EDUCATION AND THE DEVELOPMENT OF MIND:

A CRITIQUE OF INFORMATION-PROCESSING THEORY

by

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Abstract

Throughout the history of educational thought an implicit ideal of education has been the development of mind. The ideal has been justified by metaphysical arguments, e.g., Plato's appeal to eternal forms, by pragmatic arguments, e.g., Dewey's appeal to the instrumental value of producing democratic citizens, and by "transcendental" arguments, e.g., R.S. Peters' argument for rationality.

A recent scientific argument for the development of mind (cognitive development) has profoundly influenced educational decisions about theory and practice. This argument appeals to empirical evidence and invokes a computational model of mind whereby the mind is an information-processing system (IP) and knowledge is the product of natural internal processes and mechanisms. This "naturalized" account of cognitive development differs significantly from the traditional educational account of the development of mind, particularly in respect to several decisions regarding the implementation of cognitive teaching and learning practices. These controversial decisions raise the central question in this thesis - *ought IP to influence educational decisions about theory and practice?*

To answer the question, the computational approach is contrasted with a normative or "conventionalist" approach to the development of mind which draws on philosophy of mind, epistemology and philosophy of education. In so doing, the thesis argues for the educational ideal on new grounds - the logical relationship between the concepts of mind, knowledge and education.

The examination reveals several good reasons for educationalists to resist the influence of IP theory; i) the naturalistic approach is incommensurate with the normative approach - the central concepts on the two approaches have different meanings, are governed by different criteria and principles and are embedded in different "conceptual webs"; ii) the naturalistic approach is conceptually confused and in many respects, incoherent; iii) the IP conception of mind is based on fallacious assumptions, and; iv) the implicit scientific "promise" to offer proof about the nature of mind and knowledge is constrained by limited methods and theoretical problems.

The conclusion of the thesis is that for these reasons among others, IP theory ought not to influence education theory and practice and that educators ought to critically examine the consequences of that influence.

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Introduction:

Education and the "Cognitive Revolution"

The so-called "cognitive revolution " is much in evidence in education. It appears in both direct and indirect form. The direct form is educational research actually done by cognitive scientists. . . . But the cognitive revolution is also represented in the work of many educational researchers who are not explicitly doing cognitive science.

Carl Bereiter and Marlene Scardamalia (AERA)

The Gognitive Revolution

In a recent document produced by the American Educational Research Association, cognitive psychologists Bereiter and Scardamalia report on their extensive review of the current literature on cognition and the curriculum. [1] In order to emphasize the increasing influence of cognitive research on educational theory and practice, Bereiter employs the analogy of a cognitive revolution, which he claims is "much in evidence in education".

Among the points raised by Bereiter to substantiate his analogy, three are particularly relevant to my philosophical interest, namely, different interpretations of the relationship between the concepts of mind, knowledge and education. Bereiter claims; i) that educational decisions always involve, at least implicitly, notions about what goes on "in the mind"; ii) that what is new is the explicitness of the interest and effort to give mentalistic notions an empirical and scientific basis, and; iii) that an educational concern with cognitive processes or outcomes inevitably forces a confrontation with more "basic theoretical issues of cognition". [2]

Bereiter's points reinforce my deep concern about the unwarranted influence of the information processing conception of mind (IP) on education. I believe that an important role for philosophy of education lies in addressing the educational and philosophical issues which are central to the so-called "cognitive revolution" in education.

Clarifying the Analogy

A "cognitive" revolution implies radical changes in institutionalized beliefs about cognition and cognitive development. If Bereiter's analogy is apt, then one would expect that some radical changes have taken place in the way we think about the human mind and its development. I suggest that such changes *have* occurred in respect to at least three traditions of thought on this topic. The first change might be described as *the psychological "explanation" for human action*, or more precisely, the demise of behaviourism and the rise of cognitivism. On the tradition of psychological behaviourism as exemplified in the work of Watson, Skinner and Thorndike, human action was explained as a causal response to environmental stimuli. The mind was held to be a mysterious "black box" which was either insignificant or irrelevant to why humans do the sorts of things they do.

The black box has now been opened. Not only is the mind now the primary subject of psychological research, the corollary is that the mind can *only* be studied by scientific empirical methods. A "scientific turn" has been made toward discovering facts about the mind as well as the physical world. For some researchers, the study of the mind is the scientific study of the operations of the brain, i.e., neurophysiology. However, many cognitive psychologists have replaced the study of behaviour with the study of cognitive and metacognitive processes, i.e., second-order mental processes used to exert control over primary thinking processes. Cognitive science provides supporting research on the operational structures or architectures of cognition and is often taken to be synonymous with cognitive psychology. Scientific materialism has become the method

of choice to discover the facts about mental events. As with behaviourism, the "facts" are derived from causal theories, the difference is that instead of causal theories of human action, researchers now posit causal theories of human thinking.

The second radical change might be characterized as a change in *the prevailing metaphor of mind*. The relationship between mind, knowledge and education is a central feature of the historical tradition of educational theory. For example, such imposing figures as Plato, Locke and Dewey expressed the relationship between mind, knowledge and education in terms of *metaphors* of mind, e.g., Plato's "well of knowledge", Locke's "blank slate" or "empty room" and Dewey's notion of a "biological system". In each case, the metaphor embodies a complex argument for the development of a particular sort of mind through a particular sort of education based on the acquisition of particular sorts of knowledge, or in Dewey's case, through a particular kind of "knowing".[3] Although they are not explicitly designated as such by Bereiter, there are good reasons to conclude that these metaphors and the arguments they embody are among the traditional theories of mind that have been overturned by the cognitive revolution. These reasons become obvious when we look at the revolutionary replacement, i.e., the new and allegedly "better" metaphor of mind.

The cognitive metaphor of mind is often referred to as the computational analogy. On this metaphor, the operations of the human mind are taken to be analogous to those of a computer. The brain is compared to the hardware and mental operations are compared to the software or operating programs used in the computer. Thus, humans are

taken to be one example of an "IP system" and the study of the mind is focussed on the "mental" level of description through *models* and simulations.

Models of IP range according to levels of concreteness, from mechanical models and flow charts to less concrete pictorial, symbolic and verbal models. The predominant model is that of action as a result of IP, similar to that of a computer. IP is a *functional* or operational view of mind, that is, it is concerned with *how* the mind functions as a system to access and process information and ultimately, to produce knowledge. IP is paradigmatic in the fields of cognitive psychology and cognitive science, that is, it is assumed to be the best operational view of mind upon which to base learning-theory research.

A third "radical" change is found in the current position or *stance taken by philosophy regarding psychological research.* Whereas European or "continental" philosophy has deep psychological roots, several influential "analytic" philosophers (following Frege's move to separate logic from psychology and epistemology), held what has been described as an anti-psychological and anti-scientific stance. This is to say that such philosophers were concerned with non-scientific problems such as dualism, i.e., the "mind/body" problem, with the existence of God and free-will or simply with linguistic analysis. However, the "new" scientific approach to the study of mind *is supported* by an increasing number of analytic philosophers, specifically those advocates of what is called philosophical functionalism.

The computational metaphor takes the form of philosophical functionalism in a relatively new and specialized branch of philosophy of mind. The term 'functionalism'

originated in the work of Putnam, and is currently advocated by other philosophers such as Fodor and Block.[4] Functionalism is a sort of indirect answer to the mind-body problem, namely, "How is it that human physical movements or actions can be caused by mental states or events?" On the functional account, the answer is that the brain functions in a systematic way, responding to perceptual stimuli (in a "language of thought") and processing representational symbolic information by means of unconscious mechanisms. In this way, the brain functions to cause our beliefs, desires etc. which, in turn, cause us to behave in different ways.

In summary, there *are* radical changes evident in the way many psychologists, educators and philosophers now think about the development of mind. First, cognitive psychologists have replaced behaviourism - which held that matters of the mind were irrelevant to the study of human action, with cognitivism - which holds that not only *is* the nature and function of the mind relevant to human action, it is *all* that is relevant. Such cognitivists hold further, that we can improve the way our minds function by "thinking about it" through metacognitive strategies.

Secondly, the study of the development of mind has moved from comprehensive theories of its development through knowledge and education, which were embodied in a variety of metaphors, to a scientific computational metaphor and the view that the human mind is an IP system. Finally, the philosophical stance towards psychology has changed from one fundamentally opposed to scientific research to one in which some philosophers use such research to support their arguments for functionalism. In short, Bereiter's analogy is alarmingly apt.

IP and Educational Decisions

Bereiter claims that "educational decisions always involve, at least implicitly, notions about what goes on in the mind". He notes that what is new is "the explicitness of the interest and the effort to give mentalistic notions an empirical and scientific basis".[5] To summarize his observations, educational decisions have been influenced in three ways. The first is a curricular shift in educational practice from an emphasis on what Bereiter calls 'formal' or 'textbook' knowledge to mental models and metacognitive strategies for improving how we think. This is not simply an instructional or pedagogical shift - we are teaching students that this is the "proper" way to develop their minds.

The second shift is one of values, particularly in respect to knowledge. Although Bereiter says that "knowledge is a central theme" of the revolution, [6] IP researchers have an extremely loose conception of knowledge which ranges from sensory or perceptual "information" to background or formal "knowledge". Moreover, rather than regarding knowledge as intrinsically valuable, it is taken to be a "tool" we use to improve our thinking ability.

Finally, empirical research now influences educational theory and policy directly through research done by cognitive scientists on the nature and function of the mind, and indirectly, through research on education as cognitive training and the development of cognitive strategies to be used by both students and teachers. As noted in the previous section, these are all aspects of cognitivism and IP theory.

I maintain that the influence of IP on educational theory and practice is a matter of grave concern. My first concern is with the development of mind as an educational

ideal. This ideal has historical precedents in the history of educational thought in the work of such thinkers as Plato, Locke and Dewey.[7] The arguments raised by such thinkers in support of the ideal were what Scheffler calls "full-blown philosophical interpretations", i.e., they use ethics, epistemology and metaphysics etc., to argue for a normative relationship between the concepts of mind, knowledge and education. The relationship embodies the development of mind as an educational ideal in the pursuit of human betterment. In contrast, the information-processing conception of mind is posited as the paradigm model for cognitive development by researchers in cognitive science and psychology. As such, the "argument" for IP is a different kind of argument from those which have historically influenced educational theory and practice. The cognitive argument is based on scientific canons and the assumption that the appropriate study of the human mind is a study of natural processes and mechanisms such as those posited by the IP model.

My second concern is that whereas the historical educational influences were the arguments of individual philosophers who brought together metaphysics, epistemology, ethics etc. into unified (albeit different) views, contemporary academics are compartmentalized into various disciplines within which researchers may pursue common goals yet be unaware of the implications of their theories for related disciplines. This "disciplinary compartmentalization" is particularly pertinent in the case of educational research.

Education is intimately concerned with epistemological issues - knowledge is the central achievement of education; with philosophy of mind - education has historically

been held to be the development of mind; and with psychological theories of learning - learning is central to the achievement of knowledge. However, due to the disciplinary compartmentalization, educational researchers may lose sight not only of the logical relationship between the concepts of mind, knowledge and education, but of the serous implication of that relationship, i.e., that different conceptions of mind imply different conceptions of knowledge and education. Although these concerns are arguably, serious problems for educationalists, to my knowledge, neither concern has been the subject of discussion in the educational literature.

The pervasive influence of IP theory on educational theory and practice noted by Bereiter, may be due to several commonly held assumptions on the part of educational researchers. Of these, three assumptions are possible, if not probable, explanations of the largely uncritical acceptance of IP theory by educationalists. The first assumption is that "new" views of mind are compatible with traditional conceptions of knowledge and education. The problem with this assumption is that it seems to contradict the implication of the logical relationship between the concepts of mind, knowledge and education - that different concepts of mind imply different concepts of education. We need to know whether the new concept of mind is commensurate or compatible with the traditional concepts.

The second assumption is that as we learn more about mind, we can change our conceptions of knowledge and education to correspond to the "new" view of mind. The problem with this assumption is that (due to the disciplinary compartmentalization and the complexity of contemporary cognitive theories) we may not know whether the new

view of mind is coherent in the first place. Further we may not fully understand the educational implications of the "new" relationship.

The final assumption is that traditional conceptions of knowledge and education are no longer relevant to the contemporary development of mind - that cognitive science and psychology can provide us with the answers to cognitive development and provide appropriate guidance for educational theory and practice. The problem with this assumption is that we may not understand the limitations of the scientific approach to the development of mind and consequently we may misconstrue the consequences of such an assumption for education.

From my concern with the uncritical acceptance of the influence exerted by IP theory on educational theory and practice and with the possibly fallacious assumptions that explain such an influence, emerged the research question that directs this thesis: *Ought IP to influence educational decisions about theory and practice?*

Accordingly, IP theory is examined in terms of three questions which arise from these concerns and problems. First, what concepts of knowledge and education follow from the information-processing conception of mind? Second, are the IP conceptions of mind, knowledge and education reconcilable with the traditional concepts? Finally, is IP a coherent view of mind?

Confronting the Issues

Bereiter cautions:

> An educational concern with cognitive processes or outcomes inevitably forces a confrontation with more basic theoretical issues of cognition. Educators cannot safely appropriate the tools and findings of cognitive research while ignoring the theoretical questions that lie behind them. [8]

This thesis is perhaps an "ironic" response to Bereiter's admonition. It is a "confrontation with the basic theoretical issues of cognition" and it argues that *when* educators are aware of the "tools and findings of cognitive research" in respect to information-processing, they *cannot* "safely appropriate the tools and findings of cognitive research".

There are few, if any, clear and coherent arguments for the computational analogy in the educational literature. Nor are there any serious attempts to deconstruct the theory into its essential components, i.e., the concepts of mind, knowledge and education. For this reason I have compiled a composite of this view from the literature of cognitive science, cognitive psychology and philosophy of mind (specifically philosophical functionalism). I call this approach the "computational approach to the development of mind". However, I am specifically interested in the cognitivist interpretation of the approach. Further, although to my knowledge no cognitive researcher explicitly subscribes to the view as it is here articulated, given the absence of any argument for this position in the literature, this thesis may provide a plausible explanation for why cognitive researchers might so-subscribe.

I contrast the computational approach to another composite which I have organized for the purposes of this thesis. I do so for two reasons namely, for clarificatory purposes and as a counterpoint to what is otherwise a negative thesis. I call the contrasting approach the "conventionalist approach to the development of mind". Again, the composite was deemed to be necessary due to the lack of an explicit argument in the

educational literature for a normative approach to the development of mind that elaborates a different sort of relationship between the three central concepts.

Although it can be argued that the traditional liberal conception of education as advocated by Oakeshott, Peters, Hirst and Scheffler (among others) does advocate this relationship, it is in large part, either unknown to contemporary educationalists or it is taken to have little to say on the controversial and current subject of mind. To my knowledge no individual used in the composite actually subscribes to the view so expressed. The conventionalist view is compiled from the literature of philosophy of mind, epistemology, and philosophy of education. The common assertion of all advocates so construed is that 'mind' is not the sort of "thing" posited by the IP conception. Rather 'mind' refers to human beliefs, desires, fears, goals etc.

The thesis is divided into three sections, each of which is an elaboration of a central premise. Section I develops the first premise - that educational theory and practice is currently influenced by two distinct approaches to the development of mind, each of which is concerned with the relationship between the concepts of mind, knowledge and education. Chapter 1 explores three historical examples of the relationship. Chapter 2 describes the computational approach to the development of mind which holds that in the relationship, the mind is an information-processing system. Chapter 3 describes an alternative approach to development of mind, i.e., a "conventionalist" approach which holds that our conceptions of mind, knowledge and education are rather, embedded in public linguistic conventions. The concepts of mind, knowledge and education embodied in the two current views are shown to lack synonymity.

Section II develops the second premise - that the two approaches to the development of mind are incommensurate due to sources of difference in fundamental assumptions underlying each of the three pairs of concepts. Chapter 4 argues that the concept of mind in each view is based on opposing responses to the "mind-body" problem. Chapter 5 argues that the concept of knowledge following the two conceptions of mind differs in terms of assumptions about the task of epistemology, the nature of knowledge, and how knowledge is acquired. Chapter 6 argues that the fundamental differences in assumptions about the concepts of mind and knowledge are followed by different assumptions about the nature of learning, the relevant criteria for cognitive development and ultimately, about the purpose and scope of education. The profound differences in assumptions about the three concepts lead to the conclusion that the two approaches are incommensurate.

Section III develops the third premise - that there are good reasons for educators to question some central claims made by the advocates of computation. The section is divided into two parts. Part 1 argues that the computational approach is flawed on conceptual and methodological grounds. Chapter 7 follows Searle's argument that the computational approach is based on fallacious assumptions of mind. Chapter 8 examines some conceptual and theoretical limitations of information-processing methodology and some general problems related to metaphors of mind. The examination leads to the conclusion that there are serious problems to be redressed before an argument can be raised in respect to compatibility.

The thesis concludes that in its cognitivist interpretation, the computational approach does not lead to the normative development of mind in an educational sense. Therefore, the research of such advocates of IP theory ought not to influence educational theory and practice. Part 2 summarizes the thesis argument and discusses some implications arising from the conclusion of the thesis. In summary, this thesis follows Hacker's observation that:

> The task of philosophy is not to construct theories about cognitive processes which scientists can then elaborate and test; it is rather to destroy those illusions.[9]

Notes: Introduction

1. Carl Bereiter & Marlene Scardamalia (1992) "Cognition and Curriculum" 517 in: P. Jackson (ed) *AERA Handbook of Research on Curriculum* (New York:MacMillan). For simplicity the references to this article will use the first author's name only.

2. Ibid.

3. See Francis M. Cornford, (1957) *Plato's Theory of Knowledge* (Bobbs-Merrill); Locke, John (1959) *An Essay Concerning Human Understanding: Volumes One and Two* Alexander Campbell Fraser, (Ed) (NY: Dover Publications Inc.); Dewey, John (1933) *How We Think* (Boston: D.C. Heath and Company); (1964) *John Dewey on Education* Reginald Archambault (ed) (NY: Random House Inc.)

4. See Hilary Putnam (1975) *Mind, Language and Reality*, Philosophical Papers, Vol.2 (Cambridge University Press). It should be noted that Putnam takes a different view in later works, e.g., (1988) *Representation and Reality* (Mass: MIT Press); Jerry A. Fodor (1975) *The Language of Thought* (Thomas Y. Crowell); Ned Block, "The Computer Model of the Mind" 819 in: D.N. Osherson and E.E. Smith (eds) (1990) *Thinking: An Invitation to Cognitive Science* (Mass: MIT)

5. Bereiter, *Cognition*, 517

6. Ibid., 521

7. Israel Scheffler (1965) *Conditions of Knowledge* 2 (Chicago: University of Chicago Press)

8. Bereiter, *Cognition*, 518

9. P.M.S. Hacker (1990) *Wittgenstein: Meaning and Mind* Volume 3, Part I, 145 (Oxford: Blackwell Publishers)

Section I:

Influential Approaches to the Development of Mind

PREFACE

The question of whether or not IP theory ought to influence educational theory and practice suggests that there is a relationship between the development of mind and education in the first place. While this relationship might appear to be self-evident, this thesis takes the position that the relationship has not been clearly articulated in the literature. Thus, the question regarding the influence of information-processing may be in large part a consequence of this lack of clarity.

The central purpose of this section, therefore, is to clarify; i) what is meant by the development of mind, i.e., the relationship between the concepts of mind, knowledge and education; ii) a significant implication of that relationship, and; iii) how two current influential approaches to the development of mind interpret the relationship.

The section is divided into three chapters. The first chapter illustrates the logical relationship between the concepts of mind, knowledge and education with precedents from the tradition of historical educational thought. The precedents point to a significant implication of the relationship between mind, knowledge and education, namely that *different conceptions of mind imply different conceptions of knowledge and education*. The second and third chapters examine two prevailing views of development of mind in terms of; i) how each characterizes mind, knowledge and education, and; ii) what each view presupposes about the development of mind.

Several caveats govern the material in this section. First, from the wide choice of historical exemplars in the history of educational thought, Plato Locke and Dewey

were chosen as exemplars due to; i) their attention to the details of each concept, and; ii) their profound and lingering influence on educational theory and practice.

Secondly, the reconstruction of the views of the historical thinkers and of the two current approaches to development of mind is limited by the scope of this thesis to minimal descriptions and summaries of what are extremely complex arguments. The emphasis in the reconstruction is on the three concepts (mind, knowledge and education) and on the different interpretations of the relationship between them.

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It is hardly surprising . . . that the concept of knowledge should have given rise to a variety of traditions of full-blown philosophical interpretation. For not only does the mere breadth of the concept lend itself to alternative emphases, but its intimate association with variable ideals of civilization and with changing technologies and scientific models invites correspondingly varying evaluations.

Scheffler, "Conditions of Knowledge"

Chapter 1
Historical Approaches to the Development of Mind

The western intellectual heritage holds that the *development of mind* is achieved through *education*, i.e., the acquisition of worthwhile *knowledge* and understanding. This view has philosophical roots in the history of educational thought where the precedents for the relationship between mind, knowledge and education are first articulated.

Of the many philosophical arguments germane to the development of mind, those of Plato, Locke and Dewey have been particularly influential on educational theory and practice. Although each thinker argues (albeit implicitly) that the development of mind reflects a logical relationship between the concepts of mind, knowledge and education, their understanding of the nature of that relationship differs. For example, Plato argues for a rational interpretation of the relationship, i.e., the development of mind is related to reason; Locke argues for an empirical interpretation, i.e., the development of mind is related to sensory experience, and Dewey argues for a pragmatic interpretation, i.e., the development of mind is related to solving "real" problems in practical situations.

Each interpretation reflects the social and technological ideals of its historical context and each presupposes a particular conception of mind, expressed as a metaphor of mind. Given a particular concept of mind, the concepts of knowledge and education are then construed in such a way as to meet the necessary conditions for developing that

sort of mind. At the same time, each view reflects the epistemological perspective of its time, i.e., a position on what counts as knowledge, what we can, in fact, know and how we can come to know. Thus, as Scheffler points out, different traditions invite "correspondingly varying evaluations".

Plato's Rational Approach

Development of Mind: Enlightenment

Plato holds that the development of mind is a matter of enlightenment, i.e., the achievement of intellectual freedom from ignorance, through episteme (true knowledge) and noesis (philosophical reason). Plato's method of achieving enlightenment is articulated in the *Republic* where he describes the "four stages of cognition". Socrates says:

> Take, as corresponding to the four sections, these four states of mind: intelligence for the highest, thinking for the second, belief for the third, and for the last, imagining. These you may arrange as the terms in a proportion, assigning to each a degree of clearness and certainty corresponding to the measure in which their objects possess truth and reality.[1]

Plato claims that we become enlightened by achieving four increasingly sophisticated levels of abstract thinking or states of mind which characterize our understanding of what we perceive. In the initial level, Eikasia - a state lacking enlightenment, we imagine that all the images we perceive are "real". Pistis is a state of common sense belief in visible things, belief which although it may be correct, is not based on any justification or "chain of reasoning" for holding the belief.

Dianoia is characterized by the ability to think abstractly, to theorize using abstract principles and the ability to reason discursively, that is, from premises to a

general conclusion. The final level, Episteme or true knowledge (logos) of the forms, is characterized by Noesis or intelligence (rational intuition) and represents the culmination of philosophical reasoning ability and the recognition, or at least apprehension of the forms.

Noesis is achieved through the *dialectic mode*, that is, the ability to respond to questions concerning the justification for the individual premises of an argument, thereby leading to the development of a necessary cognitive perspective (synoptic understanding) of overarching fundamental principles on which the premises depend. This ideal state, if achieved, provides the foundation for distinguishing justified true belief from *unjustified* true beliefs or *false* beliefs.

On Plato's view, the ability to theorize is the appropriate point for those who seek true knowledge, that is, those who would be enlightened, to begin their education or their theoretical recollection of "the knowledge within." Enlightenment is achieved by means of an education of a particular nature. Enlightenment requires recognition of the distinction between; i) our beliefs or opinions about the visible world of appearances and ii) knowledge about the intelligible world of underlying principles which explain or justify our beliefs and opinions, thereby rendering them either true or false.

Mind: A "Deep Well" of Knowledge

On Plato's view, knowledge is *within* individuals, at least within those individuals whose souls have "seen all things". In this sense, knowledge could be said to reside in the soul, a view which is clearly articulated in Meno. Socrates says:

> Thus the soul, since it is immortal and has been born many times, and has seen all things both here and in the other world, has learned everything that is. . . .

> so that when a man has recalled a single piece of knowledge - learned it, in ordinary language - there is no reason why he should not find out all the rest, if he keeps a stout heart and does not grow weary of the search, for seeking and learning are in fact nothing but recollection.[2]

Scheffler uses the metaphor of "a deep well" to describe Plato's rational view of mind. Although Plato does not explicitly refer to 'the mind', the idea of mind as a metaphorical well is an apt description of his view.[3] On Plato's account of cognitive development, knowledge arises from within the individual in a perpetual cycle of recollection and renewal. Substantive knowledge is located *within* individuals, available to be recalled in some manner, and sensory perception and experience are not directly responsible for the acquisition of knowledge.

Knowledge: Eternal Forms and Anamnesis

According to Plato, we begin our mortal lives without knowledge , or at least unaware of knowledge that may exist in our souls. We are limited initially to information obtained by means of sensory impressions and believe that our impressions are of the "real" world. Our perceptual beliefs are based on opinions (doxa), that is, we hold something to be the case because it *appears* or *seems* to be so. Beliefs may be true or false - there is no method of proving which is the case until the reasons or justification for holding such beliefs are understood. Plato contrasts opinions with knowledge (episteme), a state of mind [4] which is exemplified by the recognition or awareness of certain unchanging fundamental principles or metaphysical forms such as truth, beauty, justice etc. Scheffler characterizes this view of knowledge as a "rational" interpretation, in the sense that for the rationalist, knowledge is constituted by general and necessary

truths which may be established by means of *deductive chains of reason* which are linked to self-evident basic truths.[5]

According to Plato, whatever is not true or certain, i.e., that which is uncertain and changing, is the object of ignorance, belief or opinion. Given the changeable nature of the physical world, our perceptions of it are only "manifestations of things in various forms", that is, we see only particular examples of "real" objects, whose essential forms are unchanging. To "know" then, is to grasp the *essence of an idea*, i.e., that, by virtue of which something can be said to be beautiful, just, good, etc. or whatever it is that constitutes "---ness". Knowledge lies in the realm of abstract thought, in essential concepts, beyond particular instances or concrete examples. In order to grasp the essence of a concept it is necessary to clarify it through analysis and distinguish the essential criteria that constitute the concept. On this view, without a grasp of the essence of something, we cannot recognize particular instances or examples of it.

Different states of mind distinguish knowledge from beliefs. The first distinction is that between belief (in the sense of being aware of having a belief that p) and other mental activities such as dreaming. The beliefs of which we are aware can be categorized in terms of whether they are beliefs which we hold to be true by virtue of some reason, i.e. justification, as opposed to those which we take on faith (such as religious beliefs).

Our justified beliefs can be categorized in terms of whether they are in fact true (in the sense that they are proven facts) or false (due to a problem with the evidence used to justify the belief). Further, it is possible to have a true belief which is unjustified, that

is to say the belief has been proven to be true but we are not aware of the justification for it. Those beliefs of which we are aware that are both justified and true are the necessary constituents of knowledge.

Cornford notes that knowledge, on Plato's view, is distinguished from opinion or true belief in at least three significant ways. First, knowledge is infallible, whereas belief may be either true or false. Second, knowledge can only be of "real" objects (the immutable, unchanging forms), whereas our beliefs are based on only partly real and mutable objects. Thirdly and perhaps most significantly,

> Knowledge is produced by *instruction*, always accompanied by a true account of its grounds, unshakable by persuasion and possessed by gods and only a few among men. True belief is produced by *persuasion*, not based on rational grounds, can be changed by persuasion and is possessed by all mankind.[6](italics added)

Plato's rational view of knowledge is governed by three criteria; first, one must believe; second, the belief must be justified or rationally explained; and third, the belief must be true by virtue of its relationship to its objects - the unchanging metaphysical forms. This conception has come to be known as the "tripartite analysis of knowledge".

Plato's account of how knowledge arises (his theory of Anamnesis) is illustrated by means of an uneducated slave. In the dialogue, Meno's slave is questioned according to the dialectic method (that of analysis and clarification) which Socrates equates with "midwifery", thus directing attention to the notions of 'assisting' and 'drawing out' in the 'rebirth' of knowledge. [7] The slave boy is found to be able to conclude through reason, presumably without help from anyone, that a square based on the diagonal of an original square has an area twice as large as that of the original square. He was able to

do so, Socrates says, "because truths his soul knew before birth still existed in it and could *with a great effort be recalled*".[8] (italics added)

Education: A Socratic Dialectic

The Platonic concept of education includes those disciplines that, "yield a priori certain knowledge of immutable and eternal objects and truths". [9] Plato outlines a program of studies centred around the development of reason which, if followed by the individual, leads to the final level of enlightenment. The program begins with reading, writing, rudimentary arithmetic and geometry, music (arts, culture, philosophy) and athletic exercises. This level of education was mainly confined to the world of appearance and belief, whereas Plato's higher level of education was an "escape" from the "prison" of appearances through the training of the intellect. The higher level of intellectual training includes several branches of mathematics and moral philosophy in which the technique of the Dialectic in philosophic conversation was emphasized.

Plato does not explicitly refer to the role of the teacher. By inference, however, the epitome of an educator is Socrates, who exhibits the characteristics of wisdom, virtue, intellectual courage and the desire to seek truth. Thus, the educator is an exemplar, one who has gone before and who understands what it is to search for knowledge. The role of the exemplar is that of a mentor who, by means of skilful and perceptive questions assists the student to come to an understanding of what is most worthwhile and to begin the quest for truth.

In summary, Plato argues that the development of mind reflects what he holds to be a *rational relationship* between mind (soul), knowledge (of the eternal forms) and

education (a dialectic). The development of mind, i.e., enlightenment is achieved when the mind/soul gains intellectual freedom through reason and acquaintance with the eternal forms of knowledge. This sort of development is fostered by the study of philosophy, mathematics and the dialectic method, a purely rational conversation during which an individual becomes aware of his or her innate knowledge.

Locke's Empirical Approach

Development of Mind: Reflexion and Introspection

According to Locke we are born without knowledge - our empty minds are characterized by metaphors such as "tabula rasa" (blank slate), empty rooms and cabinets. All that we can ever know comes from our awareness of the ideas that we gain through experience and our perception of their relationship to each other. Locke holds that:

> *All the ideas* that we have and can have about existences *must have been experienced* in one or other of these ways, as far as their elementary constituents are concerned: otherwise the words supposed to have meanings are only empty sounds. [10]

On Locke's view, "the ideas first in the mind, it is evident, are those of particular things, from whence, by slow degrees, the understanding proceeds to some few general ones; which being taken from the ordinary and familiar objects of sense, are settled in the mind, with general names to them." In other words, our perception of ideas about the world and our knowledge of them, are initially ideas about particular things. We move, according to Locke from the particular to the "less general or specific, which are next to particular" and finally to general ideas which are "fictions and contrivances of the mind." [11]

Locke says that everything in the mind is either perceived or willed. To "perceive" involves different activities such as knowing, believing, reasoning and sensing. Further, to perceive is to receive impressions from either within (to be aware of ideas by means of introspection) or from without (by means of sensory impressions). To "understand" is to exercise certain *innate powers of mind*, which include the ability to; perceive ideas, distinguish ideas of some things from ideas of other things, retain the distinctions in the mind (memory), combine ideas of some things with ideas of other things, abstract ideas from ideas of other things, and to use a sign to refer to an idea. [12]

Mind: A "Blank Slate"

Although Locke is most commonly credited with the "tabula rasa" or "blank slate" metaphor, he also uses the metaphor of an "empty room" to describe his view of mind. Both metaphors are apt descriptions of mind as passive or receptive to the imprinting and manipulation of its objects. The picture of mind as a blank slate requires that knowledge is obtained by means of some sort of innate ability and that we are constrained in our acquisition of knowledge by both the extent of our innate perceptual ability and what percepts are available to be obtained. This view of mind offers an account of our sensory abilities and accords them an important role in the acquisition of knowledge.

Locke's conception represented a radical departure from the Platonic tradition of "knowledge within", i.e., the notion of innate "ideas" which can be recalled by means of intellectual understanding. Locke's contrasting work provided a foundation for a new tradition namely, *empiricism* - the view that knowledge is gained through experience and observation by means of sensory impressions and innate powers of mind.

Locke claims that objects in the world possess primary and secondary qualities which stimulate our senses by means of sensory impressions thus causing us to perceive ideas of them. We 'know' that we perceive an object in the world when we perceive the idea of it which results from imprints of the sensory impressions upon our minds. Through introspection and the exercise of the innate powers of the mind (recollection and contemplation) upon the ideas, we come to understand a variety of relationships between both simple and complex ideas and develop our ability to posit generalizations using our ideas.

Scheffler notes that in the empirical tradition, the relationships among elementary phenomena "are natural associations tentatively projected as generalizations from our limited past experience." He comments, "the mind must, of course, be construed as having the power to compare, combine, analyze, and generalize upon the materials furnished to it by experience, as well as the ability to perform logical operations upon its concepts." On the empirical view, all knowledge "which reaches beyond the circle of the mind's own concepts and refers to the world must be based upon observation of what lies beyond, of what is not innate in the mind itself".[13]

Knowledge: Sensory Impressions and Ideas

Locke's concept of knowledge is based on the relationship between experience and ideas. The objects of thinking which he calls *ideas* are the most important constituents of knowledge. Locke holds that, "Since the mind hath no other immediate object but its own ideas, which it alone does or can contemplate, it is evident that our knowledge is only conversant about them".[14] In order for perception (in the mind) to occur of external

object (outside the mind) there must be an idea to represent it. Ideas are " whatever it is which the mind can be employed about in thinking".

Locke posits two features of ideas, namely, that they are things perceived or thought about and that they must be capable of being used as signs. Every idea is a sign for something. We use words to signify ideas, thereby bringing the ideas before our minds. The things signified agree or disagree with each other in a way parallel to the way the ideas agree or disagree. There are two sorts of ideas: they may be *simple*, i.e., the product of things in the world, or *complex*, i.e., derived from their own archetypes (made by mind itself).[15]

All ideas that can enter into propositions originate in either extended things around us and/or the mental operations of which we are conscious. Locke further classifies ideas according to their source. Thus, ideas are gained through either *sensation* (through sense organs/ neurological events) or *reflection* (through introspection of mental operations) such as perceiving, remembering, reasoning, doubting and willing.[16]

On Locke's empirical view, knowledge is constituted by the perception of the agreement or disagreement of ideas which are held in our mind for further reflection. When we reflect on previously perceived simple ideas, we connect them or separate them in a variety of ways, thereby constructing complex ideas. Locke states:

> *Knowledge* then seems to me to be nothing but *the perception of the connexion of and agreement, or disagreement and repugnancy of any of our ideas.* Where this perception is, there is knowledge, and where it is not, there, though we may fancy, guess, or believe, yet we always come short of knowledge.[17]

The unit of knowledge is a "mental proposition", namely, knowledge *that* something is the case rather than knowing *how*, or what is currently described as

"procedural knowledge".[18] Propositions are claims that something is true, i.e., that something is in fact, the case. On Locke's view, to *know* is to join or separate simple ideas, and make complex ideas based on the perception of agreement or disagreement of those ideas. Complex ideas may be either true or false depending on the accuracy of the connecting or separating. [19]

Four sorts of "agreement and disagreement" contain all the knowledge that we have or are capable of having. These sorts of agreement or disagreement are based on the notion that to be conscious implies an awareness of the contrast between differing things and the lack of contrast between things that are the same. Locke claims that the first such distinction is one of *identity* or *diversity*, i.e., awareness that what is one thing is distinct from another thing. This distinction is fundamentally necessary, for without it there can be no reasoning, knowledge or imagination - in fact, "there can be no distinct thoughts at all". [20]

The second and third sorts of agreement and disagreement refer to awareness of the *relationship* (either agreement or disagreement) between any two ideas. The relationship may be such that it is subject to change (non-coexistence) e.g., changes in nature, or it may be independent of the powers and laws by which change is determined (co-existence), e.g., pure mathematics. The final sort of distinction is that between real existence or *certainty* versus *probability*. [21] According to Locke's concept of knowledge, all we can inquire about is whether something is, or is not the same as something else; whether it does or does not co-exist with some other idea in the same subject; whether

it has this or that relationship with some other idea, and; whether it has a real existence outside the mind. [22]

Education: Observation and Reflection

Locke belonged to the rational scientific age by virtue of his strong belief in experience, ordered by natural reason. His method of inquiry into the nature of truth is based on the model of natural science, that is, his generalizations are formulated by reason and tested on the basis of empirical observation. It follows that Locke's educational theory is based on a similar method of acquiring knowledge through experience mediated by reason.

Locke's educational views, which are articulated in his "Thoughts on Education" are based, in part, on his concept of knowledge described in the "Essay Concerning Human Understanding". In fact, Price notes that Locke's educational views are justified by virtue of their epistemological correctness, that is, the degree to which these ideas agree or disagree. Price comments on the "bearing of Locke's epistemology" on his views concerning the education of young gentlemen:

> It seems to be threefold. It provides a way of justifying the objective of their moral training, an illumination of the objective of their intellectual training, and a part of the method for both. [23]

Locke advocates a sort of education that emphasises the importance of experiences and observation, presumably to extend the ideas on "the slate" or add to the furniture in "the room". The starting point for Locke lies in establishing the child's "needs" and developing a balance between reason, freedom and authority. This is accomplished

through planning based on observation of children at play and recognition of their various individual differences.

The role of the teacher or tutor (in Locke's case) is that of an exemplar, that is, one who displays all the qualities of character that are deemed desirable to develop in the child. Further, the tutor ought to stimulate the child's curiosity and desire to learn. Jeffries notes that Locke's theory of knowledge, "turned away from the Platonic-Aristotelian tradition by which philosophers had tried to derive knowledge from the operations of reason alone." He points out further that "Although Locke's empirical theory of knowledge was implicitly the one that science uses to explore the world, his educational application of it was almost wholly passive, that *learning for him was receptive* rather than active." [24]

Empirical education, in Scheffler's opinion is, "one which supplies abundant and optimally ordered phenomenal experiences to the student so that his powers of observation and association may take hold and enable him to grasp the natural order among events." Further, the ideal education

> Trains the student not only in proper logical habits but in traits requisite for learning from experience - accurate observation, reasonable generalization, willingness to revise or relinquish purported laws which fail to anticipate the actual course of events.[25]

The empirical view of education assumes that Plato's notion of innate ideas is false. Therefore, it is necessary to assist children to have naturally-ordered experiences which provide opportunities for observation through which children may gain ideas which are the means by which they come to understand the world in which they live.

In summary, Locke argues that the development of mind reflects an *empirical relationship* between the mind (a blank slate), knowledge (agreement /disagreement of ideas) and education (phenomenal experiences). This sort of development of mind is achieved through introspection and rational reflexion, both of which require that education emphasize mental stimulation through sensory experiences.

Dewey's Pragmatic Approach

Development of Mind: Intelligent Behaviour

Although Dewey uses the term 'knowledge' intermittently in his various writings, he holds the view that human inquiry or active learning is rather a matter of 'knowing' which is constituted by a psychological relationship or transaction which he calls his *reflex arc* theory.

Dewey's "reflex arc" theory describes *a psychological relationship* between a stimulus, a decision to "re-direct activity and re-construct the environment", and the "influence of the decision in future stimuli".[26] Dewey, following Darwinian theory, views humans as biological organisms that survive and evolve through adaptation to, and control over, their environment.

Dewey claims that "habits give control over the environment, power to utilize it for human purposes". This is accomplished in two ways, namely, by "habituation" (adaptation to surroundings) and "readjusting" to meet new conditions. Habituation and readjustment provide the necessary fundamentals for Dewey's theory of growth which, when simplified, states that habituation "furnishes the background of growth" and that readjustment "constitutes growing".[27]

Dewey holds that the human brain is "essentially an organ for effecting the reciprocal adjustment to each other of the stimuli received from the environment and responses directed upon it." [28] Thus, it is not surprising that Dewey's view of the nature of human inquiry is an extension of his reflex arc theory. That is, he views inquiry as a *process* of *"reflective thought"*, a process wherein an individual is stimulated by "real" doubt and responds to the stimulation with a form of scientific deliberation.

According to Dewey, two factors constitute the nature of every human being - force and pattern. Dewey claims that force or "impulse" is an innate function of human nature which causes us to be constantly active. Pattern, or what Dewey calls "habit", on the other hand, is entirely acquired. On Dewey's theory, a response to a given stimulus offers a release for the impulse to act. The mode of release is taught by experience. Thus, all human behaviour is composed of innate impulse organized by acquired habit.

Intelligence or intelligent behaviour, is activated when other habits break down, thereby causing the impulse to be blocked. By entertaining hypotheses as to what conduct might resolve the blockage of impulse, selecting the best alternative and acting upon it, i.e., the method of science, we thereby "behave intelligently".[29] Desire or interest also arises when impulse is blocked - thus causing the learner to feel the need to overcome or solve the problem.

> Intelligence is the habit of responding to problematic situations . . . The knowledge which intelligence creates is not passive recognition of an unalterable world. Rather it is a relation between a meaning or a thought and an overt action . . . The purpose of knowing is never certainty . . . rather the truth of knowledge is the utility a thought possesses for showing us the way to the solution of a problem.[30]

Mind: A Biological Organism

The transactive nature of the relationship between the knower and the known on the pragmatic view places certain restrictions on the construction of an apt metaphor of the mind. Scheffler limits his metaphorical analysis to the following:

> The process of learning from experience is thus an active process for the pragmatist. The mind is conceived neither as a deep well of necessary truths nor as a blank slate upon which experience writes. Rather, it is viewed as *a capacity* for active generation of ideas whose *function* it is to resolve the problems posed to an organism by its environment.[31]

Scheffler's notions of "capacity" and "function" suggest a mechanistic metaphor, yet consideration must be taken of Dewey's view of humans as organisms. Like Plato, Dewey does not discuss a picture of the mind, in fact, given his antipathy toward mind-body dualism, it follows that he would not accept any description of a mind distinct from the body. [32] Thus an appropriate depiction of Dewey's view must be one that reflects his monist or holistic orientation.

An appropriate metaphor might be that of a "biological organism", i.e., a natural mechanism which operates on impulses and has the specific functions of problem-solving and proceeding according to the consequent solutions. The biological organism metaphor is consistent with the sense of regeneration in Dewey's theory of knowing, that is similar to a computer "feedback program" which has been designed to revise and regenerate its contents from its own experience.

This depiction of the mind is active by nature and it implies an innate capacity or ability to regenerate the materials upon which it operates. The mind is limited in what

it knows only by the extent of its own experience, the degree of efficiency it develops and the degree to which optimum conditions contribute to its operation.

Knowledge: Adaptation and Assimilation

Dewey's interest in the nature of human *inquiry* led him to develop a theory of "active knowing through experience" rather than a "concept" of knowledge. What Dewey calls "reflective thought" is controlled by the knower and invokes ideas of choice, active participation and willing cooperation on the part of the learner. In this sense, Dewey's theory is perhaps best described as a theory of the nature of "learning" as distinguished from a theory of knowledge. On Dewey's view,

> Intelligence begins in consciousness . . . The consciousness of problems in our environment leads to thought. This is the use of symbols - of words and sentences; and symbols represent actions to be performed, together with the consequences to which those actions lead. [33]

According to Dewey, the scientific method can be applied to individual inquiry in a *process* involving the formation of ideas, acting on ideas/hypotheses, observing consequences/conditions which result and organizing facts/ideas which follow from the conditions. Dewey claims that:

> The development of the experimental method as *the method of getting knowledge* and of making sure it is knowledge, and not mere opinion - the method of both discovery and proof - is the remaining great force in bringing about a transformation in the theory of knowledge.[34]

Dewey's method of "transforming the theory of knowledge" is governed by what he calls *criteria of experience*, namely, the principle of *continuity* and the principle of *interaction*. The principle of continuity of experience (also called experiential continuum or category of continuity) is, simply put, the fact that we are shaped, changed, or in some way

modified, by each of our experiences. To that extent, we are never quite the same person upon exiting an experience that we were upon entering it. The principle of interaction, again simply put, acknowledges equal "rights" to both internal and external conditions governing a particular experience. Although he acknowledges equal rights to both internal and external conditions, Dewey holds that external 'acts' have temporal priority over internal acts. [35]

Knowledge is made instrumental, on Dewey's view, through "purposes" or "ends-in-view". Purposes are formed through a "complex intellectual operation " which involves observation of surrounding conditions; knowledge of what has happened in similar situations in the past; and judgement which puts together what is observed and what is recalled.[34] Dewey claims that:

> What he [the child] has learned in the way of knowledge and skill in one situation becomes an instrument of understanding and dealing effectively with the situations which follow. The process goes on as long as life and learning continue. [37]

On Dewey's view, *one major mode of knowing* ought to be applied consistently in all areas of thought. Thinking is not a "separate mental process", but rather a matter of habits of mind which are directed by objects, subjects or topics which stimulate or evoke response. Dewey believes that thought can be indirectly "trained" in an "environment" under "conditions" which cause correct habits of mind to be developed. The "habits", namely, *directness, open-mindedness, single-mindedness* (or wholeheartedness) and *responsibility* are features of what Dewey calls the "method of knowing" or "the reflective situation". [38]

Education: Learning Situations

Again, Dewey does not view education as a "concept" to be analyzed. Rather, he argues for a scientific theory of education. According to Dewey, the experience of learning must begin within the scope or level of the child's experience and from there, develop progressively to richer and more organized forms. Thus, the process is a "constant spiral" in which connectedness in growth must be the "constant watchword." [39] The experience of learning is determined by the 'quality' of the experience. Dewey posits two aspects of experience, namely, agreeableness or disagreeableness, and the influence upon future experiences.

When governed by the principles of continuity and interaction, learning is necessarily a part of the child's present experience.

> Any normal experience is an interaction of these two sets of conditions. Taken together, or in their interaction, they form what we call a *situation* . . . The conceptions of *situation* and of *interaction* are inseparable from each other. An experience is always what it is because of *a transaction taking place between an individual and what, at the time, constitutes his environment,* [40]

The educator, on Dewey's view, should be primarily concerned with the *conditions* under which learning takes place. It is the business of the educator to arrange the conditions in such a manner that children will have experiences that develop the correct habits of mind. These conditions might be called 'learning situations'. Thus, according to Dewey:

> The immediate and direct concern of an educator is then with the *situations in which interaction takes place.* The individual, who enters as a factor into it, is what he is at a given time. It is the other factor, that of objective conditions, which lies to some extent within the possibility of regulation by the educator.[41]

The content of education, on Dewey's view, should include all subjects required for shaping the impulse of the young in the pattern of the parent society. Thus, business management, natural and social sciences, humanistic classical subjects and both practical and fine arts ought to be taught. However, the emphasis in this prescription is on the teaching of the subjects rather than the requirement that they be imposed on all students. Dewey holds that students should only study those subjects on which their "impulse focuses".[42]

Pragmatic education assumes that children are primarily biological organisms; that they act on an innate impulse which seeks release through the successful resolution of problems; that what is learned cannot and ought not to be distinguished from who it is that is doing the learning, and; that the notion of a mind independent of what it knows is false. On the pragmatic view, education is a means of controlling the environment of self-regulated learning (which is motivated by innate impulse) in order to ensure that children experience the optimal conditions under which to learn to become efficient problem-solvers and to thereby develop the habits necessary to behave intelligently.

In summary, Dewey argues that the development of mind reflects a *pragmatic relationship* between the mind (a biological apparatus), knowledge (problem-solving ability) and education (appropriate learning situations and interactions). This sort of development holds that "appropriate habits of mind" are achieved through a "method of knowing", i.e., hypothesizing and experimentation. Education is accordingly, conceived as providing appropriate learning experiences within a "problem-solving" environment.

Summary of Chapter 1

In the history of educational thought, education is taken to be the development of mind through the acquisition of worthwhile knowledge and understanding. Although the three historical examples reflect the "variable ideals of civilization", "changing technologies" and "scientific models", as noted by Scheffler, there are important similarities among the approaches. The similarities illustrate the logical relationship between the concepts of mind, knowledge and education. For example, each view argues either explicitly or implicitly that; i) education is primarily concerned with the transmission and acquisition of knowledge and understanding which is a necessary condition for the development of mind; ii) the development of mind through knowledge and education is normative, i.e., such development presupposes that some knowledge is more worthwhile than others; iii) given a particular conception of mind, a particular kind of knowledge is necessary for its development, and; iv) the desired kind of knowledge can only be acquired through a certain type of education. Finally, each conception of mind can be expressed in terms of a metaphor of mind. Not only do these metaphors imply (if taken literally) that "the" mind has some sort of ontological status, they are what Berger calls "guiding metaphors of mind", i.e., they shape and direct those human activities which are related to mind. [43]

In addition to the similarities, what is philosophically interesting is that the examples reveal an important implication of the relationship, i.e., that different conceptions of mind imply different conceptions of knowledge and education. First, what counts as knowledge (the conception of knowledge) depends on the view of how it

is acquired in the first place. However, how knowledge is acquired depends on what are held to be the essential characteristics of mind. For example, if as Plato argues, the mind is conceived as an internal well, then prior incarnations serve to explain the acquisition of innately pure (true justified belief) knowledge. If, on the other hand, as Locke argues, the mind is conceived as a passive "blank slate", then stimulation by sensory experience serves as an explanation for the acquisition of propositional knowledge, i.e., that such and such is the case. Finally, if as Dewey argues, the mind is conceived as a biological organism, then particular mental activities explain "knowing" and knowledge becomes "the act of knowing" rather than a propositional state.

Secondly, differing conceptions of the purpose and scope of education follow from the three conceptions of mind and knowledge. On the Platonic version, education as a rational dialectic is both necessary and sufficient for the development of an innately reasonable inner mind which is a repository of pure knowledge. On the Lockean version, an internal yet passive mind must be stimulated and developed by an education that provides sensory stimulation through observation and experience of particular cases. On the Deweyan view of mind, education must foster mental development by providing a stimulating environment for certain sorts of mental interactions, i.e., problem-solving activities.

Finally, the different conceptions of mind emphasize the acquisition of different kinds of knowledge. The Platonic conception of mind emphasises the acquisition of what might be called apriori knowledge, i.e., philosophical and mathematical principles which are necessary for the development of reason. The Lockean conception of mind

emphasizes the acquisition of empirical or contingent knowledge, i.e., knowledge gained through the senses. The Deweyan conception of mind holds that the distinction between apriori and contingent knowledge is a false dichotomy and argues that all knowing is a practical form of scientific hypothesizing subject to the criteria for warranted assertibility.

The historical examples provide a useful frame of reference for examining current approaches to the development of mind. They serve as reminders of; i) the logical relationship between the concepts of mind, knowledge and education, and; ii) the implication of that relationship, i.e., that different conceptions of mind imply different conceptions of knowledge and education. Further, current views can be similarly examined in terms of; i) the interpretation of the relationship between the concepts of mind, knowledge and education; ii) the particular conceptions of mind, knowledge and education.

Notes: Chapter 1

1. Francis M. Cornford, (1941) *The Republic of Plato* 226 (Oxford: Oxford University Press)

2. Guthrie (trans) "Meno" 364 in Hamilton and Huntington (eds) (1961) *Plato The Collected Dialogues* (Bollingen Foundation)

3. Israel Scheffler, (1965) *Conditions of Knowledge* 5 (Chicago: University of Chicago Press). Scheffler suggests that for the rationalists, innate knowledge was like a "deep well of necessary truths". He adds that the sketch is a composite; that it is helpful to associate Plato, Descartes and Leibnitz with rationalism, Locke, Berkeley, and Hume with empiricism and Pierce, James and Dewey with pragmatism. In Plato's case, the conception of the mind/soul as a "deep well of knowledge" accords with his notion of the Socratic dialectic, a "drawing out" of "deeply buried" knowledge in a practice similar to "midwifery".

4. See Cornford, *Republic*, Chapter XIX, 184, e.g., "and might we call their states of mind knowledge and belief? Certainly."

5. Scheffler, *Conditions*, 2. See also Barrow,(1976) *Plato and Education* (London: Routledge). Barrow observes that on Plato's view, knowledge allows us to distinguish right opinion or belief from incorrect opinion. Knowledge is of what is true and what is certain, not of what is false or uncertain. It follows that the *objects of knowledge* are axioms and metaphysical forms (or at least the ideas of them).

6. Francis M. Cornford, (1957) *Plato's Theory of Knowledge* 141 (NY: Bobbs-Merrill)

7. Cornford, *Theory* 2. Cornford describes Anamnesis as the theory in which, "Knowledge is acquired, not through the senses or as information conveyed from one mind to another by teaching, but by recollection in this life of realities and truths seen and known by the soul before its incarnation". See also the introductory conversation in the later dialogue, "Theaetetus" 20-28 and Cornford's account of midwifery and Anamnesis, 27-28. Both are found in *Theory of Knowledge*.

8. Guthrie (trans) *Meno*, 353

9. Cornford, *Republic* 236

10. Kingsley Price, (1967) *Education and Philosophical Thought* 280, (Boston: Allyn and Bacon Inc.)

11. John Locke, *An Essay Concerning Human Understanding: Volumes One and Two*, Vol.I lix, A.C.Fraser (ed) NY: Dover Publications Inc., (1959) In what Fraser describes as the passage which is "the key to all his thoughts on all subjects", Locke comments: "It [idea] being that term which, I think, serves best to stand for whatsoever is the object of the understanding when a man thinks, I have used it to express whatever is meant by phantasm, notion, species,or whatever it is which the mind can be employed about in thinking."

12. Price, *Education* 253

13. Scheffler, *Conditions* 3-4

14. Locke, *Essay*, 167, bk.4, ch 1

15. Ibid. 275, Vol.II In another section of the essay, Locke discusses general ideas and distinguishes between notions and their connection to simple and complex ideas. Locke says that "notions" are nothing but abstract ideas in the mind to which the name is annexed. Fraser notes that: "Notion will not stand for every immediate object of the mind in thinking as idea does... the term notion is more peculiarly appropriated to a certain sort of those objects which I call mixed modes...Besides the sensations or phantasms, the sensible ideas of corporeal things passing impressed upon us from without, there must be also conceptions [concepts or notions] or intelligible ideas of them actually exerted from the mind itself; or otherwise they could never be understood". 52, Vol.II

16. Price, *Education*, 255

17. Locke, *Essay,* bk.4, ch.1, 167

18. See Essay, Vol I, Prolegomena, lviii. Fraser notes that, "Proposition - spontaneous or reflective, mental or verbal--being thus the unit of knowledge, it follows that on one of the elements essential to knowledge can, *per se*, constitute knowledge."

19. Price, *Education*, 278. Price illustrates Locke's theory using the example of "the idea of whiteness" which agrees with "the idea of colour" but disagrees with "the idea of taste". Thus, to say that white is a colour is true by virtue of agreement of ideas. However, to say that white is a taste is false or a mistake. In this case, two ideas have been joined that disagree. Further, to say that white is not a colour is a false proposition or a mistake by virtue of separating two ideas which are essentially in agreement.

20. Locke, *Essay*, Vol II, 169

21. Ibid., 170-71 Locke makes further distinctions in respect to knowledge, e.g., "ways in which the mind is possessed of truth; each of which is called knowledge", and

"of the degrees, or differences in clearness, of our knowledge". Although these distinctions are interesting, they are both complex and controversial and a discussion of them is beyond the scope of this thesis.

22. Ibid.

23. Price, *Education*, 284

24. M.V.C. Jeffries, (1967) *John Locke: Prophet of Common Sense*, 55 (UK: Methuen & Co.). In reference to Locke's *Thoughts on Education*, Jeffries argues (vii) that Locke, "brings to a clear focus the new spirit of empirical enquiry that was destined to revolutionize philosophy and science, and, with them, the theory and practice of education".

25. Scheffler, *Conditions*, 4

26. H.W. Schneider, (1970) "Dewey's Psychology" 6 in: *Guide to The Works of John Dewey*, Boydston (ed)(Southern Illinois University Press)

27. John Dewey, (1916) *Democracy and Education* 52 (NY: Macmillan Co)

28. Ibid., 336

29. Price, *Education*, 552-553, 556

30. Ibid. 560

31. Scheffler, *Conditions*, 5 (italics added)

32. As a pragmatist, Dewey eschews all forms of dualism - the notion that we can distinguish mind from body, subject from object, analytic propositions from synthetic propositions and the knower from the known. It follows that there can be, on this view, no serious discussion of the nature of an independent entity such as "the mind".

33. Price, 558-559 - from Dewey's "Quest for Certainty"

34. Dewey, *Democracy*, 338

35. Archambault (ed)(1964) *John Dewey on Education* 435 (NY: Random House) Dewey asserts that, "The active side precedes the passive in the development of the child-nature; that expression comes before conscious impression; that the muscular development precedes the sensory; that movements come before conscious sensations; I believe that consciousness is essentially motor or impulsive; that conscious states tend to project themselves in action...ideas (intellectual and rational *processes*) also result

from action and devolve for the sake of the better control of action. What we term reason is primarily the law of orderly or effective action".(italics added)

36. John Dewey, (1938) *Experience and Education* 69 (NY: Collier-Macmillan)

37. Ibid. 44

38. Dewey, *Democracy*, 173

39. Dewey, *Experience*, 75

40. Ibid., 44-5

41. Ibid., 45

42. Price, *Education*, 558

43. Eva Berger,(1991) *Metaphor, Mind and Machine*, 296 (unpublished PhD Thesis, New York University). Berger's thesis examines how metaphors of mind arise and change. Her analysis reveals three levels at which metaphors of mind may be identified; i) linguistic or implicit metaphors which are unavoidable in the use of any language; ii) guiding metaphors which are "consciously chosen by the author to structure his argument", and; iii) expressive or rhetorical metaphors that express or exemplify an underlying idea that the writer already has in mind. Berger classifies those metaphors that shape and direct theories of mind and education, e.g., Plato, Locke and Dewey, as "guiding metaphors of mind". Significantly, Berger claims that, "*notions of education 'follow from' a construct of what the mind is like: they are based on concepts of mind and knowing*". (p 34)

The computational analogy is part of the metaview which treats people as information-processing systems. On the computational theory of mind, mental activity is computation: mental processes consist of operations performed on symbolic representations, the formal manipulation of abstract symbols according to rules.

Valentine, "Conceptual Issues in Psychology"

Chapter 2
The Computational Approach

Recent developments in cognitive science have lead to the view that the mind is an information-processing system governed by natural laws of science.[1] This view seems to accord with the historical examples of the development of mind noted in Chapter 1. For example, the computational view holds that the development of mind involves an important relationship between mind, knowledge, and in a broad sense - some sort of "education". A "guiding" metaphor of mind explains and constrains how knowledge is acquired, what constitutes "knowledge" and thus, what sorts of "knowledge" are acquired. Finally, the relationship held to obtain between the concepts of mind, knowledge and education - a "computational" relationship, reflects the prevailing technological influence of the computer.

The force of the analogy between computation and the human mind can be traced to two ideas posited by Turing. [2] The first idea is known as the "Turing Test", in which Turing questions whether it is possible to distinguish between a computer and a human in terms of their responses (behavioural output) to questions (input) in the performance of his test. Turing argues that a computer could, in theory, simulate human responses to a set of questions such that the machine responses would be indistinguishable from the human responses. The second idea is Turing's notion of a "Turing machine" that can perform any formal algorithm (in mathematical logic) and of a "Universal Turing

machine" that can simulate any Turing machine. Searle claims that from these notions came the idea that the human brain might be some sort of universal Turing machine. [3] Such a machine is claimed to have the ability to "process" (read and write), to "store" (remember) symbolic expressions (semantic codes), and to perform *any* computation. Hence the claim is that the machine is capable of performing *any* of the operations involved in human thought. The machine can represent and alter the symbols 1 and 0; move along an infinite tape, and; respond (act accordingly) to a complex set of instructions or computational functions. In other words, a universal turing machine could perform the mental operations involved in human "thinking".

When human thought is conceived in terms of computational ability, there appears to be a remarkable similarity between computers and humans as information-processors. The alleged similarities include the observations that both consist of networks which operate in binary fashion; both are predominantly digital in nature, that is, their representation is symbolic and discrete; both are electrical in nature; both are information-processors and symbol manipulators, and; both have outputs or products which are solutions to problems. [4]

The alleged similarities between humans and computers led cognitive scientists to hypothesize that we could simulate the working of the human mind by means of computational models. Researchers hold that the utility of such models lies in their ability to provide descriptions, promote understanding and offer explanations of mental processes. Models are believed to offer the promise of theories with high levels of generality. Further, as models supposedly demand precision, it is hoped that *mental*

processes will be made explicit and theories will be able to be formulated unambiguously. Scientists believe that information-processing models may lead to new insights and the generation of new hypotheses in addition to their alleged conceptual contributions, e.g., the resolution of philosophical problems. Thus there is a sense in which the computational approach to mental development has become paradigmatic in the fields of cognitive science and psychology. For example, Valentine notes that:

> Computer simulation or artificial intelligence as it is generally known has become increasingly popular in psychology over the past thirty years particularly in cognitive psychology where *the computational theory of mind and functionalist philosophy have become dominant.* [5] (italics added)

This chapter examines the computational approach in terms of three central questions, similar to those used in the examination of the historical examples; i) what is meant by the development of mind on the computational approach?; ii) what are the central concepts of mind, knowledge and education? and; iii) what is taken to be the justification for this approach?

Development of Mind: Cognitive Change

On the computational approach, "development of mind" is taken to be similar to, if not synonymous with "cognitive development", which in turn is interpreted as "changes" in cognitive abilities. In contrast to the historical examples, this scientific approach does not posit an argument for what such development *ought* to be. Rather, the empirical research follows hypotheses which can be generally construed as tentative, testable assertions about what *is* the case in cognitive development.

Although 'cognitive' has been (broadly) defined as, "denoting mental processes connected with understanding, formulation of beliefs and acquisition of knowledge", [6]

researchers argue that defining 'cognitive' in this way does not necessarily produce either precision or consensus on what counts as cognitive development. For example, Flavell asks, "what psychological processes *cannot* be described as 'cognitive' in some nontrivial sense, or do not implicate cognition to a significant degree?". He notes that:

> Mental processes habitually intrude themselves into virtually all human psychological processes and activities, and consequently, there is really no principled, nonarbitrary place to stop. [7]

Within the field of cognitive psychology, research on development is based on four main *theories of development*. The first is Piaget's theory of assimilation-accommodation which posits four general stages of development, namely: i) sensorimotor; ii) preoperational; iii) concrete operational and,: iv) formal operational. The second theory is information-processing (IP) theory which holds that cognitive development is a matter of acquiring, representing, storing and retrieving information. The third main theory, Neo-piagetian theory, is a combination of Piagetian theory and IP. The fourth theory is the contextual approach which looks at the child's cognitive development as a consequence of interaction with peers, adults and the environment following among others, the work of Vygotsky and Bruner. Flavell notes that, "These views are by no means incompatible, and many contemporary psychologists favour some blend of them."[8] Further, there seems to be an assumption that all four theories are necessarily interrelated. This is suggested by Flavell's comment that:

> *Change [cognitive development]* comes about through assimilation-accommodation cycles (Piaget); improved procedures for problem solving and increased processing capacity, speed, and efficiency (information-processing and neo-piagetian); and adult-guided or peer-guided improvement of existing competencies and engagement in progressively more complex tasks and activities (contextual).[9]

According to Flavell, within each theoretical approach, the research on cognitive development is guided by two general questions, "what does children's thinking look like at various points throughout development? (the description question)" and, "how does this development come about? (the explanation question)". Flavell points out that the two questions are not independent. He notes for example, that "Piaget's search for broad, abstract, complex cognitive structures led him to processes that would keep the entire cognitive system in balance".[10] Notwithstanding the importance of the interrelationship, an examination of all the theories is beyond the scope of this thesis. Therefore, the focus of the examination will be on that theory which is essential to the computational approach, i.e., information-processing theory.

In general, psychological research devoted specifically to information-processing theory assumes that: i) the quality of children's thinking at any age depends on what information they represent in a particular situation, and; ii) how they operate on the information to achieve their goal, and how much information they can keep in mind at one time.[11] In contrast to the historical examples, the goal of IP research (as it is understood by the researchers) is not to explain or describe the acquisition of knowledge and understanding. Rather, it is understood that:

> The ideal goal of the information-processing approach is to achieve a model of cognitive processing in real time that is so precisely specified, explicit and detailed that it can actually be run successfully as a working program on a computer. The model should also make specific predictions about how the child (and computer) would behave under specific task conditions or constraints, and in response to specific inputs. [12]

To achieve this goal is a matter of "trial and error" and inference. For example, the length of time taken to perform a given task, verbal reports, analyses of changes in

behaviour over a series of trials, etc., suggest to the researchers possible "mechanisms of developmental change". Flavell observes that, "in essence, the researcher analytically decomposes tasks into their components and tries to infer what the cognitive system must do to deal adequately with each component".[13] According to Flavell:

> It [IP] tries to provide an explicit, detailed understanding of what a child's cognitive system actually *does* when dealing with some task or problem, here and now, or "on line". It attempts to answer such questions as: what does the system do first, at the onset of the information-processing episode? What is the second thing it does, and the third? Are some of these processing steps carried out simultaneously (parallel processing) rather than successively (serial processing)? Which ones? [14]

Mind: An Information-Processing System

Simply put, advocates of the information-processing view of mind hold that the mind is similar to a computer in that the brain is like the hardware and the mind is analogous to the software or programs used to run the computer. This view is referred to as the computational analogy or simply as information-processing (IP). The information-processing metaphor of mind is what Berger calls a "guiding" metaphor of mind, that is, it has the power to shape how we think about the mind, knowledge and education in the same way that the guiding metaphors of Plato, Locke and Dewey influenced historical educational thought.

IP theory is a functional or operational view of mind, that is, it is concerned with *how* the mind functions as a system to access and process information and ultimately, to produce knowledge. There are two distinct approaches taken by researchers. Searle characterizes the approaches as Strong and Weak Artificial Intelligence (AI). The weak view is that the mind is similar to a computer program and consequently, we can learn

about how the mind works by simulating such workings on computer programs. The strong view is that, for all important purposes, the brain *is* a computer and what we mean by mind *is* a program which operates according to innate rules. Searle characterizes the argument for information-processing (in the strong AI sense) as follows;

> A computational simulation is actually duplicating and not merely modelling the functional properties of the brain. The reason is that the brain . . . is an information-processing system. And this fact about the brain is . . "intrinsic". It is just a fact about biology that the brain functions to process information. [15]

The computational metaphor takes the form of philosophical functionalism in philosophy of mind. On the functional account, the brain functions in a systematic way, responding to perceptual stimuli and processing representational symbolic information by means of unconscious mechanisms. In this way, the brain functions to cause our beliefs, desires etc. which, in turn, cause us to behave in different ways. For example:

> Human brains are like digital computers in so far as they are 'semantic engines'. That is, human brains operate by representing incoming perceptual information in a language of the brain ('the language of thought') in propositional form and then operating over it in much the way that our propositional attitude vocabulary says it does. [16]

In cognitive science, IP research is typically concerned with the architecture or structural framework for cognitive development and with how the IP models *actually* work. Pylyshyn argues that the functional structure of the machine is the correct level at which to view cognitive processes. On his account it is at the functional level that the semantic interpretation of mental states takes place. At this level, "the states represent the things that are the objects of thought and reasoning, what the subjects are thinking *about*."[17]

Thus, researchers on artificial intelligence provide possible architectures for functional explanations. The architectures range from traditional models based on adult processing abilities, i.e., functional models of IP, to modern connectionist systems which attempt to provide architectures which are "neuronally plausible", that is, they are based on what we know about the capabilities of neurons. Although connectionist networks, e.g., parallel distributed processes (PDP) are gaining ascendancy in cognitive science, they have not yet reached the level of sophistication to be incorporated into mainstream developmental cognitive psychology. Lyons notes that:

> Connectionism is radically different from the theory of brain functioning that underlies the functionalism of Fodor. *Fodorian Functionalism is based on an information-processing* view of the brain, on the premises that there is a language or representational system in the brain and that the brain operates in terms of a program in much the same way a digital computer does. [18]

In mainstream cognitive psychology, theories of cognitive development are closely aligned with the traditional functional model of mind. Valentine notes that functionalism in cognitive psychology is similar to psychological behaviourism but allows for mental states.

> The dominant theory of mind in current cognitive psychology is *functionalism*. In this view mental states are defined in terms of causal relations to environmental stimuli, other mental states and behavioural responses. [19]

The traditional functional models play a significant role in the psychological theories of cognitive development which have influenced educational theory and practice. The traditional model has several significant features. These features are localized mechanisms or components which function as processors of information, namely, i) perceptual mechanisms which glean information from information-bearing sensum; ii)

visual and auditory mechanisms which transform information into images or representations; iii) memory mechanisms which store images for retrieval in either long-term or working memory; iv) a central processing mechanism which retrieves information from memory and transforms it into cognitive instructions, and; v) motor mechanisms which transform cognitive instructions to behaviour.

A critical question for IP researchers is, "*how* does the system extract information from localized or specific storage areas such as long-term and working memory?" [20] An explanation of the central-processing function is an important research topic in the field of cognitive psychology. The psychological explanation of the central function, known as metacognitive theory, is discussed in some detail in Chapter 7. The functionalist response to this question is similar to metacognition in that on functionalism, the central processing unit functions in an "executive capacity" to manipulate information. Block describes the functional answer as follows:

> The paradigm of defining or explicating intelligence in cognitive science is a methodology sometimes known as *functional analysis*. Think of the human mind as represented by an intelligent being in the head, a "homunculus". Think of this homunculus as being composed of smaller and stupider homunculi, and each of these being composed of still smaller and still stupider homunculi, until you reach a level of completely mechanical homunculi. [21]

Knowledge: Information, Epistemology and Psychological Processes

The computational approach differs significantly from its historical precedents in terms of its conception of knowledge. Three areas of difference are particularly relevant to this thesis. First, researchers do not take cognitive development to be (necessarily) concerned with the acquisition of knowledge in the traditional sense. Secondly, as cognitive science is essentially descriptive, i.e., normatively neutral, the epistemological

issues which were a matter of profound concern to the historical theorists are conceived in quite a different light. Finally, an increasing number of cognitivists hold that the relation between information and knowledge can be explained in epistemological terms if the relationship is an account of mental processes.

Knowledge as Information

The task of cognitive research is to provide an explanation and description of learning processes, i.e., how we develop the necessary cognitive skills to acquire and manipulate *information*. In other words, the computational approach to the development of mind is in part, an account of the relationship between mind and information, rather than between mind and knowledge as was the case in the historical examples. A cognitive researcher describes cognitive development as follows:

> Humans attend to *information*, transforming it into a mental representation of some sort, compare it with information already in the system, assign meaning to it, and store it. *Automatization* occurs as mental procedures are practiced and are more efficiently executed. These procedures, along with an increasing speed of processing and increasing capacity, drive cognitive development. [22]

On IP, cognitive development can (apparently) occur without any reference to knowledge in the traditional sense. A possible explanation comes from Sternberg's observation that, "most of the early work in cognitive science almost totally neglected the issue of knowledge." The reason for this was that:

> It was thought that domain-general, problem-solving heuristics or rules of learning were the most important ingredients of any intelligent system. . . knowledge was not a factor that would distinguish more intelligent from less intelligent systems. [23]

However, some references can be found in the literature that suggest a connection between knowledge and information.[24] In the literature of cognitive psychology,

Sternberg for example, refers to "knowledge-acquisition" components which function to encode, combine and compare new information to old, so as to allow learning to take place.[25] Flavell also refers to knowledge as one of many "higher-mental-processes" and discusses *metacognitive knowledge* as knowledge of one's own thinking processes. Flavell notes that some of the information that is processed, "is more 'declarative' in nature, consisting of knowledge of word meanings, facts and the like". Other information is described by Flavell as being more "procedural" in type, "consisting of knowledge of how to do various things". [26]

In the cognitive literature, the term 'knowledge' seems to be used in (at least) three different ways: i) to describe a certain sort of information; ii) to describe a product of information-processing, or iii) as synonymous with information. The possible conflation of the terms may be explained by the underlying assumptions obvious in the questions posed by the researchers. The researchers' understanding of the relationship between cognitive development, knowledge and mind is revealed in Flavell's illuminating comment:

> If the cognitive differences between young children and their elders proved to be largely due to differences in knowledge, we would hesitate to speak of qualitatively different "stages" of cognitive development. First, a "difference in knowledge" has more of a quantitative than qualitative sound to it. It suggests one kind of mind with two different amounts of accumulated knowledge rather than two basically different kinds of mind. It does not suggest a fundamentally different intellectual modus operandi, as is at least arguably the case for the younger infant as contrasted with the child and adult. [27]

According to Flavell, the issue of whether "cognitive development is primarily the acquisition of knowledge in many specific domains" is "far from settled", although "many cognitive developmentalists are currently pondering this issue". [28]

The issue becomes more complex when the views of knowledge from the supporting fields are included in the discussion. For example, on philosophical functionalism what counts as belief and knowledge is a matter of functional equivalence. That is to say, if two organisms or systems function in similar ways, the products of those functions can be said to be equivalent. Humans function in such as way as to transform perceptual information into representations, i.e., beliefs. If a machine functions to convert perceptual information into representational form, the representations are functionally equivalent to the human beliefs. Lyons notes that according to functionalists such as Fodor:

> Our ordinary belief-desire vocabulary does not merely apply literally to humans at the macro level but it also applies literally to humans at, if not a micro level, then at least at a sub-macro level. For true descriptions of human cognitive functioning, in terms of our belief-desire (or propositional attitude) vocabulary, are true descriptions of the way human brains actually operate. [29]

In the literature of cognitive science there are a number of references to "tacit" knowledge. On this topic, Pylyshyn notes that, the term *tacit knowledge* is "used here in the usual way to refer to real knowledge that subjects have even though they are not aware of having it and using it". Pylyshyn claims that this is "an unproblematic idea in contemporary cognitive science, where it is taken for granted that subjects need not have awareness or "metaaccess" to most cognitive structures and processes". [30] Rumelhart notes connectionism and traditional IP models differ in respect to where they locate (tacit) knowledge:

> From conventionalist programmable computers we are used to thinking of knowledge as being stored in the states of certain units in the system. In our systems we assume . . . that long-term storage takes place in the connections among units. *Knowledge* is not directly accessible to interpretation by some

separate processor, but it *is built into the processor itself and directly determines the course of the processing.*[31]

"Naturalized" Epistemology

Two of the historical examples of approaches to the development of mind (Plato and Locke) were concerned with the concept of knowledge in a traditional epistemological sense. In the third example, Dewey's conception of knowledge as "knowing" moved away from the traditional analysis and toward a more "natural" account. On the traditional view, epistemology is primarily concerned with three questions, namely; i) what is knowledge? ii) how is knowledge obtained? and; iii) what can we claim to "know"? The answers to these questions constitute a theory of knowledge such as those of Plato and Locke.

The traditional approach to epistemological questions was that of a conceptual analysis of 'knowledge'. There is a sense in which this sort of analysis proceeds sequentially: The analysis begins by distinguishing the essential logical features of knowledge and the nature of its objects. Given the essential features, the analysis then moves to the questions of how such knowledge might be obtained and justified. Finally, given the nature and the methods of acquiring and justifying knowledge claims, the analysis reveals what we can logically claim to "know". In other words, traditional epistemological analysis begins with the substantive question and then moves to the procedural question. This approach assumes that we need to know what it is that we are investigating before we can postulate a theory of how we go about obtaining it.

Traditionally, on what has come to be known as the "tripartite analysis of knowledge", the essential criteria of knowledge are truth, justification and belief. That

is, one must believe that p, p must be true, and one must have acceptable reasons, i.e., justification, for believing that p. In this sense, traditional epistemology has an evaluative or normative dimension. Although there are disagreements over the extent to which each individual criterion is normative, there is general agreement that the requirement for justification is what makes the concept of knowledge a normative concept. For example, on the subject of normative epistemology, Kim argues:

> That justification is a central concept of our epistemological tradition, that justification, as it is understood in this tradition, is a normative concept, and in consequence that epistemology itself is a normative inquiry whose principle aim is a systematic study of the conditions of justified belief. [32]

The traditional view is held among others, by classic foundationalists who hold in addition that there is a class of basic, indubitable and intrinsically justified beliefs upon which the justification of all other beliefs is based. According to classic foundationalists, knowledge claims which do not meet the criterion of indubitability are not genuine knowledge claims. Thus, classic foundationalism raises the apparent impossibility of justifying our non-basic beliefs. For example, we either can know nothing of reality (Plato's view), or we can only know what is accounted for by means of sensory perceptions (Locke's argument). However, given the Cartesian arguments about the fallibility of the senses, we seem to be left with skepticism, i.e., that view that we cannot really "know" anything.[33]

The idea of "naturalizing" epistemology can be attributed to Quine's argument that among its other deficiencies, traditional or classic foundationalism fails to provide broad enough grounds for the justification of beliefs to defeat skepticism. Quine argues against the normative and evaluative aspects of traditional epistemology, claiming that

"the Cartesian quest for certainty" is a "lost cause". On Quine's view, scientific psychology provides both the "evidence" for the acquisition of knowledge and a "description" of the processes by which it is acquired. Thus, according to Quine, the "new", i.e. naturalized, epistemology goes on "in a clarified status". Quine argues that descriptive epistemology, "or something like it, simply falls into place as a chapter of psychology and hence of natural science." That is:

> It studies a natural phenomenon, viz., a physical human subject. This human subject is accorded a certain experimentally controlled input-certain patterns of irradiation in assorted frequencies, for instance - and in the fullness of time the subject delivers as output a description of the three-dimensional external world and its history. [34]

Modern epistemologists are divided in their approach to the study of knowledge. Some epistemologists, following Quine, adopt a position from philosophy of mind, e.g., identity theory, functionalism, philosophical behaviourism, etc., and argue for a particular psychological theory of knowledge acquisition. However, when knowledge acquisition is linked through psychology to the scientific study of cognitive development, epistemology becomes "naturalized", that is, the nature of knowledge and the account of its acquisition is an account of *natural mental processes and mechanisms*. The problem for these epistemologists is to show how a "normatively-neutral" psychological description of mental processes is related to a normative concept of knowledge.

Psychologistic Epistemology

Supporting some of Quine's arguments (but not necessarily for the same reasons), Goldman refers to the tradition of epistemology as "historical epistemology" and argues that the modern "psychological orientation" is a continuation of the historical tradition.

He notes that the historical literature is "replete with descriptions and classifications of mental faculties and endowments, processes and contents, acts and operations". Citing Locke, Kant and Hume for support, Goldman claims that, "psychologistic epistemology, then, is in the mainstream of historical epistemology." [35]

Goldman's "historical and genetic reliabilism" is an argument for; i) the relationship between epistemology and psychological processes, specifically cognitive processes, and ii) the importance of genetic epistemology, i.e., theories of belief-genesis and belief-justification. Significantly, Goldman sees a relationship between his theory and the theories of the historical predecessors to IP, i.e., Plato, Locke and Dewey. Goldman argues:

> Among historical writers, it might seem that *Locke* and Hume had Genetic theories of sorts, but I think that their Genetic theories were only theories of ideas, not of knowledge or justification. *Plato's* theory of recollection, however, is a good example of a *Genetic theory of knowing*. And it might be argued that Hegel and *Dewey* had Genetic epistemologies. [36] (italics added)

Goldman claims that "advances in human intellect" have been due, in large part to "instruments", "tools" and "helps" such as systems of language and notation, proof techniques in mathematics, and methodologies of empirical science, etc. Goldman claims that:

> The intrinsic properties of the mind still hold significance for epistemology. First, unless the mind has a suitable structure, it cannot *use* tools properly or successfully. Second, the invention, acquisition, and selective retention of intellectual tools must ultimately rest with native cognitive mechanisms. [37]

Goldman views modern epistemology as a "multi-disciplinary affair", with an essential interest in the "processes" of belief-genesis and belief-justification in addition to the processes of perception, memory, problem-solving etc. Thus, for Goldman, these

psychological processes are "certainly a point of concern" and have "epistemic significance".

Goldman is particularly interested in what he calls "primary epistemology", i.e., individual epistemology or the acquisition of knowledge by the individual. He claims that within individual epistemology, "the objects of epistemic evaluation are cognitive processes, structures and mechanisms." [38] Regarding the relationship between his "individual epistemology" and particular theories of mind in cognitive science and psychology, Goldman declares himself to be "ideologically neutral". As Goldman puts it:

> In linking epistemology with cognitive science, I use the term 'cognitive science' (or 'cognitive psychology') neutrally. Some use the phrase in an 'ideological' way to advocate a particular brand or style of theorizing. For example, it may designate a computational approach, or an approach that focuses on a certain level of abstraction, say, functional as opposed to neural...but my usage is not ideological in any of these ways. *It includes any scientific approach to cognition.* [39] (italics added)

Education: Cognitive Training

Unlike its historical predecessors, the computational approach does not explicitly argue that a particular sort of "education" is necessary for the development of mind. In fact, the concept of education is not mentioned in the literature related to IP theory in either cognitive psychology, cognitive science or philosophical functionalism. On one hand, this is not surprising given the research emphasis on "natural cognitive development" which presumably takes place independent of education.

On the other hand, to assume that the researchers hold that *all* cognitive development is a matter of natural maturation, unaided by any social intervention, seems

rather extreme. Although the extreme view might be held by some researchers, it does not explain the profound influence IP has had on educational theory and practice. A more moderate explanation is that IP researchers hold that although cognitive development involves natural mental processes, at some level such development is fostered by some form of cognitive instruction or "cognitive training". The moderate view is supported by the fact that the cognitive literature does contain occasional references to formal instruction or domain-specific knowledge, which is presumably gained through some sort of instruction. Further, the moderate view is assumed by those researchers who investigate the curricular and instructional implications of the IP model in for example, the literature of educational psychology (discussed in some depth in Chapter 6).

There are some features of the IP model which suggest that at some level instruction is useful and perhaps necessary for cognitive development. One feature is the functionalist notion of an homunculus such as that which is found in metacognitive theory, i.e., learning in terms of hierarchical processes mediated by a central executive (homunculus).[40] On metacognitive theory, second order or metacognitive processes can be used to exert *executive control* over first order processes. Thus, students could theoretically be trained to use metacognitive strategies to improve their learning abilities. The "executive" control functions as an homunculus to perform such tasks as choosing, implementing, and monitoring effective strategies in problem-solving tasks. On the IP model, metacognitive thinking of this sort is deemed to be an important part of teaching and learning. The ability to *manipulate information strategically* might be learned by

simulating the strategies or metacognitive processes followed by "experts" in specific areas, such as mathematicians, business people, scientists, writers, etc.

On the IP model, the interest is on the functional aspects of mind. What is desirable is posited in terms of *learning processes*, i.e, to increase the speed of processing, to increase flexibility (plasticity), and to overcome the "information-processing bottleneck". As output is taken to be a function of input, it follows that the "best" way to engage students in developmental activities is to make available the widest variety of information for students to access (thus, the significance of instructional technology). As the amount of available information is beyond any one person's comprehension, IP theory suggests the notion of *"networking"*, i.e., sharing information, to build on the knowledge of others through, for example, group discussions and projects. The IP model emphasizes the aspect of *efficiency* in particular cognitive abilities, e.g., to "process", "store" and "retrieve" computational, symbolic information. Although efficiency might be taken to be a kind of skill which is increased through practice, such practice could presumably be fostered by instruction and appropriate developmental activities.

Finally, an important feature of cognitive research based on the information-processing model is the emphasis on the quality of *thinking skills*. As one researcher puts it:

> The quality of children's thinking at any age depends on what information they represent in a particular situation, how they operate on the information to achieve their goal, and how much information they can keep in mind at one time. [41]

Improvement in thinking skills is implicit in the popular slogan that the purpose of education is "learning how to learn". This notion seems to advocate an instrumental view of education. For example, it accords with the idea that instruction should fit a student with marketable job skills, that dealing with the everyday world requires the ability to "interact" with information of various sorts and that human "progress" depends on increasing our ability to efficiently manipulate our growing storehouse of data.

Summary of Chapter 2

> As cognitive psychology sets the agenda, its questions take the form, "How does this organism receive information through its sense organs, process the information, store it, and then mobilize it in such a way as to result in intelligent behaviour?" [42]

The computational approach to the development of mind is a scientific approach. Guided by a theoretical, metaphorical model of mind, cognitive researchers seek to explain what is the case in cognitive development rather than what ought to be the case. The computational approach to the development of mind provides a further example of a logical relationship between conceptions of mind, knowledge and education. First, when the mind is conceived as an information-processing system, then what counts as knowledge for the cognitive researchers, is the information that is so-processed. Further, the innate processes and mechanisms are taken to provide a satisfactory explanation for the acquisition of such information. For the cognitivist, a profoundly different conception of the purpose and scope of education follows from this view of mind, namely that education is either irrelevant to the natural processing ability or, it is conceived as some form of cognitive training, i.e., skill development. Finally, this view of mind emphasizes the acquisition of different kinds of knowledge, variously construed as tacit knowledge,

metacognitive knowledge, procedural knowledge, perceptual information, or simply as "information". The epistemological claims which support such kinds of knowledge as knowledge, are supported by a form of "naturalized epistemology" or what is called "psychologistic epistemology".

The computational approach serves as a dramatic example of the implication of the relationship between mind, knowledge and education, that is, that different conceptions of mind imply different conceptions of knowledge and education. For the cognitivist, the development of mind is explained by the computational relationship between mind (an IP system), knowledge (construed as information) and education (construed as cognitive training). The development of mind, i.e., cognitive change, is achieved when one develops the ability to efficiently process, i.e., access, retrieve and manipulate information. Although this ability is a natural, i.e., innate ability of mind, the degree to which the mind achieves efficiency in information-processing may be fostered by cognitive training.

The computational approach is based on the scientific "discovery" of the relationship between mind, knowledge and education - a normatively neutral, naturalized description of psychological processes which explain *how* the mind works. Thus, the computational approach, unlike its historical predecessors, is not an explicit argument for human betterment in terms of the betterment of society. Nevertheless, the cognitive research which advocates this approach has significantly influenced contemporary educational theory and practice. A second influential approach to the development of mind provides a sharp contrast to the computational view. This alternative approach is the subject of Chapter 3.

Notes: Chapter 2

1. Elizabeth R. Valentine,(1992) *Conceptual Issues In Psychology* (second edition) 128-129 (London: Routledge) Valentine notes for example, that in cognitive psychology, "the computational theory of mind and functionalist philosophy have become dominant". The points being made in this thesis are that the computational analogy and IP feature prominently in the literature of cognitive science, psychology and philosophy of mind, and that it is the dominant paradigm for research. This is not to say that *all* researchers in these fields agree with this approach.

2. John Searle (1994) *The Rediscovery of the Mind* 202 (Mass: MIT). Searle believes that Turing's (1950) classic paper is "the foundation of the cognitivist view". He says that the Church-Turing thesis and Turing's theorem are "the primal story" in mainstream cognitive science. Zenon Pylyshyn (1989) "Computing in Cognitive Science" in: *Foundations in Cognitive Science*, Michael Posner (ed) 56, (MIT, Ma) also refers to Turing's paper in his discussion of the "classical view of computing and cognition".

3. Searle, *Rediscovery*, 202

4. A. Newell, P. Rosenbloom & P. Laird (1993) "Symbolic Architectures for Cognition" 101 in *Foundations of Cognitive Science* Posner, M.(ed) (Cambridge: MIT Press)

5. J. Flavell, P. Miller & S. Miller (eds) (1993) *Cognitive Development*, 9 (New Jersey: Prentice-Hall)

6. Antony Flew (1979) *A Dictionary of Philosophy* (New York: St Martin's Press)

7. Flavell, *Cognitive,* 2

8. Ibid., 3

9. Ibid., 17

10. Ibid., 4

11. Ibid., 8. Flavell cites Seigler, (1991) *Children's Thinking* (New Jersey: Prentice-Hall)

12. Ibid., 9

13. Ibid., 11

14. Ibid., 9

15. Searle *Rediscovery* 223

16. William Lyons (ed) (1995) *Modern Philosophy of Mind* lix (London: J.M. Dent)

17. Zenon Pylyshyn (1989) "Computing in Cognitive Science" 72 in: *Foundations in cognitive Science*, Michael Posner (ed) (Mass: MIT)

18. Lyons, *Modern*, lxii

19. Valentine, *Conceptual*, 32

20. The response to this question is the source of an important distinction between traditional IP systems which posit a central processing unit and the newer parallel-processing systems.

21. Ned Block, "The Computer Model of the Mind" 819 in: D.N. Osherson and E.E. Smith (eds) (1990) *Thinking: An Invitation to Cognitive Science* (Mass: MIT)

22. Flavell, *Cognitive*, 20

23. Robert Sternberg (1990) *Metaphors of Mind* 133 (NY: Cambridge University Press)

24. See for example, Fred Dretske (1981) *Knowledge and the Flow of Information* (Mass: MIT Press). However, Dretske's work is often found under the category of "epistemology" or "philosophy of mind" and is (unfortunately) rarely cited or discussed in the psychological literature specifically concerned with cognitive development.

25. Sternberg, *Metaphors*, 122

26. Flavell, *Cognitive*, 8

27. Ibid., 146

28. Ibid.

29. Lyons, *Modern*, lx

30. Pylyshyn, *Computing*, 87. Pylyshyn further qualifies his use as having "nothing to do with Polanyi's use of the same phrase."

31. David Rumelhart (1989) "The Architecture of the Mind: A Connectionist Approach" 136 in: *Foundations in cognitive Science*, Michael Posner (ed)(Mass: MIT)

32. Jaegwon Kim (1993) "What Is Naturalized Epistemology?" 330 in Pojman (ed) *The Theory of Knowledge* (California: Wadsworth Inc.)

33. Rene Descartes (1988) *Descartes Selected Philosophical Writings*, Cottingham et al (translators) 17 (NY: Cambridge University Press) Descartes observes: "Whatever I have up till now accepted as most true I have acquired either from the senses or through the senses. But from time to time I have found that the senses deceive, and it is prudent never to trust completely those who have deceived us even once."

34. Willard Quine (1993) "Epistemology Naturalized" 325 in Pojman (ed) *The Theory of Knowledge* (California: Wadsworth Inc.)

35. Alvin Goldman (1986) *Epistemology and Cognition* 6 (London: Harvard University Press)

36. Alvin Goldman (1993) "Reliabilism: What Is Justified Belief?" 301 in: Louis Pojman (ed) *The Theory of Knowledge* (CA: Wadsworth). Goldman does not explicitly define a "genetic" theory of knowledge. Presumably he uses the term 'genetic" to emphasize his concern with the origins or sources of an individual's knowledge. For example, he contrasts a genetic theory to the "dominant approach" in epistemology which according to Goldman "makes the justificational status of a belief wholly a function of what is true of the cognizer at the time". In addition he suggests that Plato's theory of recollection "is a good example of a Genetic theory of knowing". (301)

37. Goldman, *Epistemology*, 5

38. Ibid.

39. Ibid., 7

40. See for example, J.G. Borkowski (1985) "Signs of Intelligence: Strategy Generalization and Metacognition", in S. Yussen. (Ed.) *The Growth of Reflection in Children* 105-140 (Toronto: Academic Press Inc.); Ann Brown (1978). "Knowing When, Where, and How to Remember: A Problem of Metacognition" in R. Glaser (Ed.) *Advances in Instructional Psychology* 77-165 (NJ: Erlbaum Association); Ann Brown, J. Bransford, R. Ferrara & J.C. Campione (1983) "Learning, Remembering and Understanding" in P. H. Mussen (Ed) *Handbook of Child Psychology* Vol. 3, 77-166 (NY: Wiley); John Flavell (1978) "Metacognitive Development" in J. M. Scandura & C. J. Brainerd (Eds.) *Structural/Process Models of Complex Human Behaviour* 213-245 (The Netherlands:Sijthoff and Noordhoff); J. Garofalo & F. Lester (1985) "Metacognition, Cognitive Monitoring, and Mathematical Performance", *Journal for Research in Mathematics Education* Vol.16., No.3, 163-176.

41. Flavell, *Cognitive*, 8. Flavell cites Seigler (1991) *Children's Thinking*

42. Carl Bereiter and Marlene Scardamalia (1992) "Cognition and Curriculum", 521 in: P. Jackson (ed) *Handbook of Research on Curriculum* (New York: MacMillan)

To acquire knowledge is to learn to see, to experience the world in a way otherwise unknown, and thereby come to have a mind in a fuller sense . . . It is only because man has over millennia objectified and progressively developed [conceptual schemas] that he has achieved the forms of human knowledge and the possibility of the development of mind as we know it is open to us today.

Hirst, "Liberal Education and the Nature of Knowledge"

Chapter 3
The Conventionalist Approach

Much of the philosophical work of Wittgenstein and Ryle is devoted to a critique of "false" accounts of knowing, e.g., causal theories of knowledge acquisition, inner processes, private languages, introspection, etc. These philosophers suggest that; i) the proper account of knowledge acquisition is a matter of learning (through instruction) and; ii) that propositional knowledge is acquired through language acquisition and the "conventions" associated with its use.

No modern philosopher of mind or epistemologist explicitly denies that there is a relationship between knowledge, mind and education. Nevertheless, the contemporary literature of epistemology and philosophy of mind is largely concerned with either: i) theories of knowledge acquisition which do not refer to the development of mind through education or conversely; ii) theories of mind which ignore the consequences of such conceptions for the achievement of worthwhile knowledge. [1]

In contrast, several philosophers of education, e.g., Oakeshott, Peters, Hirst, Hamlyn, Scheffler, etc., followed the ideas of Wittgenstein, Ryle and Austin regarding conceptual analysis or mapping the logical "geography" of concepts. These philosophers of education became interested in the linguistic conventions of the concept of knowledge and the implications of the conventions for the development of mind in an educational

context. They were interested, as were their historical predecessors, in questions such as what counts as knowledge?, what sorts of knowledge require formal instruction? and what knowledge is most worthwhile? Their answers to these questions became the criteria used to mark the concept of liberal education and Hirst's forms of knowledge thesis became a central feature of the liberal concept. Although critiques of this view have been the subject of much debate in the educational literature, the liberal "ideal" nevertheless remains a powerful force in shaping educational theory and practice.

The ideas of these philosophers, among others, constitute what might be called the "conventionalist approach" to the development of mind.[2] The conventionalist approach, as here presented, accords with the historical examples in that it; i) explicitly argues for a logical relationship between the concepts of mind, knowledge and education; ii) clarifies the relationship through conceptual analysis, i.e., establishes the criteria which govern the use of the concepts, and; iii) emphasizes the value of knowledge and understanding in the pursuit of human betterment.

The conventionalist approach differs from the historical examples in three significant ways. First, it is not the view of a single thinker but is rather, a composite of many views assembled for the purposes of this thesis.[3] Secondly, the conventionalist approach does not follow a "guiding" metaphor of mind, as did all the previous examples.[4] Finally, the conventionalist approach is grounded in human linguistic conventions which are a important part of what Wittgenstein calls our "form of life". Thus, human language has a central role in the acquisition of knowledge and the development of mind.

The conventionalist approach provides a sharp contrast to the computational approach in that it is a normative approach, i.e., it is an argument for what *ought to* be the case in the development of mind, rather than what *is* the case. Further, the conventionalist approach is based on the logical criteria of the relevant concepts rather than on empirical evidence and mental models. Finally, in contrast to the dearth of references to education in much of the computationalist literature on development of mind, the conventionalist approach holds that education *is* the development of mind.

This chapter follows the format used to examine the previous approaches. That is, the conventionalist approach is discussed in terms of the answers to three questions: i) what is meant by the development of mind on this approach? ; ii) what are the characteristics of the concepts of mind, knowledge and education?, and; iii) what is taken to be the justification for the conventionalist approach?

Development of Mind: Knowledge and Understanding

Hirst points out the difficulty in assigning questions regarding cognitive development to appropriate fields of inquiry. He notes that it is difficult to determine which questions are empirical and which are philosophical. Hirst is concerned with *"what* is involved in understanding" and says that "this is surely a philosophical matter". However, he observes:

> Just which questions about the development of understanding are philosophical questions and which are psychological, is far from clear at present... *How* in fact understanding is developed, how in fact these distinct language-games come to be correctly played and used, is another matter. On the face of it, questions in that area seem empirical, but how far that is true is a complex problem. [5]

On the conventionalist approach, what is meant by the development of mind follows from serious consideration of what we mean by mind in the first place. From the many complex arguments that contribute to this approach, some important features are commonly used to mark the conventionalist view of the development of mind. These include; i) references to human capacities and dispositions; ii) the acquisition of worthwhile knowledge, and; iii) the development of reason.

Ryle argues that to talk of a person's mind is to talk of the person's "abilities", "liabilities" and "inclinations" to do certain sorts of things. In other words, this is to talk about dispositions to "undergo certain sorts of things" and about "the doing and understanding of these things in the ordinary world". [6] Following Ryle, Kenny points out that mind is related in important ways to particular complex human capacities:

> The mind can be defined as the capacity for behaviour of the complicated and symbolic kinds which constitute the linguistic, social, moral, economic, scientific, cultural and other characteristic activities of human beings in society. . . In its primary sense *the human mind is the capacity to acquire intellectual abilities*. It is a capacity, not an activity; babies have minds even though they do not yet exhibit intellectual activities. [7]

To hold that the development of mind is in large part the development of these capacities is to hold that mental development is based on a complex interrelationship. The individual capacities cannot be looked at in isolation. Language provides the ability to conceptualize and organize beliefs into concepts. The concepts are then used to discriminate between naive and sophisticated beliefs and other concepts. None of this is possible beyond a basic or naive level *without the acquisition of knowledge*.

Knowledge changes naive beliefs, i.e., "doxa" or opinions, to sophisticated beliefs, i.e., "episteme". Sophisticated beliefs yield sophisticated goal-directed plans or

intentions. The success of more sophisticated plans in turn, transform our beliefs and concepts. Knowledge provides the means to both acquire new concepts and to use "old" concepts in new and more sophisticated ways. The development and utilization of concepts has a "symbiotic" relationship with meaningfulness. Hirst points out that:

> It is because the concepts are used in a particular way that any proposition is meaningful. The concepts on which our knowledge is built form distinctive networks of relationships. If we transgress the rules of the relationships which the concepts meaningfully permit, we necessarily produce nonsense. [8]

Looked at in a different way, cognitive development can be described as the development of human discriminatory abilities. Our basic "animal" ability to make sensory discriminations leads to the formation of beliefs which, with language, can be expressed in propositional form. Groups of interrelated beliefs form concepts which are used to make further discriminations, e.g., to put beliefs into a variety of categories and to change both the beliefs and the categories in which they fit. The acquisition of knowledge provides new concepts and beliefs with which we are able to make further discriminations. Ultimately, education provides the understanding that is necessary to discriminate between different categories of knowledge.

Human cognitive development can also be expressed in terms of a logical progression of cognitive abilities. For example, in the case of say, a tree, the developmental progression would be: i) to believe that x (that this object is a tree); ii) to have the concept of x (treeness) i.e., to know that an x is an x (that a particular instance of a tree is a tree); iii) to categorize all x's as x's (that all instances of trees are trees) and distinguish x's from y's (to distinguish particular trees from particular rocks); iv) to distinguish all categories of x's from all categories of y's (to distinguish all trees

from all rocks); v) to recognize beliefs as beliefs, concepts as concepts and categories as categories (to distinguish among i-iv); vi) to understand the relationships among various beliefs, concepts and categories of x's and y's (e.g., both trees and rocks are objects in the world that we perceive with our senses; trees are living things, whereas rocks are not; trees are examples of vegetation, whereas rocks are examples of minerals, etc.). In addition to these abilities, knowledge provides the cognitive ability to apply standards of correctness to beliefs, concepts and categories. This is in part, what is meant by the ability to reason. For example, Hirst points out that:

> The acquisition of knowledge in any area involves the mastery of an interrelated group of concepts, of operations with these, of particular criteria of truth or validity associated with these concepts, as well as more general criteria of a reasoning common to all areas of knowledge.[9]

Hirst notes that reasoning is not a matter of "a sequence of mental occurrences", rather it is related to developing the natural human capacity for rationality. He claims:

> To say one has reasoned something out is not to describe a particular sequence of mental occurrences, it is to say that one has achieved in the end a relationship between propositions which satisfies the public criteria necessary for giving reasons. The development of rationality is therefore, not dependent on the exercising of particular mental processes, but it is dependent on one's coming to recognize that there are tests of validity for one's arguments and tests of truth for one's beliefs. [10]

Reasoning ability is arguably the central feature of what is called human "intentionality". Reasoning is the means by which intentionality becomes more sophisticated, a way in which mind is developed. For example, plans, i.e., goal-oriented behaviour, become more complex as beliefs become more sophisticated. With knowledge, our desires become more distinct and directed toward more specific ends. However, the satisfaction of desires becomes more complex as social norms and

sanctions are realized. Our ability to reason is the way in which we can devise goal-directed plans that establish a balance between the satisfaction of desires and normative social behaviour.

To foster the relationship between the acquisition of knowledge, the development of sophisticated concepts, and the development of mind is a primary function of education. Hirst argues that, "to be without any knowledge at all is to be without mind in any significant sense". He claims that, "the acquisition of knowledge is itself a development of mind and new knowledge means a new development of mind in some sense". On Hirst's view:

> Knowledge is not a free-floating possession. It is characteristic of minds themselves. Thus, to fail to acquire knowledge of a certain fundamental kind, is to fail to achieve rational mind in that significant respect. Not all knowledge is of equal importance in the development of rationality of course, yet the fundamental relationship between knowledge and the development of mind is of central educational significance. [11]

In order to foster the relationship between knowledge and mind, education must be concerned with what knowledge is both available and worthwhile and how it is obtained. Hirst asks, "what then is involved in the acquisition of knowledge"? He observes that it involves:

> Learning many different concepts, using these in a growing awareness of facts, truths, and forms of many kinds, mastering many logical operations and principles, applying the criteria of different types of judgement and so on. [12]

Hirst concludes that these achievements are in fact, "neither more or less than the very achievement of mind itself".

Knowledge is more than simply what constitutes various human "experiences". Rather, knowledge is the means by which we can *interpret* human experience through the

ability to make discriminations provided by the development of our linguistic, rational and social capacities. Hirst notes that what the development of understanding involves is "a progressive differentiation of our experience through the acquisition of new concepts under which it is intelligible". On Hirst's view, we achieve understanding through the use of "categorial and conceptual apparatus" and that having such an apparatus of concepts is "a necessary part of what it means to have a mind". Thus, Hirst concludes:

> The development of mind involves the achievement of an array of concepts and on this all intelligibility depends. The provision of experience in itself is quite inadequate for developing even the simplest body of concepts, and without these nothing more complex can possibly be achieved. [13]

Mind: A Term of Reference

Like its historical predecessors, the conventionalist approach to the development of mind is based on a particular conception of the relationship between mind, knowledge and education. Unlike the former views however, the latter does not explain the concept of mind in terms of a "guiding" metaphor.[14] One reason for this is that in discussing human minds, we are discussing complex interrelationships which cannot be captured by a simple "picture" of a concrete object such as a well, a slate, a machine, etc. For example, Oakeshott argues that:

> Mind is made of perceptions, recognitions, thoughts of all kinds; of emotions, sentiments, affections deliberations and purposes, and of actions which are responses to what is understood to be going on. It is the author not only of the intelligible world in which a human being lives but also of his self-conscious relationship to that world, a self-consciousness which may rise to the condition of self-understanding. [15]

Rather, conventionalists hold that 'mind' is a term used in our ordinary language to refer to the beliefs, desires, fears, intentions, goals, etc., which characterize human thought. Thus, the term 'mind' *expresses* the concept of mind. For the purposes of this thesis, the conventionalist conception of mind will be depicted as CM or simply as 'mind'.

The concept of mind central to the conventionalist approach (CM) is similar in some respects to the "intentional" view of mind held by some philosophers of mind.[16] However, to use the label 'intentional' for the conventionalist concept of mind would require distinctions and details which are beyond the scope of this thesis. CM is also related in several ways to what has been called the "common sense" view of mind. A common sense view of mind might be taken as (to use Ryle's analogy) a map of the "logical geography" of mind. For example, Hacker, Wittgenstein and Ryle argue that a common sense view of mind is not a "theory of mind" in the scientific sense. Rather, it is an account of mind that uses the grammar of our language to note the important criteria or features of mind and the distinctions that we make when we talk about mind. Hirst adds that:

> Common sense knowledge is to my mind simply that collection of elementary knowledge, or what is claimed to be such, from the different forms [of knowledge], which is largely taken for granted in a given society. [17]

Baker argues that a common sense conception of mind functions as a "cognitive background" for our practical affairs, "from formulating our personal ambitions to explaining and predicting behaviour, to developing laws and institutions, to devising theories". According to Baker:

> A commonsense conception is a conception of reality that one learns in learning a natural language. It reflects the world as encountered - the world of medium-sized objects, artifacts as well as natural objects; of persons with propositional attitudes and various character-traits; and of conventions and obligations. [18]

The purpose or function of mind on the common sense view, is to direct action and, "ultimately, to allow us to flourish as human beings". On Baker's view common sense is "embodied in natural language", it is the "sea in which we all swim - scientists and nonscientist alike". [19] According to Baker, modern inquiries into the nature of mind often assume that "science is the measure of all things", that practical knowledge is of no value unless it is reducible to scientific theory, i.e., the "received" view. Proponents of the received view grant a common sense understanding of mentality which is useful for practical purposes, however, they grant it a probationary status which is subject to scientific verification.

Baker's aim is to expose the poverty of the "received" view. By contrast, Baker wants to show that, "the commonsense understanding of mentality, which is characterized by beliefs, desires, and intentions, requires no special validation by the sciences". She argues that beliefs, desires etc. are "attitudes" which we attribute to others. They are expressed in propositions, thus they are referred to as "propositional attitudes".

Baker claims that common sense is inseparable from the larger "linguistic community". She points out that when we speak of a "commonsense conception" the relevant community is "a whole linguistic community". Therefore:

> If theories were to replace common sense, then sets of sentences (whose epistemic credentials are certified by disciplinary communities) would replace all reason-terms in a linguistic community. To say that commonsense psychology is irreplaceable is to say that not all reasonably comprehensive sets of sentences in

> which commonsense psychological terms occur *can* be replaced by theories that are themselves replaceable.[20] (italics added)

Baker holds that science is not the only form of knowledge. She claims that law, literature, art and music are "leading sources of insight into human reality". Baker comments that it is "embarrassingly obvious" to mention that commonsense psychology is, and has been throughout history, accessible to many writers and thinkers without the "specialized training" of science. For example, she notes that common sense has been well explored and expanded by Confucius, Augustine, Shakespeare, Jane Austin, T.S. Eliot, and "countless others". Baker argues that:

> One endorsing the exclusivity of science must hold either that these writers did not contribute to what we know, or that they were "really" doing science. Since neither alternative has a shred of plausibility, the premise that truth belongs to science alone seems false. [21]

Notwithstanding Baker's convincing arguments for the "common sense" concept of mind, it is important for clarity to distinguish CM from ordinary "common sense", i.e., the employment of previously successful habits to a particular task. Although CM may include ordinary common sense, it differs in several ways. First CM is a conception of mind, i.e., beliefs, desires, fears etc., whereas the phrase 'common sense' is used to refer to a way of doing things, i.e., a practical ability. CM is concerned with intellectual concepts which distinguish for example, cognitive perception from sensory perception; whereas 'common sense' may be used to refer only to sensory perception. CM can be seen as what Baker calls a "conception of reality" that is learned through acquiring a language, whereas "common sense" may be acquired by simply mimicking or copying a common practice.

Knowledge: Forms of Knowing

Of the many possible influences on the development of mind, the acquisition of different forms of knowledge which are embedded in particular linguistic frameworks is particularly important for the development of sophisticated beliefs, goals etc. In this sense, Hirst argues that the acquisition of knowledge *is* "itself a development of mind". Hirst's forms of knowledge thesis is based on a question concerned with the formal relationships among cognitive structures. Hirst asks:

> If the fundamental objectives of education are developments of the rational mind, what formal relationships are there between the various objectives, the concepts, facts, norms, principles, and so on? [22]

Hirst's answer to this question suggests that the relationship between knowledge and mind involves the development of basic human capacities and may have implications for the study of consciousness. Hirst claims:

> The development of mind has been marked by the progressive differentiation in human consciousness of some seven or eight distinguishable cognitive structures, each of which involves the making of a distinctive form of reasoned judgement and is, therefore, a unique expression of man's rationality. This is to say that all knowledge and understanding is logically locatable within a number of domains.[23]

What Hirst means by a "form of knowledge" is in a sense, a further refinement of Oakeshott's idea of a metaphorical "conversation" based on the "historical traditions of understanding". Hirst's forms categorize the traditions of human understanding according to the kinds of linguistic propositions they embody and the logical relationships among the central concepts. Hirst says:

> By a form of knowledge is meant a distinct way in which our experience becomes structured round the use of accepted public symbols. The symbols thus having public meaning, their use is in some way testable against experience and there is the progressive development of series of tested symbolic expressions. [24]

Following Oakeshott, Hirst argues that the forms of knowledge are, "the basic articulations whereby the whole of experience has become intelligible to man". In this sense they are, "the fundamental achievement of mind." The forms of knowledge are central to what Oakeshott calls the individual "engagement" of understanding and they are the answer to the substantive question, "what is worthwhile knowledge?" which is asked by liberal educators. On Hirst's view:

> To be without any knowledge at all is to be without mind in any significant sense. Nor is it that the mind needs some content to work on, as if otherwise its characteristics could not be expressed. The acquisition of knowledge is itself a development of mind and new knowledge means a new development of mind in some sense. [25]

Hirst attributes the idea of "forms of knowing" and the relationship between knowledge, reality and mind to the seven Greek liberal arts. [26] Hirst's modern articulation of the forms of knowledge bears some similarity to the historical view. However, Hirst's view differs significantly in terms of his justification for the forms, the nature of truth and the general conception of reality. Hirst distinguishes the forms of knowledge according to three criteria. First, each form involves "certain central concepts that are peculiar in character to the form". Secondly, in any given form of knowledge these and other concepts denote "certain aspects of experience" and "form a network of possible relationships in which experience can be understood". As a result, the form has a "certain logical structure". Finally, the form, "by virtue of its particular terms and logic", has "expressions or statements" that in some way or other, are "testable against experience" in accordance with "particular criteria that are peculiar to the form". [27]

Hirst classifies the forms of knowledge as mathematics, physical sciences, human sciences, religion, aesthetics, philosophy and ethics. Within each form are cognitive structures which when understood, allow us to distinguish our individual experiences and compare them to an historical tradition, to examine our own assumptions about the justification and truth of knowledge claims, and thereby to further our understanding. A more sophisticated cognitive perspective is achieved by this transformation of our understanding, which is gained from the examination of human experience within each of the various forms of knowledge. Hirst claims that:

> The objectives with which education is most centrally concerned are thus not isolated ends, but elements within integrated developing structures of understanding. Certainly all the concepts, truths, norms, principles, criteria, all the developments of mind we are interested in, have their appropriate place in relation to these structures, and even those elements which are common to different areas have significance only within these structures. [28]

The Logic of the Forms

There is a sense in which the logical relationship between the concepts of mind, knowledge and education reflects a multitude of logical relationships internal to each concept. Something that might be called "interdependency" is at work here. It is similar to circularity, but is not circular in the critical sense. Rather, the interdependency is more like a logical tautology or mathematical proof. For example, in the case of mind there is a logical relationship between beliefs, cognitive capacities and action. In the case of education there is for example, a logical relationship between learning, teaching and knowledge. In the case of knowledge there are logical relationships between language, meaning, and truth; between meaning, truth and reality; between concepts, reality and truth, etc.

In the forms of knowledge, one internal relationship is between propositions, concepts and principles. Propositions, i.e., that "x", are grouped in concepts, i.e., the various propositions that determine what it is to be an x. Logical relationships among concepts, i.e., conceptual schemes, are determined by general principles, e.g., that all x's are not y's. On this point, Hamlyn observes that:

> The notions of a concept and principle are interconnected; to have a concept of something is to know the principle in accordance with which things are said to be of the relevant kind. [29]

This organization is neither static nor linear. It might be described as being "dynamic", "interactive", or "transformative". That is, on one hand propositions form concepts and concepts are grouped into schemata by organizing principles, etc. On the other hand, the concepts are used to identify what counts as a proposition, principles are used to identify what counts as a concept etc.

In his forms of knowledge thesis, Hirst identifies different logical categories which contain this internal relationship of propositions, concepts, conceptual schemata and principles, and organizes them into larger categories, in this case - forms of knowledge. What makes the categories those of knowledge is that the propositions in the relationship are facts, that is, they are statements that express the proposition "that x is the case". What makes a proposition a fact as opposed to a mere belief is the element of truth.

The notion of truth or what counts as a true fact is central to Hirst's thesis. In fact, his thesis is that there are different kinds of true facts, that concepts are used in different ways to pick out different kinds of facts, and that different kinds of organizing

principles are used to organize concepts into conceptual schemata. Thus, there are different frameworks of knowledge. Hirst notes that:

> The conceptual and logical analysis which indicates the divisions I have stressed is a matter of the logical relations and truth criteria to be found at present in our conceptual schemes. [30]

Hirst warns that an understanding of the different forms or disciplines of knowledge is not simply a matter of studying the linguistic distinctions or conceptual relationships. Rather, each of the disciplines that form the mind requires, "particular training in this form of discourse". Hirst notes that:

> No doubt it is because the forms require particular training of this kind in distinct worlds of discourse, because they necessitate the development of high critical standards according to complex criteria, because they involve our coming to look at experience in particular ways, that we refer to them as disciplines. *They are indeed the disciplines that form the mind.* [31] (italics added)

There is a significant difference between learning a fact, learning that it is a fact and learning about or coming to understand a form of knowledge. Yet, as Hirst's thesis points out, facts gain their meaning and their status as facts, i.e., their validity as truth claims, from their membership in particular forms of knowledge. Thus, learning that a fact is a fact and understanding why it is a fact requires an understanding of the form of knowledge in which that fact obtains. Hirst explains:

> The logic of a form of knowledge shows the meaningful and valid ways in which its terms and criteria are used. It constitutes the publicly accepted framework of knowledge... coming to understand a form of knowledge involves coming to think in relations that satisfy the public criteria. [32]

To understand a form of knowledge is not only to understand the relationship between facts, conceptual schemes and organizing principles, it is to understand what it is that constitutes a form of knowledge and what distinctions are used to differentiate

between one form and another. In Hirst's words it is to "appreciate the forms for what they are." He comments:

> Out of this general pool of knowledge the disciplines have slowly become ever more differentiated and it is this that the student must come to understand, not confusing the forms of knowledge but appreciating them for what they are in themselves, and recognizing their necessary limitations. [33]

Hamlyn observes that, "there *are* priorities in learning", which may be described as epistemological or logical. In the case of "growth of knowledge", Hamlyn argues that certain things must be done before others. He says that, "not only is it the case that certain facts must sometimes be known if one is going on to make sense of others", but that it is also the case that, "sometimes certain things must be understood, certain concepts grasped, before progress can be made at all". [34]

Referring to Ryle's analogy, Hamlyn notes that "the child in school is not so much learning the geography of an area as acquiring the tools and techniques by which he may eventually come to make a map of it". According to Hamlyn, concepts can be thought of as "tools of this kind". However, Hamlyn points out that:

> There is inevitably in the process of acquiring concepts a delicate balance between a kind of abstract understanding of what it is to be an X and a knowledge of what things conform to this criterion. In learning - that is to say in the growth of knowledge and understanding of a subject-matter - there must at every stage be achieved a balance of this sort if progress is to be maintained.[35]

On Hamlyn's view, "unless this balance is attained, one cannot be said to have a proper understanding of the concepts involved". [36]

Education: Liberal Education

The literature of philosophy of education has, for many years, been concerned with accounts of liberal education and various critiques of those accounts. In the current literature, what is meant by liberal education is no longer clear. Rather, what is meant seems to depend on whether the discussant is supportive or critical of liberal education, on the particulars of the argument and on the discussant's underlying reasons for presenting the argument.

For the purposes of this thesis, what might be called the "traditional" view of liberal education has been selected for analysis. Liberal education in the traditional sense is the view advocated by Oakeshott, Peters, Hirst and Scheffler (among others). This view is based on a logical analysis of the concept of education and is concerned with the necessary features of such a concept. In this sense the traditional view of liberal education follows Wittgenstein and Ryle in that it maps or charts the "logical geography" of the concept of education. Hirst claims that the traditional view of liberal education is:

> The appropriate label for a positive concept, that of an education based fairly and squarely on the nature of knowledge itself, a concept central to the discussion of education at any level.[37]

On the traditional liberal conception of education, the development of mind is achieved through the acquisition of knowledge and understanding and the development of what Peters calls a "cognitive perspective". Hirst argues further that the significance of the acquisition of knowledge to liberal education can in fact "be based directly on an

explication of the concepts of 'mind' and 'knowledge' and their relationships." [38] (italics added)

It is beyond the scope of this thesis to reconstruct the conceptual analysis of the concept of liberal education in detail. What is relevant to this thesis are; i) some features of the theoretical foundations of the traditional view which are noted by Oakeshott; ii) Peters' notions of "non-instrumental value" and "cognitive perspective", and; iii) Hirst's argument for his "forms of knowledge" thesis. As Hirst's thesis has been summarized, an overview of the remaining two features is necessary to point out their relevance to the development of mind.

Theoretical Foundations

Oakeshott views all human conduct as a series of "engagements", of which the most fundamentally important is the engagement to understand "what is going on". According to Oakeshott, the engagement of human understanding is an "unsought" condition, a necessary part of being human. Thus:

> Understanding as an engagement is an exertion; it is the resolve to inhabit an ever more intelligible, or an ever less mysterious world. This unconditional engagement of understanding I shall call 'theorizing'. It is an engagement to abate mystery rather than to achieve definitive understanding. [39]

In other words, the engagement to understand is a continuous activity of learning to understand our own theories about the world and our relationship to or with it. Oakeshott notes that the activity is one of constant self-interrogation. We always ask for justification, i.e., "*why* do I hold this to be what is going on?" The answer to the question is always in the form of a new theorem, which is then interrogated accordingly. Thus, the engagement to understand is an exertion in which an individual moves from

one temporary conditional platform of understanding to another in a limitless quest in which understanding is an end in itself, in other words, a "lifelong engagement". Oakeshott maintains that the nature of human conduct is to "become by learning", and that:

> The learning we are concerned with is a self-conscious engagement. It is . . . a self-imposed task inspired by the intimations of what there is to learn (that is, by awareness of our own ignorance) and by a wish to understand. Human learning is a reflective engagement in which what is learned is not merely a detached fragment of information but is understood or misunderstood and is expressed in words which have meanings. [40]

Liberal education includes a considered curriculum of learning, which is designed to provoke distinction and discrimination. Education is, therefore, an engagement to learn by study, through effort and surmounting difficulties, in a personal transaction between the learner and the teacher concerning something of worth. In this sense, education, according to Oakeshott, is a necessary part of the engagement to understand, a specific transaction between a teacher and a learner in which the learner comes to understand and eventually participate in a metaphorical "conversation" with generations of human beings engaged in historical traditions of understanding. Oakeshott describes the engagement in education as:

> An endless unrehearsed intellectual adventure in which, in imagination, we enter into a variety of modes of understanding the world and ourselves and are not disconcerted by the differences or dismayed by the inconclusiveness of it all. And perhaps we may recognize liberal learning as, above all else, an education in imagination, an initiation into the art of this conversation in which we learn to recognize the voices; to distinguish their different modes of utterance, to acquire the intellectual and moral habits appropriate to this conversational relationship.[41]

Peters' "Non-Instrumental" Attitude

According to Peters, the ideal of liberal education, which has its roots in early Greek culture, re-emerged in the nineteenth century as a contrast to "training". Peters notes that:

> Traditionally the demand for "liberal education" has been put forward as a protest against confining what has been taught to the service of some extrinsic end such as the production of material goods, obtaining a job, or manning a profession. In other words it has been a plea for education rather than vocational training or training of hand and brain for utilitarian purposes. [42]

Peters argues that education is distinguished from training by certain criteria. First, 'education' implies, "the transmission of what is worth-while to those who become committed to it." Next, 'education' must involve, "knowledge and understanding and some kind of cognitive perspective which are not inert." Finally, Peters argues that 'education' at least, "rules out some procedures of transmission, on the grounds that they lack wittingness and voluntariness on the part of the learner." [43]

Following Oakeshott, Peters describes the "educated person" as one whose concern for knowledge and understanding gives rise to an attitude of determination to search for justification for his or her theories about the world. Such a person constantly queries what is out there, why do this rather than that, is never satisfied and always wonders how this or that ought to be conceived. This kind of understanding, according to Peters, is not "specialized" or confined to any particular sort of knowledge, it is rather, a "breadth" of understanding, the recognition that experience can be reacted to in more than one way. Thus, through theorizing, an individual develops a "cognitive

perspective" which is continually adjusted by forging new connecting links or relationships between different forms of knowledge and theories about the world.[44]

According to Peters, there are two distinct kinds of value connected to this kind of understanding. On one hand, it has "instrumental" or practical value in that it improves our everyday lives, ie., securing jobs, acting appropriately in a particular situation, making decisions and the like. On the other hand, it has "non-instrumental" value in that it is satisfying, rewarding to the inquiring individual to achieve a new, if temporary, level of understanding, i.e., to see the world from an enhanced perspective that has been refined by new knowledge.

Peters notes that the non-instrumental value of knowledge and understanding is "virtuous" in three respects. First, it is worthwhile for the reason that it is absorbing and results in a grasp of truth. Secondly, it eliminates boredom through the joy found in the mastery of rules. Peters argues that an individual is "transformed" by knowledge and understanding and the consequent alteration of his or her cognitive perspective. It is a source of interest to discover a new perspective or to falsify an old perspective. The final virtue is the value of reason. Peters acknowledges that this view is based on the assumption that we value a state of mind that is neither deluded or prejudiced, a state where error matters. Thus, we value the *attempt* to find truth. The "key" to the non-instrumental attitude, according to Peters is that "regard, respect, or love" is shown for the "intrinsic features of activities." In other words, one does things for reasons that are "reasons for doing this sort of thing." Such reasons are "internal to the conception of the activity" and include caring about "the standards which are related to its point",

valuing "clarity" and examining evidence carefully in an "attempt to eliminate inconsistencies." [45] The educated person, then, on Peters' view is an inquirer, an individual who is engaged in the pursuit of knowledge and understanding that continuously transform the individual's cognitive perspective of the world and his or her relationship to it. The substantive question, "what is worthwhile knowledge and understanding?" is central to the individual engaged in this sort of education. One must be concerned with *what it is* that is necessary to know, in order to better understand the world and one's relationship to it.

In summary, the tradition of liberal education holds that a necessary condition for the development of mind, i.e., beliefs, desires, intentions etc., is worthwhile knowledge and understanding. The transmission and acquisition of such knowledge and understanding is in turn, a primary function of education (in the liberal sense).

Liberal Education and Mind

Despite the many references to the development of mind, in particular those found in the work of Hirst and Oakeshott, the traditional view of liberal education (LE) is generally taken to be an account of the relationship between knowledge and education rather than an account of the relationship between mind, knowledge and education. Therefore it is important, in light of modern educational discourse, to distinguish the liberal conception of mind from theories of mind such as IP and from "guiding" metaphors of mind which emphasize particular aspects of the relationship between mind, knowledge and education. There are good reasons to assume that the liberal conception of mind is closely related to the conventionalist conception of mind (CM) as it is

construed in this thesis. For example, both views are concerned with the logical criteria for the development of mind. Both views hold that the acquisition of knowledge is central to cognitive development and that the knowledge so acquired is in large part a matter of linguistic conventions, that is, the ways in which the logical nature of language itself shapes our understanding of human experience. Both LE and CM hold that; i) mind is not that which is described by psychological or scientific theories of mind; ii) mind is not a mysterious inner essence with mysterious qualities, and; iii) human cognitive development is not achieved by some sort of metaphorical "control" of internal mental processes. Rather, to re-emphasize Hirst's assertion, the significance of the acquisition of knowledge to liberal education can in fact "be based directly on an *explication of the concepts of 'mind' and 'knowledge' and their relationships*".

Both LE and CM are concerned with the conditions under which beliefs are transformed into knowledge and with the logical relationships between meaning, truth and reality. On both views, the transformation is necessarily a matter of deliberate learning. The transformation of beliefs into knowledge and understanding that takes place in learning is described by Oakeshott and other liberal educators in terms of "educational engagement". According to Oakeshott such learning is the "price of being human". Oakeshott's comment on this topic points to the important relationship between liberal education and the conventionalist view of mind:

> What distinguishes a human being, indeed what constitutes a human being, is not merely his having to think, but his thoughts, his beliefs, doubts, understandings, his awareness of his own ignorance, his wants, preferences, choices, sentiments, emotions, purposes and his expressions of them in utterances or actions which have meanings; and the necessary condition of all this is that he must have

learned it. The price of the intelligent activity which constitutes being human is learning. [46]

Summary of Chapter 3

The conventionalist approach to the development of 'mind' is a philosophical approach which charts the necessary criteria for the concepts of mind, knowledge and education. The conventionalist approach is not "guided" by a metaphor of mind, nor is it based on any prior psychological "theories". Rather, the criteria for each concept are clarified by investigating the logical geography of each concept.

The conventionalist conception of mind includes the beliefs, desires, intentions, fears etc. which are the criteria that mark our use of the term in ordinary language. The criteria are part of our linguistic conventions, which are part of our form of life. The conception of knowledge embodied in the conventionalist approach is based on the premise that human experience is organized in terms of several forms of knowledge. Each form has distinctive central concepts, distinctive organizing principles and distinctive tests for truth. The forms, which are based on the criteria of the concept of knowledge, include mathematics, physical sciences, human sciences, religion, aesthetics, philosophy and ethics. Each form is held together by internal logical relationships, e.g., between propositions, concepts and principles; between language, meaning and truth; and between the linguistic conventions and our human form of life. On the conventionalist approach human cognitive development is determined by the degree to which an understanding of these forms of knowledge is achieved.

The conventionalist concept of education has its foundations in the seven Greek liberal arts. Liberal education includes a considered curriculum of learning, which is

designed to provoke distinction and discrimination. Education is an "engagement" to learn by study, a personal transaction between the learner and the teacher concerning something of worth. In this sense, education is necessary for the development of 'mind' through knowledge and understanding. Through education, the learner is eventually able to participate in a metaphorical "conversation" with generations of human beings engaged in the historical traditions of human understanding. The necessary criteria for cognitive development marked by this concept include; i) the non-instrumental value of knowledge and understanding, i.e., the value of learning for its own sake; ii) a depth and breadth of knowledge and understanding, and; iii) a cognitive perspective (transformation of beliefs, knowledge and understanding) produced through an engagement with the forms of knowledge. The development of a cognitive perspective and all that it entails, is a necessary condition for the development of 'mind'.

Notes: Chapter 3

1. P.M.S. Hacker (1995) "Analytic Philosophy: What, Whence and Whither?" (unpublished paper). This trend may be due in part to what Hacker calls the "anti-psychological turn" in philosophy. Hacker observes that with this "turn", the accounts of the various linguistic conventions regarding the concept of knowledge became the domain of those working on psychological aspects of human learning. Hence, in cognitive psychology and science, researchers developed "theories" of knowledge acquisition which as has been noted, culminated in information-processing theory and alleged "cognitive revolution" in education.

2. The "conventionalist approach" is a label for a composite of views which have been amalgamated for the purposes of this thesis. What all the views have in common is their interest in the relationship between linguistic conventions, the criteria or conditions for knowledge, and the development of mind through knowledge and understanding.

3. Unlike the historical examples this work is not that of a single thinker and unlike the computational approach, the thinkers do not explicitly subscribe to the "conventionalist approach" (there is no such approach in the literature).

4. This is not to say that conventionalists do not use metaphors in their writing. For example, Wittgenstein uses the metaphor of "language games", Oakeshott refers to education as a "conversation", etc. My point here is that 'mind' is not posited as a concrete metaphor, i.e., a thing.

5. Paul Hirst (1974) "Language and Thought" 82 in *Knowledge and the Curriculum,* Hirst (ed) (London:Routledge & Kegan Paul)

6. Gilbert Ryle (1949) *The Concept of Mind* 199 (Chicago: University of Chicago Press)

7. Anthony Kenny (1989) *the Metaphysics of Mind* 21 (Oxford: Oxford University Press)

8. Paul Hirst (1969), "The Logic of the Curriculum" in *Journal of Curriculum Studies*, 151

9. Ibid.

10. Ibid., 150

11. Ibid.

12. Ibid., 148

13. Ibid., 149

14. CM is my label for the conventionalist view of mind. To my knowledge there is no such designation found in the literature. The work used to support this view does not imply that the authors (Ryle, Wittgenstein, Kenny, Hirst, Oakeshott, Peters) would agree with this designation.

15. Michael Oakeshott (1989) "A Place of Learning" 19 in *The Voice of Liberal Learning* Fuller (ed) (London:Yale University Press)

16. Although "intentionality" is related to human beliefs, desires, fears, goals, etc., the notion is controversial and subject to various interpretations. For example, Searle (1995) *The Construction of Social Reality* (NY: The Free Press) claims that "with consciousness comes intentionality, the capacity of the mind to represent objects and states of affairs in the world other than itself". Searle says that he

> uses "intentionality" as a technical term meaning that feature of representations by which they are *about* something or *directed* at something. Beliefs and desires are intentional in this sense because to have a belief or desire we have to believe that such and such is the case or desire that such and such be the case. Intentionality, so defined, has no special connection with intending. (6-7)

Baker (Explaining Attitudes) says that "Intentionality is the ability of one thing to be *about* another thing" and uses for examples, "The sentence 'snow is white' is about snow and snow's being white." (5) Armstrong (1995) "The Causal Theory of the Mind", in Lyons (ed) *Modern Philosophy of Mind* (J.M.Dent, London) claims that intentionality is "a philosophically notorious feature of all or almost all mental states". He suggests that a "causal analysis of the mind" shows "promise" of explaining intentionality. (183)

17. Paul Hirst (1974) "The Forms of Knowledge Re-visited" 90 in *Knowledge and the curriculum* (London:Routledge)

18. Lynne Rudder Baker (1995) *Explaining Attitudes* 221 (Cambridge University Press)

19. Ibid., 223

20. Ibid., 72

21. Ibid., 89

22. Hirst, *Logic*, 150

23. Ibid., 151

24. Paul Hirst (1974) "Liberal Education and the Nature of Knowledge" 44 in *Knowledge and the curriculum* Hirst, (ed) (Routledge & Kegan Paul)

25. Hirst, *Logic*, 150

26. Although Hirst does not list the seven Greek liberal arts, presumably he is referring to those listed by St. Augustine. Price (1967) *Education and Philosophical Thought*, specifies these as: grammar, dialectic, rhetoric, music, geometry, and astronomy. He notes that St. Augustine "probably intended to include arithmetic as well". (123)

27. Hirst, *Liberal Education*, 102-103

28. Hirst, *Logic*, 152

29. David Hamlyn (1967) "The Logical and psychological Aspects of Learning" 37 in *The Concept of Education*, Peters (ed) (London: Routledge & Kegan Paul)

30. Hirst, *Forms Re-Visited*, 92

31. Hirst, *Liberal Education* 45

32. Ibid., 50

33. Ibid., 52

34. Hamlyn, *Aspects*, 32

35. Ibid., 38

36. Ibid., 40

37. Hirst, *Liberal*, 30

38. Ibid., 33

39. Michael Oakeshott (1975) *On Human Conduct* 1 (Oxford University Press)

40. Oakeshott, *Place*, 22

41. Ibid., 39

42. R.S. Peters (1966) *Ethics and Education* 18 (Scott, Foresman and Company)

43. Ibid., 20

44. R.S. Peters (1973) *The Philosophy of Education* 245 (Oxford University Press)

45. Ibid.

46. Oakeshott, *Place*, 20

Section II:

Fundamental Differences

PREFACE

Debates related to the study of mind are often impeded by superficial technical arguments that do not address the fundamental assumptions that give rise to the surface arguments in the first place. Searle points out that:

> Quite often the fundamental issues in the debate do not rise to the surface. If you debate with people, for example, about strong artificial intelligence or the indeterminacy of translation, the sheer implausibility of such theories is disguised by the apparently technical character of the arguments bandied back and forth. Worse yet, it is hard to get the assumptions that lead to these theories out in the open. [1]

The examination of the two current approaches to development of mind in Section I reveals a lack of similarity between the pairs of concepts in the two approaches. That is, although each approach accounts for the relationship between the concepts of mind, knowledge and education, the respective pairs of concepts are not synonymous - in fact they differ in several respects. Following Searle, I believe the lack of synonymity is a reflection of much deeper differences between the two approaches in respect to their fundamental assumptions about the concepts themselves. As the two theoretical approaches to the relationship, i.e., computational and conventionalist, rest on their fundamental assumptions, it is particularly relevant to this thesis to do as Searle suggests and "bring them out in the open". The purpose of Section II therefore, is to point out some sources of what are arguably irreconcilable differences in the two approaches to development of mind. To do this, I contrast the computational approach (M1) and the conventionalist approach (M2) in terms of their fundamental assumptions about each of three pairs of concepts (mind, knowledge, education).

An important distinction between the two approaches to the development of mind is that the former (on the cognitivist interpretation) is primarily a scientific view of the subject matter whereas the latter is primarily a philosophical view. Accordingly, the two views differ in terms of; i) the sorts of questions that are asked about each concept; ii) the manner in which the questions are answered, and; iii) what counts as an appropriate answer. An examination of the respective questions and answers in the two approaches reveals conflicting fundamental assumptions about each of the three concepts and about what is the appropriate theoretical approach to the development of mind. Thus, in addition to the lack of synonymity noted in Section I, the two approaches are shown to be irreconcilable, i.e., they are not alternative methods for achieving the same outcome. Given this distinction, the computational and conventionalist approaches to the development of mind appear to be examples of what Phillips calls "discontinuous or incommensurate paradigms".

Phillips points out that on Kuhn's view (albeit controversial), incommensurate theories or paradigms are examples of "incompatible modes of community life" within which researchers work with different concepts, different rules and criteria and between which there cannot be any rational change or exchange of ideas. On Kuhn's view, change is discontinuous and revolutionary in nature, i.e., change requires the replacement of one paradigm with another rival paradigm.

In contrast to Kuhn's *strong sense* of incommensurability, a more moderate view or *weak sense* of incommensurability holds that although two paradigms may be

concerned with different concepts, rules and criteria, it does not follow that the paradigms are incompatible.[2] Phillips notes that a consequence of these arguments is that:

> Rival paradigms cannot be incompatible if the meanings of their terms are different. For if a particular key term appears in rival paradigms, then because in each it would be used in such different ways, and it would be embedded in such different conceptual webs, in effect it would be a different term in each setting, so there would be no bar to accepting both the "rival" paradigms for they are not *really* rivals! In other words, if paradigms are incommensurable a person is free to accept both of them. [3]

The contrast between the fundamental assumptions of the computational and conventionalist approaches to the development of mind in Section II is concerned with the issue of incommensurability in the weak sense, i.e., whether the terms are used in different ways and embedded in "different conceptual webs". Chapter 4 contrasts the two conceptions of mind as responses to the "mind/body" problem. The examination emphasizes the different fundamental assumptions about the relation of mind to body that underlie each conception. Chapter 5 contrasts the assumptions about the nature and acquisition of knowledge that follow from the different responses to the mind/body problem. Of particular significance are notions of causal mental processes and views about the task of epistemology. Chapter 6 contrasts the assumptions about education which follow from the respective assumptions about both mind and knowledge. The emphasis in this chapter is on the different assumptions about what constitutes "learning" and the "development of mind."

The intention of this section is to maintain an objective stance toward each approach, that is, the examination is not intended to be an argument for either approach. Of the many possible differences between the two views, the emphasis in this section is

on distinguishing those assumptions about each concept which render the two approaches incommensurate. The issue of compatibility between the two approaches is taken to be a separate issue which will be a subject of discussion in the final section of the thesis.

Notes

1. John Searle (1994) "What's Wrong with the Philosophy of Mind?" 283 in *The Mind-Body Problem* Warner & Szubka (eds) (Oxford: Blackwell Ltd)

2. Denis C. Phillips, (1987) *Philosophy, Science, and Social Inquiry* 23 (Pergamon Press)

3. Ibid., Phillips cites, for example, Scheffler, Toulmin, Newton-Smith

The vigorous mind-body debate...occupies center stage in contemporary philosophy. The issue is whether the scientific program of a fully mind-independent description and explanation of nature extends without fundamental modification to the description and explanation of the mind. It is difficult to imagine a philosophical issue more fundamental to our understanding of science and self.

Warner, "The Mind-Body Problem"

Chapter 4
The "Matter" of Mind

The computational conception of the mind described in Chapter 2 takes the form of a scientific metaphor which represents a complex theory of the cognitive functions of the human brain. The conception of the mind as an information-processing system is intended to explain *how the mind works* to access, store, retrieve and monitor perceptual information and thus, to acquire knowledge. The central components of the mind on this view are alleged to be internal mental processes, metacognitive control mechanisms and an unconscious symbolic language of thought.

This conception differs in several important respects from the conventionalist conception of mind described in Chapter 3. For example, on the conventionalist view 'mind' is an ordinary language term which is used to express the concept of mind and refer to human beliefs, desires, goals, etc. Thus, the term expresses *what we mean* by mind. On the conventionalist approach, the development of 'mind' is concerned (among other things) with the acquisition of knowledge based on public linguistic conventions rather than on private mental processes.

As Searle implies, it would be a mistake to see the differences in the two approaches simply as superficial disagreements between scientists and philosophers. Rather, the disagreements are a consequence of much deeper disciplinary assumptions

held by advocates of each approach, e.g., fundamental assumptions about the nature of mind and the proper methods by which it ought to be studied.

Warner notes that the mind-body problem is a central issue in current philosophical debate. As presented in this thesis, the computational and conventionalist approaches reflect some of the central disagreements about this historical dilemma. In this sense, the conception of mind on each approach can be seen as a theoretical response to the mind/body problem. The purpose of this chapter is to contrast the two approaches in terms of; i) assumptions about the significance of the mind/body problem; ii) responses to the problem, and iii) consequences for the respective conceptions of mind.

The Mind-Body Problem

The mind/body problem is often attributed to Descartes' distinction between a material body and an immaterial mind.[1] The problem is expressed by the apparent difficulty in answering certain sorts of questions, such as, "are the mind and body essentially the same sort of thing, e.g., physical things?" and "what is the nature of the relationship between mind and body, such that mental events seem to cause physical activity and vice versa?"

Traditionally, philosophical attempts to answer the mind/body questions are categorized as either "monist" or "dualist". Dualism is the view (held by Descartes) that mind and body are distinctly *different* sorts of entities. The body is held to be a material substance with mass and extension, while the mind is held to be immaterial or lacking in physical substance. This position accounts for both a spiritual existence unconstrained

by a mortal body on one hand and the increasing evidence provided by the natural sciences of the existence of a real world on the other.

Monism is the view that mind and body are essentially the *same* sort of things. Monism can take two different forms, namely materialism or idealism. On materialism, both mind and body are held to be physical entities governed by laws of nature. An example of this view is the current neurophysiological view that the mind is nothing more or less than the brain. Thus, the relation between mind and body can be explained in terms of causal relationships, e.g., neural activities, between natural phenomena. This version of materialism is known as reductionist, i.e., it reduces the mental to the physical. On idealism (a position not widely held today) all that exists is the mental, i.e., minds and ideas - the body is merely a mental construct. This view is best exemplified by the Berkeleyan argument that everything we perceive is simply a construction of the mind, "Esse est percipi", i.e., nothing exists except our perceptions.[2]

Within each category (monism and dualism) are a number of differing approaches which involve complex distinctions that are not essential to this thesis. To put the mind/body problem in its simplest terms, the problem for the non-reductive materialist is to provide a meaningful account of the relationship between mental and physical activities without reducing mental activity to the level of chemical or biological stimuli and responses. The problem for the dualist on the other hand, is to explain first what it is that exists independently of the physical brain and secondly to explain how an immaterial essence has the power to affect physical action.

Recent developments in the field of neurophysiology have supported a philosophical move toward scientific materialism and a study of the causal relationship between neural states of the brain and human action. This move is seen by many researchers as restricting the study of mind to either dualism (regarded by some as a form of non-scientific mysticism) or the more "scientific" materialism. However, dissatisfaction with reductive neurophysiological explanations has resulted in a revival of the study of the nature and *function* of a non-reductive consciousness.

The Computational Response: A Materialist "Answer"

The computational approach to the development of mind (M1) assumes that the mind-body problem, i.e., the problem of the relationship between the mind and body, is a genuine problem. The question to be answered is an explanatory question, e.g., how does the mind work so as to account for human beliefs, desires and goal-directed activities? The computational "answer" to the question is that the human brain functions as an information-processing system. Thus, regardless of whether "the mind" is simply a label for the brain or whether it is viewed as an emergent property of the brain, the mind is essentially a physical phenomenon. As such, the operations of the mind are governed by physical laws of natural science. What the dualist takes to be immaterial states, e.g., beliefs, desires, fears, goals, etc., are explained on the IP model by natural mental processes and mechanisms which cause us to believe, desire, fear and so on. In other words, the IP explanation of the mind can be construed as a materialist answer to the mind/body problem.

The IP response to the mind-body problem is based on several fundamental assumptions about the mind which generally correspond to the three fields in which IP is advocated. Those assumptions are philosophical, scientific and psychological. There is a sense in which the explanatory power of IP as a theory of mind depends on the collective assumptions of these fields. For example, philosophical functionalism provides the logic for IP, i.e., a philosophical argument for the functional relationship between human beliefs, desires, intentions, etc., and human action. Cognitive science provides a model of the physical "structure" or architecture that allows such a relationship to "actually" occur. Cognitive psychology provides both the details of the operations, i.e., mental processes and mechanisms etc., and empirical evidence that IP is in fact the case in human activity. Each field provides a necessary component in the overall theory of mind and all three fields hold several common fundamental assumptions about mind that are necessary to support IP theory.

Philosophical Assumptions

Philosophical functionalism holds that the "answer" to the mind/body problem is that the mind *functions* in such a way as to explain our behaviour. Fodor explains the rationale for this approach as follows:

> In the past fifteen years a philosophy of mind called functionalism that is neither dualist nor materialist has emerged from philosophical reflection on developments in artificial intelligence, computational theory, linguistics, cybernetics, and psychology. All these fields, which are collectively known as the cognitive sciences, have in common a certain level of abstraction and a concern with systems that process information...In the functionalist view the psychology of a system depends not on the stuff it is made of (living cells, mental or spiritual energy) but on how the stuff is put together. [3]

The strength of functionalism as opposed to strict monism or dualism is that it (allegedly) does not reduce the mind, i.e., mental states, to brain states. As it makes no sense correlating or identifying computer programs with computer hardware, so too, it makes no sense to attempt to correlate human mental descriptions with neurophysiological processes. As Lyons puts it, on this view:

> Mind talk and brain talk are two equally legitimate but different ways of talking about the human brain and central nervous system. Seeing our mental talk in this way shows how nonsensical is any suggestion that we could or should eliminate it. Just as a computer scientist could not get by without ever mentioning computer programs and programming, so a philosopher of mind or cognitive psychologist could not get by without talking about a human's mental life. [4]

Although not all philosophical functionalists subscribe to the information-processing theory of mind, IP *is* nevertheless, an argument for the mind which consists of a description of its functional operations. Therefore, in respect to the mind-body problem, IP advocates assume that information-processing operations, e.g., the accessing, sorting, retrieving, and manipulation of information, are functions of the brain which are controlled by an internal mechanism referred to as an homonculus or series of homunculi. (See Block, Chapter 2)

Further, it is assumed that information-processing is made possible by an innate, symbolic language of thought which is a function of the human brain (See Lyons, Chapter 2). What gives meaning (semantics) to our beliefs, desires, goals, etc. is assumed to be an intrinsic feature of a natural phenomenon - the brain. Thus, it is assumed that these features can be discovered by scientific investigation. Finally, functionalism assumes that cognitive architectures do in fact, explain the way in which the human brain functions to perform these operations.

Scientific Assumptions .

Not all cognitive scientists subscribe to information-processing theory. In fact new connectionist theories are rapidly replacing IP theory as the dominant paradigm in the field. However, cognitive science has provided an architectural framework or model for IP theory that supports two basic assumptions. The first assumption is that information-processing is a function of the cognitive architecture (of the brain). The traditional model, which Pylyshyn calls the "classical computational or cognitive architecture" is characterized by three distinct levels of organization.

The first level, the *semantic or knowledge* level explains: i) the relationship between beliefs, goals and behaviour, and; ii) why beliefs can be changed in rational ways. It is at this level that Pylyshyn and Fodor argue for the "language of thought", i.e., that knowledge must be encoded by a system of symbolic codes which are structured much like language. This argument is necessary to explain how knowledge principles can be governed by physical laws. The second level or *symbol* level is responsible for the symbolic encoding of the semantic content of knowledge and goals. This level explains the relationship between representational forms and behaviour. The third level is the *physical or biological* level. The physical form of the system limits the principles by which the system can function. Pylyshyn suggests that this level *may* provide explanations for the "nature of cognitive development" and "some changes that are now called learning". [5]

The second assumption of cognitive science is that mental events are subject to physical laws which can, in fact, be discovered by science. Pylyshyn says that an area

of study which "discovers" a uniform set of principles (which can account for the phenomena in that domain) may be characterized as a natural scientific domain. He then advances what he calls a "bold hypothesis", namely that:

> Cognition is the domain of phenonema that can be viewed as natural information-processing, which in current terms means that it is computational, that being the only notion of autonomous mechanistic information processing that we have. [6]

Psychological Assumptions

A general assumption of cognitive psychology is that human mentality and action are caused or determined by some natural laws. Thus, when those laws are discovered, human action is predictable. Given that assumption, IP can be seen as a psychological account of mental activity that adheres to regularities or natural laws. It can be reproduced in artificial constructs and described in terms of the functions of unconscious processes and mechanisms.

In cognitive psychology, information-processing is assumed to be related to intelligence in a similar fashion to that noted by Block (96). The relationship between cognitive functioning and intelligence is argued by Sternberg, who says that contemporary metaphors of mind arising from the field of cognitive psychology are posited for the purpose of answering questions about the *nature and nurture of intelligence*. Sternberg claims that:

> Research in the field of human intelligence, as in other scientific fields of endeavour, is guided by a somewhat motley collection of models or metaphors. Each metaphor generates a series of questions about intelligence, which the theories and research seek to address. [7]

Sternberg categorizes the metaphors according to three types. The first type are of interest to this thesis as they "look inward", that is, they describe intelligence as a

function of an inner mental process or processes, e.g., geographical, computational, biological and epistemological.

Sternberg points out that on the internal view of intelligence, psychological theorists may use one of three main levels of analysis; the biological, the molar or the behavioral level. The molar level, which is the one chosen by cognitive theorists, is characterized in terms of mental functioning, as either cognitive or motivational. Cognitive functioning is further depicted as having three aspects, namely, a metacognitive aspect, a cognitive aspect and a metacognitive-cognitive interaction aspect. All three aspects are concerned with the interaction between processes and knowledge which Sternberg explains in his "triarchic" theory of intelligence.

In what he calls the "componential subtheory", Sternberg specifies the structures and mechanisms that underlie intelligent behaviour and describes how intelligent behaviour is generated by means of mental mechanisms. The mental mechanisms to which Sternberg refers include *metacomponents* which control information processing and enable monitoring and evaluation of information-bearing processes; *performance components* which execute the plans constructed by the metacomponents, and *knowledge-acquisition components* which encode and combine new information and compare new information to old so as to allow learning to take place. Sternberg defines a component as:

> An elementary *information process* that operates upon internal representations of objects or symbols . . . The component may translate a sensory input into a conceptual representation, transform one conceptual representation into another, or translate a conceptual representation into a motor output. What is considered elementary enough to be labelled a component depends upon the desired level of theorizing. [8] (italics added)

Metacomponents, on the other hand, are higher-order executive processes used in planning, monitoring and decision-making in task performance. More specifically, Sternberg says that, "metacomponents are specific realizations of control processes that are sometimes collectively (and loosely) referred to as the 'executive' or the '*homunculus*'." [9]

On IP, intelligence is explained in terms of metacognitive theory, i.e., homuncular control over thinking processes, in accord with philosophical functionalism. Brown also takes the position that metacognitive control processes are related to what we refer to as intelligence. She argues that, "In the domain of deliberate learning and problem-solving situations, conscious executive control of the routines available to the system is the essence of intelligent activity." Brown clarifies the relationship between metacognition and intelligence:

> To make explicit our position, the bias is toward a definition of intelligence based on executive functioning . . . *Thinking efficiently is the essence of intelligence* . . . The ability to use programs appropriately is the essenee of machine intelligence; it is also a reasonable definition of human intelligence.[10] (italics added)

To review, the information-processing concept of mind is the consequence of several fundamental assumptions about the mind, assumptions which stem from the traditional mind/body problem. First, IP theory is a response to the mind/body problem - it is an answer to the question of *how* the mind works to affect human beliefs, desires and goal-directed activities. In other words, IP is an explanation of the relationship between mind and body. Second, to see IP as an answer to the mind/body question is to assume that human activity is determined (caused) and can, therefore, be explained by

natural laws or observable regularities. Third, notwithstanding Fodor's claim to the contrary, IP theory assumes materialism, i.e., the mind is a natural phenomenon with ontological status. Further, "the mind" is an individual, internal, and private phenomenon which is accessible through introspection. Fourth, IP assumes that the relation between mind and body can be explained functionally. The mind functions by means of a symbolic language of thought, mental processes and metacognitive mechanisms, which are related to what we call intelligence, and thus are constitutive of intelligent behaviour. Fifth, IP assumes that a computational model of the mind makes human learning processes intelligible. Finally, many IP advocates assume that the scientific explanation is the "best" explanation available, i.e., that there are no alternatives. For example, Pylyshyn notes:

> It must be stressed that at present there exists no alternative to what Newell has called the *physical symbol system* assumption for dealing with reasoning in a mechanical way. . . the rational strategy is to continue with the classical assumption until some better alternative comes along. At least that is the strategy adopted in every other mature science. [11]

The Conventionalist Response: An Intellectual Myth

The conventionalist approach to the development of mind takes the position that the mind-body problem is an example of an intellectual myth. That is, the mind/body problem is an "artificial" problem, set-up by confused philosophers. On the conventionalist view, the concept of mind is established by the logical criteria which govern our ordinary use of the concept. As we already know what we mean by mind, the "problem" does not deserve an answer. Rather the "mind/body problem" needs to be revealed as a myth.

An intellectual myth is a complex, technical answer to an "artificial" problem. The answer cannot be critically examined because the problem can only be understood in terms of the *hidden assumptions* within its complex context. Button et al note this artificiality in "many of the central intellectual problems which belong to the philosophy of mind and to cognitive science." They argue that artificial problems are, "created in the way in which they are set up." What may appear to be "seemingly insuperable difficulties" of a particular problem are rather, a consequence of the fact that the problem is not a "genuine problem" which requires a solution. "Spurious premises" generate "illusory" problems which dissolve when the "initial suppositions behind the formulation of the problem can be explicated sufficiently clearly." [12] Similarly, Hacker observes that:

> The history of philosophical psychology exemplifies again and again a tendency to mystify the mental, to project the entanglement of concepts which occurs in philosophical reflection onto the mind, and then to conclude that the mind is very mysterious. The mind appears to be a queer kind of medium, and we imagine that the mechanism of the mind, the nature of which, it seems, we don't quite understand, can bring about effects which no material mechanism could... This is mere illusion.[13]

In order to eliminate intellectual myths, it is necessary to examine common assumptions, to reveal error and incoherence and to go back to the "rough ground" of ordinary language. For example, Ramsey observed that "opposing philosophical views" in unresolved long-term debates often assume that the "truth" lies in one of the two opposing positions. On Ramsey's view:

> It is a heuristic maxim that the truth lies not in one of the two disputed views but in some third possibility which has not yet been thought of, which we can only discover by rejecting something assumed as obvious by both the disputants. [14]

"Something assumed as obvious", i.e., a common assumption, is evident in the mind/body debate. The common assumption is that of an "inner/outer picture". For example, the mind/body problem can be interpreted as positing that the mind is either a material substance like the body (the outer picture), or an immaterial substance (the inner picture). Another interpretation can be that the *explanation for the relationship* between mind and body is either in terms of an outer picture, e.g., behaviourism, or in terms of an inner picture, e.g., cognitivism.

Wittgenstein challenged this "inner/outer" picture. According to Hacker, Wittgenstein questioned the "framework of the centuries-old debate, holding that philosophers do not place the question-marks deep enough down." On Hacker's view, what should be challenged is:

> The inner/outer picture of the mind, the conception of the mental as a 'world' accessible to its subject by introspection, the conception of introspection as an analogue of perception, the idea that the capacity to say how things are with us is a form of knowledge...the supposition that explanation of human behaviour in terms of reasons and motives is causal...[and that] psychological expressions are uniformly or typically names of mental objects, states, events and processes. [15]

Rather than engaging in senseless debate over an "artificial problem", philosophers who take a more conventionalist view of mind often proceed by a process of elimination, that is, they begin by pointing out *what mind is not*. For example, Ryle argues that mind is *not* a mysterious ghost in a machine, nor is it a repository of "non-physical objects". Ryle says that, "to talk of a person's mind is *not* to talk of a repository which is permitted to house objects that something called 'the physical world' is forbidden to house." [16]

Although mind has historically been explained in terms of metaphors, some theorists remind us of the dangers in mistaking metaphors of mind for literal truths. [17] They note that metaphors of mind are analogies used to point out similarities between a familiar object or experience and a less well-known one (in this case, mind) in order to facilitate understanding. Although a particular metaphor might appear to be apt, i.e., it explains mind in a simple, easily understood way, it does not follow that "mind" is literally identical to the simple object. In other words, mind is *not* for example, a blank slate, a deep well, an information-processing system, in any literal sense.

Oakeshott claims that mind is *not* an inexplicable process, nor is it a mysterious ethereal substance. For example, Oakeshott says that, "mind is not itself a chemical process, nor is it a mysterious x left over, unexplained, after the biochemist has reached the end of his chemical explanation; it is what does the explaining." [18] Hirst adds that mind is *not* a naturally developing body part such as a muscle or organ:

> It is *not* that the mind is some kind of organ or muscle with its own inbuilt forms of operation, which if somehow developed, naturally lead to different kinds of knowledge. It is *not* that the mind has predetermined patterns of functioning. Nor is it that the mind is an entity which suitably directed by knowledge comes to take on the pattern of, is conformed to, some external reality. [19]

It is often claimed that mind is the ability to think. As this construal excludes inanimate objects such as rocks, trees etc., we can comfortably (we assume) say that the ability to think is what we mean by mind. Thus, when we consider the relationship between mind and thoughts or thinking, we tend to talk about mind as if it were some "thing" that generates thoughts. However, Hirst also points out that:

> Thinking is not something we find out that minds can do, as if we could track down and identify minds independently of thought and then discover that these

> minds act in certain ways. To think is part of what it means to have a mind. We cannot therefore, give an account of thinking from some prior knowledge of mind, all we know of mind must derive from our understanding of thought, feeling etc. Of the nature of what underlies these experiences we can necessarily say nothing. [20]

What Hirst is pointing out here is that when mind is construed as the ability to think, it seems that mind can be described by explaining "thinking processes", a notion which leads to conceptions such as the computational metaphor.

Mental "Processes"

The notion of "processes", particularly "mental processes" is essential to information-processing theory. Hacker, following Wittgenstein, notes that the artificial mind/body problem produces a philosopher's myth about mental processes. He points out that the question of the relationship between mind and body was initially a polarized debate between philosophical "dualists" and "behaviourists". Dualism on one hand, "insists that there are mental states and processes; after all, we experience them, are intimately acquainted with them, know them by introspection." On the other hand, behaviourism insists that either this is "a pre-scientific mythology, that there are no mental states and processes, that these are fictions", or on logical behaviourism, "that mental states are just logical constructions out of behaviour and dispositions to behave." According to Hacker:

> Torn between these poles, materialism attempts a synthesis: there are indeed mental states and processes, only they are identical with brain-states, which cause behaviour. But this too is unsatisfactory for a multitude of reasons, and we replace it by something more up to date, viz. functionalism: mental states and processes are functional states of an organism that cause behaviour and are 'realized' in the nervous system. [21]

The myth is then created by assuming an *improper* analogy between physical processes and mental processes. This point is extremely subtle and is best described by Wittgenstein as a "conjuring trick" which we accept due to our "*will to believe*" certain philosophical and psychological illusions. Wittgenstein asks how the philosophical problem about mental processes and states and about behaviourism arises. He says, "the first step is the one that altogether escapes notice. We talk of processes and states and leave their nature undecided. Sometime perhaps we shall know more about them -- we think". However, according to Wittgenstein:

> That is just what commits us to a particular way of looking at the matter. For we have a definite concept of what it means to learn to know a process better (the decisive move in the conjuring trick has been made, and it was the very one that we thought quite innocent.) And now the analogy which was to make us understand our thoughts falls to pieces. [22]

Descriptions of the mental as events and processes can be both confusing and misleading for several reasons. First, there is the natural tendency to assume that "sometime" we can learn about mental processes. We then apply our familiar conception of physical processes to their mental surrogates (the fatal mistake). We assume that mental processes are like the well-known physical processes of say, digestion or manufacturing. This assumption suggests that mental events are in some sense passive, that is, we have no conscious control over them as in the case of digestion. Further there is the suggestion of homogenizing mechanisms in mental activity, i.e., that something is being processed or is a typical product of processing. Finally, such processes take place in stages, are controlled either autonomically (by design) or deliberately by an outside "programmer".

The *real* problem, however, is that to understand mental processes we need to know the "grammar" of their nature, i.e., the logical connections implied in our use of the terms. Yet, due to the "misleading forms of language which mask categorical differences from our eyes", and due to our "will to illusion" this sort of logic is contrary to our natural inclinations. Wittgenstein points out that our "language grew up and became as it did because human beings had - and have - the tendency to think in this way.[23] He observes that:

> Human beings are deeply embedded in philosophical,i.e., grammatical, confusion. And they cannot be freed without first becoming extricated from the extraordinary variety of associations which hold them captive. You have, as it were, to reconstitute their entire language.[24]

According to Wittgenstein, what makes the logic of mental processes so difficult to understand is not "the lack of some special instruction in obstruse things necessary for its understanding", but rather, "the conflict between the right understanding of the matter and what most men *want* to see." [25]

To avoid the mistake in logic it is necessary to understand that if mental processes did exist, they would *not* be the same sorts of things as physical processes. This is Ryle's thesis in his "Concept of Mind".[26] Ryle claims that the mind/body distinction assumes either that the mental is in fact, physical or that it is a world similar to but different than the physical, i.e., a mysterious ethereal world. According to Ryle, Descartes and many subsequent philosophers hold that the difference between intelligent and unintelligent human behaviour must be a difference in their *causation*. It follows that:

> While some movements of human tongues and limbs are effects of mechanical causes, others must be the effects of non-mechanical causes, i.e., some issue from movements of particles of matter, others from workings of the mind.. . as thus represented, minds are not merely ghosts harnessed to machines, they are themselves just spectral machines.[27]

The attempt to explain mental processes using the same terms that we use to explain physical processes, e.g., in causal terms, is what Ryle calls a "special category mistake". The mistake reinforces Descartes' "dogma of the ghost in the machine" and is nothing less than a "philosopher's myth". According to Ryle:

> The 'dogma of the ghost in the Machine'. . . is entirely false, and false not in detail but in principle. It is not merely an assemblage of particular mistakes. It is one big mistake and a mistake of a special kind. It is, namely, a category-mistake. It represents the facts of mental life as if they belonged to one logical type or category (or range of types or categories), when they actually belong to another. The dogma is therefore a philosopher's myth. [28]

Contributing to the problem of explaining mental processes is the cognitivist belief in "introspection", i.e., the ability to observe one's mental activities on a first-hand basis. The notion of introspection appears to be a fundamental assumption of metacognitive theory, as in, for example, "thinking about one's own thinking" processes. Ryle discusses the relationship between introspection and the consequent confusion about the nature of consciousness. He notes again that many philosophers, "chiefly since Descartes", have operated with a concept of consciousness which holds that, "the states and operations of a mind are states and operations of which it is necessarily aware, in some sense of 'aware'", and that, "this awareness is incapable of being delusive." [29] According to Ryle, on this view consciousness was:

> Imported to play in the mental world the part played by light in the mechanical world. In this metaphorical sense, the contents of the mental world were thought of as being self-luminous or refulgent. This model was employed again by Locke

> when he described the deliberate observational scrutiny which a mind can from time to time turn upon its current states and processes. . . the myth of consciousness is a piece of para-optics. [30]

Ryle is not claiming that we are not aware of our thoughts in the sense that we "keep a log" of them. In fact, he acknowledges that what we mean by "self-consciousness" (in a general sense) is that we "pay heed" to our qualities of character and intellect. Rather, he is arguing that we are not aware *by introspection* of any mental processes of thinking. He claims that, "we usually do know what we are about". However, he notes three important qualifications. The first qualification is that:

> No phosphorescence-story is required to explain how we are apprised of it; second, that knowing what we are about does not entail an incessant actual monitoring or scrutiny of our doings or feelings, but only the propensity *inter alia* to avow them, when we are in the mood to do so; and third, that the fact that we generally know what we are about does not entail our coming across any happenings of ghostly status. [31]

To review, the conventionalist view of mind holds that the mind-body problem is an intellectual myth that leads to misleading accounts of mind. First, 'mind' is a term used to refer to human beliefs, desires goals, etc. 'Mind' has no knowable ontological status, i.e., existence or identity. There is no distinct physical or other thing that is "the" human mind. Second, given that there is no such thing as the mind, the conventionalist view holds that the notion of mental processes that produce beliefs, desires, etc. "in" the mind is a spurious assumption which reifies the mind. Human beliefs, desires, fears and goals are not caused by mysterious mental processes, nor are they predetermined by some grand design. Third, as there is no such thing as "the" mind, there can be no models of "it" nor of "its functions". Any such model simply perpetuates an intellectual myth. Fourth, the notion that we can observe the workings

and/or products of the mind through introspection is fallacious, another philosophers' myth used to "explain" how we know about the mind. There is no "thing", the workings of which to observe. Fifth, empirical evidence of the existence of the mind or of its functions is misleading and, as will be noted later, pernicious. Finally, what is important on this view is not to explain how "the" mind works, but to understand how the mistaken approach was initiated in the first place.

Summary

In respect to "the matter of mind", the computational and conventionalist approaches reflect profoundly different fundamental assumptions about the nature of mind and what are the appropriate questions to ask about mind. The deeper (often hidden) assumptions are related to the historical debate known as the "mind-body" problem. When these assumptions are "brought out into the open", the two conceptions of mind can be seen to be based on irreconcilable differences.

Advocates of the information-processing conception of mind (IP) assume that the mind/body issue is a genuine problem; whereas the advocates of the conventionalist conception (CM) argue that the mind/body problem is an intellectual myth. IP theory is an answer to the question of the relationship between mind and body; whereas on CM, any attempt to answer such a question is to perpetuate an intellectual myth.

IP assumes that there is such a thing as the mind (it has an ontological status), the operations of which are symbolic and computational; whereas CM assumes there is no such entity as mind - what we refer to as 'mind' is a conception of human beliefs, desires

etc. IP assumes that the mind is an internal, unconscious and natural phenomenon; whereas CM assumes that 'mind' is a concept which is based on logical criteria.

A consequence of the different assumptions about the nature of mind and the significance of the mind/body problem is that the two approaches differ in the methods deemed appropriate for the study of mind. IP uses a metaphor or cognitive model to explain *how* "the" mind works; whereas CM uses conceptual analysis (logical geography) to map the criteria for *what* we mean by 'mind'. IP assumes that the mind can and must be explained by psychological processes; whereas CM assumes that we already know what we mean by 'mind' and that psychological theories of mental processes perpetuate the myth and are mistaken. IP assumes that scientific evidence for the existence of the mind is provided by empirical studies; whereas CM assumes that the "evidence" for the concept of mind is provided by logical criteria.

The fundamental assumptions about the mind on the two views are incommensurate, that is, the two approaches cannot be seen as rivals or alternative ways of developing mind. The two approaches not only have conflicting views about the significance of the mind/body problem, they ask different kinds of questions about mind and consequently, look for different kinds of answers. What is meant by mind and what are deemed to be the proper methods for the study of mind are two fundamentally different things. As foreshadowed by the historical examples in Section I, the different assumptions about the nature of mind correspond to different assumptions about the nature and acquisition of the knowledge necessary for the development of mind. These assumptions are the subject of Chapter 5.

Notes: Chapter 4

1. Cottingham et al Translation (1988) *Descartes - Selected Philosophical Writings*,(UK: Cambridge University Press)

2. Louis Pojman (ed) (1993) *The Theory of Knowledge* 83 (California: Wadsworth Inc.)

3. Jerry Fodor (1994) "Mind and Brain" 24-25 in *The Mind-Body Problem*, Warner & Szubka (eds) (Oxford:Blackwell Ltd). Contrary to Fodor's suggestion, many functional theorists do take a "materialist" position in the mind-body debate, e.g., they hold that the mind is (at least) an emergent property of the brain. Fodor himself acknowledges that (see p31) However, to say this is not to say that the study of the brain will necessarily provide adequate answers to questions about the mind. Regarding "avoiding reductionism", Kim argues otherwise, i.e., that functionalism is reductive - see pp 242-259 (same volume).

4. William Lyons (ed) (1995) *Modern Philosophy of Mind*, lix (London: J.M. Dent)

5. Zenon Pylyshyn (1989) "Computing in Cognitive Science" 56-7, 60-1, in: *Foundations in Cognitive Science*, Michael Posner (ed)(Mass: MIT)

6. Ibid., 85

7. Robert Sternberg (1990) *Metaphors of Mind* 3 (NY: Cambridge University Press)

8. Robert Sternberg (1985) *Beyond IQ* 97 (NY: Cambridge University Press)

9. Ibid., 99

10. Ann L. Brown (1978) "Knowing When, Where, and How to Remember: A Problem of Metacognition" 140 in: R. Glaser (Ed.) *Advances in Instructional Psychology*. (NJ: Erlbaum Association).

11.Pylyshyn, *Foundations*, 62

12. Graham Button et al (1995) *Computers, Minds and Conduct* xi (UK: Polity Press)

13. P.M.S. Hacker (1996) "The Achievement of the Investigations" 233 (unpublished paper)

14. Ibid., 183

15. Ibid., 227

16. Gilbert Ryle, G. (1949) *The Concept of Mind* 199 (University of Chicago Press)

17. See for example, Israel Scheffler (1960) *The Language of Education* 48 (ILL: Charles Thomas); Denis C. Phillips, (1987) *Philosophy, Science, and Social Inquiry* (Pergamon Press); David Leary (1990) "Psyche's Muse: The Role of Metaphor in the History of Psychology" in: *Metaphors in the History of Psychology*, (1990) David Leary (ed) (NY: Cambridge University Press) and; Kurt Danziger (1990) "Generative Metaphor and Psychological Discourse" (same volume)

18. Michael Oakeshott (1989) "A Place of Learning" 19 in *The Voice of Liberal Learning* Fuller (ed) (Yale University Press)

19. Paul Hirst (1974) "Liberal Education and the Nature of Knowledge" 41 in *Knowledge and the Curriculum* Hirst (ed) (London: Routledge & Kegan Paul)

20. Paul Hirst (1974) "Language and Thought" 72 in *Knowledge and the Curriculum* Hirst (ed) (Routledge & Kegan Paul)

21. P.M.S. Hacker (1990) *Wittgenstein: Meaning and Mind (Part II Exegesis)* 133 (Oxford: Blackwell)

22. Ludwig Wittgenstein (1953) *Philosophical Investigations* #308 (Oxford: Blackwell Ltd.)

23. Hacker, 138. Hacker cites Wittgenstein from the "Big Typescript", #423.

24. Ibid, 138

25. Ibid., Hacker cites Wittgenstein from "Big Typescript", #406

26. Gilbert Ryle (1949) *The Concept of Mind* (Chicago: University of Chicago Press)

27. Ibid, 18-19

28. Ibid, 16

29. Ryle, 158

30. Ibid, 139

31. Ibid, 161

Philosophical questions about the nature of knowledge belong either to epistemology or to the philosophy of mind. The two groups of questions may be roughly separated by saying that the first group concentrates on the nature of knowledge, whereas the second concentrates on the nature of the knower.

Flew, "A Dictionary of Philosophy"

Chapter 5
The "Nature" of Knowledge

Flew's observation suggests an important difference between the two approaches to the development of mind namely, the *focus* of their respective questions about knowledge. As noted in Chapter 2, many cognitive researchers who advocate the computational approach are philosophically aligned with philosophy of mind, specifically philosophical functionalism. Hence, on Flew's account, these researchers are primarily concerned with the "nature of the knower". The advocates of the conventionalist view, on the other hand, are primarily concerned with the traditional epistemological task, i.e., the analysis of knowledge (Chapter 3). Thus, on Flew's account conventionalists are primarily concerned with the "nature of knowledge".

However, Flew correctly notes elsewhere that, "to ask [any] philosophical questions about knowledge can be a way of asking questions about the nature of mind". In other words, regardless of the different foci, in asking their respective questions about knowledge, both groups are concerned with the nature of mind. This uniquely *reciprocal* aspect of the relationship between the concepts of mind and knowledge was illustrated by the historical examples (Chapter 1). Thus it is reasonable to expect that the answers to the questions about knowledge are related in some way to the different assumptions about the "matter" of mind discussed in the previous chapter.

The interesting question about knowledge arising from Flew's observations is how the answers to the different sorts of questions about knowledge are related, or whether there is, in fact, a relation. For example, do answers to questions about the knower presuppose the answers to the question about knowledge? Or conversely, what (if anything) do answers to the questions about knowledge assume about the knower?

The incommensurate assumptions about mind held by the two approaches are based on the disparate responses of their advocates to the historical "mind/body" problem and the "matter" of mind (Chapter 4). Similarly, the different questions about knowledge and corresponding assumptions about its "acquisition" are related to several historical and contemporary controversies in epistemology. Three such issues are particularly relevant to this discussion: i) the problem of certainty and the justification of beliefs; ii) the notion of "naturalized" epistemology, and; iii) attributions of knowledge, e.g., distinctions between subjective and objective knowledge. The debates over these issues involve large bodies of literature which are beyond the scope of this thesis. The issues are here discussed, albeit briefly, for the purpose of pointing out their relevance to the underlying assumptions on the two approaches.

The purpose of this chapter is to contrast the assumptions about knowledge on the two approaches in terms of their respective responses to the three epistemological issues. The responses reflect incommensurate assumptions held by their advocates about the task of epistemology, the central epistemological questions and ultimately, about the nature of knowledge itself.

Epistemological "Problems" - Skepticism and Justification

Traditional epistemology is concerned with the answers to three interrelated questions about knowledge; i) what is knowledge? - a *substantive* question; ii) how is knowledge acquired? - a *procedural* question, and; iii) what, if anything, can we know? - a question about the *scope* of knowledge. The standard "answer" to the substantive question is the tripartite analysis of knowledge which holds that knowledge is true, justified belief. Following this analysis, the questions about acquisition and scope are traditionally based on differing views of human nature and development, such as those of Plato, Locke and Dewey (Chapter 1).

Historical philosophical debates about different aspects of the central epistemological questions have resulted in the establishment of many different epistemological "camps" or positions. Of particular interest to the present discussion is the position known as "foundationalism" which is primarily concerned with the justification of beliefs. "Classical" foundationalism, a position attributed to Descartes among others, holds that knowledge is indubitable or certain and is acquired through intuitive personal experience. On Descartes view, we have two sorts of beliefs; i) basic beliefs - which are infallible intuitive beliefs, and; ii) non-basic beliefs - which must be justified in virtue of their relation (by inference) to basic beliefs. Given his conception of indubitable or certain knowledge, Descartes' conclusion regarding the question of scope is that we can *know nothing for certain* except that we think and therefore we exist - "cogito; ergo sum". The Cartesian method for examining the scope of knowledge, i.e., universal doubt, has come to be known as methodological skepticism. [1]

Two problems associated with classical foundationalism are relevant to this discussion. The first is the problem of certainty, i.e., the indubitability of knowledge, which leads to methodological skepticism. This problem, among others, inspired Quine's thesis of naturalized epistemology which was discussed in Chapter 2. The second problem is related to the inferential justification of non-basic beliefs. The condition of certainty is not taken to be a necessary condition of knowledge by most contemporary epistemologists. However, without the infallible grounds for non-basic beliefs provided by the certainty of basic beliefs, the justification of the non-basic beliefs seems to either; i) lead to an infinite regress, or; ii) be confounded by counter-examples to the standard analysis. Of the latter type, the Gettier counter-examples to the tripartite analysis are of particular interest.[2]

Gettier is specifically concerned with cases in which the standard (tripartite) analysis allows knowledge in which there isn't the right connection between the belief and what makes it true. For example, Gettier cites a case in which Smith "knows" that p (the next president of his company is a man with ten coins in his pocket) according to the standard (tripartite) analysis of knowledge.

First, Smith believes that p. Secondly, he is justified in believing that p: he has good evidence; i) that Jones will be the next president, and; ii) that Jones has 10 coins in his pocket, and; iii) he infers p from the conjunction of these two propositions. Finally, p is true - when Smith is offered the position instead of Jones, he subsequently discovers that he (Smith) has the same set of coin in his own pocket. Thus on the standard account it seems that Smith "knew" that p, but he didn't.

On the Gettier account, the tripartite analysis is insufficient for distinguishing between cases of genuine knowledge and cases of justified true belief which are nevertheless "accidental", i.e., due to chance or luck. Although it could be argued that the Gettier counter-examples create a "pseudo-problem", they nevertheless highlight the problems connected with justification that pose a source of frustration for contemporary epistemologists.

The Computational Approach: A Naturalized Connection

The discussion of information-processing theory in Chapter 2 revealed that in the field of cognitive psychology, researchers who advocate IP claim that it is an account of the functions of the human mind. One such function is taken to be the acquisition, manipulation and retrieval of information provided by cognitive processes and mechanisms. It was also noted that these researchers generally do not support their claims about the acquisition of various sorts of knowledge with references to epistemological theories.

Arguably, this lacuna may be due to the assumption that such knowledge claims are "scientific descriptions" and as such are not subject to epistemic canons or criteria. On the other hand (given the lack of any explanation for the lacuna) it seems equally arguable that the researchers assume that a "scientific" account of knowledge acquisition is supported by some of the seminal arguments for naturalized epistemology. In either case, IP researchers in cognitive psychology and advocates for naturalized epistemology share several common assumptions about the acquisition of knowledge. Of these, three

assumptions are of interest in this discussion. These assumptions form the basis of what might be called "the task" of naturalized epistemology.

The Task of Naturalized Epistemology

The first common assumption is that the acquisition of knowledge is best addressed by "marrying" epistemology and psychology. For example, in his argument for naturalized epistemology, Quine claims that certainty is not a necessary condition of knowledge. Rather, knowledge is "fallible", i.e., subject to tests and revision. Quine argues further that the notion of justification is not required on a natural account. Rather than relying on the traditional "conceptual studies" of knowledge, Quine holds that the *emphasis in epistemology ought to be on the psychological processes and mechanisms that produce the beliefs in the first place.*[3] Inasmuch as Quine's thesis is a response to the historical epistemological "problems" of skepticism and justification, the cognitive researchers who advocate IP and assume naturalized epistemology are wittingly or unwittingly, responding to these historical problems.

Goldman's causal theory of knowledge is an explicit argument for the relationship between epistemology and cognitive psychology.[4] He argues that a natural account of knowing (naturalized epistemology) is provided by the causal processes and mechanisms which are postulated by cognitive science and psychology. There is a sense in which Goldman and the IP researchers share a common purpose, namely to provide a psychological account of the acquisition of knowledge through mental processes and mechanisms. For example, Goldman says:

> It becomes clear how portions of psychology that study basic cognitive mechanisms are relevant to judgements of knowledge. Only if (some of) our

> basic cognitive processes are either reliable or higher-order reliable can we qualify as knowers. Therefore, whether we so qualify hinges, in part, on facts in psychology's bailiwick. [5]

In fact, throughout Goldman's work runs the constant theme that embodies an even stronger claim, namely that:

> Psychology is needed not merely to tell us whether we do know, but whether it is humanly possible to know. The reliable-process theory of knowing entails the logical possibility of knowledge, but it does not entail that knowledge is humanly possible. It is humanly possible only if humans have suitable cognitive equipment. And this is something of which we can best be apprised only with the help of psychology. [6]

The second common assumption held by cognitive researchers and the advocates of naturalized epistemology is that knowledge acquisition is best described in terms of *causal relationships*. Cognitive psychologists generally hold that the causal relationship is a natural "lawlike" relationship between "input processes", i.e., stimulation from the environment, and the various information-processing mechanisms.

In a "causal theory of knowledge", Goldman combines the central tenets of naturalized epistemology with information-processing theory and applies the combination of ideas to the tripartite analysis of knowledge. On Goldman's theory, both beliefs and their justification are "caused", i.e., produced, by cognitive processes and mechanisms. Goldman's theory provides a detailed account of the central processes of IP theory and an argument for their relevance to the acquisition of knowledge.

Goldman's causal theory is a response to the epistemological "problem" posed by the Gettier counter-examples. Goldman provides an account of justification that considers the element of "luck" or "chance" and thus precludes the possibility of getting to truth in the "wrong way". He allows that the three conditions for knowledge on the

traditional tripartite account of knowledge are sufficient for non-empirical knowledge.[7] However, he argues that in the case of empirical knowledge, i.e., knowledge gained through experience, an additional condition is required. The fourth condition for knowledge on Goldman's account is a causal condition, specifically a causal connection between the knower's belief and the fact that makes the proposition true.[6] If such a causal connection does not exist, Goldman argues that the justification condition of knowledge is not satisfied and the believer cannot claim to "know". He states:

> If there is a continuous causal chain of the sort he envisages connecting the fact...with his belief of this fact, then S knows it. If there is no such causal chain, however, S does not know that proposition. [8]

The causal connections or "chains" which Goldman posits involve psychological processes which "produce" true beliefs and confer the justificatory status of the belief. Thus, in Goldman's view, the correct account of the acquisition of knowledge is a scientific psychological account, i.e., psychologistic epistemology. Goldman holds that "appropriate knowledge-producing causal processes" include perception, memory, a chain of "warranted" inferences, or combinations of these processes.

Perceptual processes are the "simplest case of a causal chain". Goldman uses as an example, the case of seeing a vase, in which there is a causal connection between the "presence of the vase" and "S's believing that a vase is present". On his view:

> That our ordinary concept of sight (i.e., knowledge acquired by sight) includes a causal requirement is shown by the fact that if the relevant causal process is absent we would withhold the assertion that so-and -so *saw* such and such. [9]

Goldman argues that if a laser photograph of that very vase were to block S's view of the vase, "we would deny that S *sees* that there is a vase in front of him" as the vase does not have the right role in the formation of his belief.[10]

Similarly, knowledge based on memory is caused by the *process of remembering*. For example, "S remembers p at time t only if S's believing p at an earlier time is a cause of his believing p at t". Goldman notes that not every causal connection between an earlier and later belief is a case of remembering, but declines to describe the process in detail. Rather,

> This is a job mainly for the scientist. Instead, the kind of causal process in question is to be identified simply by example, by "pointing" to paradigm cases of remembering. Whenever causal processes are of that kind - whatever that kind is, precisely - they are cases of remembering.[11]

Goldman notes further that knowledge can be "acquired" by a combination of memory and perception. For example, a fact causes S to believe p by perception at one time and memory causes the fact to be believed at a later time.

Knowledge gained by the *process of inference* does not entail, according to Goldman, "that S went through an explicit, conscious process of reasoning." Goldman acknowledges that, "my use [of the term 'inference'] will be somewhat broader than its ordinary use" and comments:

> I am inclined to say that inference is a causal process, that is, when someone bases his belief of one proposition on his belief of a set of other propositions, then his belief of the latter propositions can be considered a cause of his belief of the former proposition. [12]

Goldman characterizes the cognitive processes in terms of levels, the lowest of which is the basic or primary process. Many of the so-called "first-order" procedures

used to form beliefs are not necessarily deep-seated psychological processes. Goldman distinguishes "basic" elementary processes from "secondary" processes which are, "deep-seated psychological processes: parts of the architecture of cognition". [13] Second-order processes are further characterized as "processes used in acquiring processes", reminiscent of metacognitive theory. For example:

> A further requirement for knowledge is needed. Not only must the belief result from a reliable process, or method, the process or method used must have been acquired (or sustained) by *a suitable second-order process.* [14] (italics added)

Goldman's account of second-order processes appears to be at least compatible, if not synonymous, with the *metacognitive theory* advocated by cognitive psychologists (See Chapter 7). For example, according to Goldman, knowledge is acquired by means of mental processes that have a reliable causal relationship such that the reliability of first order causal processes is determined by the reliability of second-order processes. His characterization of second-order processes bears a remarkable resemblance to the descriptions of metacognitive processes posited by Flavell, Brown and Sternberg. For example, Goldman says:

> We may characterize a second-order process as a process that *controls* the acquisition of new methods, or otherwise *governs* the repertoire of methods available for use in the cognitive system. Next, a second-order process may be called 'metareliable' in case, roughly, the methods it tends to acquire and preserve have sufficiently good reliability properties; or if it tends to *improve* the reliability properties of the method repertoire over time. [15]

The third common assumption shared by advocates of IP (in cognitive science, cognitive psychology, and philosophy of mind) and advocates of naturalized epistemology is that questions about the acquisition of knowledge can be answered by giving an *account of the individual knower.* An interesting aspect of such an account is that the

knower need not necessarily be "aware" of such knowledge. For example, advocates of IP in cognitive science and psychology refer to various types of "unconscious knowledge", e.g., tacit knowledge, metacognitive knowledge, of which the cognizer is not immediately aware.

Similarly, in his account of knowledge based on testimony, Goldman states his requirements for the knower regarding the "reconstruction" of the causal chain. He observes that although, "a correct reconstruction is a necessary condition of knowledge based on inference", it is not necessary that "he reconstruct every detail". Rather, the knower must be able to "reconstruct all the important links" and his "inferences must be warranted", i.e. the propositions upon which he bases his belief of p "must genuinely confirm p very highly".[16] Goldman claims that his theory is stronger than the traditional account in that it strengthens the requirements for justification. On the other hand, he notes that his account is weaker (better) than the traditional account in that it allows for knowledge where the knower is not "required to state his justification for believing p, or his grounds for p".

A second interesting feature of the account of the individual knower is its focus on and subsequent interpretation of one of the central epistemological questions noted at the beginning of this chapter.

The Central Epistemological Questions

On the cognitivist interpretation of computation, the primary epistemological question is the *procedural* question, i.e., how is knowledge acquired? Hence, when we know *how* knowledge is acquired, we can then ascertain what knowledge is, or what

counts as knowledge and thus, what we can actually claim to know. Significantly, the question "what is knowledge" is interpreted by many cognitive theorists as "what counts as *knowing*?" and is subsequently answered, as Flew notes, with an account of the *nature of the knower*. The "conceptual shift" is arguably due to the fact that the procedural question is subject to interpretation.

Advocates of the computational approach seem to interpret the procedural question as referring to the origins or genesis of knowledge, i.e., it is what Scheffler calls a "genetic question". According to Scheffler, the answer on this interpretation is "to give an account of the processes or mechanisms by which knowledge develops." [17]

Given a genetic interpretation of the procedural question, the answer to the substantive question, i.e., what counts as knowledge (knowing) can be variously construed as tacit knowledge, perceptual information, problem-solving ability, metacognitive knowledge etc. The question of scope, i.e., what can we know, thus depends further, on a theory of representation. That is to say, we can as individuals come to "know" whatever the IP processes and mechanisms mind are "reliably" capable of representing and we can "know" about our inner thoughts by means of introspection.

The Nature of Knowing

There is a sense in which the computational approach (at least on Goldman's account) presupposes the three conditions of knowledge that comprise the traditional response to the substantive question, i.e., what is knowledge? However, on the genetic interpretation of the procedural question, the "conditions" are changed. At least three

features of knowledge on the genetic interpretation distinguish it from the traditional account.

The first feature is that knowledge is characterized in terms of *the individual "knower"*. This is not surprising as Goldman is particularly interested in what he calls "primary epistemology", i.e., individual epistemology (Chapter 2). The second feature is that within individual epistemology, "the objects of epistemic evaluation" are cognitive processes, structures and mechanisms. That is, individuals *acquire* their beliefs and the justification for those beliefs by means of cognitive processes and mechanisms. Finally, the genetic account is explicitly concerned with *empirical knowledge*, i.e., knowledge from experience, the justification of which is not, on Goldman's view, properly addressed by the tripartite analysis. Such empirical knowledge is characterized by many cognitive researchers as "private" or *subjective knowledge*.

The Conventionalist Approach: A Linguistic Connection

The conventionalist response to the historical and contemporary problems of epistemology is predictably, the argument that the "problems" are further examples of intellectual myths or philosophers' muddles. The epistemological myths, like the myths of mind, are created by fallacious assumptions and the misuse and abuse of language (Chapter 4). On the conventionalist view, the central epistemological questions can be and arguably ought to be, answered by clarifying the logical connections between language and the conditions of knowledge, i.e., belief, justification and truth.

The Historical Epistemological "Problems"

Wittgenstein argues that the "problems" of certainty and skepticism associated with classical foundationalism are not serious problems. On Wittgenstein's view, all our beliefs rest on the foundations given by our "form of life", i.e., riverbed propositions that cannot be doubted. For example:

> My 'mental state', the "knowing", gives me no guarantee of what will happen. But it consists in this, that I should not understand where a doubt could get a foothold nor where a further test was possible...Now I would like to regard this certainty, not as something akin to hastiness or superficiality, but as a form of life.[18]

Wittgenstein uses as an example, "I KNOW that this is my foot. I could not accept any experience as proof to the contrary" and argues that what follows from this is that, "I shall act with a certainty that knows no doubt, in accordance with my belief".[19]

In respect to the problem of justification by inference, inasmuch as this problem is concerned with the "knowledge" acquired through private or subjective experience - Wittgenstein argues that there is no such thing as *subjective* knowledge.

The "Myth" of Subjective Knowledge

A source of intellectual myths (noted in Chapter 4) is a common, albeit mistaken assumption, held by opposing positions in an unresolved historical debate. The source of the myth of "subjective knowledge" is the epistemological debate which involves "first person" or subjective knowledge claims about perceptual experience.[20]

Hacker points out that in the historical debate, skeptics have argued that although "we know how things subjectively appear to us to be", perceptual experiences cannot "provide us with adequate grounds for knowledge claims about objects".

Representationalists argue that "knowledge of subjective experience constitutes an adequate basis", i.e., inference to the best explanation, of the "regular course of our experience". Idealists conclude that "knowledge claims about objects are claims about the coherence and regularity of actual and possible experience", and phenomenalists argue that "material objects are merely logical constructions out of actual and possible sense data". [21] Hacker notes that the presupposition of all participants in the debate is that first person knowledge claims are in fact knowledge, i.e., that one can "know" in the subjective sense, that "we are having such-and-such a perceptual experience". The question, "how can we account for or explain this sort of knowledge" is based on that presupposition.

Again, Wittgenstein challenges the common assumption by asserting that first person knowledge claims are not knowledge at all as there is no possibility of not knowing, finding out, confirming, disconfirming etc. in the case of perceptual experience. Hacker points out that:

> If such utterances are not expressions of secure knowledge, then they are *a fortiori* not *evidence* for assertions about objects, hence do not constitute the foundations of empirical knowledge. The role of such forms of words as 'it looks thus-and-so to me', 'It appears to me just as if...', 'It seems to me that...' is altogether different from that attributed to it by the foundationalist tradition in epistemology. [22]

Hacker notes that a similar example is found in a debate in philosophical psychology. In this case, the debate is between mentalists (who hold that psychological propositions are descriptions of events from private access) and behaviourists (who deny privileged access and argue that such propositions are descriptions of behaviour and dispositions). Both sides assume that both first and third person propositions are

descriptions of states of affairs. In what has come to be known as his "private language argument", Wittgenstein challenges the common presupposition that first person utterances are either descriptions or expressions of self-knowledge. Hacker observes:

> They are commonly avowals, manifestations or expressions of experience, not assertions based on evidence or observation. Their third-person counterparts, however, are descriptions for which there are behavioural criteria for their assertion. What they describe can be known, believed, or supposed to be so.[23]

The Task of Normative Epistemology

On the conventionalist approach, the historical epistemological "dilemmas" (which are of serious import on the computational account) are dispelled by Wittgenstein's arguments. The epistemological problem which remains is that which is posed by naturalized epistemology and its influence on views about the proper task of epistemology.

Hacker argues that Quine's naturalized epistemology marked the end of serious philosophical analysis and the beginning of an era of scientism and intellectual myth-making. For example:

> Quine's ontological turn, his physicalism, his advocacy of naturalized epistemology, his behaviourism and consequent exclusion of questions of normativity from the philosophy of language...diverted attention to putative ontological enquiries as to whether certain 'entities' exist, or need to be 'posited' for the purposes of science or for the best 'theory' about what there really is...Naturalized epistemology in effect reinstates a form of geneticism which analytic philosophy's anti-psychologism had laboured to extirpate. [24]

Hacker observes that among the "trends" stimulated by Quine are the growth of computer sciences and artificial intelligence, and the achievements of neuro-physiological psychology. He points out that post-behaviourist cognitive science "was born" and analytic philosophy of mind "declined". Significantly, on Hacker's view:

> Philosophy of psychology allied itself with the speculations of cognitive science, and the boundary lines between analytic investigations into the articulation of psychological concepts and hypotheses concerning the workings of the brain blurred. [25]

The "cognitive turn" initiated by naturalised epistemology has been taken by many theorists to represent the demise of analytic philosophy. However, Hacker argues to the contrary, that the problems generated by the field of cognitive science present a formidable and necessary task for contemporary analytic philosophers:

> It is part of the critical task of philosophy to question not the truth, but the *intelligibility* of, for example, theoretical linguists' talk of an innate language of thought, of a 'language gene' or of speakers of a language unconsciously 'cognizing' a universal theory of grammar or a theory of interpretation necessary for mutual understanding...Critical analytic philosophy is no extension of science, but a tribunal of sense before which science should be arraigned when it slides into myth-making and sinks into conceptual confusion. [26]

The Epistemological Questions

In contrast to the computational approach, the conventionalist approach takes the *substantive* question, i.e., "what is knowledge?" to be the primary question in epistemology. Following the conventionalist approach to mind, i.e., establishing the criteria that govern the use of the term, the epistemological question is (predictably) answered by establishing the criteria for the concept of knowledge.

The conventionalist approach generally follows what was described as the "tripartite analysis of knowledge" in Chapter 2. Thus, when we know *what* knowledge is, that is, when the conditions for knowledge, i.e., true, justified belief, are established through analysis, then we can examine the ways in which such knowledge is "acquired" and conclude what if anything, we can claim to know. Significantly, as noted in Chapter

3, educational advocates of the conventionalist approach take the primary question a step further and ask, "what sorts of knowledge are most worthwhile?"

Whereas the computational view interprets the procedural question as a genetic question, the conventionalist approach seems to take it to be what Scheffler calls a "methodological question: how ought the search for knowledge to be conducted"? To answer this question, Scheffler says, is to "offer some conception of proper methods to be employed in inquiry, together with a justification of those methods." [27] Accordingly, the conventionalist answer to Scheffler's question is that worthwhile knowledge is "achieved" in a deliberate conscious inquiry, i.e., an engagement with the forms of knowledge in what is known as a liberal education (Chapter 3). Whereas the computational approach is concerned with the *causal* connections between beliefs, justification and truth in respect to the acquisition of individual "knowledge", Hirst and Hamlyn describe the *logical* connections involved in the "achievement" of public forms of knowledge.

The conventionalist account may be based on a subtle, if not implicit distinction between foundational beliefs which are *acquired* naturally, i.e., picked up casually without thought, and knowledge which (they hold) is *achieved* through learning, i.e., the result of a deliberate conscious effort to succeed. Unfortunately, educationalists do not consistently refer to knowledge as an achievement term and the distinction between 'achievement' and 'acquisition' is not made clear in respect to knowledge in the literature of philosophy, cognitive science and psychology. Hence the term 'acquisition' is often used indiscriminately in reference to knowledge.[28]

On the conventionalist view the answer to the question of scope, i.e., what *can* we know, is embodied in the forms of knowledge which capture the best of all human experience. We are constrained only by the bounds of rationality and by the limits of our language. In Oakeshott's words we can know all we can learn to know - "the actual enquiries, utterances and actions in which human beings have expressed their understanding of the human condition".[29]

Grounding the Forms of Knowledge

Hirst argues that his thesis stands on the grounds of rationality. That is, what and how we think is a matter of the logic of our language. Our linguistic conventions are all we have to express human experience and our understanding of such experiences. In Wittgenstein's words, this is our "form of life". Hirst observes that:

> Being rational I see rather as a matter of developing conceptual schemes by means of a public language in which words are related to our form of life, so that we make objective judgements in relation to some aspect of that form of life. [30]

Hirst asserts that our "form of life" is inescapable, and further that, "all intelligibility that we can have is tied to the creation of concepts within a setting that being given. . is in large measure not of our creating". Hirst points out that "we are the beings we are" and that we are subject to our "given capacities and contexts". He notes that "even if these are in the process of change, they have now the character they have and not another".[31]

Hamlyn follows a similar line of argument on the subject of objectivity. He notes that the grounds for our objective judgements, i.e., our conceptual systems, are not just "conventions". According to Hamlyn, the grounds for our objective judgements, i.e.,

our conceptual systems, are "anchored" by what Wittgenstein calls the "forms of life". Hamlyn comments:

> It is forms of life, he says, which are in a sense the 'given'. The point could be put in other ways by saying that forms of life constitute the anchoring points for conceptual systems, and thus prevent the complete amendment and abandonment of that conceptual scheme which we at present operate with... it is not a matter of convention that the world is as it is and that things affect our senses in the way that they do. [32]

Hamlyn concludes that, "our employment of the concepts of truth and fact depends both upon the existence of an objective world and upon our being able to make statements". According to Hamlyn, it would be "wrong to deny that facts are independent of ourselves", but it would be equally wrong to, "assert that there is any other way in which the facts may be discovered except by seeing which statements are true". The reason for his claim is that, "by 'fact' is meant just that which corresponds to such a statement".[33]

Language and Knowledge

Hirst points out that he "assumes it to be obvious" that language "has been and is of crucial importance in the general development of man's thought and understanding". He claims that language "plays a vital role" in the transmission of such thought and understanding to "succeeding generations". [34]

Hamlyn explains the "obvious importance" of language in some detail and relates language to the basic human ability to make distinctions. This basic ability is enhanced by language when we use linguistic distinctions to organize conceptual schemes into categories. On Hamlyn's view:

> The notion of categories arises initially from consideration of the ways in which it is possible to deal with the world linguistically (or, for that matter, in thought). We find ourselves with certain ways of thinking about the world, and these are reflected in language in the existence of certain distinct uses of expressions.[35]

Hamlyn alludes to the "interdependent" nature of the logical relationships when he discusses the relationship between the linguistic ability to categorize and the ability to think about the world. Hamlyn notes that:

> There is an inevitable circularity here, due to the fact that we are in the most general sense at the frontiers between language or thought and the world. We can explain the category only by reference to the modes of thought by which we pick it out and vice versa. A category is merely the concept of one type of entity which is so picked out. Facts are picked out by the making of true statements; hence it is that they are merely what true statements state, and that true statements state facts. [36]

Both Hirst and Hamlyn refer to Wittgenstein's notion of a "language-game" to explain the logical relationship between language and knowledge of the world. On Hirst's view, Wittgenstein's notion is "enormously to the point" as we can "profitably" think of his (Hirst's) forms of knowledge as such language-games. Hirst notes that each form of knowledge is distinct in terms of its "rules for the forming of expressions that will carry out the appropriate function". He says that in this sense "mastery of a form of understanding or thought" is "essentially learning how to play a complex game of terms" and "learning to play it so that by sticking to the rules it can fulfil its own peculiar function". [37]

Hamlyn uses Wittgenstein's "language games" to point to the important relationship between communication, definitions and judgement and to note that this relationship is dependent on "public agreement" on the criteria. The public agreement is

a feature of language, that is, language is what we use to communicate, to understand and to agree on criteria. According to Hamlyn:

> One of Wittgenstein's most important remarks in his *Philosophical Investigations* is the one to the effect that if language is to be a means of communication there must be agreement in judgements as well as agreement in definitions. [38]

Hirst argues that learning to use language and learning to understand its significance in this way is both a necessary and central feature of education. On Hirst's view:

> It is therefore in general necessary to the growth of understanding to learn to use the appropriate language in which that understanding is expressed and communicated. This is to say that the place of language in education is necessarily central. [39]

Meaning and Truth

Another important logical relationship internal to Hirst's thesis is that of the relationship between language, meaning and truth. This relationship is based on the prior relationship between concepts and the criteria for their correct application. Following Wittgenstein and Ryle, Hirst notes that what is involved in understanding this relationship is a matter of understanding the "logical geography" of concepts. He claims that this is not the same thing as "grammatical analysis", i.e., distinguishing the functions of words in the structure of a language. Rather, the logical geography of concepts has to do with learning to use word patterns in such a way as to convey meaning. Hirst argues that:

> Conceptual analysis, or logical geography as Ryle has called it, is concerned precisely with this, distinguishing those patterns of terms which can be found when we do things with words. This is essentially not the grammatical analysis of language but the analysis of meaning. The distinction between grammatical structure and logical structure must be kept clear. [40]

Learning to use language to convey meaning is a matter of learning the public "conventions" for the use of terms. This is an essential feature of Wittgenstein's

language-game analogy. Hirst points out that the conventions for the correct application of terms, i.e., to convey meaning, are in fact the criteria that are used to establish the truth of knowledge claims. Hirst explains this in detail:

> No concepts can be the basis of shared meaning without criteria for their application. But the criteria for the application of a concept, say 'x', simply are the criteria for the truth of the statements that say that something is an 'x'. By this chain of relations, that meaning necessitates concepts, that concepts necessitate criteria of application and that criteria of application are truth criteria for propositions or statements, the notions of meaning and true propositions, and therefore meaning and knowledge, are logically connected. [41]

Hamlyn puts it another way, that is, he relates the logical connection between meaning and truth to the notion of objectivity and human understanding. By objectivity, Hamlyn is distinguishing between the idea of "subjective" knowledge, i.e., that one can intuitively come to know independently of public communication, and "objective" knowledge, i.e., that which accords with public standards. On Hamlyn's view, objectivity or public standards are a necessary feature of what we mean by truth. Thus, "to understand the criterion for a concept is to understand what constitutes the conditions in which the concept is properly given application". Hamlyn argues that, "these conditions must be something that can be understood by all of us, and therefore they must be public".[42] Hamlyn concludes that:

> An understanding of what men say involves not only an understanding of the individual words that they use (something that might be expressed in definitions) but also the criteria of truth of the statements that they make by means of those words (something that implies agreement on the circumstances in which those statements might be said to be true). There are thus certain conceptual connexions between the concepts of meaning, truth and agreement; to understand these connexions is to go some way towards an understanding of the notion of objectivity itself. [43]

Hirst argues that an important criterion for each of the forms of knowledge is a particular "truth test" or a "test against experience". What Hirst is getting at here is that within what Oakeshott calls "the realm of human experience", there are different kinds of objective judgements that we make about what counts as a true proposition. These sorts of judgements are a function of our linguistic conventions, i.e., our different "language-games". For example, we refer to scientific truths, mathematical truths, logical truths, etc. In each case, what counts as a true proposition is based on a different sort of objective judgement. Hamlyn describes this relationship as a matter of "different reasons" for the verification of facts as facts:

> Different statements may be regarded as true for very different reasons; that is to say that their verification may be very different. The grounds for the assertion that a scientific statement is true may be provided by listing the evidence; while those for the assertions that Pythagoras' Theorem is true may be provided by giving the proof. There may be different grounds again for legal, moral, aesthetic truths, etc. In the ordinary sense of the word 'ground' it would not be right to say that correspondence with fact is a ground for declaring a statement to be true. [44]

Our linguistic conventions or language-games provide different conceptual schemes with which we can make objective judgements. Each language-game provides grounds for what counts as a true statement. The grounds for truth in no one language-game supervenes the grounds for truth in any other game. To suggest otherwise would be like suggesting that the rules for playing chess are the same rules that are used to play cricket or baseball. Hamlyn argues that:

> If objectivity cannot be identified with the attainment of truth as such, it is even more true that it cannot be identified with the attainment of truth of a particular kind, e.g., scientific truth, or truth which can be ascertained by procedures such as observation. This is particularly important in the light of the existence of subject-matters such as art and morals in which truth, where it exists, is not to be ascertained by observation or any of the procedures available to science. [45]

Hirst's forms of knowledge thesis does not *rest* on any particular epistemological "theory" of truth. If anything, both Hirst and Hamlyn subscribe to a limited version of the correspondence theory of truth, the details of which are beyond this thesis. However, it is worthwhile to note that Hamlyn argues that the correspondence theory of truth, i.e., that truth is agreement with the facts, suffers from both a circularity problem and a lack of clarification. For example, Hamlyn notes that to say that, "a statement is true if and only if it corresponds to the facts" is, "to confuse what it is to say that a statement is true with the grounds for appraising it as such".[46] Hamlyn takes the position that the correspondence theory of truth is a problem connected to the philosophical "quest for certainty". He points out that:

> Because philosophers have often been interested in the search for certainty, the Correspondence theory of truth has often been fitted to the task of providing a means of finding out for certain whether a proposition is true - a test of truth... This view can be rejected if it is granted that such certainty is not a requisite of knowledge... the Correspondence theory has also been considered as an elucidation of the notion of truth, either as a theory about the meaning of the word 'true' or as an account of the conditions under which we apply the word 'true'. But in this sense the theory is circular. [47]

Significantly, Hamlyn notes that, "the assertion that a statement is true *if and only if* it corresponds to the facts is not an assertion drawn from ordinary language". He claims that such an assertion, "is nothing if not a philosopher's remark". Hamlyn notes that, "when we say that some theory fits the facts, we generally mean that it is consistent with what has already been discovered".[48] According to Hamlyn, "the Correspondence theory of truth seems to me disputable only by one who denies objectivity altogether (and for such a philosopher no theory of truth will do)". However, he warns that, "because of the ultimate generality of the theory . . . it is impossible to lay down the conditions

under which a statement corresponds to the facts in any detail". Thus, Hamlyn concludes that:

> Since statements may be of a great number of different kinds, no general account can be given of the ways in which it is possible to state facts. Nor does the theory as I have given it presuppose any particular theory of meaning.[49]

In his discussion of the Correspondence theory of truth Hamlyn points out significantly, that many philosophers who argue for a particular theory of truth invoke Aristotle. In fact, the Aristotelian version of truth is simply, "to say that what is, is not or that what is not, is, is false, while to say that what is, is or that what is not, is not, is true."

The Nature of Knowledge

On the conventionalist view, the criteria for knowledge are established from an analysis of the concept. The tripartite analysis establishes three necessary and jointly sufficient conditions for knowledge; i) the belief that p; ii) justification (based on reason) for holding the belief, and; iii) evidence that p is true. Following Wittgenstein's argument against subjective knowledge, an explanation of the nature of the knower is not necessary in a discussion of the achievement of knowledge. Rather, what is at stake in the discussion is what sorts of knowledge are worthwhile for anyone to achieve, irrespective of an individual's "nature". Knowledge on the conventionalist account is objective (based on public linguistic conventions). This sort of knowledge is, significantly, distinguished from information.

Kenny argues that mistakes in distinguishing information from knowledge are due to our tendency to conflate sense perceptions with knowledge. He notes that errors in

describing the nature of sense perception can be traced back to Descartes' belief that *something* inside the body is aware of internal images. Over the years the idea of an internal homunculus or "manikin" has become more sophisticated and is explained in terms of advancing technology. On the modern computational version of mind, the explanation of "seeing" in fact reproduces puzzles which involve seeing and the homunculus. Kenny argues that to see this:

> We must emphasize *the difference between the containing of information* (in the sense of communication theory) and *the possession of knowledge*. It is possible for a structure to contain information about a particular topic without having any knowledge of that topic... A category difference is involved here. To contain information is to be in a certain *state*, while to know something is to possess a certain *ability*. [50] (italics added)

He cautions that, "to have a sensation is not the same thing as to be in possession of a piece of knowledge". On Kenny's view, both the information which is acquired through the senses and the "discriminations performed with their aid", may be *acquired* and performed by means other than the senses, and "indeed by agents other than human beings". He says for example that, "a scanner might discover, and a computer tabulate, visual information". Kenny points out that:

> Such operations are not sense-perception because they occur without pleasure or pain... The distinction between intellectual knowledge that p and the sensation that p is to be sought, as Aristotle said, in the different relationship of each mode of cognition to pain and pleasure.[51]

Oakeshott also argues against conflating or "assimilating" knowledge and information. He is concerned specifically with distinguishing the abilities found in conjunction with information from those required for judgement. Although Oakeshott allows that "there is in all knowledge an ingredient of information", he argues that:

> This ingredient of information, however, never constitutes the whole of what we know. Before any concrete skill or ability can appear, information must be partnered by judgement, 'knowing how' must be added to the 'knowing what of information. [52]

Oakeshott further notes that information is "unlike knowledge" in that information may be "useful or useless". He describes information as the "knowing that" or propositional part of knowledge which may be useful when it is relevant to "the matter at hand" or useless, i.e., "notoriously inert", when it is not relevant. Oakeshott comments:

> The component of 'information' is easily recognized. It is the explicit ingredient of knowledge, where what we know may be itemized. Information consists of facts, specific intellectual artefacts (often arranged in sets or bunches). It is impersonal, not a matter of opinion. Most of it is accepted on authority, and it is to be found in dictionaries, manuals, textbooks and encyclopedias. [53]

On Oakeshott's view, judgement, i.e., the "knowing how" part of knowledge, cannot be specified by propositions. It does not appear in the form of rules and cannot be resolved into information. Judgement, Oakeshott claims, *"is the ability to think"*. Further, judgement must be taught in a particular relationship between teacher and pupil and it can only be taught in conjunction with the transmission of information.

> What is required in addition to information is knowledge which enables us to interpret it, to decide upon its relevance, to recognize what rule to apply and to discover what action permitted by the rule should, in the circumstances, be performed. [54]

Summary

On the computational approach, cognitive researchers who advocate IP seem to share the Cartesian assumptions that; i) if knowledge is possible, it is "acquired" by the individual (beliefs which are justified by inference), and; ii) humans are capable of

introspection, i.e., that an inner eye or homunculus allows one to conduct an internal inspection of one's beliefs. These researchers seem to assume that knowledge is an individual *acquisition* and that the procedural question has a "genetic" interpretation, i.e., it refers to the origins of an individual's knowledge.

In contrast to the Cartesian position, advocates of the conventionalist approach (following Wittgenstein) hold that; i) basic beliefs are "riverbed" propositions which cannot be doubted, or grounded and; ii) there is no such thing as subjective or internal knowledge. The conventionalist view takes the question of knowledge "acquisition" to be a methodological question, i.e., how ought the search for knowledge to be conducted? On this interpretation, worthwhile knowledge (which is justified and tested for truth in terms of public standards) is an *achievement*. That is, it is a deliberate and conscious engagement with the various forms of tested (objective) knowledge, i.e., linguistic conventions. Such knowledge is distinguished from information.

On the computational account the task of epistemology appears to be "naturalized", i.e., epistemology is "married" to cognitive psychology (and metacognition) to give an account of the individual's "acquisition of knowledge" in terms of cognitive processes and metacognitive mechanisms. A causal relationship between environmental stimuli and cognitive mechanisms (similar to that posited by Goldman) is assumed to account for the justification of an individual's beliefs. Thus, knowledge on the computational view can be taken by cognitive researchers to be subjective and not necessarily conscious. It can be subsequently characterized as information "acquired" by means of an information-processing system e.g., perceptual information, tacit knowledge,

metacognitive knowledge, etc. In contrast, the conventionalist view asserts that such naturalized epistemology gives rise to "unintelligible trends" and intellectual myths. The task for contemporary philosophy is rather, to "question the sense" of the mental "phenomena" and "processes" posited by cognitive researchers.

Notes: Chapter 5

1. Cottingham et al Translation (1988) *Descartes - Selected Philosophical Writings*, (UK: Cambridge University Press). Descartes concluded further that God exists and is no deceiver - thus other things are knowable.

2. Edmund L. Gettier (1993) "Is Justified True Belief Knowledge?" 134 in *The Theory of Knowledge* Louis Pojman (ed) (California, Wadsworth Inc.)

3. See, for example, Willard Quine (1993) "Epistemology Naturalized" 320 in *The Theory of Knowledge* Louis Pojman (ed) (California: Wadsworth Inc.); "Two Dogmas of Empiricism" 395 (same volume)

4. It is important to note that Goldman's causal theory is part of his early work (1967). Therefore, any criticisms of the causal view noted in this thesis cannot be construed as criticisms of Goldman's current views. In his later work, he appeals to the "objective reliability" of belief-producing processes (mentioned in chapter 2). In his most recent work, Goldman argues that his account is normative. See for example, his "Epistemic folkways and Scientific Epistemology" - Chapter 9 in Alvin I. Goldman (1992) *Liasons: Philosophy Meets the Cognitive and Social Sciences* (Mass: MIT Press).

Arguably, IP theorists base their claims about knowledge on some sort of epistemological theory. Of several epistemologists interested in information-processing, Goldman's work was chosen as an example for several reasons. The main reason is the tremendous scope of his work. In various writings he advocates (his particular version of) *naturalized epistemology*; he claims to be a *foundationalist* of sorts; he is explicitly interested in what he calls *psychologistic epistemology*, and; he makes some (albeit brief) claims about the implications of his work for *education*. The second reason is his attention to the details of particular mental processes, specifically the second-order processes which are central to IP theory.

5. Alvin Goldman (1986) *Epistemology and Cognition* 53 (London: Harvard University Press)

6. Ibid., 54

7. Alvin Goldman (1993) "A Causal Theory of Knowing" in Pojman (ed) *The Theory of Knowledge* (California: Wadsworth Inc.)

8. Ibid, 139

9. Ibid., 138

10. Ibid.

11. Ibid., 139

12. Ibid., 140

13. Goldman, *EC,* 53

14. Ibid., 52.

15. Ibid., 374

16. Goldman, *Causal*, 140

17. Israel Scheffler (1965) *Conditions of Knowledge* 5 (Chicago: University of Chicago Press)

18. Ludwig Wittgenstein (1969) *On Certainty*, G.E.M. Anscombe & G.H.von Wright (translation) #356-#358 (NY: Harper & Row)

19. Ibid., #360

20. The label "the myth of subjective knowledge" is my term - stipulated for the purposes of this thesis. Neither Hacker nor Wittgenstein use the phrase in their respective writings.

21. P.M.S. Hacker (1996) "The Achievement of the Investigations" 185-6 (unpublished paper)

22. Ibid., 185

23. Ibid., 186

24. P.M.S. Hacker (1995) "What Whence and Whither" 29 (unpublished paper)

25. Ibid.

26. Ibid., 32

27. Scheffler, *Conditions*, 5. It is important to note that Scheffler views these as two distinct questions. Although Hirst and Hamlyn do not refer to Scheffler's questions, their arguments suggest that they take the interpretation as stated in this thesis.

28. An exception is Tasos Kazepides, who makes this distinction in his (1991) "On The Prerequisites of Moral Education: A Wittgensteinean perspective" 266-267 *Journal of Philosophy of Education,* Vol.25, No.2. Kazepides notes that "riverbed

propositions" are "enabling beliefs that constitute the framework of our thinking and [that] cannot be learned". He argues that:

> Learning requires prior experience and involves some form of thinking while acquisition of river-bed propositions does not because it cannot. Unlike the understanding of sophisticated knowledge claims, the acquisition of the rock bottom beliefs does not allow the use of the intellectual acts of explaining, doubting, justifying, etc.(266)

29. Michael Oakeshott (1989) "A Place of Learning" 28 in *The Voice of Liberal Learning* T. Fuller (ed) (London:Yale University Press)

30. Paul Hirst (1974) "The Forms of Knowledge Re-Visited" 93 in *Knowledge and the Curriculum*, Hirst (ed) (London: Routledge & Kegan Paul)

31. Ibid., 93

32. David Hamlyn (1972) "Objectivity" 255-256 in *Education and the Development of Reason*, Deardon, Hirst & Peters (eds) (London: Routledge & Kegan Paul)

33. David Hamlyn (1972) "The Correspondence Theory of Truth" 272 in *Education and the Development of Reason*, Deardon, Hirst & Peters (eds) (London: Routledge & Kegan Paul)

34. Paul Hirst (1974) "Language and Thought" 69 in *Knowledge and the Curriculum* Hirst, (ed) (London: Routledge & Kegan Paul)

35. Hamlyn, *Correspondence*, 270

36. Ibid., 270

37. Hirst, *Language*, 81

38. Hamlyn, *Objectivity*, 246

39. Hirst, *Language*, 79

40. Ibid., 80

41. Paul Hirst (1974) "Realms of Meaning and Forms of Knowledge" 64 in *Knowledge and the Curriculum* Hirst, (ed) (London: Routledge & Kegan Paul)

42. Hamlyn, *Objectivity*, 253. In a recent publication, Searle makes a similar point when he distinguishes "individual intentionality" from "collective intentionality". Searle says:

> The crucial element in collective intentionality is a sense of doing (wanting, believing, etc.) something together, and the individual intentionality that each person has is derived *from* the collective intentionality that they share". See John Searle (1995) *The Construction of Social Reality* 25 (NY: The Free Press)

43. Ibid., 246

44. Hamlyn, *Correspondence*, 268

45. Hamlyn, *Objectivity*, 247

46. Hamlyn, *Correspondence*, 260

47. Ibid., 267

48. Ibid., 270

49. Ibid., 273

50. Anthony Kenny (1989) *the Metaphysics of Mind* 108 (Oxford: Oxford University Press)

51. Ibid., 112

52. Michael Oakeshott (1989) "Learning and Teaching" 53 in *The Voice of Liberal Learning* Fuller (ed) (London: Yale University Press)

53. Ibid., 51

54. Ibid., 54

This process in which an organism adapts itself and records its reactions to its environment is called "learning"; indeed it is spoken of as a process of acquiring, storing and retrieving useful information, and in a human being it is said to be only more versatile than in an octopus. . . Yet clearly the learning in which we may become human is very different from this process of organic adaptation to circumstances.

Oakeshott, "The Voice of Liberal Learning"

Chapter 6
The "Voices" of Learning

Both the computational and conventionalist approaches assume that learning is necessary for the development of mind. However, as Oakeshott's comment suggests, the two approaches have different assumptions about what is involved in "learning". The assumptions about learning, and subsequently about education, are explicitly related to the respective conceptions of mind and knowledge.

On the computational view, the mind is a symbolic and computational information-processing system and knowledge is generally conceived as information which is *acquired* by natural cognitive processes and mechanisms. In contrast, the conventionalist view holds that 'mind' is a term which is used to refer to the concept of human beliefs, desires, goals etc., and that knowledge is *achieved* in a deliberate engagement with several public forms of knowledge. Given the reciprocal nature of the relationship between the concepts of mind, knowledge and education, it is reasonable to expect that the disparate conceptions of mind and knowledge will be reflected in the respective conceptions of education.

As in the case of mind and knowledge, differences in the two views of education have their origins in, among other issues, an historical debate such as the one suggested by Oakeshott's comment on "learning". The controversy of interest to this discussion

might be called the developmental problem, i.e., the controversial issue of cognitive development. Thus, the contrast between the two approaches comes full circle to the issue of cognitive development which was first introduced in respect to the historical examples (Chapter 1).

The two contemporary interpretations of development of mind were noted in Chapters 2 and 3. The computational approach holds that the development of mind is synonymous with cognitive development and is a matter of improving information-processing functions through cognitive training. The conventionalist approach argues that the development of mind is an educational development which includes an engagement with the forms of knowledge and the consequent transformation of one's cognitive perspective.

The purpose of this chapter is to contrast the two approaches in terms of their fundamental assumptions about learning and their consequent conceptions of "education". The assumptions about learning are shown to be based on deeper, often hidden assumptions which reflect the controversy about the nature of human cognitive development.

The Issue of Cognitive Development

Biologists tell us that all animals, including humans, have the innate basic capacity to *discriminate*, i.e., to distinguish by means of perception, some elements of their environment. Different animals have differing discriminatory abilities, e.g., visual, aural, tactile, etc. In addition to the ability to make sensory discriminations, humans have additional innate capacities which appear to be the consequences of evolutionary

development. Some of these essentially cognitive capacities allow humans to "be disposed to" make *conceptual discriminations*, which can be characterized as rational, linguistic and social. These sorts of discriminations form the basis of human thought. They dispose humans to think *linguistically*, i.e., to conceptualize through language, to think *rationally*, i.e., to reason, and to think *socially*, i.e., to interact with others and with their environment.

We take it for granted that unless one's ability to function in this way is impaired by accidents causing damage to the brain, that all humans have these innate capacities and dispositions. However, we do not take it for granted that the capacities are developed to the same degree in all humans. Nor do we hold that the capacities are developed naturally, i.e., through maturation. Rather, human cognitive development is subject to certain conditions. The "issue" of cognitive development involves different views of (among other things), i) what the "necessary conditions" for cognitive development are deemed to be, and ii) which fields of inquiry are best suited for their study. This then, is the "complex problem" of cognitive development or development of mind to which Hirst refers (Chapter 3).

For those fields such as education wherein theory and practice rely on conceptions of knowledge and the development of mind, there are two contemporary influences. On one hand (the computational approach) there is the suggestion that we can rely on empirical psychological descriptions or generalizations of what investigations reveal "to be the case" in cognitive development. On the other hand (the conventionalist approach) it is argued that the cognitive development of human minds is the result of deliberate

efforts to ensure the rational, linguistic and social development of the young through education. On this view, education is to "be in sight" of certain necessary criteria for human cognitive development. Although these are fundamentally different approaches, advocates of each view hold that their respective approach is based on particular features which mark the conditions for cognitive development.

The Computational Approach: The Voice of Naturalised Learning

Information-processing researchers hold that the complex issues of cognitive development are best addressed by positing a theoretical account of cognitive "change", i.e., a *connection* between the cognitive abilities of infants and the higher cognitive abilities found in adults (Chapter 2). The researchers are both guided and constrained by their assumptions about: i) the nature of the mind - following the mind/body problem; ii) the nature and acquisition of knowledge - following Quine's naturalization hypothesis, and its implications for personal knowledge, and; iii) the relation between knowledge and intelligence. An important cognitive "connection" between infants and adults is deemed to be that of learning "theory". What is significant on the IP account is that ultimately what is being learned is how to exert control over "natural" cognitive processes and mechanisms, i.e., learning how to learn.

Psychological "Laws"

As a science, psychology seeks common "laws" that explain and predict the occurrence of psychological phenomena. To attempt to "discover" any general laws of learning is a formidable task. When the theories of learning assume that learning is a matter of "assimilation and accommodation" of a "system" to its "environment", the task

becomes herculean. Not surprisingly then, descriptions of the task are vague, complex and laden with technical jargon. For example, on the IP view of learning, Simon and Kaplan comment:

> There are many forms of learning. One important form is the accumulation of information in memories and the acquisition of access routes for retrieving it. Learning changes systems semipermanently and hence increases the difficulty of searching out invariants. On the longest time scale intelligent systems evolve both biologically by mutation and natural selection and socially through the accumulation and transmission of new knowledge and strategies... what room is left for a general science of cognition? We must seek invariants in the inner and outer environments that bound the adaptive processes. We must look for basic characteristics that might be held in common among diverse kinds of intelligent systems and also for common elements at the knowledge level, among complex problem environments. [1]

Given the possibility of an infinite set of external and internal co-variants that might affect "semipermanent change", it is almost predictable that researchers would be led to the assumption that an internal mechanism might be a more "appropriate" hypothesis to account for changes due to learning. Thus, it is not surprising that Simon and Kaplan note that, "intelligent systems are highly adaptive and flexible in their behaviour" and that this could, "lead to the notion" that a great many of the invariants are to be found, "not in their behaviour when confronted by their usual tasks, nor in the structures responsible for performance" but rather, "*in the long-range mechanisms that bring about adaptation* - their learning mechanisms". [2] With this hypothesis, the next step is almost inevitable, that is to hypothesize about the possibility of a universal learning mechanism. Simon and Kaplan note:

> We should not suppose that it will be simple to find invariants even in learning systems. After all we must be prepared for the phenomenon of "learning to learn". The adaptive mechanisms themselves may learn from experience. [3]

Unconscious Processes

The "scientism" noted by Hacker in the research on mental processes is, arguably, most obvious in the way researchers attempt to defend their accounts of "learning processes". For example, VanLehn argues:

> The ultimate explanation for the form and content of the human experts' knowledge is the learning processes that they went through in obtaining it. Thus the best theory of expert problem-solving is a theory of learning. Indeed learning theories may be the only scientifically adequate theories of expert problem solving. Thus the focus of attention in the 1980's has been the acquisition of expertise.[4]

A similar example is found in VanLehn's "definition of learning" in relation to problem-solving. VanLehn claims that "learning" in this context means "resilient changes in the subject's knowledge about the task domain that are potentially useful in solving further problems."[5] Flavell's description of the cognitive researcher's task, i.e., to "decompose tasks into their components" and "infer what the cognitive system does", is illustrated in VanLehn's description of the "general process" of problem-solving. The constraints imposed by trying to articulate a universal law of thinking lead almost irrevocably to technical jargon and vagueness. For example:

> The overall problem-solving process can be analyzed as two cooperating subprocesses, called understanding and search. The understanding process is responsible for assimilating the stimulus that poses the problem and for producing mental information structures that constitute the person's understanding of the problem. The search process is driven by these products of the understanding process rather than the problem stimulus itself. The search process is responsible for finding or calculating the solution to the problem. To put it differently, the understanding process generates the person's internal representation of the problem, whereas the search process generates the person's solution. [6]

Learning "Mechanisms"

In cognitive science, the emphasis on the structure or architecture of information-processing systems strongly influences the researchers' "operational" conception of learning. What counts as "learning" is whatever can account for the sort of "intelligent behaviour" that is capable of being reproduced in machines. For example:

> Because learning is a product of both the current state of the organism and the current pattern of input, systems that continually act in similar environments will respond very similarly to the same problems, and thus will demonstrate similar degrees of observable intelligence.[7]

Although its advocates maintain that cognitive science has made significant progress in the field of artificial intelligence, there still remain profound differences between what the information-processing models can do as compared to the human mind. Given these limitations, learning, at the moment is restricted to "the lack of errors" in processing operations. For example:

> Any intelligent, human or nonhuman, system has to have the ability to learn. In fact, the ability to learn under partial instruction has been used to measure human intelligence (e.g., Feuerstein, 1979). The link between learning and intelligence is most obvious in the absence of any learning capabilities. A system that repeatedly makes the same errors can hardly be classified as intelligent. [8]

In cognitive science and psychology, then, learning is primarily (if not completely) a matter of machine-like operations, i.e., processes and mechanisms, that can be duplicated by models such as a computer. These "mental" operations are categorized into higher and lower levels of operational complexity. For example, Sternberg refers to Langley and Simon's (1981) taxonomy of learning in information processing systems, which includes "additions to and reorganization of an existing knowledge base", "augmentation of recognition mechanisms", and the "creation and modification of search

and evaluation heuristics". [9] Clearly, this taxonomy is concerned with the operations of a system, not with what it is that is being "operated" on. It seems unlikely that the cognitive "definition" of learning will change significantly in the future as long as the research assumes its position of philosophical functionalism. Sternberg reaffirms the commitment of IP to functionalism:

> The position advocated here is functionalism. Functionalism holds that mental states are to be understood in terms of their functional relationship, not in terms of any material instantiation. Therefore, the same mental states that occur in humans can also occur in other living beings, or even in machines. *Only when functionalism is assumed can findings in non-human intelligence be related directly to human intelligence.* [10] (italics added)

Cognitive Training

In a discussion of IP and teaching it is important to re-emphasize two points noted in Chapter 2. The first point is that direct IP research, i.e., research on the IP model itself in cognitive science and cognitive psychology is not explicitly intended by the researchers to have educational applications. Consequently, it is not surprising that little if any, reference is made to the consequences of IP for education. Rather, with the exception of Goldman, the educational implications of IP and recommendations for education are posited by researchers who *interpret* the data and conclusions from the direct research in terms of its applications for education. This sort of research was referred to as the "applied research" in Chapter 2.

The second point is that, given the aim of direct cognitive research, namely to "achieve a model of cognitive processing that can be successfully run on a computer", there is no reason for researchers to worry about whether the model explains the human acquisition of "knowledge", per se. If information is what is used by the model to

produce intelligent behaviour, then for cognitive science, information is both necessary and sufficient for learning. Therefore, the discussion of IP in this chapter is not a discussion about IP theory in the same sense as it was in the previous chapters. This discussion focusses on educational research and the educationalists who claim that IP is a theory of mind and knowledge *in an educational sense*.

With those points in mind, when Flavell describes cognitive development as a "qualitatively different kind of mind" that performs "qualitatively different kinds of mental operations" (Chapter 2), and when learning is conceived in terms of mental processes and mechanisms, one might expect a "qualitatively" different approach to teaching which is based on those assumptions. For example, Goldman notes possible "regulative" applications for his "theoretical" primary epistemics.

> There are some prospects for *deliberate control of cognitive operations*, should this prove advisable. Habits in deployment of the cognitive repertoire may be *amenable to inculcation and training*. There may be *techniques* for promoting the use of certain *sequences or patterns of operations* over others. If primary epistemics distinguishes superior from inferior processes, it is natural to try to *promote the better* over the worse. A challenge is then extended to educational theory to devise techniques for achieving this end. [11]

In other words, given the assumptions underlying IP theory, it is both understandable and predictable that researchers would advocate "techniques" for "inculcating and training" those "sequences or patterns of operations" that are assumed to be "better processes" for promoting cognitive development. That is exactly what is, in fact, advocated. For example, in his review of the research on cognition, Bereiter notes that cognitive research "seems to be converging on one or two coherent

envisionments". The envisionments are concerned with, "things that might be called "cognitive approaches" to education". [12]

Among the "envisionments " noted by Bereiter are: i) cognitive teaching, ii) education for expertise, and, iii) teaching tacit knowledge. Cognitive teaching is in fact, described as "cognitive apprenticeship", an instructional approach advocated by Collins, Brown and Newman. Significantly, the Brown in this case, is the same Brown who is recognized for her work in metacognitive theory (See Chapter 2) and who advocates that students can be trained to exercise metacognitive control over mental operations. The apprenticeship model stresses cognitive modelling on the part of the coach of the thought processes that are "involved in expert performance". Collins et al note that there is an important difference between "formal schooling and "apprenticeship", namely that:

> Perhaps as a by-product of the relegation of learning to schools, skills and knowledge have become abstracted from their uses in the world. In apprenticeship learning, on the other hand, target skills are not only continually in use by skilled practitioners, but are instrumental to the accomplishment of meaningful tasks. [13]

This is a curious comment. Prima facie, the researchers seem to be implying that learning ought not to be "relegated" to schools because schools "abstract" skills from their uses in the "world". On the other hand, they may be suggesting that schools *ought to* be concerned with the "target skills" and their relationship to the world, in a less "abstract" manner. Arguably, the latter interpretation of the statement provides an accurate description of what is meant by "cognitive training".

The idea that learning is associated with meaningful tasks and that such tasks are best accomplished by exercising the target skills associated with modelling thought

processes is typical of Brown's metacognitive approach to cognitive training. In other words, learning is a matter of monitoring and controlling first-order thinking processes by means of second-order processes. This construal fits comfortably with Goldman's causal theory of justification and his challenge to education to "inculcate" and "train" appropriate "habits" in students' "cognitive repertoires". Notwithstanding the distinction between schooling and apprenticeship, Bereiter observes that "the six methods identified by Collins, Brown and Newman, appear to be characteristic of the instructional approaches emerging from cognitive research." [14]

Bereiter's envisionment of "education for expertise" is significantly, not "educational" in terms of its implementation. As Bereiter observes:

> The literature on expertise, it must be recognized, is largely silent on the question of educational means. Two handy words, "experience" and "practice" paper over the large gap that should be filled by a theory of acquisition. The literature does, however, *offer pointers to kinds of research that should yield educationally useful knowledge*. [15] (italics added)

The final envisionment of a cognitive approach to education is something Bereiter calls, "identification of teachable components of tacit knowledge". As might be expected from its label, this approach does not offer any significant insights concerning the particularly human achievements through education. Rather, it advocates that what humans achieve through education can be explained in terms of what can be taught to a machine. For example:

> Expert systems embody experts' knowledge in rules, which, since they have in a sense been taught to a machine, can be potentially be taught to human learners.[16]

There seem to be two ways of looking at the picture of the relationship between IP and education. On one hand, it would seem that the direct research on IP theory has no interest in what counts as knowledge acquisition, cognitive development and learning in an educational sense. On this view, it follows that IP is not relevant to education. On the other hand, the educational recommendations made by those researchers who apply IP theory to educational research seem to suggest that education ought to be a matter of training and inculcating "computer-like" processes into the minds of the young.

The Conventionalist Approach: The Voice of Liberal Education

Oakeshott argues that when the human sciences are conceived as natural sciences, there is an implicit suggestion that science will "restore exactness" to our understanding of learning and the acquisition of knowledge. He claims that this is not, in fact, the case. Rather, the scientific explanations add categorical confusion to our limited understanding of learning. Although he does not refer to IP directly, Oakeshott is particularly opposed to the sort of description offered by IP theory. He comments:

> The investigation of human actions and utterances and the practices and relationships to which they may subscribe as if they were non-intelligent components of a 'process', or the functional constituents of a 'system', which do not have to learn their parts in order to play them...is to remove human action and utterance from the category of intelligent goings-on. [17]

The various processes involved in constructing a computer model capable of "learning to read", is an example often used by cognitive scientists to demonstrate the significant advances made in the field of artificial intelligence. However, Oakeshott notes that what is being "replicated" by the model is not, in fact, what goes on in the human version of "learning to read".

> Learning to read or to listen is a slow and exacting engagement, having little or nothing to do with acquiring information. It is learning to follow, to understand, and to rethink deliberate expressions of rational consciousness; it is learning to recognize the fine shades of meaning without overbalancing into the lunacy of 'decoding'; it is allowing another's thoughts to re-enact themselves in one's own mind; it is learning in acts of constantly surprised attention to submit to, to understand and to respond to what (in this response) becomes a part of our understanding of ourselves. [18]

The phrase 'cognitive development' is rarely used by advocates of the conventionalist approach. Based on their fundamental assumptions that: i) 'mind' is a concept used to pick out human intentionality, and; ii) worthwhile knowledge and understanding are achieved by engaging with the forms of knowledge, the conventionalist view holds that what is necessary for "cognitive development" is an educational engagement with worthwhile knowledge, i.e., development of 'mind'. In this sense, the conventionalist approach takes a normative, i.e., evaluative, view of learning and of what *ought* to be learned. The underlying assumption on the conventionalist view is that cognitive development is concerned with the development of human linguistic, rational and social capacities.

Developing Human Capacities

A significant aspect of the human capacity for thought is what might be called the "recursive" or "transformational" quality of human thinking. Humans, generally-speaking, develop their various capacities through the acquisition of knowledge, improving a variety of skills, and reflecting on the relevance of their various experiences. However, as each capacity develops, it simultaneously *transforms*, i.e., enhances, the other capacities. For example, the ability to use language transforms the ability to reason which in turn, transforms one's interactions with others and changes the nature of one's

experiences. Further, the nature of an individual's experiences in turn affects the scope and degree of the particular skills and knowledge that are developed, which further develops the capacities, etc. Hirst suggests this sort of transformation when he points out, among other things, the importance of experience and conceptualization to human cognitive development. He says that "to have a mind basically involves coming to have experience articulated by means of various conceptual schemata." [19]

The transformational ability of the human 'mind' could be described as being on a continuum. At one end of the continuum, say, the basic end, Dretske notes that transformation is involved in changing sensory perception to cognitive perception, i.e. the ability to distinguish "seeing" a cat, from seeing "that it is" a cat. At the other end of the continuum of transformation, is the ability to transform one's experience, skills and knowledge into what Peters describes as a cognitive perspective or what Oakeshott describes as "conditional platforms of understanding". [20]

The ability to transform one's experience in this way is more than just the ability to add to one's repertoire of information, an observation which is made by several philosophers of education. Further this ability does not develop "naturally". Rather, it involves coming to understand a complex interrelationship between language, concepts, underlying principles, meaning, etc., that constitute various forms of knowledge.

Of the infinite list of conditions that affect human cognitive development, e.g., environmental factors, maturation, experience, etc., some conditions are particularly significant. That is to say, without these conditions, the other factors cannot lead to the sophisticated cognitive development and dispositions of the educated human adult. These

conditions are (minimally): language acquisition; self-awareness or self-consciousness; the acquisition of knowledge, and; the ability to reason. These conditions are the necessary criteria for the cognitive development of the human mind.

The conventionalist approach to the development of mind is concerned with the distinctive features of the human mind, in particular with what humans think about, namely, their beliefs, desires, intentions etc. The cognitive development of human thought (from the naive beliefs and desires of the young to the sophisticated perspectives of educated adults) is a matter of deliberate effort to ensure the maximal development of the individual's rational, linguistic and social capacities.

Learning as a Normative Engagement

On Oakeshott's view, to think of learning as a matter of unconscious causal processes is to miss what is most important about the concept. Whereas causal processes imply determinism and a consequent lack of individual responsibility or choice, Oakeshott argues that learning can entail a sense of an individual's responsibility for his or her thoughts. He points out that thoughts, beliefs, doubts etc., imply an awareness of one's ignorance. The expression of one's doubts, beliefs, etc. in utterances is something that, on Oakeshott's view, must be learned. Learning involves a desire to come to know, it involves a personal effort which is exerted for particular reasons. It is something that one can only do for oneself. Oakeshott claims:

> A learner is not a passive recipient of impressions, nor one whose accomplishments spring from mere reactions to circumstances, nor one who attempts nothing he does not know how to accomplish.. . he wants to know what to think and what to believe and not merely what to do. Learning concerns conduct, not behaviour. [20]

This is not to say that learning cannot, in some cases, be simply be a matter of accident, i.e. the non-intentional acquisition of behavioural mannerisms or expressions, etc. Nor is it to say that learning is not, in some cases, a matter of habit or practice, as in the case of "rote-learning" or "skill development". However, it *is* to say that learning can be, and often is, much *more* than an accidental, habitual or routinized occurrence. For example, Oakeshott notes that:

> Learning is a comprehensive engagement in which we come to know ourselves and the world around us. It is a paradoxical activity: it is doing and submitting at the same time. And its achievements range from merely being aware, to what may be called understanding and being able to explain. [21]

Without the constraints of a particular "model" of learning, Oakeshott observes that the criteria for the correct application of the concept of learning include the particularly human attributes of choice and self-direction. Learning is not passive. Rather it is an active, reflective engagement which involves self-consciousness and consciousness of the world in which one exists. Oakeshott argues that:

> By learning, I mean an activity possible only to an intelligence capable of choice and self-direction in relation to its own impulses and to the world around him. These, of course, are pre-eminently human characteristics. [23]

On Oakeshott's account, learning is much more than the acquisition of information. It is concerned with "perceptions, ideas, beliefs, emotions, sensibilities, recognitions, discriminations, theorems" and with "all that goes on to constitute a human condition". He claims that:

> Human learning is a reflective engagement in which what is learned is not merely a detached fragment of information but is understood or misunderstood and is expressed in words which have meanings. [24]

Scheffler echoes Oakeshott's observations about the intentional and conscious aspects of learning in respect to knowledge. He also notes the particularly normative element of knowledge as it applies to both the learner and the teacher. That is, on Scheffler's view, the element of judgement or reasoned deliberation is essential to knowledge claims. For example, Scheffler notes that:

> 'Knowing that' attributions reflect the truth judgements and critical standards of the speaker; they commit him substantively to the beliefs he is assigning to others, and they hinge on the particular criteria of backing for beliefs, which he adopts. [25]

Scheffler notes that the term 'learning' has two uses. The first is a "tutorial use", which implies coming to believe that Q but does not imply knowing that Q, except knowing in a *weak* sense. The second use is a "discovery use", in which something is learned through investigation of relevant evidence. Scheffler points out that this can be a case of knowing in the *strong* sense.[26] The variations in the distinctions are due to the relative difficulty of what it is that is being learned. If p is simple, we may know that p immediately, however, if p is complex, we may only believe that p. The difficulty of learning p, according to Scheffler, is determined by both the technicality or complexity of the subject and by the method by which belief is acquired. Scheffler observes that learning,

> Takes place . . . by emulation, observation, identification, wonder, supposition, dream, imitation, doubt, action, conflict, ambition, participation, and regret. It is a matter of insight and perception, invention and self-knowledge, intimation and feeling. [27]

The *normative* considerations of rationality, critical reflection and judgement are the relevant criteria for learning which leads to "strong knowing as an outcome". Scheffler notes:

> Emphasis on teaching, with its distinctive connotations of rational explanation and critical dialogue, may have the same point: to develop a sort of learning in which the student will be capable of backing his beliefs by appropriate and sufficient means. [28]

In addition, Scheffler notes the significance of the idea of understanding, which is deemed to be a desirable attainment of both teaching and learning. Understanding is related to knowledge, but is more than knowledge. Scheffler comments:

> What constitutes understanding if it is not simply familiarity or skill of a certain sort is a separate question. Some have suggested that understanding involves something analogous to perception: seeing the point. Or it might be construed to include having explained or paraphrased the doctrine in question in special terms, initially intelligible to the person. Or, again, it might be thought to require a certain degree of experience or maturity (as in understanding Shakespeare's plays). However we interpret it, it seems *not* to reduce to the subject use of *know*. [29]

Educating For Enlightenment

As noted in Chapter 3, the conventionalist conception of liberal education has its origins in the seven Greek liberal arts. On this conception, education offers an avenue of intellectual freedom from ignorance through the development of a cognitive perspective, i.e., a way of seeing the world that is based on a depth and breadth of understanding. This sort of education is often referred to as education for enlightenment and is distinguished from socialization (enculturation) and training (the acquisition of skills).

Training vs Education

Peters distinguishes 'training' according to 3 criteria: i) there is some specifiable type of performance that has to be mastered; ii) practice is required for the mastery of it, and; iii) little emphasis is placed on the underlying rationale.[30] Peters points out that "we do not call a person educated who has simply mastered a skill even though the skill may be very worth-while". In addition, according to Peters, an educated person "must also know that certain things are the case"; must have "developed some sort of conceptual scheme at least in the area in which he [or she] is skilled"; and "must have organized a fair amount of information by means of it".[31] Peters argues that:

> To be educated requires also some understanding of principles, of the 'reason why' of things. . . the knowledge which a [person] must possess to qualify as being educated must be built into his [or her] way of looking at things. It cannot be merely inert. . . for 'education' implies that a [person's] outlook is transformed by what he [or she] knows.[32]

In contrast to training, Peters summarizes the main criteria which are to be satisfied by an 'educated person'. First, such a person is one whose "form of life" - as exhibited in his or her conduct, the activities to which he or she is committed, and in his or her judgements and feelings - "is thought to be desirable". Secondly, an educated person is one who, whatever he or she is trained to do, "must have knowledge, not just knack, and an understanding of principles". The educated person's form of life must also "exhibit some mastery of forms of thought and awareness which are not harnessed purely to utilitarian or vocational purposes or completely confined to one mode". Finally, the educated person's knowledge and understanding must not "be inert" - either in the sense that they make no difference to his or her "general view of the world", his or her

"actions within it and reactions to it", or "in the sense that they involve no concern for the standards immanent in forms of thought and awareness as well as the ability to attain them".[33]

On Peters' view, 'education' is a normative concept, that is, 'education' restricts the manner in which it is carried out. For example, Peters claims that "talk of 'education' then, from the inside of a form of life, is inseparable from talk of what is worth-while, but with the additional notion written into it that what is worth-while has been or is being transmitted in a morally unobjectionable manner."[34] He specifies that the learner must display both "wittingness and voluntariness", a "commitment which comes through being on the inside of a form", and "must care about standards such as clarity, etc". Peters argues that:

> A [person] cannot really understand what it is to think scientifically unless he [or she] not only knows that evidence must be found for assumptions, but cares that it should be found: in forms of thought where proof is possible, cogency and simplicity, and elegance must be found to matter. And what would historical or philosophical thought amount to if there was no concern about relevance or coherence? All forms of thought and awareness have their own internal standards of appraisal. To be on the inside of them is both to understand this and to care.[35]

Scheffler, citing Peters, supports the view that 'education' is a normative concept. For example, he says that "when I describe myself as educating, I am typically making a claim of value with respect to my goals; I am speaking *normatively* rather than *descriptively*".[36] Scheffler specifically notes the contrast between education and information. He points out that this contrast is particularly important in the present period "in which the computer model of education has become so prevalent". Scheffler argues that:

> The notion of education as consisting in a treasury of information, that is, in a so-called database, which can be called up at will by the student, or metaphorically by the mind of the student, is detrimental to any likely view of education as requiring understanding.[37]

He claims (echoing Oakeshott) that an item of information is "hardly understood" unless, "you know to what it relates" and, "you can apply it intelligently when relevant to the problem you are trying to solve". Scheffler argues that the "notion of education as information" leaves out of the account, "the ability to raise a question" which differs from "the ability to supply an informative answer." [38] Scheffler concludes that:

> The normative conception of education implies that you must not merely be able to formulate a question to which an item of known information might be relevant... a whole panoply of competencies surrounds any bit of information and its omission trivializes the normative notion of education... you need to include these competencies if you are not to distort the concept beyond recognition. [39]

In his argument for the importance of a cognitive perspective to education, Scheffler makes a significant point about cognitive perception. His point is related to Dretske's point (this chapter) about the *transformative* aspect of cognitive perception through "experience, learning, study and practice". Scheffler also notes that:

> The idea of a cognitive perspective, in short, embodies an emphasis on breadth of knowledge, on the possession of principles, on the activity of the mind, and on the *transformation of perception*. [40]

The "transformation of perception" is Dretske's argument for the importance of his distinction between sensory and cognitive perception. The idea of cognitive perception implies that the beliefs gained by means of sensory perception must be transformed into knowledge by cognitive perception. This idea is intriguing - however, it seems to make more sense to say that sensory perception is transformed *by* knowledge *into* cognitive perception. The transformation entails language acquisition and some sort of conceptual

schema. Scheffler adds the point that cognitive perception can be further transformed through education to yield a "cognitive perspective", which is more like what we mean by understanding.

If the distinctions made by Dretske, Peters, Oakeshott and Scheffler are correct, then a non-normative account of the processes of knowing and learning is not an 'educational' account. IP is (at best) an explanation of a "prerequisite" for education - a first step in the complex process which culminates in understanding. The normative account of the achievement of knowledge, learning through teaching, and understanding gained through education is the sort of cognitive development that Hirst describes as the "development of mind". In the light of the distinctions noted in the final section of this chapter, Hirst's description of this development reflects a much deeper understanding than may have originally been attributed to it:

> To acquire knowledge is to learn to see, to experience the world in a way otherwise unknown, and thereby come to have a mind in a fuller sense . . . It is only because man has over millennia objectified and progressively developed [conceptual schemas] that he has achieved the forms of human knowledge and the possibility of the development of mind as we know it is open to us today. [41]

Engagement and Transformation

The notions of engagement and transformation are particularly significant to the account of liberal education. The term 'engagement' is used by liberal educators to refer to that qualitative aspect of learning that emphasizes an individual's effort and commitment to learn to understand solely for the sake of learning. Thus the phrase 'liberal learning' was favoured by Oakeshott. Similarly, the notion of engagement is related to Peters' criterion of value - specifically, the non-instrumental value of

knowledge and understanding, to Oakeshott's view of human conduct, and to what is meant by 'understanding' in Hirst's forms of knowledge.

The liberal notion of 'engagement' is related to the transformational aspect of learning. It is through "engaging with" a form of knowledge that one comes to understand, i.e., one's cognitive perspective is transformed by knowledge. It may be that these terms are meaningful in that they describe what it is to understand the internal logic of the forms of knowledge. For example, Hirst points out that learning which involves understanding is "an engagement with the beliefs, practices and sentiments of others so that one comes to think, believe, feel and imagine for oneself" [42] and Peters talks about "engaging in" the activity of justification.

The notion of being "on the inside of a form of knowledge" as previously noted by Peters, and of interrogating the assumptions and justifications of its fundamental principles, illustrates the essentially transformative nature of this type of engagement. The individual in this sense is "enmeshed within" the forms of knowledge, seeking to enhance his cognitive perspective.

Scheffler views educational engagement as a "triadic" transaction between the teacher, the learner and what it is that is being learned. In other words, according to Scheffler, "someone" *teaches* "something" *to* "someone else". In this transaction, the teacher provides a role model for the learner. The teacher *exemplifies* the quest for understanding, articulates the value of coming to know and is a source of guidance for the learner within the forms of knowledge. The teacher shares the distinctive language, methodology and particular questions related to whatever form or forms are being

discussed, pointing out assumptions, justifications and fundamental principles related to the form. In this way, the learner gains vision or new insight into his experience. Scheffler says:

> Teaching is consummated in the student's own insight . . . For, having acquired this learning not merely by external suggestion but through a personal engagement with reality, the student can appreciate the particular fit which his theories have with real circumstances, and, hence, the proper occasions for them to be brought into play. [43]

Educational engagement on the liberal view is a self-imposed undertaking - an inquiry about the world and about one's relationship to it. It is an extension of the human engagement to understand, which involves education when it becomes necessary for the individual to further his or her understanding through the forms of knowledge in order to develop a more sophisticated cognitive perspective. The engagement is of a substantive nature in that it is necessarily concerned with knowledge deemed to be worthwhile in the quest for understanding. The undertaking is not for personal gain in the sense of instrumental reward, it is rather a non-instrumental pursuit to satisfy the inquiring mind. As Oakeshott says, it is a self-imposed inquiry "to find out what is going on".

Summary

Following their incommensurate assumptions about mind and knowledge, the two approaches to the development of mind hold incommensurate assumptions about both the importance of education and/or what is meant by the concept. Further, advocates of the computational approach seem to hold two different views about the significance of education to their research. On one hand, the researchers, i.e., scientists, who are directly concerned with the development of IP theory rarely, if ever, mention education

in their literature. One can only speculate why this is the case. For example, these researchers may assume that education is not relevant to their construal of cognitive development. It might be the case that they see education as peripheral to their particular model, or they may assume that whatever education contributes will be reflected in changes to the brain (via sensory input) - thus it is captured by the model.

On the other hand, the researchers who are concerned with the application of IP theory to educational theory and practice, conflate education with schooling and suggest that skill development following IP theory, i.e., cognitive training, has some sort of "educational" merit. In contrast to both views, the conventionalist approach holds that cognitive development, i.e., the development of mind, is essentially an *educational* engagement.

The incommensurate conceptions of 'education' are based in part on deeper assumptions about the nature of learning and cognitive development. On the computational approach, learning appears to be solely a matter of *natural* processes that are common to both humans and machines. In contrast, the conventionalist approach holds that "liberal" learning has a *normative entailment* which includes a deliberate, particularly human effort to achieve something of worth.

IP is a scientific approach to cognitive development, i.e., cognitive change - it is concerned with *descriptions of the natural functions* of cognitive processes and mechanisms. The goal of some advocates of this view is to train students to develop skills related to the highly-efficient manipulation of information for the purposes of problem-solving. In contrast, liberal educators are concerned with the criteria for

developing the educated person in accordance with an ideal of human betterment. The notion of cognitive training implies that if 'education' is valuable in any sense, the value is instrumental, i.e., useful for some further purpose. Liberal education holds that although education may have an instrumental value, the achievement of worthwhile knowledge and understanding also has intrinsic value, i.e., it is worthwhile in and of itself.

Notes: Chapter 6

1. H. Simon & C. Kaplan (1993) "Foundations of Cognitive Science", 39 in *Foundations of Cognitive Science* Posner, M. (ed) (Cambridge: MIT Press)

2. Ibid., 39

3. Ibid., 42-43

4. K. VanLehn (1993) "Problem solving and Cognitive Skill Acquisition" 529 in *Foundations of Cognitive Science* Posner, M. (ed) (Cambridge: MIT Press)

5. Ibid., 529

6. Ibid., 530

7. Robert Sternberg (1990) *Metaphors of Mind* 143-144 (Cambridge University Press)

8. Ibid., 140

9. Ibid., 140

10. Ibid., 145

11. Alvin Goldman (1986) *Epistemology and Cognition* 380 (Cambridge: Harvard University Press)

12. Carl Bereiter & Marlene Scardemalia (1992) "Cognition and Curriculum" 532 in: P. Jackson (ed) *AERA Handbook of Research on Curriculum* (New York: MacMillan)

13. Ibid., Bereiter cites Allan Collins, John Seely Brown, and Susan E. Newman (1989) "Cognitive Apprenticeship: Teaching the Crafts of Reading, Writing and Mathematics" in *Knowing, Learning and Instruction: Essays in Honor of Robert Glaser*, edited by Lauren B. Resnick 454-494 (NJ:Erlbaum)

14. Ibid.,532

15. Ibid., 534

16. Ibid., 534

17. Michael Oakeshott (1989) "Learning and Teaching" 35 in *The Voice of Liberal Learning* Fuller,T. (ed) (London: Yale University Press)

18. Ibid., 69

19. Paul Hirst (1974) "Liberal Education and the Nature of Knowledge" 41 in *Knowledge and the Curriculum* Hirst (ed) (London: Routledge & Kegan Paul)

20. Michael Oakeshott (1975) *On Human Conduct* 1 (Oxford: Oxford University Press)

21. Oakeshott, *Learning*, 44

22. Ibid., 43

23. Ibid., 43

24. Ibid., 22

25. Israel Scheffler (1965) *Conditions of Knowledge* 13 (Chicago: University of Chicago Press)

27. Israel Scheffler (1991) *In Praise of the Cognitive Emotions* 90 (London: Routledge)

28. Scheffler, *Conditions*, 10

29. Ibid., 18

30. Richard S. Peters (1967) "What is an Educational Process?" 15 in *The Concept of Education* (London: Routledge & Kegan Paul)

31. Ibid., 6

32. Ibid., 7

33. Ibid., 9

34. Ibid., 5

35. Ibid., 8. See also Richard Peters (1973) "The Justification of Education" 240 in *Philosophy of Education* (Oxford: Oxford University Press). Peters' "neo-Kantian" argument in this article is often called his transcendental argument for education (which was noted in the abstract).

36. V. Howard and Israel Scheffler (1995) *Work, Education and Leadership* (New York: Peter Lang) 82. See Ch. 5 "The Concept of the Educated Person" where Scheffler

refers to R.S. Peters' work. See for examples: R.S. Peters (1960) *Authority, Responsibility and Education* (NY: Paul S. Eriksson Inc.); R.S. Peters ed. (1967) *The Concept of Education* (London:Routledge & Kegan Paul Limited); R.S. Peters ed. (1973) *The Philosophy of Education* (Oxford: Oxford University Press)

37. Ibid., 83

38. Ibid.

39. Ibid.

40. Ibid.

41. Hirst, *Liberal*, 40-41

42. Ibid., 102-103

43. Israel Scheffler (1967) "Philosophical Models of Teaching" 127 in *Concept of Education*, R.S. Peters (ed) (London: Routledge and Kegan Paul)

Section III:

Part 1: The Question of Compatibility

PREFACE

When two paradigms are incommensurate in the "weak sense" of incommensurability, they are not "rival" paradigms. This is to say that one paradigm cannot replace the other due to, say its better explanatory value. As "explanatory value" would be judged by a different set of criteria on each paradigm, we have no further independent set of criteria by which we can evaluate such merit. Phillips observes further that in a case of weak incommensurability, the two paradigms are *not incompatible* - "a person is free to accept both of them".

The computational and conventionalist approaches to the development of mind appear to be in the class of incommensurable paradigms in the weak sense. Thus on Phillips view, it would appear that educators "are free" to accept both approaches. There are (at least) three problems with this corollary. The first problem can be rephrased as a question of semantics - if two paradigms are not incompatible, does it follow that they *are* compatible? In other words, does a lack of incompatibility presuppose compatibility? To put the question simply - is an individual cognizer really "free" to accept both paradigms?

The second problem is conceptual, and follows from the first - does 'acceptance' imply that one believes something to be the case? To clarify, it seems that one could "accept" that both paradigms exist - that each has its set of concepts, its fundamental assumptions, its advocates, etc. This notion is not significantly different from Hirst's thesis about the different forms of knowledge, in which each discipline could be seen as an incommensurable paradigm in the weak sense. On the Hirstian view, this is merely

to "accept" that one paradigm provides a set of "fallible" empirical facts about human development whereas the other paradigm provides a set of philosophical arguments about what is important in human development. The two paradigms are clearly not rivals - nor is either one reducible to the other.

However, if "acceptance" is taken to imply that one *believes that something is the case*, then the question of whether an individual cognizer is "free" to accept both paradigms becomes a different sort of question. It seems that if this is what is meant by acceptance, then what is being suggested might involve some sort of reduction or replacement, notwithstanding the incommensurability. In the case of the two paradigms in question, to believe that the computational approach to the development of mind is the case, is to believe that humans do in fact conform to the model and that educators ought to implement the appropriate cognitive strategies which will ensure the appropriate development on this model. To say this is to say that the computational approach ought to influence educational theory and practice - the position which is at issue in this thesis.

A central premise in this thesis is that the three concepts in each paradigm are logically interrelated. They are based on interlocking fundamental assumptions about each of the three concepts. Thus, not only are the respective pairs of concepts incommensurate, but the underlying assumptions about the concepts are incommensurate. What is at issue in the fundamental assumptions are the ontological and metaphysical status of the mind, the epistemological position held in respect to the acquisition of knowledge and what is necessary and sufficient for the educational development of mind.

In other words, to advocate one or the other approach is not simply to argue that

the conceptions are properly construed and correctly applied but to hold (believe to be true) the fundamental assumptions that govern the application of the concepts. However, the fundamental assumptions, like their corresponding concepts, are constituted by different sorts of evidence and different criteria for what counts as convincing evidence. For the individual cognizer to "hold" (believe to be the case) both sets of assumptions at the same time is to suggest that one can hold a set of inconsistent beliefs. Similarly, to attempt to combine both paradigms in educational practice is either to "see" one approach in terms of the criteria or concepts which constitute the other (reduction) or to attempt to combine what might be called two "constitutively uncombinable" paradigms.[1] In this sense, given the uncombinability of the fundamental assumptions, it seems that an individual cognizer is not and could not under any circumstances, be "free" to hold (believe to be the case) both the computational and the conventionalist paradigms.

The third problem might be called one of "detachment". Can an individual cognizer "accept" one of the three concepts from one paradigm, say the IP concept of mind, and a different concept from the other paradigm, say the conventionalist concept of liberal education? Again, given the fundamental assumptions that govern the correct application of the concepts, if "acceptance" implies believing to be the case, then the idea of doing this is incoherent - it becomes a case of holding a set of inconsistent beliefs. This is not to say that an individual cognizer could not hold both the IP concept of mind and a conception of liberal education that is not the conventionalist interpretation of liberal education. In this case two questions must be answered. The first is "what is *this*

conception of education?" and the second is, "how does this conception account for the normative development of mind?"

It is beyond the scope of this thesis to argue for either the compatibility or incompatibility of the two approaches. It is sufficient for the purposes of the thesis to show that the two approaches are incommensurate and in so doing, to explain why IP theory is constitutively uncombinable with the educational development of mind on the conventionalist construal. However, it is within the scope of the thesis to point out several good reasons for educators to resist, i.e., be skeptical of, the educational merits of some claims made by IP theorists.

The purposes of Section III are twofold. Part 1 argues that there are good reasons (conceptual and methodological) for questioning the coherence of IP as a conception of mind. Chapter 7 is concerned with the illusory nature of IP. The chapter begins with a summary of Searle's critique of the information-processing model of mind, which is in his words, "the worst mistake in cognitive science". This is followed by a review and critique of two sources of conceptual confusion namely, metacognition and IP conceptions of knowledge. Chapter 8 examines the general assumption that the mind is an appropriate subject for scientific investigation. The methodological assumptions entailed by this approach are examined in respect to the canons of science and the use of models and "guiding" metaphors of mind. Part 2 contains the conclusions and implications that follow from the central argument of the thesis.

Notes

1. The notion of "constitutively uncombinable" goods is discussed in some detail by Gray in respect to Isaiah Berlin's work on value pluralism. See John Gray (1996) *Isaiah Berlin* 45-56 (NJ:Princeton University Press)

One of the worst mistakes in cognitive science...is to suppose that in the sense in which computers are used to process information, brains also process information. (Searle 223)
Searle, "Rediscovering the Mind"

Chapter 7
Conceptual Chimeras

The notion of a "chimera" implies utopian or unrealistic ideas. It is held to be a mythical creature which is made up of the parts of various animals. The computational approach is similarly, a composite - made up of various interrelated arguments from different fields, i.e., cognitive science, cognitive psychology and philosophical functionalism. Two additional aspects of the chimera are attributed to the computational approach in this chapter. The first, suggested by Searle's comment is that the notion of IP is, like the chimera, an unrealistic idea. The second aspect is the "elusive or vague" quality of the concepts which are central to the computational approach.

The analysis in Section II reveals that the computational approach to the development of mind is not relevant to 'educational' theory - the information-processing concept of 'mind', 'knowledge' construed as information and 'education' construed as cognitive training are stipulated conceptions that are posited by researchers for experimental purposes (from Section I). They are based on fundamental assumptions that are incommensurate with the underlying assumptions about the use of those concepts in an educational context (from Section II). For those researchers who would nevertheless argue that the two approaches are compatible, there are several conceptual problems that must be redressed if the advocates of the computational approach wish to make any sensible claims for compatibility.

The purpose of this chapter is to illuminate two issues related specifically to IP theory, that must be resolved. The first issue is Searle's argument that information-processing is a false, if not incoherent theory.[1] Searle argues that the human mind is not a physical phenomenon *such that it can be "discovered" by science.*[2] The second issue is the lack of conceptual clarity. Several conceptual "worries" from the literature which support this argument have been discussed in previous chapters, e.g., the problems of mental processes, the myth of private knowledge, etc. Two problems are worthy of further discussion in respect to conceptual confusion; i) the concept of metacognition (Chapter 2), and; ii) the proliferation of vague references to knowledge (Chapters 2 and 5). Significantly, criticisms of IP voiced from within the field of cognitive psychology are related to both the conceptual confusion and the influence of IP on conceptions of knowledge.

Fallacious Assumptions About "The Mind"

Searle's claim that the computational analogy is "one of the greatest mistakes in cognitive science" strongly suggests that the concept of mind as an information-processing system is, in fact, the sort of intellectual myth produced by what Hacker has labelled "scientism" (Chapter 4). According to Searle, the mythical status of IP is due to its relation to a deeper myth, namely, the myth of scientific materialism, i.e., the belief that mental events can be discovered and explained by physical laws.

On Searle's view the supposition that the mind is analogous to a computer program is mistaken in four respects. The first mistake is to assume that syntax is intrinsic to physics. [3] In order to take this point we need to understand the significance

of "syntax" and to know what Searle means by "intrinsic to physics". Searle is a philosopher of language and holds that any philosophy of mind is related in important ways to philosophy of language. In philosophy of language, structural elements (syntax) are contrasted with meaning elements (semantics). The structure of language is an intrinsic or embedded feature of language, whereas semantics, i.e., meaning is extrinsic or socially assigned. That syntax is not sufficient for semantics. i.e., mental contents, is the subject of Searle's famous "chinese room " argument in which he claims that given the structure of a language, one can perform tasks in that language, without understanding what the words mean.

One way in which computation models of the brain differ from other computational models, the argument goes, is that both the brain and the computer *function* as formal symbolic systems. When looked at in this way, it seems that the syntax of a symbolic language is intrinsic to both brains and computers. Thus the program or syntax, an intrinsic "language of thought" is deemed to be a suitable subject of scientific study. Searle argues that this is mistaken, that syntax is not the name of a physical feature like mass and gravity, that computation is an "observer relative" feature of the world except for the few cases in which computation is being performed by a conscious mind. Searle says:

> Notions such as computation, algorithm and program do not name intrinsic features of systems. Computational states are not *discovered* within the physics, they are assigned to the physics. This is a different argument from the chinese room argument [which] showed that semantics is not intrinsic to syntax. I am now making the separate and different point that syntax is not intrinsic to physics.[4] (italics added)

When we understand that syntax is not intrinsic to physics, it follows that the language of thought hypothesis is incoherent. As Searle points out, "There is no way you could discover that there are, intrinsically, unknown sentences in your head because something is a sentence only relative to some agent or user who uses it as a sentence."[5]

A similar distinction can be made in the case of natural science. The natural science of physics is the study of intrinsic features of the world such as the mass of objects which would exist even "if we all died". Other features of the world are observer relative, such as the observable fact that a particular mass is assigned, say, the function of a bathtub. Searle notes that, "there is a natural science that includes mass in its domain, but there is no natural science of bathtubs." [6]

Searle observes a further problem when computation is taken to be an intrinsic feature of the world, namely that it can be realized in a multiplicity of ways. When computation is a program of instructions and each instruction specifies a condition and an action to be carried out if the condition is satisfied, then anything that could be seen as following this pattern, for example, thermostats or sets of levers, would count as computational. [7] In fact, says Searle, according to cognitive scientists, a computational machine could be made out of anything, "cats and mice and cheese and levers or waterpipes or pigeons." [8] Searle argues:

> The really deep problem is that syntax is an observer relative notion. The multiple realizability of computationally equivalent processes in different physical media is not just a sign that the processes are abstract, but that they are not intrinsic to the system at all. They depend on interpretation from outside.[9]

Searle's argument on this point can be summarized as follows: i) The aim of natural science is to discover intrinsic features of the world. ii) Observer relative or

assigned features are not intrinsic features. iii) Computation is an observer relative, i.e., assigned feature. iv) Therefore, cognitive science cannot "discover" computation in the world.[10]

Searle admits that we could no doubt discover patterns of events in human brains that are isomorphic to the implementation of programs in a computer. However, to say that something is *functioning* as a computational process is to say something more than that a pattern of physical events is occurring. The idea of functioning as a computational process requires that some outside agent assigns that interpretation to a particular process. This observation leads Searle to point out the second mistake in the computational analogy, namely, to try to solve the problem of agency and syntax by means of an homunculus.

This move produces what Searle calls the homunculus fallacy.[11] Again, to take his point, we need to know what Searle means by an homunculus and why the use of this device leads to a fallacy. The homunculus is a traditional literary device positing a "little person" in the mind, a trickster responsible for uncontrollable acts. The device has been used by cognitive psychologists in explanations of "meta-theories" to describe the theoretical entity in charge when we "think about our thinking". The notion of an homunculus raises the spectre of a regression problem observed by William James in his early discussions of consciousness:

> The thinker cannot divide himself in two, of whom one reasons whilst the other observes him reason. The organ observed and the organ observing being, in this case, identical, how could observation take place? [12]

To avoid the consequences of this puzzle, James enigmatically concluded that "*the thoughts themselves are the thinkers.*" [13] (italics added)

The homunculus is necessary to avoid an infinite regress when describing "who" or "what" it is that judges or observes our own mental events or to whom the "inner eye" belongs. Searle observes that cognitive scientists use variations of the homunculus to describe the program user or implementer in the computer-brain analogy:

> The idea always is to treat the brain as if there were some agent inside it using it to compute with. . . it looks as if we have to invoke a homunculus inside the system to treat its operations as genuinely computational. [14]

Recognizing that the homunculus is simply a device to provide a theoretical "user" for the syntax or language of thought, it then must be explained away by the researchers. To do this they posit other homunculi with progressively decreasing powers of intelligence. Thus, what it is that the original "chief" homunculi theoretically does can be explained by lesser homunculi doing a variety of tasks, which in turn is explained by more homunculi performing still lower level tasks until eventually we have reduced the tasks to those actually performed in the brain by neural activities.

Searle notes that on this argument, "Only the bottom level really exists; the top levels are all just as-if." [15] The problem then becomes that without the homunculus, there is no entity to interact with the syntax.

> The attempt to eliminate the homunculus fallacy through recursive decomposition fails, because the only way to get the syntax intrinsic to the physics is to put a homunculus in the physics... if we are to suppose that the brain is a digital computer, we are still faced with the question, "And who is the user?" [16]

Searle's argument on this point is: i) to say that something functions as a computer we must identify a user; ii) the homunculus does not qualify as a real user and

it cannot be explained away by the notion of lesser homunculi, and iii) therefore, if there were a syntax, i.e., a language of thought, there is no internal entity to interact with the syntax.

The third mistake in the computational analogy is to assume that syntax has some sort of causal power. This mistake is based on a distinction between "levels" of explanation. The standard account is that the relation between cognition and computer programs is explained at three different levels, namely, hardware (the brain), program (mental processes and mechanisms) and intentionality (knowledge level). The contribution of cognitive science on this account is at the program level. Thus, cognitive science, quite rightly, is concerned with the mental mechanisms that cause the production of mental phenomena in a manner similar to that in which biological mechanisms cause biological phenomena. The argument is that

> The mechanisms by which brain processes produce cognition are supposed to be computational, and by specifying the programs we will have specified the causes of cognition. [17]

For Searle, this distinction moves cognitive theory from a state of falsity to one of incoherence. Humans consciously follow rules when performing computations and similarly, humans can program computers to perform certain operations which accord with those rules. The computer doesn't *literally* follow rules, in fact it can't, because, as Searle points out, "it has no intentional content intrinsic to the system that is functioning causally to produce this behaviour". [18]

To clarify this point, the basis of the account of the brain as an information-processor is the notion that internal programs are the cause of intentional thinking.

Searle's argument is that without an homunculus interacting with syntax to "cause" understanding in "accord with a set of rules", there is no basis for such a causal claim. He has demonstrated in his first two moves that the notions of intrinsic syntax and homunculi are fallacious. Thus, without a user, both the brain and the commercial computer have only patterns, and the patterns have no causal powers in addition to those which are implemented by the user. So it seems there is no way cognitivism could give a causal account of cognition.

> The implemented program has no causal powers other than those of the implementing medium because the program has no real existence, no ontology beyond that of the implementing medium. Physically speaking, there is no such thing as a separate program level. [19]

The final mistake is to assume that the brain does, in fact, perform information-processing. According to Searle, this is "in some ways, the central issue in all of this". He describes the process by which computers are programmed with encoded syntactical information by outside conscious agents. Once it has been programmed, the computer goes through a series of electrical stages that the outsider can interpret both syntactically and semantically even though the hardware has no intrinsic syntax or semantics. As Searle says, "it is all in the eye of the beholder". Finally an output is produced in the form of physical phenomena, e.g., a printout which an observer can interpret as symbols with a syntax and semantics. [20]

As humans our mental events are made up of real experiences with meaningful content, i.e., intrinsic intentionality. Searle says that "to confuse these events and processes with formal symbol manipulation is to confuse the reality with the model." [21] We can, with a computer, make an information-processing model of a particular event

or phenomenon, but that doesn't mean that the event or phenomenon is itself, an information processing system. Rather,

> The information in the brain is always specific to some modality or other. It is specific to thought or vision, or hearing, or touch, for example. The level of information-processing described in the cognitive science computational models of cognition, on the other hand, is simply a matter of getting a set of symbols as output in response to a set of symbols as input. [22]

In summary, what Searle has done is to outline the main arguments for information-processing and show that they are fallacious. The explanation for how knowledge arises provided by the computer analogy requires that we accept the following: i) that there is an intrinsic syntax, i.e., language of thought that can be discovered by means of scientific methods. Searle shows that this is logically impossible; ii) that the rule-based interaction between an internal homunculus and the posited symbolic language of thought causes intentionality, i.e., gives meaning to our everyday actions. Searle points out that there can be no such entity, no such syntax, no such interaction, and thus, no such causality. Therefore, what we mean by mind - our beliefs, desires, intentions etc., is in fact, *not explained* by IP theory.

The Problem of Conceptual Confusion

To the extent that IP is a "scientific" theory, the elusive quality of its central concepts can be explained in part (but not defended) by the criteria used to evaluate scientific research. The emphasis in the scientific community is on: i) scope, i.e., the degree to which a theory can be generalized; ii) parsimony, i.e., the simplicity of the theory; iii) testability, i.e., the ease with which a theory can be replicated, and iv) the empirical support, i.e., the available evidence for the theory. Thus, some vagueness may

not be deemed to be problematic by psychological researchers. As long as everyone in the scientific community recognizes what you are talking about, the question of clarity may not appear to be an important issue. This point is made by both Flavell and Sternberg (Chapter 2). Valentine further observes that some psychologists fear that explicit definitions will i) presuppose answers to questions to be asked, ii) be too imprecise, or, iii) be too restrictive.[23]

Several conceptual problems associated with M1 have been discussed in previous chapters: "introspection" and "internal mental processes" (Chapter 4), "private knowledge" (Chapter 5) and "learning" (Chapter 6). The two remaining problems are i) "metacognition" and its alleged relation to intelligence and ii) the proliferation of vague "knowledge" claims noted in Chapters 2 and 5. These problems are not unrelated and deserve a closer examination.

Metacognition

Metacognition is described by Brown et al as a "many-headed monster of obscure parentage" (note the allusion to a chimera) [24]. The notions of "mental processes", cognitive "mechanisms", "intelligence" and the "homunculus" are significant features in the various arguments for IP in the literature of cognitive psychology, cognitive science and philosophical functionalism. Vagueness and conceptual confusion are particularly evident in the work of metacognitive researchers such as Flavell, Brown and Sternberg. For example, metacognition is variously described as "thinking about one's own thinking", "one's knowledge concerning one's own cognitive processes and products or anything related to them", "exerting executive control over one's first order thinking

processes" and "specific realizations of control processes that are sometimes collectively (and loosely) referred to as the 'executive' or the 'homunculus'".

To take a minimal perspective, it would appear that thinking about one's own thinking may be nothing more than reflecting, i.e., thinking about one's past actions or what one previously thought about a particular topic. If that were the case, then metacognition does not require extensive empirical research. On the other hand, it seems that the researchers are taking metacognition to be a complex phenomenon, involving awareness of certain executive abilities that are concerned with reflecting more on *how* we think than on *what* we think about. Or maybe they are talking about the ability to control how we think about what we think. This suggests that we can think about *how* we think about *what* we think about. With that suggestion it becomes apparent that metacognitive theory leads to what is known as "a vicious regression". The regression is exacerbated by the presence of the homunculus which is designated by both Brown and Sternberg.

Confusion about the nature of metacognition is made more complicated when the phenomenon is linked (if not made synonymous) by Brown and Sternberg to the notion of intelligence. As noted by both Ryle and Scheffler (among many others), the concept of "intelligence" is far from conceptually clear. It is variously argued by Sternberg, Brown, and Flavell (among others) that intelligence is a "capacity", a "disposition" an "ability" etc. Debates are waged over whether intelligence is an innate ability, whether it is nurtured in certain sorts of environments or whether it is a combination of both. In particular, it is controversial whether intelligence is the sort of thing that can be

measured, and if so what it is in fact that is measured. Ryle notes that to attempt to explain "what makes the overt act a manifestation of intelligence" in terms of mental processes is to subscribe to the "dogma of the ghost in the machine." Ryle argues that what is *not* measured by "intelligence" is

> The occurrence in someone's hidden stream of consciousness of special processes functioning as ghostly harbingers or more specifically as occult causes of the performances so characterised...[or] an internal shadow-performance [that is] the real carrier of the intelligence ordinarily ascribed to the overt act. [25]

Thus, employing "intelligence" to explain or define metacognition seems to be misleading. If intelligence is merely a label for the ability to retrieve information and solve problems by means of information processing it is circular. Intelligence explains neither "how" mind is developed nor "what" it is that constitutes the developed mind. As the term 'intelligence' has enjoyed several decades of misunderstanding, it does not seem to serve the interests of clarity to say that intelligence is metacognition or that metacognition is intelligence. We still don't know exactly what it is that we are talking about.

A cursory survey indicates that Flavell, Brown and Sternberg use the terms 'thinking', 'thinking efficiently', 'understanding', 'knowing', 'knowledge', 'consciousness', 'imagining', conceptualizing', 'self-regulating', 'problem-solving', 'decision-making' and 'intelligence' to refer to metacognitive abilities or processes. A concept that can be described using this range of terms is either hopelessly vague or at the least, too broad to be useful. Further, the terminology used to explain the relationship between the processes is often complex and technical, i.e, psychological terminology that is not readily translated into ordinary language.

Flavell, Brown and Sternberg refer to relationships between second order processes that constitute control over first order processes. However the researchers do not clearly explain the nature of the relationships. Control appears to be a matter of "mental operations", "interacting components", "higher-order processes", "executive functions", "internal representations", "mental mechanisms", "conceptual representations", "specific realizations of control processes" and the like.

Both Brown and Sternberg rely heavily on the role of the homunculus in controlling the first order processes, however neither researcher fully explains the origin of the role nor attempts to respond to the regression problem, nor do they acknowledge that the problem exists. It might be argued that such metaphysical speculation has no place in rigorous scientific research or (more likely) that the homunculus is simply a figurative device used as *deus ex machina*. However, this does not solve the problem, for as Searle points out, when the homonculus is central to the theoretical explanation, then it follows that, without the homonculus, there is no theory.

Notwithstanding what may be good reasons for a lack of emphasis on clarity, the phenomenon of metacognition, as Brown acknowledges, suffers from conceptual confusion and researchers in the field such as Schoenfeld have called for conceptual clarification, e.g.,"the confusion about metacognition can be reduced if researchers respond to the challenge to explain "what it is, why it's important and what to do about it -- all in clear language". [26]

The problem of clarity in describing the nature of the phenomenon has interesting implications for accessing information about people's awareness of the phenomenon and

the problem of measuring the results of studies involving the phenomenon. To put the matter simply, if the researcher is not clear about what it is that he or she is trying to study, how can his or her "subjects" clearly understand what they are supposed to describe? Further, if the researcher is not clear about the nature of the phenomenon and the "subjects" of the research are consequently not clear about what it is that they are trying to describe, what exactly is it that the researcher is ultimately measuring?

Psychological "Knowledge" Claims

The plethora of vague references to knowledge made by IP researchers was noted in Chapter 2. It was "explained" (but not defended) in Chapter 5 as a concern with the nature of the knower and with the justification of beliefs, i.e., to "know" is to have beliefs which are justified by other beliefs etc. Significantly, there are increasing *concerns* with IP theory and its characterization of knowledge *within the field of psychology* itself. These concerns are being voiced in the psychological literature. For example, in a recent article de Jong and Ferguson-Hessler note that:

> Research in learning and instruction claims a central role for the concept of *knowledge*. The knowledge base of a person, it is now generally assumed, is made up of different types of knowledge [which are] attributed a wide variety of properties and qualities. [27]

De Jong and Ferguson-Hessler go on to isolate more than twenty-three different terms for knowledge used in contemporary psychological literature, e.g., concrete and abstract knowledge, elaborated and compiled knowledge, tacit or inert knowledge, "knowledge-acquisition" knowledge and metaknowledge, to name just a few. These authors argue that a classification or matrix is necessary to, "avoid the introduction of still more types of

knowledge that do nothing more than describe properties of generally accepted types of knowledge". [28]

In another example, Murphy and Woods voice their concern with "unanswered questions about knowledge" in the literature of psychology. These authors observe that, "one's understanding about the nature of knowledge, implicit or explicit", has an "immediate effect" on the way he or she "discusses, theorizes, and ultimately conducts research concerning knowledge".[29] Among the "unanswered questions" posed by the authors, is the following:

> As the research community's understanding of the nature of knowledge changes, how do researchers evaluate whether these changes enrich their perspective on persistent educational maladies such as misconceptions, inert knowledge, and lack of transfer? For instance, how will the shift from research that focuses on declarative knowledge to research that focuses on procedural knowledge... affect the way in which educators understand the construct of knowledge?[30]

There is increasing recognition in the psychological literature that concerns about knowledge are related to concerns about IP theory. For example, in a recent article, Reynolds et al discuss five psychological approaches to understanding knowledge acquisition and representation. The authors observe that, "the two major theoretical events of the cognitive revolution were the emergence of notions of mental knowledge representation and the "computational metaphor".[31] They argue that:

> Although each of these theories has merit in explaining certain aspects of knowledge acquisition, no approach adequately addresses the issues of consciousness, self-awareness, and self-reflection. Also we argue that viewing cognitive functioning through the lenses of machine metaphors is never likely to lead to an understanding of these issues. [32]

In another example, Meyer examines the role of IP theories in "the historical search" for a "guiding metaphor of educational psychology". In his characterization of

IP, Meyer notes that the role of the teacher is a "dispenser of information" and the role of the student is "a recipient of information". In his discussion of "learning as information-processing", Meyer notes that:

> Learning is a process of knowledge acquisition in which information is transmitted from the teacher to the learner. It follows that teachers are dispensers of information, and learners are information-processors. . . Neisser (1967) proclaimed "information is what is transformed, and the structured pattern of its transformations is what we want to understand". If knowledge is a series of symbols then learning becomes the transmission of symbols- often in a verbal form - from a teacher to a learner.[33]

Meyer summarizes the limitations of the information-processing approach, among which is the observation that, when information-processing is "interpreted in its most literal sense": i) it is most consistent with the view of learning as a "passive atomistic and mechanical process" and; ii) its "rigid view of cognition" ignores "important aspects" of psychology such as the "finding" that learning is an "active, schematic, and effortful process".[34]

In a final example, Martin discusses the "top ten problems of psychology" in a recent article. Among the "problems" noted by Martin, is the "trend toward 'Ameaningful' thought or inquiry" which "regards knowledge as the result of processing rather than discovery". On this trend, knowledge is presumed to be "an almost automatic result of a gimmickry, an assembly line, a "methodology."[35] Another problem is that the "inquiry practices" of psychologists "reflect a misunderstanding" of the notions of operational analysis and definition, i.e., "cues for" locating the meaning of a concept are taken to be "exhaustive of the (conceptual) meanings to which they are intended". A third problem noted by Martin is that:

> Psychological data are given the appearance of regularity to support the kinds of generalizations and "law-like" statements typical of a scientific enterprise. . . In many programs of psychological inquiry, reported statistical regularities fail to correspond to the actual actions or experiences of even a single individual contributor to the reported statistics".[36]

The conceptual confusion in the literature is marked by both Phillips and Valentine who argue that part of the problem is the assumption that investigation in the human sciences can be conducted on the same lines as that of the physical sciences. Phillips cites Wittgenstein to highlight a fundamental difference between the physical sciences, e.g., physics, and the human science of psychology. In a discussion comparing the two, Wittgenstein says, "in psychology there are experimental methods and conceptual confusion." [37]

Notes: Chapter 7

1. John Searle (1992) *The Rediscovery Of The Mind* 215 (London, MIT Press). Searle says:

> I used to believe that as a causal account, the cognitivist's theory was at least false, but I now am having difficulty formulating a version of it that is coherent even to the point where it could be an empirical thesis at all.

2. Although Searle's argument is used here in support of the conventionalist position, this is not to say that Searle subscribes to that position, i.e., Searle does not propose that we replace IP with the conventionalist conception of 'mind'. In fact, in "Rediscovery of the Mind", Searle subscribes to a view which he calls "biological naturalism"(1). On the other hand, there are similarities between Searle's notion of intentionality (particularly "collective intentionality") and the conventional view of 'mind'.

3. Ibid., 207

4. Ibid., p. 210

5. Ibid., p. 210

6. Ibid., p. xiii

7. Ibid., p. 205

8. Ibid., p. 207

9. Ibid., p. 209

10. The "language of thought" (LOT) hypothesis as it is advocated by Fodor (1975) *The Language of Thought* (NY: Thomas Y. Crowell), does not mention its "discovery" by science. Searle seems to be claiming that is an assumption of LOT advocates.

11. Ibid., 212

12. Elizabeth Valentine (1992) *Conceptual Issues in Psychology*, Second Edition 58 (London: Routledge). Valentine cites Comte, 1842 Vol 1: 37-38.

13. For William James' views on 'consciousness' see William James (1890) *Principles of Psychology. Vol. 1.* (New York: Henry Holt) or William James (1962). *Psychology: Briefer Course* (New York: Collier Books).

14. Searle, 212

15. Ibid., 213

16. Ibid., 214

17. Ibid., 215

18. Ibid., 216

19. Ibid., 215

20. Ibid., 223

21. Ibid., 225

22. Ibid., 224

23. Valentine, *Conceptual*, 135

24. Ann Brown, J. Bransford, R. Ferrara & J.C. Campione (1983) "Learning, Remembering and Understanding" 22, 124, 140 in: P. H. Mussen (Ed.) *Handbook of Child Psychology* Vol. 3. (NY: Wiley)

25. Gilbert Ryle (1949) *The Concept of Mind* 50 (University of Chicago Press)

26. A. Schoenfeld (1987) "What's All the Fuss About Metacognition?" 189 in A. H. Schoenfeld (Ed.) *Cognitive Science and Mathematics Education*. pp. 189-215. Erlbaum Association.

27. Ton de Jong and Monica G. M. Ferguson-Hessler (1996) "Types and Qualities of Knowledge", *Educational Psychologist* 31(2) 105

28. Ibid.

29. P. Karen Murphy and Bradford S. Woods (1996) "Situating Knowledge in Learning and Instruction: Unanswered Questions and Future Directions" *Educational Psychologist* 31(2) 141

30. Ibid., 142

31. Ralph E. Reynolds, Gale M. Sinatra and Tamara L.Jetton (1996) "Views of Knowledge Acquisition and Representation: A Continuum From Experience Centred to Mind Centred" *Educational psychologist* 31(2) 96

32. Ibid., 93

33. Richard E Mayer (1996) "Learners as Information Processors: Legacies and Limitations of Educational Psychology's Second Metaphor" *Educational Psychologist* 31(3/4) 153-155

34. Ibid., 158

35. Jack Martin (1996) "The Top Ten Problems of Psychology" *History and Philosophy of Psychology Bulletin*, Vol.8 (1) 4 Martin cites Koch (1981)

36. Ibid

37. Denis C. Phillips, (1987) *Philosophy, Science, and Social Inquiry* 146 (Pergamon Press)

Even for the strongest sciences, the theories believed to be true are radically underjustified and have, at most, the status of "better than" rather than the status of "proven"...In any setting in which we seem to gain new knowledge, we do so at the expense of many presumptions.

Campbell, "The Social Context of Method"

Chapter 8
Methods, Models and Metaphors

The research used to substantiate IP in the fields of cognitive science and psychology is empirical research. Bereiter claims that as a result of the cognitive revolution in education, there is a "new and explicit interest" in this sort of research (Introduction). Arguably, a reason for the new interest in empirical research is the assumption that scientific "proof" about aspects of the human mind is in fact possible. Thus science appears to offer an end to the frustrating speculation about what has traditionally been taken to be a mysterious, hidden phenomenon.

Throughout this thesis an underlying question has been to what extent or under what circumstances the scientific approach is appropriate for the study of the human mind. That this is a controversial issue has been noted by Wittgenstein, Ryle, and Searle among several others. Notwithstanding the controversy, to the extent that the computational approach is deemed by its advocates to be "scientific", it is subject to the methodological criteria of the natural sciences. However, this is not to say that the methodological assumptions of the natural sciences are uncontroversial. Several methodological assumptions of the natural sciences are particularly controversial when they are applied to the study of the human mind and the acquisition of knowledge. Of these, three sorts of assumption are worthy of examination in respect to the issue of

compatibility. These are assumptions about: i) the reigning canons of science; ii) the use of models, and; iii) "guiding" metaphors. The purpose of this chapter is to point out what it is that is controversial about the methodological assumptions and in so-doing, to question as Campbell does, the assumption that science can in fact offer "proof" about the nature of the human mind.[1]

Scientific Canons

Research which is conducted in cognitive science and psychology is subject to the limitations of the discipline of science and researchers within the discipline must conduct themselves according to the reigning canons. A basic assumption of the cognitive researchers is that science is the method of obtaining knowledge about human behaviour. The scientific view of the world is that most natural phenomena are explicable by means of the scientific method, i.e., hypothesis, experimentation, revision of hypothesis, further testing, etc. The underlying assumption upon which science is based is that of determinism - the theory that all natural events have some sort of *causal* explanation.

When the scientific method is applied to the study of human behaviour further problems emerge. On this subject, Valentine notes some controversial metaphysical assumptions of the scientific community, for example; that determinism implies that behaviour is caused and is therefore predictable in principle, and that repeated successful prediction implies an underlying regularity. According to Valentine, some problems with these assumptions are that they *do not account* for the fact that purposive and causal explanations seem to be diametrically opposed. Nor do the assumptions acknowledge the issue of consciousness, that is, whether conscious processes *should* be assigned causal

efficacy. Finally, there is the question of reductionism versus emergence, that is, whether higher level descriptions of human behaviour *can be derived* from lower ones (reduction) or not (emergence).[2]

Valentine characterizes psychological explanations as being *pragmatic*, that is the explanations *depend on* who asked the question, what the question was aimed at and who gave the answer. [3] The practical problems with this type of explanation, according to Valentine, include the need to account for memory errors and interference from other intellectual tasks, difficulty in communication, and intentional or unintentional deception.

A significant issue for psychological investigation is what Valentine calls the validation problem. She notes that, "If verbal reports correlate with other measures then they are redundant; if they do not correlate the problem arises of deciding which are valid." She also refers to the experimenter bias effect, namely, that expectancy can determine the experimental outcome, serving as a self-fulfilling prophecy.[4] Similarly, Phillips notes the *theory-laden nature of observation*. He points out that:

> The theory, hypothesis, framework, or background knowledge held by an investigator can strongly influence what is observed. Thus, observation cannot be a neutral foundation nor a disinterested arbiter of disputes, for the process of observation is influenced (unconsciously) by the theories or hypotheses that the observer holds *before* the observations are made.[5]

Cognitive scientists have limited measurement instruments available to them. The accepted methods of analysis are either quantitative, qualitative or a combination of the two. Quantitative analysis is constrained by small sample size - huge representative samples are impossible to obtain and impractical to assess. Thus, what is referred to as

statistical significance is often based on small groups which are not representative of anything in particular. This problem was one of Martin's "top ten" (Chapter 7).

Qualitative analysis is constrained by its design. That is, the researcher posits hypotheses, i.e., predictions, and chooses methods by means of which the hypotheses can be tested for confirmation or disconfirmation. The choice of method is constrained by the theory and what is *not* chosen is particularly significant in that it might be a disconfirming factor. This problem is known as the problem of "theory-driven research" and leads to the larger issue (noted by Phillips and Valentine) of objective neutrality, i.e., whether or not a researcher can, in fact, be objective.

Models of Mind

The use of a model to explain the otherwise hidden aspects and workings of natural phenomena is an acceptable procedure in the natural sciences. Commonly accepted models range in terms of concreteness from models of say, the solar system, to extremely abstract models such as the contemporary diagrams of a DNA strand. Similarly, IP researchers employ a variety of operational models of the human mind to study particular aspects of its functions (Chapter 2).

Phillips notes some *misleading aspects* of models which are particularly relevant to models of mind. For example, i) models have features that are not at all analogous to or isomorphic with the phenomena that are being represented, ii) cognitive scientists use the language of the model to discuss the phenomenon itself, and iii) the diagrams used have a concreteness or appearance of being real. He points out that "picturesque models" are involved in a three-way confusion between spatial relationships in the model,

conceptual and logical relationships in the discipline and psychological associations within the learner. Finally, Phillips warns that the terminology appropriate to these domains is not always kept distinct. [6]

Phillips is also concerned with the influence of models on psychological theories. He argues that the central issue is:

> [T]he degree to which the work of researchers in educational psychology is influenced by assumptions, analogies, metaphors, or crude "models" that are held at the very *outset* of that work. And yet, many researchers consider their approaches to be pristine - they hold that their explicit models and theories have arisen *during* the course of their work and that they were directly inspired by inspection of the experimental data. [7]

Phillips points out that such work is subject to circularity. That is, the work is theory-driven, i.e., the theory provides the "prior decision about how to conceptualize the phenomenal influences, in broad terms, the ways in which these are subsequently pursued". [8] Phillips argues further that:

> The crude model or metaphor influences the specific theory, the design, and the type of data that will be collected; these then shape or constrain the nature of any results that will be found; which in turn will be published and so reinforce faith in the validity and fruitfulness of the original model or metaphor! [9]

Under these circumstances the researcher is blind to the inaptness of the chosen metaphor and blind to alternative metaphors. In other words, the researcher is "locked in" to the metaphor, i.e., one can't get outside the metaphor in order to analyze it.

"Guiding" Metaphors of Mind

Phillips' concern with the metaphorical aspect of models is related to Berger's observation that in the history of educational thought "guiding metaphors of mind" have shaped and directed "those human activities which are related to mind" (chapter 1).

Although Berger's comment was specifically concerned with the influence of metaphors on historical perspectives of education, an increasing worry about the influence of metaphors of mind, in particular the IP metaphor, can be found in contemporary literature.

Metaphors are defined as figurative literary devices employed for a particular explanatory purpose. They are useful and often insightful analogies between something that is relatively well-known and something that is less well known. As the well-known element has some similar attributes to that which is not well known, metaphors are powerful tools with which to improve our understanding.

There is of course, a broad sense in which all our language is metaphorical. For example, we often learn what words "mean" by looking them up in dictionaries, by finding synonyms or by asking someone to explain what they mean. In each case we come to understand the meaning or use of a word *in terms of other words*. So too, we come to understand aspects of our experience in terms of analogous descriptions, i.e., it is "like this or that" and we employ aspects of one experience to interpret or understand aspects of a less familiar experience. Thus, we could say that we "think" in terms of analogues or metaphor, broadly construed. The idea of thinking by analogy is Leary's thesis in a discussion of the influence of metaphors on psychological thought:

> All knowledge is ultimately rooted in metaphorical (or analogical) modes of perception and thought. Thus, metaphor necessarily plays a fundamental role in psychology, as in any other domain. In other words, the inspiration of psychological thought. . . derives from the comparative, relational mode of understanding that I presume to be fundamental to human cognition. [10]

Just as our language is used to communicate a wide variety of human experience, so too, figurative language comes in a variety of forms. When we use metaphors to aid our understanding, we wittingly or unwittingly choose among different forms of representation, each of which has *implicit assumptions*. For example, we might choose to represent our experience in poetic form (assuming the force of emotional response), scientific form (assuming the credibility of empirical facts), historical form (assuming the relevance of past events) etc. Although it could be argued that even dictionaries and mentors choose one form of explanation over another, what is usually the case is that over time, certain metaphors or analogies become conventions, that is, they are commonly taken to be the "accepted use" of the terms. Thus, they are *taken to be the "literal" translations* or interpretations of meaning. Leary notes that:

> The key to the relationship between the metaphorical and the literal is provided by the concept of conventionality. Metaphor is constituted ... by the attribution to one thing of a name or description that belongs by convention to something else...It is only with repeated usage over time that such terms are transformed by custom into "literal" terms with virtually unanimously understood referents. [11]

Leary acknowledges that he has misgivings about the "misuse and abuse" of metaphors. Presumably these misgivings involve accepting the aspects of a particular metaphor that are apt *without critically reflecting upon the aspects that are inapt*. Further, it is reasonable to conclude that the misuse and abuse of metaphors would include ignoring or hiding the *emotive and programmatic aspects* of a particular metaphor. Finally, a metaphor would be conceivably "misused" if the *argument behind it* is not clearly stated or if it is taken, without warrant, as a conventional truth. Regarding the currently popular metaphor of mind, Leary states:

> The current dominance of cognitivism in psychology is reflected in the fact that cognitive metaphors are frequently assumed to be literal descriptors of mental entities and processes. Although the literalization of the new cognitive metaphors of input, storage, retrieval, output, and all the other argot of computation and instrumentation is perhaps to be expected, given the frequent usage of these metaphors, I cannot help... in worrying about the potential *misuse* and *abuse* of metaphors. [12]

Another possible misuse of metaphors is noted by Danziger, who is concerned with the social influences and directions or *prescriptions for social action* embedded in metaphors. Danziger argues that if we believe that we "naturally" think in such and such a way, then there is a danger that we will take certain sorts of social behaviour as equally natural. In other words, if mechanistic thinking is deemed to be natural, then mechanistic social norms must also accord with human nature. For example:

> Clocks, steam engines, railways, hydraulic systems, telephone exchanges, computers, and so on, when they have been used as sources of psychological metaphors, have not been thought of as inert hardware, but as functioning systems.. . when the functioning of such artifacts is taken as prototypical for the functioning of aspects of the human mind or human behaviour, this suggests, among other things, that a certain way of organizing social life is in accordance with human nature. [13]

A potentially serious problem with metaphors of mind is perhaps unwittingly raised by Sternberg. He notes that researchers may be *confused about the questions generated* by the particular metaphor which they assume for their work. Sternberg points out that:

> Scientists are sometimes unaware of the exact nature of the metaphor underlying the research, and may even be unclear about the particular and limited set of questions that their metaphor generates. [14]

Finally, there is a danger in using metaphorical devices, namely, that over time there may be a tendency to forget that they are, in fact, metaphors and that they are *not*

to be confused with or taken to be *synonymous with truths* about either ourselves or the world. Phillips echoes both Danziger and Leary when he expresses his concern that:

> Something that starts as a metaphor can quickly become non-metaphorical. . . Thus, it might have been the case that the human cognitive apparatus was once conceived as being *analogous* to a computing device, but clearly for many of today's researchers and theoreticians there is no analogy - for them, human cognition *is* computational in nature.[15]

Valentine examines both the similarities and differences between the computer program and the human mind. On one hand, she notes that fundamental to the computational metaphor is the similarity of the human brain to a computer and its programs. The software is the abstract level - the program governing the system. The hardware is the concrete level - what the system is made of. The level at which the analogy holds is that of the software. Valentine discusses similarities such as the points that both consist of networks which operate in binary fashion, both are predominantly digital and electrical in nature, and both are information-processors or symbol manipulators.

Valentine reminds us on the other hand, of important *differences* between humans and computers, which include the facts that: i) knowledge is rule-based and explicit in computers, but implicit in humans; ii) computers function sequentially, whereas brains exhibit parallel processing; iii) computers are single-minded whereas humans have a multiplicity of motives; iv) computers lack consciousness and intrinsic interests, and; v) brains are biological organisms whereas computers are made and operated by people. [16]

Although differences between computers and brains have lead to alternate theories such as neural networks, connectionism, or parallel-distributed processing, these theories

also have their critics. The underlying concern in the majority of criticisms is whether or not a machine is an appropriate model for the human mind. The common theme of scientific canons, models of mind, and guiding metaphors is their focus on the commonalities among humans and in the case of mind, between humans and machines. Scheffler notes that metaphors can be apt analogies in some respects and inapt in other respects. In his discussion he makes a telling point, namely:

> Every two things are analogous in some respect, but not every such respect is important...If a given metaphorical statement is to be judged worthwhile or apt, *the analogy suggested must be important with respect to criteria relevant to the context of its utterance.* [17]

There is a sense in which the issue of compatibility between the two approaches to the development of mind might ultimately, rest on these grounds. On one interpretation, Scheffler's reference to the "context of utterance" seems to suggest that "relevant criteria" can be found in ordinary language. On this interpretation the question about the IP metaphor is whether it is important in respect to the criteria relevant to our ordinary language conception of 'mind'. That IP fails on this interpretation is the central claim of this thesis.

On the other hand, Scheffler's comment could be taken to suggest that different contexts (presumably) have different relevant criteria. Thus, on this interpretation, advocates of IP might argue that IP is important to the relevant criteria of "the mind" in a scientific context. In response to this interpretation, Chapters 7 and 8 were primarily concerned with some controversial aspects of the relevant scientific criteria assumed by information-processing theory. The "relevant criteria" in the scientific context arguably include the following;

i) Is 'mind' a physical phenomenon? Is what we mean by mind explained by IP?

Searle says no. He argues that it is logically impossible to *discover* an "intrinsic syntax", i.e., a language of thought, by scientific methods. There is no interaction between an internal homunculus and a symbolic language of thought which "causes" human intentionality, i.e., beliefs, desires goals etc. Reynolds et al say no - they claim that, "viewing cognitive functioning through the lenses of machine metaphors" is never likely to lead to an understanding of consciousness, self-awareness and self-reflection. (Chapter 7)

ii) Are the concepts central to the computational analogy, particularly those of 'metacognition' and 'knowledge' clear and coherent? Do they meet the criteria consistent with any "utterance" i.e., do we (or anyone) know what they mean?

Brown says no - the concept of metacognition is, "a many-headed monster of dubious parentage which suffers from conceptual confusion". Scheffler and Ryle say no - the concept of intelligence is "far from" conceptually clear. De Jong and Ferguson-Hessler say no - the various types of knowledge are so prolific that they require a matrix for categorization.(Chapter 7)

iii) Are the methods of science appropriate for the study of mind? Does empirical evidence in fact offer the sort of proof that educationalists might assume it to provide, i.e., beyond a reasonable doubt? For cognitive scientists fallibility is perfectly compatible with scientific research and any current theory is subject to further testing. However, to suggest that we revise educational theory and practice such that it is in accord with IP theory implies (at least) that the empirical research used to support the

theory is some sort of "proof" that IP is in fact, a description of the human mind. Wittgenstein says no -"in psychology there are experimental methods and conceptual confusion".(Chapter 7) Campbell says no - "in the strongest sciences, the theories believed to be true, have at best the status of "better than" rather than "proven". Valentine says no - "determinism and causal theories" do not account for the purposive aspects of human behaviour.(Chapter 8)

iv) Do scientific tests in cognitive science always measure what they claim to measure?

Valentine says no - rather, psychological explanations depend on who asks the questions, what the question was aimed at and who gave the answer. Martin says no - "in many programs of psychological inquiry, reported statistical regularities fail to correspond to the actual actions or experiences of even a single individual". (Chapter 7) Phillips and Valentine say no - qualitative analyses are "theory-driven". There is no way of proving that the inherent bias of the researcher has been completely eliminated.(Chapter 8)

v) Do models and metaphors in fact, replicate the phenomena they are intended to represent?

Phillips says no - models have features that are not at all analogous to or isormorphic with the phenomena that are being represented. Leary, Scheffler and Danziger say no - many aspects of metaphors are inapt and must be granted "critical consideration".(Chapter 8)

vi) Are similarities between humans and machines more important than the differences? Is what is unique about human minds and their intellectual development through education not worthy of consideration?

For those researchers who would argue that the two approaches to the development of mind are compatible, the foregoing arguments require rejoinders and the final question arguably deserves an answer. To them, I leave that task.

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Notes: Chapter 8

1. Donald T. Campbell, (1978) "Qualitative Knowing and Action Research" 185 in M.Brenner, P. Marsh,and M. Brenner (eds) *The Social context of Method* (NY: St Martin's Press)

2. Elizabeth Valentine (1992) *Conceptual Issues in Psychology* 2-5 (London: Routledge)

3. Ibid, 105-108

4. Ibid, 69-72, 77-79

5. Denis C. Phillips, (1987) *Philosophy, Science, and Social Inquiry* 7-9 (Oxford: Pergamon Press)

6. Ibid., 155

7. Denis C. Phillips, (1996) "Philosophical Perspectives" Chapter 33, 8 in: *APA Handbook on Research in Educational Psychology* (in press)

8. Ibid., 9

9. Ibid., 33

10. David Leary (1990) "Psyche's Muse: The Role of Metaphor in the History of Psychology" 2 in: *Metaphors in the History of Psychology*, (1990) David Leary (ed) (NY: Cambridge University Press)

11. Ibid., 6

12. Ibid., 40

13. Kurt Danziger (1990) "Generative Metaphor and Psychological Discourse" 350 in: *Metaphors in the History of Psychology*, (1990) David Leary (ed) (NY: Cambridge University Press)

14. Robert Sternberg (1990) *Metaphors of Mind* 4 (NY: Cambridge University Press)

15. Ibid., 16

16. Valentine, *Conceptual*, 137-140

17. Israel Scheffler (1960) *The Language of Education* 48 (IL: Charles Thomas)

Part 2: Conclusion and Implications

The Original Problem and Emergent Question

An explicit ideal of education is that, among other things, it is concerned with the normative development of mind. Bereiter claims that a "cognitive revolution" has taken place in education and argues that a consequence of the so-called revolution is that educational decisions about theory and practice are currently influenced by cognitive theories and the empirical research which supports them. Three such influences on educational decisions are; i) empirical research on the mind; ii) ideas about what is "in" the mind, and; iii) cognitive training, i.e., the development of cognitive "expertise" in both teaching and learning. These influences appear to conflict with the normative development of mind in an educational sense.

The "information-processing" theory of mind is central to the cognitive revolution and its influence on educational theory and practice, i.e., it is the prevailing paradigm in the fields of cognitive science and cognitive psychology. In other words, the "empirical research on the mind" is research which primarily assumes IP; the "ideas about what is in the mind" are based on IP assumptions, and; "cognitive training" is the means by which teachers and students become expert information-processors.

However, information-processing theory is not clearly described in the literature. Neither its central tenets nor its fundamental assumptions, which are related to philosophy of mind and epistemology, are explicit. Prior to the writing of this thesis such a lack of clarity made it difficult to ascertain whether or not information-processing theory does in fact, conflict with the educational development of mind. The underlying

question this thesis seeks to answer therefore, is *whether information-processing theory ought to influence educational decisions?*

Information-processing is a conception of mind. It is an example of what Berger calls a "guiding metaphor" of mind, i.e., it shapes and directs those human activities which are related to mind. The metaphor is embedded in an interdisciplinary view of cognitive development known as the computational approach. To clarify information-processing theory, this thesis: i) examined the computational approach as a whole, i.e., the relationship between the conceptions of mind, knowledge and education which are advocated on this approach, and; ii) contrasted the computational approach to what I have called the "conventionalist approach" to the development of mind - a composite which is stipulated for the purposes of the thesis. The conventionalist approach is constituted by a contrasting view of mind from philosophy, a normative conception of knowledge from epistemology and a conception of education which embodies the implicit ideal of education namely, the normative development of mind.

Summary of the Argument

This thesis is based on three main premises that lead to the conclusion. The first premise is that two distinct approaches to the development of mind are influential on educational theory and practice. Both the computational (M1) and the conventionalist (M2) approach have historical roots in the history of educational thought, particularly in respect to the relationship between the concepts of mind, knowledge and education. An examination of three influential historical precedents revealed that different conceptions of mind imply different conceptions of knowledge and education.

Although M1 and M2 each argue for a relationship between mind, knowledge and education, the relationships are based on different concepts of mind. M1 is based on a guiding metaphor of mind (in the tradition of the historical precedents) which posits that the mind is an IP system. M2, on the other hand, is based on the logical criteria for the concept of mind, i.e., beliefs, desires goals, etc. Predictably, given these differing conceptions of mind and the implication revealed by the historical precedents, the analysis showed that the concepts of knowledge and education used in the two approaches lack synonymity. On M1 knowledge, i.e., experiential information, is acquired naturally by means of internal processes and mechanisms. The efficient manipulation of this information is improved by cognitive training, i.e., skill development and strategies. On M2 knowledge is related to language development, i.e., through coming to understand public linguistic conventions or forms of knowledge. This is achieved through a particular sort of education, i.e., an educational engagement involving a teacher, a learner and something worthwhile.

The second premise is that the two approaches to the development of mind are incommensurate. The lack of synonymity among the pairs of concepts used in the two approaches was shown to be a reflection of profound differences in fundamental assumptions arising from historical disagreements about the concepts, i.e., the mind-body problem, the function of epistemology, the nature and acquisition of knowledge, and the role of education in the development of mind. A consequence of these deep assumptions is that the two approaches cannot be taken to be alternatives or rivals. Rather they are incommensurate approaches to the development of mind, i.e., the respective concepts

mean different things, are governed by different rules and criteria and, they are embodied in different "conceptual webs".

The third premise is that there are good reasons for educators to question several claims made by IP researchers and to resist the influence of IP theory on educational theory and practice. There are conceptual and methodological problems related to such the computational argument which must be redressed before any substantial claims to compatibility can be raised. These problems are specifically that i) the notions of metacognition and knowledge construed as information (which are central to the computational approach) are conceptually confused and incoherent; ii) the IP concept of mind is based on fallacious assumptions about mind; iii) the underlying theories which support IP are circular and; iv) the methods of analysis are limited. Finally, the reliance on guiding metaphors of mind is shown to be misleading and potentially pernicious.

Conclusion

In the introductory remarks to this thesis, three assumptions were taken to be possible explanations for the pervasive influence of IP on educational theory and practice. This thesis has shown those particular assumptions to be questionable, if not fallacious.

In respect to the first assumption, i.e., that the "new" view of mind (IP) is reconcilable with traditional conceptions of knowledge and education, the thesis has shown that the IP concept of mind is i) incommensurate with the traditional concepts of knowledge and education, and ii) incommensurate with the conventionalist concept of mind which is in accord with the traditional concepts.

In respect to the second assumption, i.e., that as we learn more about mind, we can change our conceptions of knowledge and education to correspond to the "new" view of mind, the thesis has pointed out that to adopt the "naturalized" conceptions of knowledge "as information" and education "as cognitive training" is to do so at the expense of the educational ideal.

In respect to the third assumption, i.e., that the traditional conceptions of knowledge and education are no longer relevant to the contemporary development of mind - that science can provide us with the answers to cognitive development and provide appropriate guidance for educational decisions regarding theory and practice, the thesis has illuminated the limitations of the scientific approach to human beliefs, desires, goals etc. and pointed out some serious consequences of such an assumption for education.

Given the lack of synonymity between the pairs of concepts central to both approaches, the incommensurate assumptions of their advocates about deep historical debates related to the concepts and, the inconsistencies that must be resolved to make an argument for compatibility, it is the conclusion of this thesis that the normative development of mind in an educational context is not possible on the computational approach as it is currently advocated in the literature. Hence, there are no sensible arguments for the influence of IP on educational theory and practice. Thus, *IP theory ought not to influence educational decisions about theory and practice.*

General Implications

It follows from this conclusion that, in respect to information-processing, the so-called "cognitive revolution" in education is misguided and misleading. Therefore the

influence of IP on educational theory and practice ought to be carefully examined and de-emphasized, if not eliminated. Given the effect of conceptions of mind on knowledge and education in the historical examples, serious consideration ought to be given to the consequences of IP's current influence.

This thesis provides a clarification of the computational concepts of mind, knowledge and education and "brings out in the open" its fundamental assumptions for educationalists. It provides a fresh perspective (the conventionalist approach) from which to understand the historical normative relationship between the concepts of mind, knowledge and education. In so doing the thesis points out previously unappreciated aspects of the relationship.

This thesis assumes, and thus can be read as, an implicit argument for: i) the logical relationship between the concepts of mind, knowledge and education, and ii) a normative approach to the development of mind. The thesis argues explicitly that there is such a relationship between the conceptions of mind, knowledge and education as presented on the conventionalist approach.

There are good reasons for educationalists to hold the conventionalist view of the development of mind. First, this approach provides an explicit and coherent view of relation between mind, knowledge and education which is grounded in philosophical responses to historical problems. Second, the approach is based on familiar criteria - what educators have always known about mind and its development. Third, the conventionalist view does not require constant change in curriculum theory and practice to accommodate emerging metaphors and theories of mind. Rather, it provides a platform

i.e., a theoretical basis, from which educationalists can evaluate such emerging theories of mind. The conventionalist approach advocates a conception of mind which is not a "guiding metaphor". Rather it provides the explicit criteria by which both historical and contemporary metaphors can be judged apt or inapt, appropriate or inappropriate, illuminating or misleading. Fourth, it provides some guidelines for psychologists concerned with the issue of compatibility. Finally, the conventionalist approach is the only coherent view (available at this time) of the relationship between the concepts of mind, knowledge and education that is concerned with the normative considerations of human betterment.

The thesis makes explicit a hitherto implicit view of mind held by liberal educators. That is, it links liberal education to a specific conception of mind and makes explicit the logical relationship between that concept, Hirst's forms of knowledge thesis, and the liberal conception of education. Thus the thesis provides an argument for liberal educators that is neither metaphysical, transcendental nor merely based on linguistic analysis.

Although the support for liberal education is an unintended consequence of the thesis, it might be suggested that the thesis is thus subject to the contemporary criticisms of liberal education in respect to issues such as conservatism, elitism, feminism and multiculturalism. Arguably, the degree to which this thesis is subject to such criticisms is a separate issue. However, a brief remark can be made in response. For this I would draw attention to Scheffler's recent comments in a discussion regarding the normative

concept of the educated person (previously cited in Chapter 6) and would argue that this thesis provides substantive support for Scheffler's responses to such criticisms.

Finally, the thesis points to a new and important role for philosophy of education, i.e., an analysis of aspects of the relationship between education and the social sciences. This role can be briefly outlined in terms of four specific implications.

Specific Implications

1) For philosophers of education: IP is only one of many "new" concepts within the fields of cognitive science and psychology which require close scrutiny by philosophers of education. Some were mentioned in passing, e.g., connectionism, learning, etc. Further, there is clearly a need for further examination of several questions raised by this thesis, in respect to knowledge (epistemology) and theories of mind (philosophy of mind).

2) For educational theory and policy: The thesis highlights the misleading and potentially dangerous influence of IP on educational theory, curriculum development and classroom practice. It raises questions about the relevance of the cognitive research that is currently so influential on educators' beliefs about what constitutes "good practice". It questions the proliferation of new books and articles which advocate the implementation of cognitive strategies for "educational" instruction. The thesis points to both the importance and relevance of contemporary philosophical analysis of these issues.

3) For teacher education and curriculum development: It follows from the thesis that future teachers should be made aware of the implications of the empirical research related to mind and knowledge in the literature on teacher education. Teacher preparation

programs should assist future teachers to understand the normative character of education and what is entailed by development of mind in an educational sense. In so-doing, such programs will provide an intellectual foundation from which teachers can critically examine the educational consequences of notions such as the "cognitive training" of their students.

4) For the enterprise of education: Due in large part to the pervasive influence of the media, both public and academic perceptions of education have been shaped by documentaries and interviews with cognitive "experts" who advocate the fallacious assumptions about mind implied by the cognitive research. Therefore, this thesis recommends a public debate on these issues and a subsequent revision of the perceptions and corresponding attitudes about what is important in education.

The information-processing theory of mind is but one of many intellectual myths that mislead and confuse those who are responsible for the education of our future citizens. To dispel such myths, as Hacker reminds us, is an important task for philosophy. However, the task is not merely an argument for some logical truth. Rather, the task for philosophers is to point out the error in our understanding and thus to reveal the myth for what it is.

> *One must begin with the error and lead it to the truth. That is, one must uncover the source of error: otherwise hearing the truth won't help us. It cannot penetrate when something else is taking its place. To convince someone of the truth it is not enough to state it; but one must find the path from error to truth.*
>
> Ludwig Wittgenstein

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