbolic universe allows for a semiotic possibility to reflect on the spoken narrative. Pre-literate speaking only affords reflection on concrete reality (left side of Figure 31), but with the introduction of writing, spoken words themselves can become objects of conscious reflection (right side of Figure 31 – the highlighted part of the diagram indicates the semiotic relationship between speaking and writing). I postulate that the child who becomes aware of words also becomes aware of the interpretive nature of verbal signification. And such awareness leads to understanding that one event may be

[108] Of course, and again, it needs to be noted that only a fraction of the studies I discuss above used writing rather than age as the criterion for metalinguistic awareness, which makes some of the claims discussed in this section still somewhat hypothetical.

interpreted in multiple ways (interpretive understanding, puns, ambiguity). In other words, I hypothesize that the medium of literacy structurally enables metalinguistic awareness, and thus sets off a process of progressive decentering away from concrete phenomena, and a progressive elaboration of verbal phenomena themselves, a process that I later relate to operational thinking. I argue that this process culminates at the onset of formal operational or *integration* stage.

5.3.3 Verbal objectivity

Like metalinguistic awareness and verbal introspection, I argue that the rise of verbal objectivity around the onset of the *elaboration* stage is contingent on writing. I use the term *verbal objectivity* to emphasize that it is the words that become objects of reflection, and to differentiate verbal objectivity from concrete object objectivity. To account for the rise of verbal objectivity, in addition to the *structural* explanation, I believe that one has to consider the *perceptual modality*, *externalization,* and especially *persistence* explanations. Unlike speaking, writing is a visual medium that persists through time, thus freezing in a graphic form the previously irreducibly temporal narrative. I suggest that verbal objectivity requires that verbal phenomena (narrative) be viewed in an atemporal manner, and that such an atemporal form of understanding of the narrative stems from the 'freezing' of the spoken words in a graphic form in writing. It is this act of freezing, I argue, that gives the words an aura of permanent meaning. Furthermore, the fact that the words reside outside of the narrator, thus are separated from the author, gives writing an aura of an independent, hence *objective*[109], carrier of

[109] One of the dictionary meanings for *objective* is "external to the mind ... dealing with outward things or exhibiting facts uncoloured by feelings or opinions" (Thompson, 1995).

meaning. What authorlessly resides on the page tends to appear more as a fact than an opinion.

Mirroring the temporal signification in speaking, the thought of preschool children appears to be markedly temporal and transitory in nature, lacking any stable objective quality. This lack of objectivity in preschool children is evident in the arbitrary application of criteria in tasks such as classification, the arbitrary application of rules and moral principles, the predominance of magical thinking, and the lack of visual perspective in drawing. All these phenomena undergo a change at the onset of schooling, and I argue that this change is attributable to the visual, persistent (thus repeatable in a literal form), and external medium of writing.

Children's games before the age of seven do not consistently follow any defined set of rules. According to Piaget and Inhelder (1969), before school "everyone plays the game as he understands it, without much concern for or checking up on what the others are doing" (p. 119). More often than not, "nobody loses and everyone wins at the same time" (Piaget & Inhelder, 1969, p. 119). In contrast, games can be significantly more structured and rule based after the age of seven. In the same way, children's moral rules lack objectivity before school age. According to Piaget and Inhelder (1969),

> the power of orders is initially dependent upon the physical presence of the person who gives them. In his absence the law loses its force and its violation is accompanied only by momentary uneasiness. Later this power becomes permanent and the process of systematic-assimilation occurs which psychoanalysts refer to when they speak of identification with the parental image or with authority figures (p. 124).

Hence school children acquire the capacity to respect rules objectively, and the objective rules begin to take precedence over the situational contingencies. "This structure is *moral realism*, according to which obligations and values are determined by the law or the order itself, independent of intentions and relationships" (Piaget & Inhelder, 1969, p.

125). In other words, "[m]oral realism leads to *objective responsibility*" (Piaget & Inhelder, 1969, p. 126).

A number of moral theories converge to capture the change into an objective morality that occurs at the onset of schooling. Piaget's (1932/1965) stage of *heteronomous morality* or *moral realism*, Kohlberg's (1984) *conventional level* of moral development, or Freud's notion of the *Oedipus complex* all assume the child's adoption of absolute, objective laws of the external moral code. Lacan's (1982) reinterpretation of the Oedipus complex considers the importance of symbolic communication in this transition. Lacan's *Name of the Father* is a symbolic mark that initiates the child to a more mature, independent life. The *Name of the Father*, according to Lacan, comprises the imposition of external symbolic rules upon the child, the imposition of the textual code that serves as an agent of social order. However, Lacan is not clear that the *Name of the Father* is a written signification. I argue that it is the introduction of the persisting, external, and absolute signifying system of writing, which carries and preserves social and moral conventions in a more objective and less context dependent way. I argue that for an oral child, rules appear and disappear just as does the sound of speech, the image of gesture, the impression of touch, or the transitoriness of any concrete action. In writing, the rules stay put, frozen in the graphic characters that signify them, hence acquiring an objective atemporal nature for the child[110].

Another phenomenon that is related to verbal objectivity is the propensity of pre-literate children to use magical explanations. Not unlike oral cultures, preliterate children frequently use magical explanations for certain events they cannot understand, such as

tricks (Amenodola, Kreuchauf, & Evans, 1998; Chandler & Lalonde, 1994). This tendency decreases at the onset of schooling (Amenodola, Kreuchauf, & Evans, 1998; Chandler & Lalonde, 1994), even though for many people it never disappears, as evident in the preponderance of religious thinking and many other magical forms of everyday reasoning. Such a transition into objectivity in children parallels the spurt of objective thought in Greece after the introduction of phonetic writing (Logan, 1986) and later during the Renaissance after the popularization of writing with the invention of the printing press (Einstein, 1979; McLuhan, 1962), events that can be interpreted as supporting the current argument.

This section merely sketched a rationale for a number of potential links to be drawn between literacy and objective thought at the onset of the *elaboration* stage. Empirical studies that consider literacy as an independent variable and the postulated cognitive effects as dependent variables are needed to assess the validity of these claims. As is the case with other phenomena, one would expect that the signs of objective thought do not appear before the child reaches the onset of the *elaboration* stage (something that itself requires clear operationalization).

5.3.4 Verbal abstraction and concrete operations

So far I have argued that metalinguistic awareness, verbal introspection, and verbal objectivity are all very closely related phenomena that are enabled by writing. All these

[110] This of course does not mean that the rules themselves have to be written. As I explained earlier, the transition into literacy has some impact on all levels of the child's symbolic communication and thought. Hence, once the objective consciousness emerges, the rules can be communicated in any medium, certainly in speech.

phenomena emerge in the early stages of writing[111]. Now I argue that the onset of the *elaboration* stage also marks the emergence of a new level of abstract thought, a level that is intermediate between inescapably concrete thought and purely decontextualized thought. This new level of abstraction is manifest in numerous related phenomena that are typically grouped under the rubric of *concrete operations* (Inhelder & Piaget, 1964). These phenomena include, among others, the achievement of the capacity for hierarchical classification, conservation, seriation, negation, and understanding abstract numericals. In this section, I argue that all these phenomena of concrete operations are contingent on writing.

I argue that despite the apparent differences among these cognitive achievements, all phenomena that fall under the rubric of concrete operations require a *consistent application of an abstract principle*. During concrete operations children acquire the ability to abstract physical and logical principles (laws) from the world of concrete phenomena (Inhelder & Piaget, 1958). I argue that such an ability to extract and consistently apply an abstract principle is enabled by writing because writing fosters the emergence of a new cognitive plane of immutable (*persistence* explanation) verbal signification (*structural* explanation). In other words, elaborating on Olson's (1994) *model theory of literacy*, I postulate that persistent written words serve as models for an application of immutable, abstract cognitive categories to concrete reality during concrete operations. I argue that Inhelder and Piaget's (1964) findings showing inconsistencies in preoperational children's application of criteria in solving tasks stems from the lack of verbal objectivity during pre-literacy. Such inconsistencies, I argue,

[111] Again, the reader has to be reminded that the direct evidence attributing writing, rather than age or schooling, to the rise of these verbal phenomena is scarce. Hence, the present claims remain to a large degree hypothetical.

mirrors the dynamic nature of spoken signification that dominates child's symbolic thought at the preschool age. In other words, the achievement of the new level of abstraction during concrete operations is closely related to metalinguistic awareness and verbal objectivity.

The concrete operational (or *elaboration*) stage is intermediate between the pre-operational and the formal operational (or *integration*) stage. During concrete operations, the child gradually learns how to abstract physical and logical principles from concrete experience, but this process occurs in a gradual manner (Inhelder & Piaget, 1958).

> [C]oncrete thought has the limiting characteristic that it cannot be immediately generalized to all physical properties. Instead, it proceeds from one factor to another, sometimes with a time lag of several years between the organization of one (for example, length) and the next (for example, weight) (Inhelder & Piaget, 1958, p. 249).

Moreover, the child's abstract thought still has not achieved a level that is independent from the concrete, as shown in the fact that

> it is often sufficient to translate a concrete operation into simple propositions and deny the subject the use of manipulatable objects for working out the operation in question for the problem to become insoluble (Inhelder & Piaget, 1958, p. 252).

Hence the task of concrete operational stage is to gradually abstract and coordinate, or integrate, various laws and principles that govern the physical and the logical world.

I propose a hypothesis that this process of integration and coordination of abstract principles runs parallel to the gradual differentiation of a purely verbal cognitive operation from the concrete context enabled by writing, and that it is enabled by the structure of written signification. As the decontextualized verbal signification gradually gains independence from the concrete, a general cognitive level of abstract signification, with coordinated reversible abstract thought, emerges at the end of the *elaboration* phase. This is not to deny that concrete action with physical reality is a necessary precursor of

decontextualized thought; of course it is, as clearly shown by Inhelder and Piaget (1958, 1964). It is only to postulate that without writing the operations would remain tied to the level of the concrete. Hence, in the next section, I argue that what is referred to as *formal operational* thought (Inhelder & Piaget, 1958) is enabled by the differentiation and integration of the semiotic structure of literacy, an achievement that marks a certain level of mastery of literacy. I thus reinterpret the rise of operational thinking in light of the literacy hypothesis, something that, as far as I am aware, has not been attempted before. As I have argued throughout this thesis in the context of other areas, I argue that *literacy is an enabling and necessary factor for the emergence of operational thought.* I argue that the emergence of concrete operations parallels in its structure the achievement of metalinguistic awareness and related verbal phenomena, whereas formal operations are predicated on the capacity for decontextualized abstract thought.

Given the striking parallels between the properties of writing and the nature of concrete and formal operational thought, it is a great surprise that no one, including the literacy theorists, has ever undertaken a reinterpretation of Piaget's operational stages in light of the literacy hypothesis. This failure to even examine the possibility that literacy is an enabling and necessary factor in the emergence of operational thought might be a result of medium blindness (McLuhan, 1964), of the fact that such an explanation appears too obvious and too simple, or the result of psychologists' tendencies to search for answers regarding psychological phenomena within the internal cognitive organization and to neglect the examination of the external conditions in which the child is actively immersed.

Of course, whether the present attempt at shedding a new light on operational thought will bear fruit remains an open empirical question at this point[112], but if the medium claims proposed here turn out to be correct, the medium framework could provide a parsimonious account for a large amount of variance attributable to these major cognitive transitions. In the least, medium analysis could greatly enrich and complement the existing internalist accounts[113]. Hence, I argue that the claims I propose here are potentially too important to be left unexamined by developmental psychologists. Below, I discuss in more detail some the phenomena related to concrete operational thought.

5.3.4.1 Hierarchical classification

The ability to classify emerges early and takes on different forms. The emergence of speaking significantly influences the child's capacity to classify, as words inherently group objects, states, and phenomena. Nouns and adjectives ascribe objects to categories, verbs classify actions and states, adjectives classify qualities, etc. Language plays a central role in classifying objects, qualities, or events (Vygotsky, 1934/1986). Yet, preschool children, while actively classifying information, have no explicit awareness of the role words themselves play in classification, because they lack the

[112] Essentially, any correlational developmental study that attempts to address this question needs to consider differential effects of 1) literacy levels, 2) age, and 3) other aspects of schooling (as the independent variables) on the development of concrete and formal operational thought (as the dependent variables). Of special interest here, of course, will be early and late readers. Experimentally, the effects of literacy can be studied by assigning children into more and less intense literacy training programs, and measuring their performance on other criteria related to the operational thought.

[113] To be sure, I am not arguing against the search for answers to cognitive growth within internal organization. Of course, humans are immensely complex self-organizing systems, and the internal laws of self-organization are indispensable in the understanding of the process of cognitive growth. At the same time, self-organization only occurs within ongoing active interaction of children with their environment, including the symbolic environment. And the parameters of that environment have great impact on the child's internal organization. Hence, I argue for the inclusion of the examination of the external parameters of symbolic process in the study of cognitive growth.

capacity for metalinguistic reflection that I argued is itself enabled by writing. This structural limitation does not allow preschool children to classify information hierarchically.

Piaget and Inhelder (1969) demonstrated that preschool children's understanding of different layers of hierarchical classification was very limited. In their classic class inclusion experiment they demonstrated that preschool children became easily mistaken when asked to operate on different levels of hierarchical classification. For example, when shown ten cows and five horses and asked whether there were more cows or animals, preschool children typically stated that there were more cows, thus comparing two exclusive classes rather than, as instructed, the higher and lower classificatory levels. In a similar manner, Deneault, Ricard, and Morin (2000), demonstrated that children before the age of seven failed when required to make hierarchical inferences. And as I discussed earlier, Vygotsky (1934/1986) demonstrated that preschool children think in complexes that are inescapably tied to concrete reality.

> The principal function of complexes is to establish bonds and relations. Complex thinking begins the unification of scattered impressions; by organizing discrete elements of experience into groups, it creates a basis for later generalizations. But the advanced concept presupposes more than unification. To form such a concept it is also necessary *to abstract, to single out* elements, and to view the abstracted elements apart from the totality of the concrete experience in which they are embedded (Vygotsky, 1934/1986, p. 134).

According to Chapman (1999), preschool children implicitly assume that different class names refer to mutually exclusive classes of objects, and thus children have difficulties comparing different levels of hierarchy. Carpendale, McBride, and Chapman (1996) elaborate this point.

> Real operations are carried out in space and time, and the operations involved in collecting hierarchically related classes tend to negate each other with respect to their respective spatio-temporal outcomes [, ... so

> that] collecting the horses into a heap would destroy the special unity of a previously collected heap of animals, and conversely, collecting all the animals together would destroy the special distinctness of a previously collected heap of horses (p. 398).

School age children become much better at hierarchical classification. "The understanding of the relative sizes of an included class to the entire class is achieved at about eight and marks the achievement of a genuine operatory classification" (Piaget & Inhelder, 1969, p. 103). Using the *blocks and non-sense word* design I described earlier, Vygotsky (1934/1986) demonstrated that school children show first signs of consistent application of abstract classificatory principles, as they begin grouping blocks according to one abstract principle that they decide to give preferential treatment.

Regarding the timing of the onset of the ability for hierarchical classification, it appears that it occurs very early during the *elaboration* stage. Even though Inhelder and Piaget (1964) initially found that class inclusion is mastered on average around the age of eight, indicating a delay in relation to the onset of reading and writing, Chapman (1999) (who modified the class inclusion experiment by introducing a precondition in which children were asked first to compare objects at the same level of hierarchy - more cows or horses – and then asked the hierarchical comparison question), found that most seven year old children scored almost perfectly on hierarchical comparison.

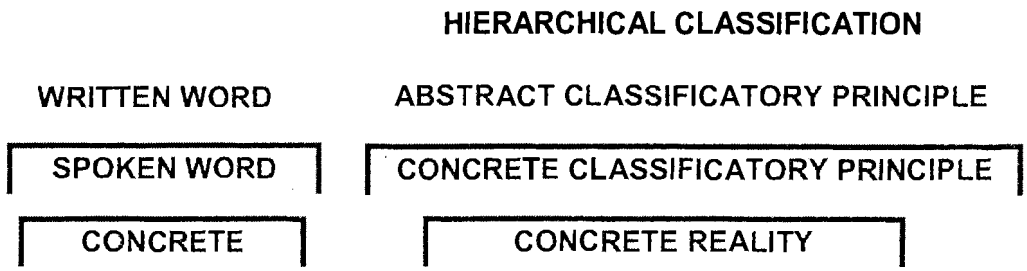
Vygotsky (1934/1986) further demonstrated that the new capacity for abstraction is a result of the application of words themselves as categories. "The decisive role in this process [hierarchical classification], as our experiments have shown, is played by the word, deliberately used to direct all the subprocesses of advanced concept formation" (Vygotsky, 1934/1986, p. 139). Vygotsky (1934/1986) concluded that "the very difference between the complex and the concept lies in the different functional uses of the word" (p.

139), even though he did not explicitly tie the achievement of abstract classification to writing.

I argue that the new capacity for hierarchical classification during the *elaboration* stage is closely related to the emergence of metalinguistic awareness and verbal objectivity, and that it should be viewed through the lens of the current semiotic/medium framework and thus attributed to writing. First, I work with Vygotsky's (1934/1986) assumption that classification is a verbal operation, i.e., that it is words that serve as classificatory principles. In order to compare nested classes, one needs to *simultaneously* consider two or more abstract overlapping classificatory principles, and I assume that such comparison can be successfully accomplished only when classificatory principles become objectified, or symbolically 'frozen'. Before writing, children are capable of using words, but spoken words function in a real-time, fluid context, and thus, I argue do not foster the cognitive freezing of categories, which I argue is required for a systematic comparison among classes of objects or events that are nested in each other.

In other words, pre-operational classification is perceptually based and unable to escape the constraints of the uni-perspectival perceptual experience. In contrast, writing codifies spoken words and hence provides an awareness of verbal categories themselves (metalinguistic awareness), at the same time 'freezing' different levels of classification (verbal objectivity), thus allowing a cross-temporal, cross-level

Figure 32: Writing as an enabler of abstract hierarchical classification.



comparison of categories. Not only does the child now become aware of the classificatory categories (*structural* explanation), but the categories also acquire an aura of objectivity (*persistence* explanation). As a result of this new awareness of objective categories, the child acquires a capacity for a consistent application of multiple classificatory principles. In other words, as portrayed in Figure 32, I propose a hypothesis that speaking allows for concrete classification, whereas writing enables abstract classification.

5.3.4.2 Seriation

The capacity for *seriation* or *ordering* is closely related to classification in that it requires a consistent application of an ordering principle. Hence, my argument regarding hierarchical classification above can be applied to the explanation of the emergence of the capacity for seriation.

The emergence of the ability for seriation occurs around the onset of school age (Inhelder & Piaget, 1964). Seriation "consists in arranging elements according to increasing or decreasing size" (Piaget & Inhelder, 1969, p. 87), and it requires a *consistent* application of one abstract principle. Such consistency is lacking in preschool children. Younger children do arrange things according to a criterion (e.g., by size), but they tend to lose track of the criterion and revert to a different strategy. In contrast, at the

operatory level, seriation is executed in a systematic, consistent manner. As I argued above, the consistency in the application of one principle is enabled by the child's awareness of the ordering principle (which is a word or a phrase), and the child's understanding of the ordering principle as persistent.

It is important to note that during the *elaboration* phase, the structure of verbal signification has just emerged, and it will take time before it becomes sufficiently elaborated to create a symbolic level entirely independent from the concrete. For the early school child, speaking is an already strongly established mode, inescapably tied to concrete reality. Hence, the classification and seriation of the early school child, while gradually establishing itself as functioning in a potentially decontextualized verbal conceptual space, is still bound to concrete reality. Early school children do not yet classify or order concepts or categories themselves, but only concrete objects and actions (Inhelder & Piaget, 1964; Vygotsky, 1934/1986). The newly emergent world of abstract (verbal) thought is an unfamiliar phenomenon for the child, and I argue that it takes some practice with the medium of writing and its corresponding conceptual potentialities for the child to achieve an independent level of verbal decontextualized abstraction and a corresponding ability to classify and order concepts themselves (which seem to occur at the onset of the *integration* phase). Inhelder and Piaget (1964) reported a number of classification and seriation studies that showed that the ability to classify objects hierarchically emerges around the onset of school age and becomes progressively more refined until the age of eleven to twelve, when it typically becomes mastered. Similarly, Sigel (1953) showed that seven year olds were capable of classifying objects according to some abstract category, but that they still predominantly used perceptual classification. The level of abstract classification thus appears to

steadily increase until the age of eleven, at which age children become fairly good at disregarding the physical similarities of objects in favour of more abstract classifications and seriation.

5.3.4.3 Conservation

Another related achievement of concrete operations is the capacity for conservation. Conservation requires an understanding that despite apparent changes, nothing in nature disappears but rather is transformed into some other form. As Piaget puts it, "in the act of melting, the grains of sugar become very small and invisible" (Piaget & Inhelder, 1969, p. 112). Hence, conservation again requires a superimposition of a consistent abstract concept on the mutable perceptual world.

Conservation emerges gradually during the *elaboration* or concrete operational stage. By the age of seven, children acquire the ability for conservation of number (the quantity of objects remains the same when the objects are rearranged, such as for instance spread out), length (length of objects remains the same when the objects are placed in a different relationship to each other), and liquid volume (changing the shape of the container does not change the amount of liquid). By the age of eight, children achieve the ability to conserve substance (a change in shape does not change the mass of the substance). Finally, by the age of ten, children learn the conservation of area (objects clustered together take up as much area as objects that are spread). The achievement of conservation also involves understanding of *reversibility* (when the water is poured back into the same container or clay moulded back into the same shape, they will be exactly the same) (Piaget & Inhelder, 1969).

I argue that the capacity for conservation is predicated on the same ability to consistently apply abstract (i.e. verbal) concepts. Such concepts, I propose, are born

within written signification that has an objective, 'frozen' quality. Written words persist through time despite the physical changes in the temporal universe, just as conserved abstract principles persist in spite of the apparent perceptual changes in the objects in question. In other words, I argue, conservation, like the written characters, removes time from the conceptual space. The substance changes phenomenologically, but the persistence of abstract significations of the physical laws allows for a simultaneous grasp of the transformative nature of physical phenomena and the invariant nature of abstract laws inherent in the physical world. In other words, I suggest that the capacity for conservation relies on forming an invariant representation of abstract physical properties of objects, a representation that persists despite the changes in appearance. I argue that such invariant static representation is a verbal operation that emerges on the cognitive level enabled by writing. Note that just as it is the case with classification and seriation, conservation during the *elaboration* stage does not acquire a decontextualized character, as it applies only to concrete physical reality. I argue that it is not until the *integration* phase that children become capable of conserving concepts themselves (e.g., time, space, etc.).

5.3.4.4 Piaget on concrete operations

The term *concrete operations* has been coined by Piaget (Inhelder & Piaget, 1958, 1964), who explains the rise of concrete operations in terms of the *interiorization of action.* The achievement of concrete operations marks an ability to internally perform cognitive operations that would otherwise have to be carried out physically on real objects. Furthermore, the interiorization of action subjects the previously concrete manipulations of objects to a more rigorous set of cognitive logical operations. According to Piaget, "at the preoperatory levels the reactions are centred on perceptual or

imagined configurations, while at the operatory levels the reactions are based on identity or reversibility by inversion or reciprocity" (Piaget & Inhelder, 1969, p. 99). According to Piaget and Inhelder's (1969) logic, the internalization happens because, in the process of repetition, actions become gradually shortened, until they eventually can be imagined rather than performed physically. In other words, with practice actions become progressively more automatic, until the child acquires the ability to perform them internally as cognitive operations.

I suggest that the main problem with Piaget's logic of the internalization of action through repetition is that it neglects or minimizes semiotic considerations. Piaget himself recognizes that language plays a very important role in operational thought, especially with regards to formal operations (Piaget & Inhelder, 1969)[114]. However, he ultimately resorts to a more abstract cognitive explanation for the rise of operational thought, and treats language as an accelerating factor. "Language may increase the powers of thought in range and rapidity, but it is controversial whether logico-mathematical structures are themselves essentially linguistic or non-linguistic in nature" (Piaget & Inhelder, 1969, p. 86).

> [L]anguage does not constitute the source of logic but is, on the contrary, structured by it. The roots of logic are to be sought in the general coordination of actions (including verbal behavior), beginning with the sensori-motor level, whose schemes are of fundamental importance. This schematism continues thereafter to develop and to structure thought, even verbal thought, in terms of the progress of actions, until the formation of the logico-mathematical operations (Piaget & Inhelder, 1969, p. 90).

[114] My entire argument regarding the reinterpretation of concrete operations in light of the literacy hypothesis relies on the assumption that it is words themselves that serve the function of classificatory, ordering, or conservatory principles (Vygotsky, 1934/1986). Contemporary Piagetian theorists (e.g., Carpendale et al., 1996) pay significant attention to the role language plays in operational thought. For instance, in their attempts to explain concrete operational thought, Carpendale et al. (1996) elaborate Chapman's earlier 'operational semantic theory' that integrates insights from Piaget and Wittgenstein, stressing the importance of explicit verifiable public criteria or rules that guide potential operations that can be carried out.

Piaget thus stresses the continuity in the development of thought and neglects to examine the emergent properties that communicative modes afford. I argue that, failing to distinguish between spoken and written signification, he is bound to give language a secondary role in the emergent of operational thought. Neglecting the role of written language, Piaget's concept of interiorization provides no specific mechanism by which the interiorization of symbolic action occurs. In contrast, I believe that the present structural framework has the capacity to provide a clear, testable hypothesis regarding the enabling conditions of operational thought. This is not to deny that literacy itself has a developmental history and is contingent on numerous developmental achievements, the examination of which is beyond the scope of this thesis. Nor is it to claim that literacy would create operational thought on its own. It is merely to claim that the introduction of literacy, itself contingent, is a necessary factor in the emergence of operational thought.

According to the semiotic model I am proposing, previous symbolic operations that have to be actually performed (e.g. concrete categorization in speaking) can be internalised when a new symbolic mode capable of reflecting on these operations (writing) becomes available. In other words, I argue that the use of writing enables a reflection on speaking and hence internalization of the abstract modes of classification, seriation, and conservation. Preliterate children use spoken words but are not conscious of words. For them, "[n]ames are attached physically to things" (Piaget & Inhelder, 1969, p. 100). In contrast, the very engagement in literate practices requires that children become aware of spoken language as an object of reflection. As a result of this discovery that words have a universe of their own, children gradually acquire the ability to substitute verbal action for concrete action on objects.

5.4 Integration of structure

The age of eleven or twelve brings about another major transition in the child's cognitive functioning, a period that is typically referred to as *formal operations* (Inhelder & Piaget, 1958). Essentially, all the achievements of formal operational thought, or what I refer to as the *integration of structure* stage, are essentially predicated on the teenager's ability to think on a purely abstract level, independently from concrete examples, an ability for what I call *decontextualized thought*. As should be evident by now, in this section, I argue that decontextualized thought is enabled by a certain level of mastery of phonetic writing. I hypothesize that during the integration phase, the purely verbal operation enabled by writing becomes sufficiently differentiated to achieve its independent capacity to function at a conceptual level free from concrete reality, an achievement that marks the integration of the entire layered semiotic structure of spoken and written signification.

It needs to be noted that the two previous stages of literacy have specific criteria that define their onset. Children's recognition that written words are not emblems for things but codify spoken words marks the onset of the *recognition* stage, whereas the spurt in reading and writing first words and sentences marks the onset of the *elaboration* phase. In contrast, defining a specific literacy criterion that marks the onset of the *integration* stage is less straightforward. It is possible that a closer examination of the literacy skills at this age might reveal that some level of the mastery of text marks the transition to the *integration* stage. Or it is possible that formal operations are brought about by gradual differentiation of the verbal semiotic structure enabled at the onset of reading and writing during the elaboration phase. In the latter case no additional specific criterion would be required to explain the emergence of formal thought. Instead, formal

thought would be then conceptualised as one of the progressive achievements of literacy. Both of these positions regarding the criterion marking the onset of different literacy stages are consistent with my present argument, but at this point, I do not know of evidence that would allow me to argue for either of these positions.

Faced with the lack of such a criterion at this point, I simply postulate that it takes time to master a new symbolic medium, and that the stage of concrete operations is a period of gradual mastery of the potential for decontextualized thought inherent in phonetic writing. In the previous section I have reviewed research that suggests that during concrete operations there already exists an abstract level, but this level can only function on concrete examples (Inhelder & Piaget, 1958, 1964; Vygotsky, 1934/1986). For early school age children, writing is thus still constrained by the concrete in the same way speaking is. It appears that on average it takes five to six years to reach the level of formal operations (Inhelder & Piaget, 1958), and I argue that this is accomplished via the differentiation of the purely verbal semiotic structure enabled by writing. Even though there are clear complications in drawing parallels between cultural and individual history[115], I believe it is worth noting that a delay in the emergence of abstract thought also occurred historically. For example, metalinguistic awareness emerged in Greece briefly after the introduction of literacy, whereas it took the Greeks several hundred years of being phonetically literate before Plato pronounced the reign of purely abstract forms and Aristotle elaborated a system of propositional logic (Havelock, 1963, 1976).

Another important preliminary note is that, unlike concrete operations, there is a great variation in the age of onset of formal operational thought. Nor does

[115] As I mentioned before, the main difference between the emergence of cultural and individual forms is that children already live in a world that is deeply structured by the symbolic systems, even prior to them using those systems themselves.

decontextualized thought develop universally, and there is a significant cultural variation in the rates of formal thinking (Piaget, 1972). Furthermore, even when decontextualized thought is present, much of human thinking still operates on a pre-formal level, and there are great individual differences in the use of formal thought (Piaget, 1972). It would make for an interesting study to attempt to attribute these variations themselves to the level of the mastery of literacy. However, one also needs to remember that everyday reasoning and dealing with concrete situations and relationships does not require much formal thought[116]. Complexity, ambiguity, power relations, and contradictions inherent in emotional and interpersonal life may frequently be more efficiently dealt with by allowing the laws of logic to be put to rest. Experiential nuances of the premises do matter in everyday communication. In these situations, often a good story will do. Interestingly, the ability to solve problems involving formal or theoretical reasoning does not correlate very well with the ability to solve typically more complex and less rule-bound, everyday practical reasoning problems (Wagner & Stenberg, 1986). Thus, formal thought might be used more by people in specialized fields that require such thinking, such as for instance in the academy. In other words, it appears that formal thought, while it clearly marks a certain cognitive advancement over concrete thinking (Piaget, 1955), is not necessarily a superior mode of discourse in all situations, and in certain contexts one would expect that little formal thought is required.

[116] Chapman (1993) discusses the common logical errors that both children and adults make (e.g., affirming the consequent), postulating that these mistakes are embedded in the structure of everyday discourse. For example, given the premises "If it rains, the grass will be wet" and "The grass is wet," many children and some adults will draw the conclusion that "It must have rained," a conclusion that is wrong from the point of view of formal logic. However, the convention of everyday discourse, Chapman explains, would require a mention of other potential antecedents. If not mentioned, other causes of wetness would be assumed irrelevant. When children were given additional information in the above task, they no longer committed the logical 'fallacy'. In a similar way, Politzer (1986) argues that most common logical errors can be explained by the conflict of syntactic rules of logic and pragmatic rules of everyday discourse.

5.4.1 Decontextualized thought

I have argued so far that during concrete operations, through her active engagement in among other things writing, the child learns to extract abstract principles that govern the physical and logical world, and progressively applies those principles to problem solving. However, during concrete operations these abstract principles can only be applied to concrete objects and events (Inhelder & Piaget, 1958). With concrete operational reasoning, the child shows great difficulties applying her abstract, logical abilities to abstract concepts themselves. "The operations ... are called 'concrete' because they relate directly to objects and not yet to verbally stated hypotheses" (Piaget & Inhelder, 1969, p. 100).

> The concrete operations relate directly to objects and to groups of objects (classes), to the relations between objects and to the counting of them. Thus the logical organization of judgments and arguments is inseparable from their content. That is, the operations function only with reference to observations or representations regarded as true, and not on the basis of mere hypothesis (Piaget & Inhelder, 1969, p. 132).

Moreover, during concrete operations, the abstract variables governing the functioning of the physical and logical world are not yet coordinated among each other (Inhelder & Piaget, 1958). The pre-formal child frequently applies multiple rules in a contradictory manner (Inhelder & Piaget, 1958).

In contrast, at the stage of formal operations the child acquires a capacity to think outside the concrete context, and she is capable of a non-contradictory application of the principles of logic and physics. Inhelder and Piaget (1958) studied the emergence of formal operations in numerous conceptual areas (e.g., equality of angle, floating bodies, pendulum swing, inclined plane, projection of shadows, motion, centrifugal force, balance, gravity, probabilities, correlations) to derive general epistemic principles that govern the emergence of logical thought. They concluded that

> propositional logic is always bound up with a combinatorial system based on the 'structured whole' as opposed to simple class inclusions that make up the 'groupings' of classes and relations of concrete logic (Inhelder & Piaget, 1958).

Such a system is based on an equilibrated combination of all the known factors among themselves in terms of all the possible links, and it allows for *reversibility*[117], that is the realization that any transformation can, at least logically, be returned to its original state by means of either *inversion* or *reciprocity* (Inhelder & Piaget, 1958).

> The liberation of the formal mechanisms from content leads the child to free himself from the step-by-step groupings and to try to combine inversions and reciprocities (Piaget & Inhelder, 1969, p. 138).

> Whereas formal structures bring together both inversions and reciprocities in a single system of transformations ... concrete structures or 'groupings' of classes and relationships derive from either inversion (classes) or reciprocity (relations), but entail no general synthesis of the two forms of reversibility (Inhelder & Piaget, 1958).

The adolescent thus synthesizes inversions and reciprocities to arrive at what Inhelder and Piaget (1958) call the "structured whole" (p. 274). Such a simultaneous consideration of logical and physical principles allows the adolescent to arrive at non-contradictory logical solutions (Inhelder & Piaget, 1958). This marks a significant advancement in terms of the evolution of thought because "propositional logic offers a much greater number of operational possibilities than simple groupings of classes and relations" (Inhelder & Piaget, 1958, p. 253). This is the case because of the multiplicative effect of coordinated operations. Inhelder and Piaget (1958) point out that "the real power of propositional logic lies ... in the combinatorial power which makes it possible for reality to be fed into the set of possible hypotheses" (p. 253).

[117] Inhelder and Piaget (1958) defines *reversibility* "as the permanent possibility of returning to the starting point of the operation in question. From a structural standpoint, it can appear in either of two distinct and complementary forms. First, one can return to the starting point by cancelling an operation which has already been performed – i.e., by inversion or negation. ... Secondly, one can return to the starting point by compensating a difference (in the logical sense of the term) – i.e., by *reciprocity*" (p. 272-273).

Inhelder and Piaget (1958) thus argue that one of the marks of formal thought is the reversal of the primacy of object-centered thought, to the primacy of idea-centered thought. While the concrete operational child relies on the direct or imaginary manipulation of objects, the formal operational adolescent starts with manipulation of ideas according to logical rules and the knowledge of the physical world, and he can then subject the derived hypotheses to concrete, empirical testing. Thus the adolescent's thought is freed from the constraint of immediate reality.

> There is no doubt that the most distinctive feature of formal thought stems from the role played by statements about possibility relative to statements about empirical validity (Inhelder & Piaget, 1958, p. 245).

The pre-formal child gradually moves towards the acquisition of an autonomous system of logical thought, but remains bound by the experiential world: "concrete operational thought is characterised by the extension of the *actual* in the direction of the *potential*" (Inhelder & Piaget, 1958, p. 248). With the achievement of coordinated logical structure, the formal child can assimilate the reality to her own hypothetical ideas derived from her coordinated logical system (Inhelder & Piaget, 1958): "Possibility no longer appears merely as an extension of an empirical situation or of actions actually performed. Instead, it is *reality* that is now secondary to *possibility*" (Inhelder & Piaget, 1958, p. 251). "The most distinctive property of formal thought is this reversal of direction between *reality* and *possibility*" (Inhelder & Piaget, 1958, p. 251). Propositional logic relies on "combining propositions from the point of view only of their being true or false" (Piaget & Inhelder, 1969, p. 135), and it enables the information to be "analyzed by means of the new propositional operations rather than by trial and error" (Piaget & Inhelder, 1969, p. 139).

During formal operations thus "the subject succeeds in freeing himself from the concrete and in locating reality within a group of possible transformations" (Piaget & Inhelder, 1969, p. 130). The adolescent "becomes capable of drawing the necessary conclusions from truths which are merely possible, which constitutes the beginning of hypothetico-deductive or formal thought" (Piaget & Inhelder, 1969, p. 132). This new cognitive ability "depends upon a transformation of thought that permits the handling of hypotheses and reasoning with regard to propositions removed from the concrete and present observation" (Piaget & Inhelder, 1969, pp. 130-131).

> The first result of this 'disconnection' of thought from objects is to liberate relations and classifications from their concrete or intuitive ties. Up to now both were bound by the essentially concrete condition of a step-by-step progression based on graduated resemblances. ... With the liberation of form and content, however, it becomes possible to establish any relations or classes. ... [The child can then] reason about a given reality ... by considering this reality no longer in its limited and concrete aspects but in terms of some or all of the possible combinations. This considerably reinforces the deductive powers of intelligence (Piaget & Inhelder, 1969, pp. 132-133).

All these quotations indicate that essentially all achievements of formal operational thought are predicated on the ability to *manipulate concepts or propositions themselves*, independently from the concrete reality these concepts or propositions might signify. I suggest that this capacity for what I have called *decontextualized thought* is the most distinct aspect of formal thought. This ability applies to both mathematical and verbal thought. In terms of mathematics, teenagers no longer have to count on fingers or imagine concrete objects when performing mathematical operations, but instead are able to cognitively manipulate the numbers themselves (Inhelder & Piaget, 1958). In terms of logic, they acquire the ability to *operate on operations themselves*, that is the ability for context independent propositional thought (Inhelder & Piaget, 1958). Freed from the inherently ambiguous perceptual reality that I argue tends to interfere with the

application of logical operations, teenagers become capable of consistent application of logical rules[118] regardless of whether the premises or concepts they work with have existential validity or not. The application of the principles of logic allows teenagers to engage in hypothetical thinking, an ability to speculate conceptually on abstract events that might or might not have existential validity (Inhelder & Piaget, 1958). In a similar manner, teenagers become capable of hierarchically classifying concepts themselves, not just concrete objects as was the case during concrete operations (Inhelder & Piaget, 1958). Finally, teenagehood is "the age of great ideals and of the beginning of theories" (Piaget & Inhelder, 1969, p. 130), which brings about "the spontaneous development of experimental spirit, which is impossible to establish at the level of concrete operations" (Piaget & Inhelder, 1969, p. 145).

Piaget's four schemes marking the achieving of formal operations show how the consistent application of the laws of logic and mathematics affects the teenager's ability to understand the invariant laws inherent in concrete reality. These four schemes are 1) proportion (e.g., "the value of a function can be modified in the same direction either by adding to the numerator or subtracting from the denominator"), 2) double system of reference (e.g., "if I perceive something moving it can still remain motionless in relation to another object that moves with it"), 3) hydrostatic equilibrium (i.e., "weight of liquid acts in the opposite direction to the weight of a piston, as a reaction opposed to its action"), and 4) the notion of probability (Piaget & Inhelder, 1969, pp. 141-144).

[118] The most common logical operations are conjunction (both A and B matter), disjunction (it's either A or B), implication (if A then B must follow), and incompatibility (if A then B cannot follow).

5.4.2 Decontextualized thought and writing

I argue that the ability to achieve the reversible, coordinated, non-contradictory system of logical thought is predicated on a certain level of decontextualization of verbal reasoning, in other words, on cognitive distantiation from the world of concrete experience, which I argue is itself contingent on a level of mastery of writing. Piaget and Vygotsky did not attribute formal operations directly to writing, but they did talk about the crucial role language plays in the formation of formal thought.

Even though Piaget never reduces formal thought to language, he does recognize that formal thinking is closely linked with intrapropositional operations, and that formal thought consists of a cognitive move away from concrete reality into the conceptual propositional verbal world.

> The propositional operations are naturally much more closely related than the 'concrete' operations to a precise and flexible manipulation of language, for in order to manipulate propositions and hypothesis, one must be able to combine them verbally (Piaget & Inhelder, 1969, p. 145).

"When verbal statements are substituted for objects, a new type of thinking – propositional logical – is imposed on the logic of classes and relations relevant to these objects" (Inhelder & Piaget, 1958, p. 253). Combining numerous areas of empirical investigation, Inhelder and Piaget (1958) draw a close parallel between the formal logical structure and language, noting

> the close correlation that exists between the mode of organization or the over-all structure of the combinatorial operations on the one hand and those of formal or interpropositional operations on the other. At the same time that the subject combines the elements or factors given in the experimental context, he also combines the propositional statements which express the result of these combinations of facts and in this way mentally organizes the system of binary operations consisting in conjunctions, disjunctions, exclusions, etc. But the coincident is not surprising when we realize that the two phenomena are essentially identical. In other words, the system of propositional operations is in fact a combinatorial system (p. 122).

However, as I already discussed in the section on concrete operations, Inhelder and Piaget (1958) adopt an abstract view ascribing both the emergence of language and of formal thought to abstract cognitive patterns that develop from progressive elaboration of action that accommodates to the nature of physical and logical reality. In other words, for Piaget, the development of formal thought appears to be a progressive step in the child's development of the knowledge of the world, a progressive accommodation to reality. And one has to agree that a coordinated system of logic serves well to understand physical reality. But I believe that once speaking and writing are distinguished as different media and the consequences of writing adequately analysed, Piaget's view can be elaborated to itself accommodate to a new variable – literacy – which enables operational thought.

Vygotsky elaborates Piaget's description of the role language plays in formal thought, seemingly giving language itself more importance with regards to the rise of formal thought. Vygotsky's treatment of language operates within parameters very similar to the present structural framework. "In operating with spontaneous concepts, the child is not conscious of them because his attention is always centered on the object to which the concept refers, never on the act of thought itself" (Vygotsky, 1934/1986, p. 171). "In the scientific concepts ..., the relation to an object is mediated from the start by some other concept" (Vygotsky, 1934/1986, p. 172)[119]. Vygotsky (1934/1986) demonstrates that during the early school years, there occurs a gradual increase in children's capacity for propositional thinking. The attainment of scientific concepts begins with the reliance on verbal definition and only later comes down to the signification of concrete phenomena. "The difficulty with scientific concepts lies in their *verbalism*, i.e. in

their excessive abstractness and detachment from reality" (Vygotsky, 1934/1986, p. 148). In contrast, spontaneous concepts proceed from concrete examples to abstract principles. Hence, the elaboration of the abstract symbolic structure has two simultaneous movements. Inductively, progressively more abstract patterns are extracted from concrete reality, and, deductively, the purely abstract concepts are superimposed on reality by the transmission of the already established cultural ways of decontextualized understanding[120].

From the point to view of the present literacy hypothesis, during concrete operations, children are not yet fluent enough with writing to use it as an independent verbal medium. I argue that regarding the bottom-up, inductive elaboration of structure, in order to understand writing, children treat written words concretely the way they treat spoken words. Thus, during concrete operations, the child still relies on the well-mastered medium of speech, with its inherent feature of concrete significations to understand writing. In other words, I propose that children at this stage have to turn the text into verbal utterance in order to understand it. Reading aloud is very common at this stage of literacy, but the sounding out of text is unnecessary later, when the operations become purely verbal and decontextualized. I suggest that one task of the concrete operational stage is thus to gradually deduce abstract patterns from concrete reality[121].

[119] Note the similarities between these statements and the structural literacy framework presented in Figure 33 below.

[120] Vygotsky (1934/1986) explains that the attainment of abstraction is aided by systematic instruction, and the school is the institution that serves the function of the executor of formal instruction. Essentially, one can consider that the major task of elementary education is the mastery of formal thought.

[121] It would be expected from the point of view of a medium framework that the gradual mastery and integration of writing into symbolic thought also, to some extent, simultaneously affects other symbolic modes. Hence, with the mastery of formal thought, the child becomes capable of performing purely abstract operations using speech, even though, as one can test for oneself, it is easier to solve complex abstract problems using the page.

At the same time, in terms of the top-down, deductive elaboration of structure, formal instruction gradually engrains in children definitional, i.e., verbal, understanding of concepts. These concepts are at first more reliant on the rote learning of verbal definitions, and are not yet integrated with the concrete examples they represent. In Vygotsky's (1934/1986) words, "almost all empirical content of the concept 'brother' is already assimilated by the child. The concept of 'Archimedean law,' on the contrary, does not evoke such a repercussion in the child's own experience" (p. 158). At the onset of the integration stage, teenagers seem to acquire the ability to regress these abstract concepts to concrete reality (e.g., generate examples from an abstract law). Hence, in addition of deducing the abstract from the concrete, the simultaneous task of the concrete operational stage would be to gradually superimpose abstract logical verbal structures on concrete reality.

During concrete operations, elaboration of abstract thought continues gradually until adolescence, both in terms of top-down superimposition and bottom-up deduction, when I argue that the integration of writing into the symbolic structure is achieved. I suggest that this three-layered structure of signification, contingent on writing, is mastered around the time of formal operations.

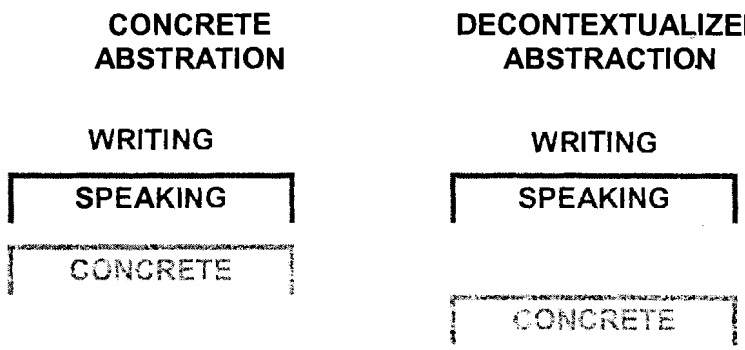
> At about the fourth grade, verbalism gives way to concretization, which in turn favourably influences the development of spontaneous concepts. Both forms of reasoning reach, at that moment, approximately the same level (Vygotsky 1934/1986, p. 149).

This means that the child can now both speak in abstract ways about the patterns inherent in concrete reality, and apply decontextualized concepts top-down to concrete reality. One result of this *integration* stage is that the ability of verbal signification emerges as a potentially independent semiotic function.

Learning to read and write entails a making of associations between the auditory code of spoken language and the visual code of writing. I argue that the emergence of the semiotic verbal structure is the result of this translation from the auditory to the visual verbal code. As I have argued throughout this thesis, I propose that it is the fact that writing codifies spoken words, something that is unique in terms of signifying systems, that allows for the emergence of purely verbal semiotic structure, which enables decontextualized thought. Because of its structural properties, writing, with its many forms that I do not discuss in the present thesis, is the only medium to signify words themselves. Hence, I argue, writing is necessary (although not sufficient) for the emergence of decontextualized thought.

The gap in the left diagram in Figure 33 symbolizes a gradually increasing independence of

Figure 33: The structure of verbal abstraction during the* elaboration *and* integration *stage.



verbal signification that emerges during the elaboration phase. I argue that it is the gradual establishment of such an independent semiotic operation, predicated on the structure of writing, that allows the child to cognitively manipulate words as *concepts*, disregarding the concrete perceptual qualities of the objects.

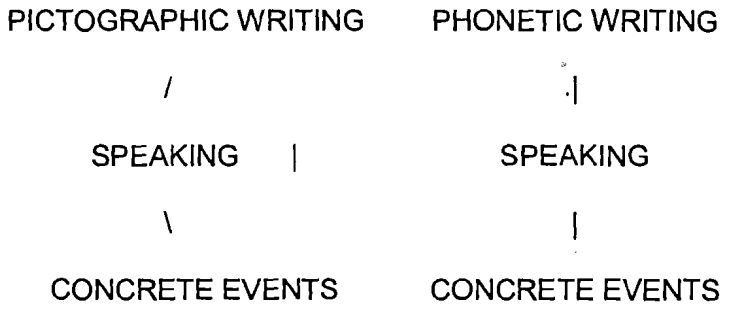
I further argue that Piaget's conceptualisation of formal operations as "second degree operations" (Inhelder and Piaget, 1958, p. 254), that is operations on operations, can also be reinterpreted in light of the semiotic structure I am proposing here. I suggest that concrete operations that "may be called first degree operations in that they refer to objects directly" (Inhelder & Piaget, 1958, p. 254) are enabled by the metalinguistic awareness itself resulting from the introduction of writing. However, at the early operational stage, writing cannot yet function as an independent medium, because of the strength of children's habits of spoken signification and their lack of skill and experience with writing. Chapman (1988b) points out that "reversibility of actions occurs in sequential time, but operational reversibility involves simultaneous coordination" (p. 9). Even though Chapman (1988b) does not tie his claims to literacy, it should be noted that speaking is a real-time sequential medium, whereas writing allows for a much more static simultaneous processing of verbal information.

I suggest that the differentiation of the verbal semiotic structure of writing from the level of the concrete, enables the existence of a cognitive level on which the child can perform purely verbal significations required for the integration of the combinatorial system of formal thought. In other words, writing provides a vehicle within which formal thought can, but of course does not have to[122], be actualized. Piaget's *second degree operations* should thus be viewed as operations on words themselves, independent from concrete content that these words signify.

[122] Piaget (1972) and Inhelder and Piaget (1958) are aware the formal thought is far from being a universal phenomenon. The current conceptualisation stresses the relatively long process of differentiation and elaboration of verbal semiotic structure that is required for the attainment of purely verbal cognitive level. This delay may at least partially account for the individual and cross-cultural variability in the levels of formal thought.

One needs to note that phonetic writing, in its arbitrariness, cut its ties with concrete representation more radically than other writing systems. Any writing system is an operation on words, but the characters in non-phonetic writing systems retain some connection with the concrete reality they represent (see Figure 34). One would thus expect that the thought of the subject engaged in non-phonetic languages would be influenced by the concrete imagistic nature of these scripts that encourages contextualized thought. In contrast, as shown in Figure 34, phonetic writing comprises a verbal signification that does not need to regress to the concrete level. The characters of phonetic writing codify only the sounds of spoken language, and cut ties with the concrete image. A letter 'A' stands for the sound 'A' and nothing else. It

Figure 34: Arbitrariness of phonetic writing.



appears that it is this feature of phonetic script that historically fostered human imagination to make a leap into the theoretical universe (e.g. Havelock, 1963; McLuhan, 1964; Logan, 1986; Ong, 1982)[123]. Following this historical hypothesis, I argue that it is the arbitrariness of phonetic writing that enables the development of formal thought.

[123] Of course the development of theoretical science has been greatly accelerated by the modern emergence of abstract mathematics (Kaput, 1996).

Chapter 6
Limitations and implications

The goal of this brief chapter is not so much to provide a summary of my argument; I have done this a number of times in my thesis. Rather, this chapter summarizes what I believe to be the most important contributions of my proposal, critically reflects on the limitations, and speculates on possible future directions for the literacy hypothesis.

6.1 Contributions

In my opinion the following are the most important contributions of the present thesis.

6.1.1 The medium

The medium is not the entire message, as I have also considered content and context, but the evidence I have brought into view suggests that the medium plays an important role in cognitive development. Placing strong emphasis on the effects that the communicative medium has on cognition has been the major task of this thesis. I consider the medium to be a modifier of the context of communicative action, and I claim that the nature of such a modification has consequences for cognitive development, especially in the area of symbolic cognition.

So far psychology has been almost completely negligent with regard to the medium analysis. I argue that there is a great imbalance in theory and research at present, in that the small amount of attention that the medium has received contrasts with the significant

explanatory potential that it could have. I have argued that the consideration of new modes of communication can be especially important in the explanation of qualitative leaps in cognition, that is that a new medium can account for the emergence of new forms of thought.

6.1.2 The literacy hypothesis

The specific medium that I explored in this thesis is literacy. My goal has been to synthesize the existing theory and research on the literacy hypothesis, most of which has been developed in the historical context, to discuss the main controversies, and to propose a literacy framework that can be applied in the area of child cognitive development. I catalogued and qualified the existing explanations for literacy effects, arguing that the *structural/semiotic* explanation is most important in understanding how literacy enables changes in cognition. I have selected what I believe are the most salient cognitive effects of literacy, namely the emergence of metalinguistic awareness in the early stages of literacy and the emergence of a decontextualized abstract cognitive level once the purely verbal level of signification is differentiated.

6.1.3 Literacy and operational thought

I further proposed a hypothetical link between literacy and the development of operational thinking. I suggested that the emergence of metalinguistic awareness provides a cognitive space for concrete operational thought, and that the gradual mastery of writing and the differentiation of purely verbal thought enables the rise of formal thought. I essentially equated the rise of formal operations with decontextualized thought. Such a hypothesis is largely a novel proposal in the area of cognitive development, and I have argued that it can enrich Piaget's view of the rise of formal

operations through progressive elaboration of logical structures during the stage of concrete operations.

6.1.4 Literacy as an enabling factor

One of the central issues that literacy theorists have rarely been explicit about is the nature of the causal relationship between literacy and the supposed literacy-specific forms of thought. Frequently, the language that literacy theorists use implies a strong causal relationship between literacy and cognition (i.e., literacy as a *sufficient* cause for the cognitive changes). Such a stance, I have argued, is the main reason for the criticism that the literacy hypothesis has been subjected to, as it neglects contextual factors and continuities in cognitive development. This 'strong' casual stance also cannot account for the delay that exists between the onset of literacy and the emergence of decontextualized thought.

I have proposed that literacy should be considered as an *enabling* and *necessary* factor with regard to the cognitive forms that it enables. This position can provide a hypothetical rational for the delay between the onset of metalinguistic awareness and decontextualized thought.

The causal stance I adopt does not deny that literacy itself has a developmental history, and that there exist continuities in symbolic development, decontextualized thought building upon earlier forms of physical action and symbolic communication. Hence, methodologically, literacy can be considered as either a dependent or independent variable in the overall system of biological and environmental contingencies of development. However, for the purpose of this thesis I have explored literacy only as

an independent variable, thus focussing my task on the exploration of the emergent properties of the medium.

6.1.5 Theoretical grounding in a systemic/constructivist framework

Literacy theorists so far have largely neglected to situate the literacy hypothesis within a broader theoretical framework. I have argued that the adoption of a systemic/constructivist framework (Chapman, 1988a; Inhelder & Piaget, 1958) allows for the literacy hypothesis to be placed within a contemporary developmental constructivist perspective, and that it would in turn enrich that very perspective. I have sketched very broad outlines of such a framework, within which the rise of metalinguistic awareness and decontextualized symbolic cognition is viewed as enabled by the child's active assimilation of the cognitive potential implicit in reading and writing.

6.2 Limitations and future directions

There are a number of potential limitations of my present work. These limitations point to some future directions for the literacy theory and research.

6.2.1 Hypothetical proposal

First and foremost, many of my claims are theoretical hypotheses that require much further theoretical elaboration and empirical validation. The amount of available research tying literacy directly to cognitive development is limited, and I have frequently used indirect research, reinterpreting it in light of the literacy hypothesis. My theoretical method has been a theoretical synthesis of the existing data and theory in an attempt to construct the most plausible literacy medium framework. Hence, the claims I am proposing should be treated as a set of hypotheses, rather than a proven theory.

6.2.2 Causality

There are two ways of viewing literacy as a factor that *enables* cognitive change. One is to see literacy as *one of* the factors, but not a necessary factor, for its supposed cognitive effects. This is the 'weakest' of the existing causal approaches, as it allows for the possibility of different routes to achieve the cognitive effects in question. For example, one can argue that writing is not necessary for decontextualized thought, as such thought could be achieved using other visual and spatial modes (e.g., mathematics, graphic representations, etc).

The second way to approach the question of causality is to view literacy as an *enabling* and *necessary* factor for the development of literacy-specific cognitive effects. According to this view, decontextualized thought would not be possible without the practice of literacy. Note that this second view does not treat literacy as a *sufficient* cause for its effects (the 'strongest' causal stance), and it thus admits that other factors may also be necessary for the literacy effects to emerge. For instance, a certain level of brain maturation, a certain level of symbolic cognition that has developed though the child's active engagement in the world prior to literacy, and a certain level of actual practice with the medium may all be necessary for the emergence of the cognitive phenomena in question. This second view is a 'middle' causal position.

I have clearly rejected the *sufficient* cause or 'strong' view of literacy. What remains is the two *enabling* positions I have outlined, both of which are theoretically plausible. The distinction between these positions is very important. For example, Scribner and Cole's (1981) position and their criticism of the 'strong' literacy thesis (as a *sufficient* factor) implicitly supports the first of the two enabling positions I have delineated above,

viewing literacy as an *accelerating* factor but treating the entire experience of schooling as the enabler of the so called literacy effects.

According to my review of the existing evidence to date, including Scribner and Cole's (1981) own research, as well as my clarification of hypothetical mechanisms of how literacy enables metalinguistic awareness and decontextualized thought (the *structural* explanation), I tentatively committed myself to the second, 'middle,' position with regards to causality, a position that considers literacy as an *enabling* and *necessary* factor in the emergence of literacy specific forms of thought. Such a position is a middle of the road between viewing literacy as a *sufficient* cause and viewing it merely as *one of* the accelerating factors.

So far, I have found no evidence that would challenge such a causal stance. However, if clear evidence were to be presented, showing that completely illiterate persons demonstrate a capacity for metalinguistic awareness and decontextualized thought, one would have to revert to the 'weaker' causal position with regards to literacy. This determination remains a task for future empirical research directly examining the effects of literacy and other relevant factors (e.g., age, other media) on cognitive development.

6.2.3 Broader theory

My proposal for a broader theoretical framework to situate the literacy hypothesis is a mere sketch, requiring much future elaboration and refinement. I have attempted to incorporate semiotics (which provides the basis for the structural explanation I have emphasized) within the triadic model that considers the child's physical as well as communicative action, within an even broader systems theory that can be applied to

investigation at all levels, and can thus link the literacy framework with biology. An adequate elaboration of such a framework is a theoretical task that surpasses the scope of my thesis. Questions of the nature of representation, the mechanisms of cognitive internalization, and so on require further theoretical elaboration.

6.2.4 Literacy effects I have postulated

With regard to the critical evaluation of the cognitive effects I have chosen to attribute to literacy, I believe that my explanation for metalinguistic awareness, decontextualized thought, and formal operations is fairly solid with regards to its theoretical underpinnings and empirical support. In contrast, the explanation for the rise of concrete operations (e.g., the attribution of the ability for *conservation* to literacy) is somewhat less theoretically direct and empirically supported. Whether literacy can account for concrete operational thought requires further empirical validation.

6.2.5 Developmental continuities

I have focussed on literacy as an *independent* variable that enables new forms of thought, and I have not dealt with the question of how literacy itself and related cognitive skills emerge in the context of development. Nor have I focussed on other factors that might also be necessary for the emergence of literacy specific skills. Full understanding of the role of literacy in development will require the examination of developmental continuities that lead to the emergence of metalinguistic awareness and decontextualized abstraction. Literacy thus needs to be placed within a developmental *continuum*, which includes the examination of how symbolic cognition develop from concrete action through the use of other modes of symbolic communication, such as gesturing, speaking, drawing, etc.

6.2.6 *Phonetic and non-phonetic literacy*

At certain points in my thesis, I draw a distinction between phonetic and non-phonetic writing, specifically arguing that the structural explanation implies that the decontextualization of thought, while possible with non-phonetic scripts, is greatly fostered by phonetic literacy. However, I do not provide an adequate elaboration of this cross-cultural argument.

The issue of specificity of the phonetic script with regard to decontextualized thought requires further cross-cultural comparison between phonetic and non-phonetic scripts. A more detailed examination of the educational pathways in which today's non-phonetic cultures attain formal operational thought should shed more light on this medium-specific hypothesis. Some questions that need to be answered are the following: What are the concrete ways in which formal thinking is taught in contemporary non-phonetic cultures? For example, do non-phonetic cultures make more use of the idiographic language of mathematics to instil abstract thought? Does it take longer to achieve formal operations in non-phonetic cultures? What are the rates of formal thought in non-phonetic cultures? Are the thinking preferences or dominant modes of thought in non-phonetic cultures different from those found in phonetic cultures? Does formal, decontextualized thought have different expressions in phonetic and non-phonetic cultures?

6.2.7 *Cultural and individual development*

The medium framework, as I propose it, can be applied to understanding both the historical and individual development of thought. However, there exist clear differences between the emergence of an entirely new form of thought in a culture and the achievement of a cognitive level by a child. The main difference in this respect is the fact

that children already grow up in a culture that is deeply saturated with social forms and practices related to literacy. I have not adequately explored the differences between ontogeny and cultural evolution, but merely concluded that it appears that the child, even though exposed to literate forms of thought and practices, does not achieve the literacy-specific forms of thought before he himself actually begins to practice literacy.

The parallels and differences between the historical and developmental achievements of metalinguistic awareness and decontextualized thought need to be further explored. For example, I have found no studies that specifically examine the emergence of dualistic metaphysics in children. It is possible that an epistemological shifts, similar to those which were introduced historically in Greece and during the European Renaissance would be expected to happen developmentally after the child masters phonetic writing. A study of changes in basic epistemological assumptions at the onset of the *elaboration* and *integration* phase is much needed to test this hypothesis. One possibility is that the mastery of writing would bring about the dualistic and mechanistic, Newtonian ways of conceptualizing reality. In a related matter, the parallel between the basic definition of operational thought and Galileo's distinction between the essential elements (shape, number, and movement, and subjective elements, color, sound, taste) is striking.

6.2.8 Different forms of literacy and other media

I have focussed on literacy without exploring different forms that literacy can take. Nor have I explored the interaction between literacy and other modes of communication that children are engaged in at the same time that they learn to read and write. It is likely that other media, such as electronic media, play a dominant role in shaping the child's

view of the world. If so, what is the nature of the interaction of literacy and other media in the development of cognition? What are the differences between the traditional printed word and the electronic word? How do specific applications of literacy affect cognition? For example, what cognitive effects would one predict for a generation of chat users? These are just examples of a wide variety of questions that needs to be considered in the elaboration of the context for the literacy hypothesis.

6.2.9 Criteria defining the literacy stages

There is a need to further establish clear, operational criteria for the proposed literacy stages. An especially significant problem in this respect is a lack of a specific criterion for the *integration* stage. Although the *recognition* stage is marked by the first recognition of the fact that a written word is not an emblem for a thing but codifies spoken sound, and the *elaboration* phase is marked by the beginning of reading and writing proper, I have not established a specific criterion marking the onset of the *integration* stage.

There are two possibilities in this respect. First, it might be that there is a certain level of the mastery of text that is required for the establishment of a decontextualized level of verbal thought. If this were the case, then the task would be to empirically determine such a level. On the other hand, it is possible that the onset of the *integration* phase is a final consequence of the gradual elaboration of the verbal cognitive structure that occurs gradually during concrete operations. In this case, one would not require a specific literacy criterion and other aspects of elementary education might be considered as contributing to the differentiation of decontextualized level of thought. Specifically, one would expect that the amount of practice with abstract forms of literacy, perhaps

also mathematics, would contribute to the achievement of decontextualized thought. I remain non-committal at this point regarding these two possibilities. A proper empirical investigation potentially might determine which one of these explanations is correct.

6.2.10 Other literacy effects and explanations

I have not attempted to list all the possible effects that have been attributed to literacy, but have merely focussed on some selected effects that I believe are most salient in the context of children's cognitive development. I have also greatly emphasized the structural explanation in my thesis. However, there exists some evidence that other explanations are also important for the understanding of cognitive changes enabled by literacy. The following are some examples of the areas that require further attention.

The medium of writing makes possible an *external storage* for information and hence it should have an effect on information processing strategies and memory. Transition to writing also constitutes a shift from predominantly auditory to predominantly visual communication, and the implication of this transition need to be further examined. The fact that while deaf/mute persons show a one to two year delay in logical thinking, blind children show a four or more year delay (Piaget & Inhelder, 1969) also provides some support for the *perceptual modality* form of explanation.

The *relational* explanation has been used the least in my present thesis. However, consideration of how writing restructures the communicative context might provide an important opening to explore literacy within the overall context. Such elaboration would enable an incorporation of those theorists that consider literacy from a broader contextual perspective. For instance, Graff (1987) is deeply concerned with the specific

uses of literacy and how literacy structures social, political, and economic relationships. I have specifically suggested that the direction of information flow might have implications for power relations, and that the speed of exchange might have implications for communicative efficiency. Such an 'economic' analysis of various contexts of literacy might shed light on questions of individualism, community, etc.

Further, there are possible links between literacy and the *narrative self*. Is it the progressively increasing verbal self-consciousness that allows the adolescent to engage in a more critical examination of the narrative-self and the verbal reality of the surrounding systems (family and other institutions)? Is the quest for 'self-definition' set off by literacy?

The area of moral reasoning could also be reinterpreted further in light of the literacy hypothesis. Teenagers' capacity to adopt abstract moral principles, and their gradually increasing commitment to those abstract value system, might be enabled by the decontextualized abstract cognitive level. Once 'frozen' on the page, moral values might have a more permanent and objective status than the transient spoken principles.

The current framework might also enrich the debate on the distinction between practical and theoretical forms of reasoning. One might postulate that the distinction between formal and everyday reasoning parallels the differences between speaking and writing, within which those modes of thought are claimed to have originated. A number of theoreticians have postulated a similar distinction in the context of cultural evolution. Donald (1991), for example, describes the cultural origins of distinct forms of thinking, tying their emergence to the use of specific modes of symbolic communication. Specifically, he claims that the *mythic* mind was enabled by the development of speech

(some 300,000 year ago), whereas the *theoretic* mind was made possible because of writing. Might a similar distinction be applicable in the context of child development?

One could also examine the possible effects that literacy might have on the perception of temporality, and the corresponding rise of the fear of death. Is it the superimposition of the static word on the temporal narrative that creates the awareness of temporality?

Another area of interest might be the relationship between literacy and the disappearance of egocentric speech. Is it possible that it is the increase in verbal self-awareness that results in the 'internalization' of self-talk?

None of these issues have been elaborated in any great detail in the present thesis. The consistent examination of different cognitive effects that have been attributed to literacy, and different explanations for those effects remain tasks for the future.

6.2.11 The question of emergence

Another question that needs to be answered by theory and research is related to the question of developmental continuity and the nature of cognitive change. This question could be put in the following way: Does the introduction of a novel form of thought enabled by a new medium result in the *addition* of a skill to an already existing repertoire of cognitive skills, or does it cause a global shift in thought that effects all existing cognitive levels? Or perhaps both of these happen to some extent. These questions regarding the nature of cognitive emergence have not been addressed to any significant extent in the present thesis.

To examine this issue one might, for example, study changes in speaking after the introduction of writing. More specifically, while speaking frequently operates on

predicates only (subject being implied), writing requires the inclusion of both subject and predicates. The reason for this is that writing addresses an absent person who might not implicitly understand the subject. One possible research question would be whether literate children use more writing-like speech.

6.2.12 The core issue

Given the key role that symbolic communication plays in cognitive growth, I believe that developmental psychologists should examine how the physical properties of communicative media, specifically literacy, modify communicative action and cognition. If I am correct, communicative technologies, such as literacy, enable medium-specific forms of thought and imagination. The possibilities and constraints of these new cognitive forms will be largely determined by how the physical aspects of the medium modify communicative action. Medium analysis is one of the most neglected areas in contemporary developmental theorizing.

References

Abram, D. (1996). *The spell of the sensuous.* New York: Random House.

Amendola, R.J., Kreuchauf, M.S., & Evans, E.M. (June 1998). Is it magic? Children's and adults' conceptions of ordinary, trick, and natural events. *Jean Piaget Symposium on Language and Literacy.* Chicago, IL.

Apperly, I.A. & Robinson, E.J. (2002). Five-year-olds' handling of reference and description in the domain of language and mental representation. *Journal of Experimental Child Psychology, 83*, 53-75.

Apperly, I.A. & Robinson, E.J. (2003). When can children handle referential opacity? Evidence for systematic variation in 5- and 6-year-old children's reasoning about beliefs and belief reports. *Journal of Experimental Child Psychology, 85*, 297-311.

Amin, T.G. & Valsiner, J. (2004). Coordinating operative and figurative knowledge: Piaget, Vygotsky, and beyond. In J.I.M. Carpendale & U. Müller (Eds.), *Social interaction and the development of knowledge* (pp. 87-109). Mahwah, NJ: Erlbaum.

Arendt, H. (1978). *The life of the mind.* New York: Harcourt, Brace, Jovanovich.

Aristotle (1946). *Metaphysics.* (J. Warrington, Trans.). London: Dent. (Original work written around 350 B.C.)

Arnheim, R. (1994). Consciousness: An island of images. *Journal of Theoretical & Philosophical Psychology, 14*, 121-127.

Ashby, W. R. (1956). *An introduction to cybernetics.* New York: J. Willey.

Astington, J.W. & Pelletier, J. (1996). The language of mind: It's role in teaching and learning. In D.R. Olson & N. Torrance (Eds.), *The handbook of education and human development* (pp. 593-619). Oxford, UK: Blackwell.

Avis, J. & Harris, P.L. (1991). Belief-desire reasoning among Baka children: Evidence for a universal conception of mind. *Child Development, 62*, 460-467.

Bakhtin, M.M. (1981). *Dialogic imagination.* Austin: University of Texas Press.

Bakhtin, M.M. (1986). *Speech genres and other essays.* Austin: University of Texas Press.

Baker, G.P. & Hacker, P.M.S. (1982). The grammar of psychology: Wittgenstein's Bemerkungenuber die Philosphie der Psychologie. *Language and Communication, 2,* 227- 243.

Barden, L.A., & Pufall, P.B. (2000, June). An investigation of the shift from intellectual to visual realism in children's drawings: Differences between children who can and cannot hear. Poster presented at 30th Annual meeting of the Jean Piaget Society. Montreal.

Bates, E. (2005). Plasticity, localization, and language development. In S.T. Parker, J. Langer & C. Milbrath (Eds.), *Biology and knowledge revisited: From neurogenesis to psychogenesis* (pp. 205-253). Mahwah, NJ: Erlbaum.

Bateson, G. (1968). Information and codification: A philosophical approach. In J. Reusch & G. Bateson (Eds.), *Communication: The social matrix of psychiatry.* New York: Norton.

Bateson, G. (1979). *Mind and nature: A necessary unity.* Toronto: Bantam Books.

Benjamin, R. (1981). *Making Schools Work.* New York: Continuum.

Bialystok, E. (1986). Making concepts of print symbolic: Understanding how writing represents language. *First Language, 15,* 317-338.

Bickhard, M.H. (1999). Interaction and representation. *Theory and Psychology, 9,* 435-458.

Bickhard, M.H. & Terveen, L. (1995). *Foundation issues in artificial intelligence and cognitive science: Impasse and solution.* Amsterdam: Elsevier.

Birdsong, D. (1989). *Metalinguistic performance and interlinguistic competence.* Berlin: Springer.

Bochenski, I.M. (1961). *A history of formal logic.* Norte Dame, Indiana: University of Notre Dame Press.

Boom, J. (2004). Individualism and collectivism: A dynamic systems interpretation of Piaget's Interactionism. In J.I.M. Carpendale (Ed.), *Social Interaction and the Development of Knowledge,* (pp. 67-85). Mahwah, N.J.: Erlbaum.

Brandt, D. & Clinton, K. (2002). Limits of the Local: Expanding Perspectives on Literacy as a Social Practice. *Journal of Literacy Research, 34,* 337-356.

Brockmeier, J. (2000). Literacy as symbolic space. In J. Astington (Ed.), *Minds in the making: Essays in honor of David R. Olson* (pp. 43-61). Malden, MA: Blackwell.

Bruner, J. (1986). *Actual minds, possible worlds.* Cambridge MA: Harvard University Press.

Carpendale J.I.M. (1997). An explication of Piaget's constructivism: Implications for social cognitive development. In S. Hala (Ed.), *Development of social cognition* (pp. 35-64). Hove, England: Psychology Press/Erlbaum.

Carpendale, J.I.M. (1999a). Symbols and side effects: Commentary on James Russell's "Cognitive development as an executive process – in part: A homeopathic dose of Piaget." *Developmental Science, 2,* 279-280.

Carpendale, J.I.M. & Chandler, M.J. (1996). On the distinction between false belief understanding and subscribing to an interpretive understanding of mind. *Child Development, 67,* 1686-1706.

Carpendale, J.I.M. & Lewis, C. (2004). Constructing an understanding of mind: The development of children's social understanding within social interaction. *Behavioral and Brain Sciences, 27,* 79-96.

Carpendale, J.I.M., McBride, C., & Chapman, M. (1996). Language and operations in children's class inclusion reasoning: The operational-semantic theory of reasoning. *Developmental Review, 16,* 391-415.

Carpendale, J.I.M. & Müller, U. (2004). Social interaction and the development of rationality and morality: An introduction. In J.I.M. Carpendale & U. Müller (Eds.), *Social interaction and the development of knowledge* (pp. 1-18). Mahwah, NJ: Erlbaum.

Carpendale, J.I.M., & Turnbull, W. (1999b). *Understanding inner processes requires outer criteria: Wittgenstein's relevance for children's understanding of mind.* Paper presented at the 1999 meeting of the Jean Piaget Society. Mexico City.

Cassirer, E. (1946). *Language and myth.* New York: Dover.

Chandler, M.J. & Lalonde, C.E. (1994). Surprising, magical and miraculous turns of events: Children's reactions to violations of their early theories of mind and matter. *British Journal of Developmental Psychology, 12,* 83-95.

Chapman M. (1987). Inner processes and outward criteria: Wittgenstein's importance in psychology. In M. Chapman & R.A. Dixon (Eds.), *Meaning and the growth of understanding* (pp. 103-127). Hillsdale, NJ: Erlbaum.

Chapman M. (1988a). *Constructive evolution: Origins and development of Piaget's thought.* Cambridge: Cambridge University Press.

Chapman M. (1988b). Contextuality and directionality of cognitive development. *Human Development, 31,* 92-106.

Chapman M. (1991). The epistemic triangle: Operative and communicative components of cognitive development. In M. Chandler & M. Chapman (Eds.), *Criteria for competence* (pp. 209-228). Hillsdale, NJ: Erlbaum.

Chapman M. (1993). Everyday reasoning and the revision of false belief. In J.M. Puckett & H.W. Reese (Eds.), *Mechanisms of everyday cognition* (pp. 95-113). Hillsdale, NJ: Erlbaum.

Chapman M. (1999). Constructivism and the problem of reality. *Journal of Applied Developmental Psychology, 20,* 31-43.

Chomsky, N. (1968). *Language and mind.* New York: Harcourt, Brace & World.

Ciancio, D., Sadovsky, A., Malabonga, V., Trueblood, L., & Pasnak, R. (1999). Teaching classification and seriation to preschoolers. *Child Study Journal, 29*, 193-206.

Collins, J.S. & Robinson, E.J. (2005). Can one written word mean many things? Prereaders' assumptions about the stability of written words' meanings. *Journal of Experimental Child Psychology, 90*, 1-20.

Cox, M.V. (1991). *The child's point of view.* New York: Guilford Press.

Cushman, P. (1995). *Constructing the self, constructing America: A cultural history of psychotherapy.* Reading, Massachusetts: Addison-Wesley Publishing.

Darwin, C. (1981). *Origin of species.* Cambridge: Cambridge University Press. (Original work published in 1859)

Dasen, P.R. (1977). *Piagetian Psychology: Cross-cultural contributions.* New York: Gardner Press.

Dawda, D. (2000a). *"The medium is the message": Deconflating speaking and writing.* Paper presented at Jean Piaget Society Meeting. Montreal.

Dawda, D. (2000b). *"The medium is the message": Touching as the first symbolic mode of the self.* Paper presented at Jean Piaget Society Meeting. Montreal.

Dawkins, R. (1989). *The selfish gene.* New York: Oxford University Press.

Deacon, T.W. (1997). *The symbolic species: The co-evolution of language and the brain.* New York: W.W. Norton.

Derrida, J. (1976). *Of grammatology.* (G. C. Spivak, Trans.) Baltimore: Johns Hopkins University Press.

Dewey, J. (1927). *The public and its problems.* New York: Henry Holt.

Donald. M. (1991). *Origins of the modern mind: Three stages in the evolution of culture and cognition.* Cambridge, MA: Harvard University Press.

Donald, M. (2001). *A mind so rare: The evolution of human consciousness.* New York: Norton.

Duranti, A. (1985). Famous theories and local theories: The Samoans and Wittgenstein. *Quarterly Newsletter of the Laboratory of Comparative Cognition, 7*, 46-51.

Edelman, G.M. (1987). *Neural Darwinism: The theory of neuronal group selection.* New York: Basic Books.

Edelman, G.M. (1989). *The remembered present.* New York: Basic Books.

Edelman, G.M. (1992). *Bright air, brilliant fire: On the matter of the mind.* New York: Basic Books.

Einstein, E. L. (1979). *The printing press as an agent of change.* Cambridge: Cambridge University Press.

Eskritt, M., & Lee, K. (in press a). *'Remember where you last saw that card?' Children's production of external symbols as a memory aid.*

Eskritt, M., & Lee, K. (in press b). The impact of notation on cognition and its development: Theoretical perspectives & empirical evidence. In S. Strauss (Ed.), *The development of notational representation.* Oxford: Oxford University Press.

Eskritt, M., Lee, K., & Donald, M. (2001). The influence of symbolic literacy on memory: Testing Plato's hypothesis. *Canadian Journal of Experimental Psychology, 55*, 39-50.

Feldman, C.F. (1991). Oral metalanguage. In D.R. Olson & N. Torrance (Eds.), *Literacy and orality.* Cambridge: Cambridge University Press.

Ferreiro, E. & Teberosky, A. (1982). *Literacy before schooling.* Exeter, NH: Heinemann. (Original work published in 1979.)

Ferreiro, E. (1986). *Proceso de alfabetizacion: La alfabetizacion en proceso.* Beunos Aires: Bibliotecas Universitarias.

Finnegan, R. (1977). *Oral poetry.* Cambridge: University Press.

Freeman, W. J. (1995). *Societies of brains: A study in the neuroscience of love and hate.* Hillsdale, New Jersey: Lawrence Erlbaum.

Freeman, W. J. (2000). Bridging the gaps between neuron, brain, and behaviour with neurodynamics. In D. Dawda, *Using systemic accounts to close the gap between biology and psychology,* Jean Piaget Society symposium, Berkley, CA.

Freud, S (1938). *The basic writings of Sigmund Freud* (A.A. Brill, Trans. & Ed.). New York: Modern Library.

Gadamer, H.G. (1992). *Truth and method.* New York: Crossroad. (Original work published in 1960.)

Gee, J.P. (2003). *What video games have to teach us about learning and literacy.* New York: Palgrave Macmillan.

Gergen, K. (1994). *Realities and relationships: Soundings in social construction.* Cambridge, MA: Harvard University Press.

Greenfield, P.M. & Bruner, J.S. (1966). Culture and cognitive growth. *International Journal of Psychology, 1*, 89-107.

Goody, J. & Watt, I. (1968). The consequences of literacy. In J. Goody (Ed.), *Literacy in traditional societies.* Cambridge: Cambridge University Press. (Originally published in 1963 in *Contemporary Studies in Society and History, 5,* 304-345.)

Goody, J. (1968). Introduction. In J. Goody (Ed.), *Literacy in traditional societies.* Cambridge: Cambridge University Press.

Goody, J. (1977). *The domestication of the savage mind.* Cambridge: Cambridge University Press.

Goody, J. (1987). *The interface between the written and the oral.* Cambridge: Cambridge University Press.

Gopnik, A. & Meltzoff, A.N. (1992). Categorization and naming: Basic-level sorting in eighteen-month-olds and its relation to language. *Child Development, 63*, 1091-1103.

Gough, K. (1968). Implications of literacy in traditional China and India. In J. Goody, (Ed.), *Literacy in traditional societies.* Cambridge: Cambridge University Press.

Gottlieb, G. (1991). Experiential canalisation of behavioural development. Theory. *Developmental Psychology, 27*, 4-13.

Gottlieb, G. (1997). *Synthesizing Nature-Nurture: Prenatal Roots of Instinctive Behavior.* Mahwah, NJ: Erlbaum.

Graff, H.J. (1981). *Literacy and social development in the West: A reader.* Cambridge: Cambridge University Press.

Graff, H.J. (1987). *The legacy of literacy: Continuities and contradictions in Western culture and society.* Bloomington: Indiana University Press.

Graff, H.J. (2005). Personal communication (January 25, 2005).

Hargrove, E.C. (1989). *Foundations of Environmental Ethics.* Englewood Cliffs, New Jersey: Prentice Hall.

Harris, R. (1989). How does writing restructure thought? *Language and Communication, 9,* 99-106.

Havelock, E. (1963). *Preface to Plato.* Cambridge: Cambridge University Press.

Havelock, E. (1976). *Origins of Western literacy.* Toronto: OISE.

Havelock, E, (1982). *The literate revolution in Greece and its cultural consequences.* Princeton, NJ: Princeton University Press.

Havelock, E, (1991). The oral-literate equation: A formula for the modern mind. In D.R. Olson & N. Torrance (Eds.), *Literacy and orality* (pp. 11-27). Cambridge: Cambridge University Press.

Haviland, W.A. (1991). *Anthropology.* Fort Worth: Hold, Reinehart, & Winston.

Hegel, G. (1984). *Letters.* Bloomington, Ind.: University of Indiana Press.

Heidegger, M. (1977). *Basic writings.* San Francisco: Harper.

Hobson, R.P. (2000). The grounding of symbols: A social-developmental account. In P. Mitchell & K.J. Riggs (Eds.), *Children's reasoning and the mind.* (pp. 11-35).

Homer, B.D. (January, 2000). Literacy and metalinguistic awareness: A cross-cultural study. *Dissertation abstracts international: Section B: The Sciences & Engineering, 61 (6-B)*, p. 3306.

Homer, B.D. & Olson, D. (1999). Literacy and children conception of words. *Written Language and Literacy, 2*, 113-137.

Horowitz. R. & Samuels S.J. (1985). Reading and listening to expository text. *Journal of Reading Behaviour, 17*, 185-198.

Hutchins, E. (1983). Understanding Micronesian navigation. In D. Gentner & A.L. Stevens (Eds.), *Mental models.* Hillsdale, NJ: Erlbaum.

Husserl, E. (1960). *Cartesian meditations: An introduction to phenomenology* (D. Carins, Trans.). (Original work published in 1931.)

Inhelder, B. & Piaget, J. (1958). *The growth of logical thinking from childhood to adolescence: An essay on the construction of formal operational structures.* New York: Basic Books.

Inhelder, B. & Piaget, J. (1964). *The early growth of logic in the child: Classification and seriation.* New York: Harper and Row.

Innis, H. (1950). *Empire and communication.* Oxford: Oxford University Press.

Itard, J.M.G (1932). *The Wild Boy of Aveyron* (G. Humphrey & M. Humphrey, Trans.). New York: Century.

Ivins, W.M. (1969). *Prints and Visual Communication*. Cambridge: M.I.T.

Ivanov, V.V. (1977). The role of semiotics in the cybernetic study of man and collective. In D.P. Lucid (Ed.), *Soviet semiotics: An anthology* (pp. 27-38). Baltimore: Johns Hopkins University Press.

James, W. (1967). *The writings of William James: A comprehensive edition* (John J. McDermott, Ed.). New York: Random House.

Jewitt, C. & Kress, G. (2003). *Multimodal literacy*. New York: P. Lang.

Kaput, J. (1996). Overcoming of the physicality and the eternal present: Cybernetic manipulatives. In R.S.J. Mason (Ed.), *Technology and visualization in mathematics education* (pp. 161-177). London: Springer Verlag.

Katsura, S. (1996). *How did Buddhists prove something?: The nature of Buddhist logic.* The Numata Yehan Lecture in Buddhism. University of Calgary.

Kitchener, R.F. (2004). Piaget's social epistemology. Carpendale, J.I.M. & Müller, U. (Eds.), *Social interaction and the development of knowledge* (pp. 45-66). Mahwah, NJ: Erlbaum.

Kohlberg, L. & Hersh, R.H. (1977). Moral development: A review of the theory. *Theory Into Practice, 16*, 53-59.

Kohut, H. (1977). *The restoration of the self.* Madison: International Universities Press.

Korzybski, A. (1950). *Alfred Korzybski: Collected writings.* New Jersey: I.G.S. Inglewood. (Original work published in 1920)

Kozulin, A. (1986). Vygotsky in context. Forward to *Thought and language,* (A. Kozulin Ed. & Trans.). Cambridge, MA: MIT Press.

Langshear, C. & Knobel, M. (2003). *New literacies: Changing knowledge and classroom learning.* Philadelphia, PA: Open University Press.

Lapham (1994). *Introduction to McLuhan, Understanding media: The extension of man.* Cambridge, MA: MIT Press.

Lawrence, J. A., & Valsiner, J. (1993). Conceptual roots of internalization: From transmission to transformation. *Human Development, 36*, 150-167.

LCHC (Laboratory of Comparative Human Cognition) (1983). Culture and cognitive development. In W. Kesson (Ed.), *Handbook of child psychology* (Vol. 1, pp. 295-356). New York: John Wiley.

Levi-Bruhl, L. (1978). *Primitive mentality* (L.A. Clare, Trans.). New York: AMS Press. (Original work published in 1923)

Levi-Strauss, C. (1966). *The savage mind.* Chicago: University of Chicago Press.

Levin, D.M. (1989). *The listening self: Personal growth, social change, and the closure of metaphysics.* New York: Routledge.

Lloyd, G.E.R. (1979). *Magic, reason, and experience.* Cambridge: Cambridge University Press.

Lloyd, G.E.R. (1990). *Demystifying mentalities.* Cambridge: Cambridge University Press.

Logan, R.K. (1986). *The alphabet effect: The impact of the phonetic alphabet on the development of Western civilization.* New York: Morrow & Company.

Lotman, Ju.M. (1977). Primary and secondary communication modelling. In D.P. Lucid (Ed.), *Soviet semiotics: An anthology* (pp. 95-98). Baltimore: Johns Hopkins University Press.

Lotman, Ju.M. (1977). Two models of communication. In D.P. Lucid (Ed.), *Soviet semiotics: An anthology* (pp. 99-105). Baltimore: Johns Hopkins University Press.

Lotman, Ju.M. (1990). *Universe of the mind: A semiotic theory of culture.* Bloomington: Indiana University Press.

Luria, A. (1971). Towards the problem of the historical nature of psychological processes. *International Journal of Psychology, 6*, 259-272.

Luria, A. (1976). *Cognitive development: Its cultural and social foundations.* Cambridge: Harvard University Press.

Magnusson, E. & Naucler, K. (1993). The development of linguistic awareness. *First Language, 37*, 93-112.

Malinowski, B. (1923). The problem of meaning in primitive languages. In C.K. Ogden & I.A. Richards (Eds.), *The meaning of meaning: A study of the influence of language upon thought and of the science of symbolism.* New York: Harcourt, Brace.

Macnamara, J. (1982). *Names for things.* Cambridge, MA: MIT Press.

Malinowski, B. (1954). *Magic, Science and Religion.* Garden City, NY: Doubleday. (Original work published in 1925.)

Manis, J.G. & Meltzer, B.N. (1972). *Symbolic interaction: A reader in social psychology.* Boston: Allyn & Bacon.

Marx, K. (1961). Economic and philosophical manuscripts of 1844. In E. Fromm, *Marx's concept of man.* New York: Ungar.

Martin, J. (2003). Emergent persons. *New Ideas in Psychology, 21*, 85-99.

Martin, J. (2005). Personal communication.

Martin, J., Sugarman, J., & Thompson, J. (2003). *Psychology and the question of agency.* Albany, NY: SUNY Press.

Martin, J. & Sugarman, J. (1999a). Psychology's reality debate: A 'levels of reality' approach. *Journal of Theoretical and Philosophical psychology, 19*, 177-194.

Martin, J. & Sugarman, J. (1999b). *The psychology of human possibility and constraint.* Albany, NY: State University of NY Press.

Maturana, H.R. & Varela, F.J. (1992). *The tree of knowledge: The biological roots of human understanding.* Boston, MA: Shambhala.

McLuhan, M. (1962). *The Gutenberg galaxy.* Toronto: Toronto University Press.

McLuhan (1964).*Understanding media: The extension of man.* Toronto: Corinne McLuhan.

McLuhan. M. & McLuhan, E. (1988). *Laws of media: The new science.* Toronto: University of Toronto Press.

McLuhan, M. & Quentin F. (1967). *The medium is the message: An inventory of effects.* San Francisco: Hard Wired.

Mead, G. H. (1974). *Mind, self, and society.* Chicago: University of Chicago Press. (Original work published in 1934.)

Merleau-Ponty, M (1962). *Phenomenology of perception.* London: Routledge and Kegan Paul.

Milosz, C. (1981-1982). *The witness of poetry.* The Charles Eliot Norton Lectures. Cambridge, MA: Harvard University Press.

Nietzsche F. (1905/1962). *Thus spoke Zarathustra* (T. Common, Trans.). New York: The Modern Library.

Neisser, U. (1976). *Cognition and reality: Principles and implications of cognitive psychology.* San Francisco: W.H. Freeman.

Norman, D.A. (1991). Cognitive artefacts. In J.M. Carroll (Ed.), *Designing interaction: Psychology at the human-computer interface.* Cambridge: Cambridge University Press.

Olson, D.R. (1994). *The world on paper: The conceptual and cognitive implications of writing and reading.* Cambridge: Cambridge University Press.

Olson, D.R. (2002). What writing does to the mind. In E. Amsel & J.P. Byrnes (Eds.), *Language, literacy, and cognitive development: The development and consequences of symbolic communication* (pp. 153-165). Mahwah, NJ: Erlbaum.

Olson, D.R. & Torrance, N. (2001). Conceptualizing literacy as a personal skill and a social practice. In Olson, David R. (Ed), *The making of literate societies* (pp. 3-18). Malden, MA: Blackwell Publishers.

Ong, W. J. (1982). *Orality and literacy: The technologizing of the world.* New York: Routledge.

Overton, W.F. (1992). *Developmental psychology: Philosophy, concepts, and methodology.*

Oxenham, J. (1980). *Literacy: Writing, reading, and social organization.* London: Routlege & Kegan Paul.

Oyama, S. (2000). *The ontogeny of information: Developmental systems and evolution.* Duke University Press.

Piaget, J. (1929). *The child's conception of world.* London: Routladge.

Piaget, J. (1953). *The origins of intelligence in the child.* London: Routledge & Kegan. (Original work published in 1936)

Piaget, J. (1955). *The child's construction of reality.* London: Routladge & Kegan. (Original work published in 1937)

Piaget, J. (1962). *Play, dreams and imitation in childhood.* New York: Norton Library.

Piaget, J. (1972). Intellectual evolution from adolescence to adulthood. *Human Development, 15*, 1-12.

Piaget, J. (1973). *Main trends in interdisciplinary research.* London: George Allen & Unwin. (Original work published in 1970)

Piaget, J. (1995). *Sociological studies.* (L. Smith Ed.; T. Brown et al., Trans.). New York: Routledge. (Original work published in 1977)

Piaget, J. & Inhelder B. (1963). *The child's conception of space.* (F.J. Langdon & J.L. Lunzer, Trans.). London: Routledge & Paul.

Piaget, J. & Inhelder B. (1969). *The psychology of the child.* New York: Basic Books. (Original work published in 1966)

Peirce, C.S. (1923). *Collected papers.* Cambridge: Harvard University Press.

Pinker, S. (1994). *The language instinct.* New York: W. Morrow & Co.

Plato (1937). *The dialogues of Plato* (B. Jowett, Trans.). New York: Random House.

Rosaldo, M.Z. (1982). The things we do with words: Ilongot speech acts and speech act theory in philosophy. *Language and Society, 2*, 203-237.

Sartre, J.P (1958). *Being and nothingness.* London: Methuen.

de Saussure, F. (1959). *Course in general linguistics.* New York: Philosophical Library. (Original work published in 1916)

Schore, A.N. (1994). *Affect regulation and the origin of self.* Hillsdale, NJ: Lawrence Erlbaum.

Schore, A.N. (1996). The experience-dependent maturation of a regulatory system in the orbital prefrontal cortex and the origin of developmental psychopathology. *Development and Psychopathology, 8*, 59-87.

Schore, A.N. (1997). Early organization of the nonlinear right brain and development of a predisposition to psychiatric disorders. *Development and psychopathology, 9*, 595-631.

Scribner, S. & Cole, M. (1981). *The psychology of literacy.* Cambridge, MA: Harvard University Press.

Sigel, I. E. (1953). Developmental trends in the abstraction ability of children. *Child Development, 24*, 131-144.

Street, B. V. (1983). *Literacy in theory and practice.* Cambridge: Cambridge University Press.

Street, B. V. (1995). *Social literacies: Critical approaches to literacy in development, ethnography and education.* London: Longman.

Thompson, D. (Ed.) (1995). *The Concise Oxford Dictionary of Current English.* Oxford: Clarendon Press.

Tomasello, M. (1999). *The cultural origins of human cognition.* Cambridge, MA: Harvard University Press.

Tomasello, M. & Camaioni, L. (1997). A comparison of the gestural communication of apes and human infants. *Human Development, 40*, 7-24.

Torrance, N. & Olson, D.R. (1985). Oral and literate competencies in the early school years. In D.R. Olson, N. Torrance, & Hildyard (Eds.), *Literacy, language, and learning: The nature and consequences of reading and writing* (pp. 256-284). Cambridge: Cambridge University Press.

Turnbull, W. & Carpendale J.I.M. (1999). A social pragmatic model of talk: Implications for research on the development of children's social understanding. *Human Development, 42*, 328-355.

Valsiner, J. & Van de Veer, R. (1988). On the social nature of human cognition: An analysis of the shared intellectual roots of George Herbert Mead and Lev Vygotsky. *Journal for the Theory of Social Behaviour, 18*, 117-136.

Van de Veer, R., & Valsiner, J. (1988). Lev Vygotsky and Pierre Janet: On the origin of the concept of sociogenesis. *Developmental Review, 8*, 52-65.

Vinden, P. G. (1999). Children's understanding of mind and emotion: A multi-cultural study. *Cognition and Emotion, 13*, 19-48.

von Bertalanffy, L. (1968). *General system theory: Foundations, development, applications*. New York: Braziller

von Glasersfeld (1979). Cybernetics, experience, and the concept of self. In M.N. Ozer (Ed.), *A cybernetic approach to the assessment of children: toward a more humane is of human beings.* Boulder, CO: Westview Press.

Vygotsky, L.S. (1986). *Thought and language.* (A. Kozulin Ed. & Trans.). Cambridge, MA: MIT Press. (Original work published in 1934)

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wells, G. (2000). From action to writing: Modes of representing and knowing. In J.W. Astington (Ed.), *Minds in the making: Essays in honor of David R. Olson.* (pp. 115-140). Oxford: Blackwell.

Wertsch, J.V. (1991). *Voices of the mind: A sociocultural approaches to meditative action.* Cambridge: Harvard University Press.

Wittgenstein, L. (1953). *Philosophical investigations.* Oxford: Basil Blackwell.

Whorf, L. (1956). *Language, thought, and reality: Selected writings of Benjamin Lee Whorf.* Cambridge, MA: MIT Press.

Wright, R. (2004). *A short history of progress.* Toronto, ON: Anansi.

Zwicky, J. (1995). Bringhurst's Presocratics: Lyric and ecology. In T. Liliburn (Ed.) *Poetry and Knowing*, (pp. 65-117). Kingston, On: Quary Press.

Appendix: Historical antecedents of phonetic writing

Summary from Logan (1986)

Around 30,000 BC, the first notches etched on animal bones to indicate quantity appeared in Western Europe. These later developed into other forms of tallying, such as notched sticks, knotted strings, counting pebbles.

Between 8,000 and 3,000 BC in the Middle East, baked clay tokens denoting specific agricultural produce and its quantity were used.

Around 3,300 BC in Sumar, clay tokens were sealed into clay envelopes, or bullae, to form permanent records of transactions. Around 3,100 BC, such tokens were impressed on the surface of the envelope instead of being sealed inside, which led to the creation of the first tablets. These tablets were the last token technology before its replacement with writing.

At approximately the same time, the first abstract use of numbers emerged in Sumar, when a symbol for the small quantity of wheat was used to stand for the numeral 1 with any other produce, whereas a symbol for a large quantity of wheat was used to stand for 10.

To further simplify their accounting system, the Sumerians started to incise instead of imprinting the numerals. The incision technology resulted in a proliferation of pictographic signs, which led to the creation of the first ideographic/pictographic writing system in which each and every word was represented by its own unique pictogram.

Next the Sumerians developed *cuneiform* (wedge-shaped), a writing system in which each pictograph was imprinted on a wet tablet.

The Sumarians also developed the first syllabary, by using signs that were syllabic (e.g., *ti* that stood for *arrow*) phonetically rather than graphically, to spell words that sounded the same (e.g., the arrow-symbol might mean *arrow* or *life* which also sounded *ti*). These syllable-signs were then combined to spell out multisyllabic words. The Sumarians used about 600 syllable-signs.

The Akkadians (Semitic people) conquered Sumar and founded Babylon. They borrowed the Sumarian syllabary and began using it in the following way. If the symbol was used as a pictogram, they pronounced the symbols in their own language. However, if they used the symbol phonetically as a syllable to pronounce other words, they used the Sumarian pronunciation. Hence, the Akkadians started to use the syllables in a more abstract manner (e.g., arrow-symbol that was pronounced as *ti* did not mean *arrow* in Akkadian). As a result, during the Hamurabi era around 1700-1800 BC, Acadians were able to reduce the number of syllable-symbols to 60, and used those symbols purely phonetically. They also continued using some ideographic and pictographic signs.

Pictographic/ideographic writing likely developed independently in a number of places: Sumar, Egypt, China (a pictographic script developed around 1500 BC), Harappa or Mohenjo-Daro culture of the Indus Valley (a still undeciphered mixture of pictograms and syllabic characters, developed around 3,000-2,400 BC), and Mesoamerica (Mayan script developed around 50 AD, and Aztec script in 1400 AD). All other writing systems evolved from these systems.

The Egyptian writing system developed around 3,000 BC and was likely somewhat influenced by the Mesopotamian cuneiform. The Egyptians first used hieroglyphs (i.e.,

carving in stone), but later developed a very efficient technology of papyrus, brush, and ink. They first developed ideographic writing, and later a syllabary. However, they used the syllabary much less frequently than it was used in Sumar or Babylon. Egyptians also used 24-25 symbols as consonants, but they only used these to spell foreign proper names.

Around 1,500 BC, Sinai and Canaan were the places of birth of the first consonantal writing system and of course the alphabet. The Seirites were a Semitic people who worked in copper mines for Egyptians, and they borrowed some elements from the Egyptian writing system. Being uneducated, they only borrowed the simplest elements, that is the uniconsonantal signs. These signs worked according to a phonetic *acrostic principle*: each sign was an object and the first consonant of this object was used phonetically (i.e., words are spelled phonetically using the names acrostically – an example in English would be the spelling of *cat* that might be spelled by depicting a can, an apple, and a table in sequence). "Aleph" denoted "oxhead," "bet" denoted "house," etc. Soon after the exile from Egypt (Moses' era), the Israelites developed a universal level of literacy. Their alphabet was pictorial. The position and orientation of letters or direction of writing were not fixed.

Note that there is some evidence that the Palestinians developed an alphabet-like system 100 or 200 years before the Israelites, and a similar borrowing from the Egyptians has been implicated. Nevertheless, all other alphabetic writing systems, including the Korean alphabet, are believed to be derived from the original alphabet created by the Israelites. The alphabet turned out to be a very efficient writing system and it soon spread across different cultures and took different forms. The signs generally became progressively less pictographic and more abstract, and around 1,100 BC, the

Phoenician script dropped all the pictorial elements and was written in horizontal lines from right to left. This gave rise to both Hebrew and Arabic.

The first fully phonetic (vowels and consonants) writing system emerged around 1,100-700 BC in Greece. The problem with consonantal writing was that it created too much ambiguity with Indo-European speech. This ambiguity is not as prevalent in Semitic languages because the roots of Semitic words are given by their consonants. Indo-European languages on the other hand are almost impossible to represent unambiguously without vowels (e.g., *bt* might mean: *bat, bait, bet, beat, bought, beet, bit, bite, boat, but, beauty*). The Greeks borrowed the Semitic alphabet from the Phoenicians but converted some of the signs into vowels (and added two vowels and three consonants), thus creating the first fully phonetic alphabet. The signs used in the system were also completely arbitrary with regard to the image they represented.