

# AIMING FOR INTELLIGENCE: A NEW CONCEPTION OF EDUCATION BASED ON THE PENTAD MODEL

by

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## **ABSTRACT**

There are numerous notions about the aims of education and these different perspectives often lead to confusion and conflict. The purpose of this thesis is to step back from these entrenched ideas in order to present a new conception: The aim for education should be to develop and maximize a comprehensive form of the remarkable intelligence that makes us so unique and capable. At present, this aim is not a focus of our educational systems in any real sense, and the social, economic, and environmental consequences of this shortcoming are becoming increasingly apparent.

To further this aim, I developed the Pentad Model of Intelligence along with the associated concept of Environmental Intelligence (ENVI). This model describes intelligence in terms of i) an anatomical structure that ii) produces cognitive capacity that iii) can be directed towards multiple operations that iv) can be improved through numerous cognitive tools with v) the overall functioning being impacted by cognitive habits and beliefs. The Pentad Model provides a more complete view of intelligence than conventional conceptions and offers a useful guide for educational reform.

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## **PREFACE: THINKING OF EDUCATION**

Education is ultimately about how we want to live and how we want our children to live. It reflects what we believe is important now and what we think will be important in the future. Many people are inclined to agree that education is a topic of great consequence and, on its surface, it just seems to be self-evidently good. Below that surface though, there is far less agreement about how to define education and its aims.

Even within North America, let alone the rest of the world, we can see that there are numerous ideas of what education should be, and that these different perspectives often lead to confusion and conflict. The purpose of this thesis is to step back from these entrenched ideas in order to present a new and straightforward focus for education. The aim of our educational system should be to develop and maximize a comprehensive form of our remarkable intelligence, or so I will argue. After all, it is our intelligence that makes us so unique and so capable.

The remainder of this Preface discusses the approach and presentation of this thesis, specifically the intention to write in a simple and direct manner, and the reasons behind that intention. Those who wish to be spared these explanations are encouraged to skip to the Introduction. For those wishing to be subjected to a potentially academic argument about academia and communication, we can start this discussion below. Either way, I'll pause now to thank you for taking the time to read and consider the ideas presented herein.

### **AUDIENCE, ANALYSTS, AND ACADEMIA**

When embarking on a task such as this it is crucial to determine the intended audience and the appropriate level of detail and complexity. Given that this text was being written as the final component of a doctoral degree, there was some motivation, for reasons to be described in the next section, to mix terms like 'phenomenologically irreducible dyad,' 'enunciatory modality,' and 'actualist monovalent analytic reinstatement' throughout with the requisite Kierkegaardian, Nietzschean, and Althusserian references. Somehow I managed to resist the temptation. Instead, some prior experiences proved more persuasive.

A decade or so ago, I worked in government as a policy analyst. One policy I wrote involved a challenging, multifaceted problem that was then being dealt with through a jumble of unclear regulations. Inspired by Justice Oliver Wendell Holmes' comment that, "I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity," I set about delving into the

legal complexity surrounding this issue and emerged two months later with a straightforward policy that was well received by colleagues here and around the globe. More importantly, the front line staff responsible for implementing the policy were enthusiastic as well. Even the legal department, a sinister bunch notorious for moving at the pace of continental drift and stifling any forward movement or signs of life within the organization, were on board. Nothing it seemed could stop this policy, or at least that is the way it looked prior to presenting it to senior management.

“It’s too complicated,” the most senior manager said of the new three page policy, while looking longingly at the crumpled mass of dozens of pages of current regulations, some no doubt originally translated from Ancient Greek texts, “the front line staff will never be able to figure this out.” The new policy was clearly needed, but it challenged the status quo on which the administrators’ expertise, and in turn some of their identity, was based. Accordingly, it was deemed unacceptable. I was eventually successful in getting the policy approved in a process that had a lot to reveal about the rational and irrational ways that people make decisions, and the need for diplomacy and the ability to step back and present an issue with someone else’s objectives in mind. It became readily apparent during this time that communication with decision makers needs to be accessible enough for them to clearly understand the matter in the midst of the dozens of other issues and distractions competing for their attention.

A failure to reach decision makers or, for that matter, the general public should not be overlooked. Useful information and ideas that are trapped in the pages of some obscure journal or hidden within esoteric technical arguments – primarily impressive only to others privy to the same language – do little to help poor children, stop gang violence, minimize air pollution, or accomplish any of the other worthwhile goals that deserve our attention. With this in mind, I have made a genuine effort to write this text at a highly accessible level; at a level that speaks to the needs and realities of decision makers and the general public who may or may not have a PhD in the topics discussed. The realization that this should be the level of focus has led me down a non-traditional academic path.

As Einstein and others have argued, ‘No problem can be solved from the same consciousness that created it. We must learn the world anew.’ This raises numerous questions about the suitability of relying on a traditional academic approach to deal with some of the complex, interrelated issues that we are facing. The current approach to academic specialization is problematical to the extent that researchers focus on their highly specialized individual pursuits while leaving the problems of society to others. As Mary Midgley writes about modern scientists, “their work is now so specialized that they neither get the time nor the training to reflect much on how their work fits into the rest of

life” (1996:140). Even when researchers are aware of and working on larger issues, their focus on a specific discipline or, as is often the case, a very narrow topic within that discipline, may result in findings that fail to consider the valuable insight and contributions of others working outside of that discipline. Alternatively, they may try to reduce the contribution of other fields into one grand explanation:

Everybody with experience of academic life knows how easily the notion of a single dominant explanatory scheme can merge into ordinary academic imperialism. It is also very easy for people who have found an intellectual scheme which fits their thinking to feel sure that it must be the only right one (Midgley, 1994:47).

The philosopher Sir Isaiah Berlin described the tendency of deep thinkers to be ‘hedgehogs’, who know one big thing, or ‘foxes’, who know many different things. The world and our interactions with it appear to be multifaceted; however, these two groups approach this situation in a markedly different manner.

Hedgehogs, knowing one big thing, believe that things are not as they seem and that once you strip away the illusion, the multiplicity of reality can be resolved into one single fundamental explanation. They tend to see everything as basic parts of some grand and glorious whole or, in a supposedly more scientific vein, they are convinced that the meaning of the whole is best understood by analyzing it into the basic parts. They search for the truth that they believe is behind the appearances by trying to reduce all appearances into whatever they believe to be truly real, for instance, the propagation of genes, the firing of neurons or, far worse, some arbitrary economic indicator. However, given the complexity of reality, the assumptions underlying our thoughts and knowledge, and our subjectivity, these reductive explanations are dubious at best. Foxes acknowledge these issues and take a different approach in trying to understand reality.

Unlike the reductive hedgehogs, foxes believe that life occurs at multiple levels and faces multiple issues. Rather than trying to reduce reality to some single fundamental explanation, their approach is to acknowledge the complexity of the situation and then deal with an issue as completely as possible. Different sorts of descriptions about an item or issue may refer to different things about it; therefore, it is not logical to suggest that only one description is correct and that the others should be reduced to it.<sup>1</sup> Foxes believe that zealously clinging to a specific discipline or theory and trying to analyze reality into an ultimate whole or ultimate parts moves us away from dealing with an issue at the level that it is actually relevant.

Academia can encourage one to be more of a hedgehog, or at least a specialist, and while this highly specialized work needs to be done, it is also quite clear that we need more

foxes. Considering the incredible number of dynamic and extremely complex systems and factors involved, to successfully deal with the issues of modern society will require us to incorporate as many viewpoints and understandings as possible. Thus, we need more generalists able to bridge the gaps between the specialists and to communicate that understanding to the public and the decision makers:

The solutions to the problems of the 21st century will come from generalists, especially those who are able to integrate the knowledge of diverse specialists, those who are able to bring together specialists and get them to communicate, those who are able to listen and be mindful. These are people who accumulate wisdom, including the realization that a single person cannot know all of the interconnections of a system. Therefore, with wisdom may come humility (Ellstrand, 2000:8).

Useful solutions to the manifold modern issues before us will take the cooperative efforts of many individuals utilizing many different approaches. This reality coupled with my past experiences with those who are in the position to make the decisions that impact our lives, along with a Chapter 1 that at one point was 237 pages long while still lacking in detail, has led me to embrace the role of a generalist committed to focusing on more interdisciplinary thought and writing at a level practical for decision makers and accessible to the general public. To further its accessibility, breadth has been combined with just enough detail to get the point across. I have also endeavoured to make this text simple and direct.

## **SIMPLE AND DIRECT**

Communication is fraught with challenges. You need to create a mental model of what you want to say, convey that model as best you can through writing (markings on a page), speaking or singing (oral sounds), or non-verbal communication (gestures, facial expressions, dance and so on), and then hope your audience is able to understand your message and recreate your mental model in their mind. The fact that what you and your audience perceive, feel, and think is impacted by biases, assumptions, and so on adds to the difficulty. To further complicate this involved process by the gratuitous use of esoteric language, as some academics seem inclined to do, is misguided. With some writing this can come across as a rather smug attempt by the author to flaunt their spectacular knowledge and insight (while possibly hiding ignorance and confusion behind grandiosity), but there may be other reasons as well. Sadly, there is research indicating that academics tend to rate the same information as having more prestige and reflecting greater competence when it is presented in a less intelligible style (Armstrong, 1980), even if it is utter nonsense.<sup>ii</sup> Potential academic disgruntlement aside though, there are several compelling reasons to try to write as clearly as possible.

If someone has ideas or insight worthy of being shared through publication then respect for the audience and the ideas appears to demand no less than the greatest clarity possible. Granted, my idea of what is clear and direct will be influenced by my particular background and perspective, but one can at least aim for easy comprehension. One can decide to not use intentionally obscure writing or slip in unexplained references and unnecessary gobbledygook. To be sure, effective communication is already difficult enough without one choosing to deliberately confuse the matter.

Along the same lines, there is little reason for disregarding readers whose busy lives and diverse experiences may not have equipped them to deal with academic verbiage and jargon. The use of unexplained references and jargon presupposes that we have all read the same things, and to some extent requires the reader to have limited their lives to the same experiences and understanding as the author. In my experience at least, it is those individuals so caught up in their own narrow area of expertise or interest, but largely ignorant about most everything else, who are the most likely to fall into this trap. They tend to fail to appreciate the limited ability of their language and models and theories to accurately represent reality. I suspect that things would improve greatly if, in addition to their intellectual endeavours, these individuals would learn to play the piano, dance the tango, trim a spinnaker, grow potatoes, frame a wall, lay tile, replace a head gasket, install a solar hot water system, troubleshoot a thermocouple, rebuild a heat exchanger, terminate network cable, setup a private branch exchange, design a circuit board, develop a business, defibrillate a child's heart, and so on. They might then not take themselves, their pictures of reality, or their language so seriously. They might then be more in awe of the complexity of life around them, more appreciative of the skills and insights of others, and more inclined to communicate clearly to those with different experiences.

Moreover, in keeping with the previous section, in my experience policy makers require accessible information to act. To the extent they are constrained for time and dealing simultaneously with several complex issues, they will respond to straightforward material and cast aside anything that forces them to decode esoteric language. In these cases, the material understandably needs to be simple and direct.

With all of the above in mind, I have endeavoured to produce a text that provides a useful and understandable contribution to the ongoing dialogue about the aims of education. It behoves us all to carefully consider our approach to education. The question Plato asked thousands of years ago, "How ought we to live?" is every bit as relevant today. Thinking about education, and how we want to prepare our children for their future, is as a good a way as any to strive towards an answer.

## **INTRODUCTION: HUMAN POTENTIAL AND INTELLIGENCE**

Aboard a kayak atop a sea of kelp, I watch the waves repeatedly roll along the beach. The sun, resting on the Sooke hills, projects a golden path that shimmers and dances across the ocean's surface. A harbour seal, her eyes unfathomable dark pools of curiosity, slides out of the hidden depths to take a leisurely breath of the warm, salty air. Immersed in this tranquility, I succumb to the slow rhythmic dance of life all around. There is a primal connection here and each gentle swell of the water causes my breathing to slow, heart rate to lower, muscles to relax. All is well, at least until an extended series of excited yelps sends me leaping haphazardly into the air. Crashing back to earth and reality, I glare at what would otherwise be an adorable, albeit shaggy, little face. The dog's barking roughly reminds me that I must have drifted off in the middle of pounding a series of supportive stakes into the ravine behind our house. I'm halfway down the hill, sledgehammer by my side, with my head just above the level of our yard. Tavis, our cairn terrier, might as well have been standing in my ear. At first I assume that he was sent by my wife to tell me to get back to work. It turns out this was not the case.

Otherwise charming, Tavis charges after crows, his sworn enemies, with considerable conviction, but they always seem to fly off to the branches above. Evidently, this does not stop him from barking. If Tavis were human he could resolve this situation to his satisfaction, utilizing technologically-advanced devices developed by other humans, by shooting an arrow, firing a bullet, or chasing his victims around with a plane, to mention a few of countless possibilities. But Tavis is a dog, so he is left to growl menacingly at the crows while they chatter at him from their protective perches. Poor Tavis, who seems to excel at keeping us apprised of any creature setting foot within a 400 mile radius of our house, is not alone:

The linchpin of human intelligence is flexibility. By contrast, animals are specialists. Beavers are remarkably adept at building dams, bowerbirds at constructing nests, the nuthatch at remembering the location of thousands of caches of acorns that it has hidden, the bee at performing dances indicating the location of food to other bees (as well as to humans who have deciphered its dance!). But each of these species is imprisoned by its adaptation. None can duplicate the achievement of the other. Bowerbirds cannot build dams, bees do not have an unusually keen memory for hidden caches of food, beavers cannot send messages, and so on. Not only can humans send messages, build dams, and record the hiding places of innumerable objects; they can duplicate the performance of every species that evolution has so far produced: the radar of the bat, the deep sounding of the whale, and so on. Indeed, humans can produce the "performances" of species that have not yet evolved, for example, species that are capable of interstellar travel, of visiting the moon, and so forth. Human intelligence and evolution are the only endlessly flexible processes on earth,

capable of producing solutions to the unceasing problems that living creatures confront (Premack and Premack, 2003:4-5).

Human creativity and intelligence are such that although a few decades ago there would have been little choice but to write everything down by hand, with each revision sending a flurry of crumpled up pages towards the recycling bin (granted, likely a trash can at that time), I can now create this text on a laptop computer that, among myriad other functions, enables me to quickly and comprehensively edit on the fly, connect instantly around the globe while accessing massive amounts of information, and perform incredibly complex calculations that not that long ago would have required a computer thousands of times larger.

Ironically, despite all this talk of technology, the previous rambling sentence took two hours to finish due to a dead battery coupled with a tree taking out our power line. Clearly, this was just a way to remind us of the inestimable innovations that have profoundly changed our lives: the in-home electricity that many of us take for granted; the telephone that was used to contact the power company; the wheels and combustion engine that enabled the repair vehicle to arrive; the governmental system that provided and maintained the roads on which the vehicle travelled; the legal and administrative systems that regulated how the repairs should take place, and so on. Countless human innovations from countless human intellects. Indeed, we could spend the next hundred pages just scratching the surface of the creative contributions of the Einsteins and Edisons, Carrs and Curies, Gandhis and Gutenbergs, let alone the endless breakthroughs devised by the billions of others who have walked the earth, but why do humans have this cognitive flexibility?

Well, for one thing, we have fairly big, metabolically demanding brains. However, the creative explosion associated with behaviourally-modern humans did not appear until some time after we became anatomically modern (Calvin, 2004). So, it appears we had the brain size well before we took advantage of it, thus big brains alone were not sufficient to get modern behavior and intellect. Another factor was at work:

In any one climate, a specialist can eventually evolve that outperforms the overburdened generalist; however, anatomical adaptations occur much more slowly than the frequent climatic changes of the ice ages, making it hard for adaptations to 'track' the climate. Indeed, the abrupt transitions can occur within the lifetime of a single individual, who either has the reserve abilities needed to survive the crunch, or doesn't. This sudden-death-overtime argument applies to many omnivores, not just to our ancestors. But there aren't any other examples around of fourfold brain enlargements in the last several million years, so an erratic climate by itself isn't a surefire way of getting a swelled head. Something else was also going on, and the episodes of abrupt climate change probably

exaggerated its importance, and kept those lean-mean-machine competitors from outcompeting the jack-of-all-trades types that evolved. Everyone has a favorite theory for what this ‘something else’ was... most people would pick language. Especially syntax (Calvin, 1996:79-80).

I can say that we are a unique species and it is quite clear to whom I am referring because no other species has the language abilities to read or write this text. This capability is tied into our distinctively adaptable intelligence. Consider the following passage:

Claudius, brother to the King of Denmark, schemes with the Queen to poison her husband, marry her, and seize the throne. Hamlet, son of the murdered king, is greatly distressed by his father's death and his mother's hasty remarriage. When his father's ghost appears to tell him that he was murdered by his own brother, Hamlet vows revenge. To cover his intentions, he feigns madness. Polonius, councillor to the court, whose daughter Ophelia is more or less engaged to Hamlet, believes that this madness is caused by repressed love. However, while he is spied on by Polonius and Claudius, Hamlet encounters Ophelia and forcefully rejects her. Afterwards, some traveling actors arrive and Hamlet asks them to perform a play that recreates his father's murder in a successful effort to get Claudius to reveal his guilt. Hamlet visits his mother, condemning her for her marriage, and accidentally kills Polonius who is hiding in the chamber. Using the excuse that he will be in danger for the murder of Polonius, Claudius sends Hamlet to England in an unsuccessful effort to have him murdered. Shortly thereafter, Laertes, Polonius' son returns and demands revenge for his father's death. Meanwhile, his sister, Ophelia, maddened by grief, has drowned. Hamlet returns and confronts Laertes and Claudius at her funeral. Claudius plots with Laertes to kill Hamlet in a fencing match in which Laertes will have a poisoned sword. The plan fails when Laertes wounds Hamlet, but Hamlet kills Laertes. The Queen drinks from a poisoned cup intended for Hamlet and also dies. Hamlet, wounded by Laertes' poisoned sword, kills Claudius before he, too, dies. Fortinbras of Norway arrives and lays claim to the throne of Denmark.

Most will recognize that this is the complicated and convoluted plot of one of Shakespeare's tragic tales of murder and revenge. However, as we now know, the equally incredible story here is that we can actually understand what is going on. From lines of markings on a page, we are able to recognize a collection of individuals; appreciate a series of complex, evolving, and interactive relationships between them; and in the process, likely develop a strong sense of how we should feel about these individuals and scenarios. No other species on the planet has this sort of language ability. We've gone from not only controlling our breath, mouth and tongues to produce sounds with shared meanings that we can use to communicate to creating a writing system that allows us to widely share ideas and information that can be considered, checked, changed, challenged, or championed by others. The impacts of this invention have been profound:



The Greeks were the first to divide the syllables (in the syllabries), of which all written systems then consisted, into vowels and consonants, that is, into the first true alphabet. The Greeks were first to use writing not merely to record goods, but to represent their ideas and knowledge. They converted “folk” knowledge into a systematic knowledge. They turned oral stories into literature and turned the calculations used in building and in marketing into geometry and arithmetic. Daily argument and bickering became logic. And speculation, at which humans excel, became philosophy. Having been the first to attach writing to mind, the Greeks changed the character of human knowledge forever. Our modern human mind consists of the mind of the hunter-gatherer plus this addition – writing. Writing has enabled the human to leap from the Stone Age into an age of space travel (Premack and Premack, 2003:9).

Written language, and oral language as well, can be thought of as mental tools that have enhanced the effectiveness of our minds. Tools are important. They allow us to do things that we otherwise could not. A hand tool like a hammer enables us to drive dozens of nails in mere minutes. A mental tool like language aids our thinking and enables us to do a nearly infinite number of things. Language is so central to our existence that it would be difficult to think of life without it. For that matter, it would be a challenge to even think of thinking without it:

It is hard to imagine how a creature without language would think, but one may suspect that a world without any kind of language would in some ways resemble a world without money – a world in which actual commodities, rather than metal or paper symbols for the value of these, would have to be exchanged. How slow or cumbersome this simplest sale would be, and how impossible the more complex ones (Bickerton, 1990:151)!

Many researchers are now exploring the development of language and how it is tied in with our becoming more intelligent and creative. For our purposes, we can sketch out one possible story by thinking of tool development in general. As much as anything, the objective of this story is to point out how mental tools can radically transform our minds by helping us to make sense of the world and to operate more effectively within it.

I’m no expert on the development of hammers, likely the first human tool, but one could guess that we started out using rocks to pound things into place or into pieces, then someone figured out to attach the rock to a piece of wood with a piece of vine, then the rock was eventually replaced with a manufactured bronze, then iron, and then steel head with a hole in it to insert the handle. These sorts of developments carried on throughout the centuries until we arrive at the present with hammers in a wide variety of different sizes and shapes, innovations including metal alloy heads and fiberglass handles, as well as electric hammers, mechanical pile drivers, and so on. Before the hammer our options for ‘hammering’ things were greatly limited, but once the hammer was with us we have

expanded its design and its use incredibly to the point that I can now use a sledgehammer specialized for driving supportive stakes, and perhaps for leaning on while lost in thought.

In our story about the development of language, largely borrowed from the work of the physicist turned theoretical neurobiologist William H. Calvin, let's assume that our ancestors started out with a basic proto-language of simple words and short sentences with no grammar. Over time, some individuals slowly progressed to longer sentences. This led to increasing dependencies among elements of the sentence, and phrases being embedded in one another. To make this work our ancestors had to develop syntax to help structure these more complex, multi-concept communications in order to prevent mental concepts from becoming mixed up:

Syntax is what you use, it would appear, to make those fancier mental models, the ones involving who did what to whom, why, when, and with what means. Or at least if you want to communicate such an elaborate understanding, you'll have to translate your mental model of those relationships into the mental grammar of the language, then you order or inflect the words to help the listener reconstruct your mental model. It might, of course, be easier just to 'think in syntax' in the first place. In that sense, we'd expect the augmentation of syntax to result in a great augmentation of guessing-right intelligence. The name of the game is to re-create your mental model in the listener's mind. The recipient of your message will need to know the same mental grammar, in order to decode the string of words into approximately the same mental understanding. So syntax is about structuring relationships between items (words, usually) in your underlying mental model... (Calvin, 1996:106-107).

Children would hear this syntax and, with their young brain's incredible capacity to adapt to the environment and to develop the neural circuitry underlying specific mental processes (Garlick, 2002), they could better figure out the conventions and eventually add their own improvements. Over time, language and intellect would improve to include the many conventions that we use today.

Well, this hardly does justice to the development of language (or hammers), but it should be clear that people throughout history have invented a multitude of physical and mental tools that can enable us to better function in the world and to understand it in new and profound ways. These tools get passed on from generation to generation and, as we learn about and use them, we come to see them as an extension of ourselves, start to think about what else we can do with them, and in some cases, greatly extend their development or application. In the case of syntax, its development provided an effective mental system to structure and express nested concepts and the relationships between items. Moreover, all of the higher cognitive functions such as multistage planning, logic,

and complex music are examples of structured thought (Calvin, 2004). Therefore, the creative explosion that led to our modern human intelligence and versatility might very well have resulted from increasingly complex language being picked up by mentally flexible children.

The explanations for why we ventured into these longer, more complex sentences in the first place include a mental overlap with the greater throwing accuracy and other ballistic movements (like hammering) our ancestors needed to survive on the savannah, the need to share the proceeds of the hunt while avoiding freeloaders as well as various other demands resulting from living in social groups, but we can leave that level of explanation to the neuroscientists. The important thing for us is to recognize that human intelligence is unique, that language plays a central role, and that we have an interesting relationship with mental tools that can help to expand our intellect. The real issue now involves what we are going to do with this tremendous potential. In the rest of this text, I will argue that developing and maximizing our remarkable intelligence should be the focus of our educational system.

The first reason for this stance should be quite clear. When our intelligence makes us so unique and so capable, why wouldn't we make it the goal for education? For that matter, is intelligence not already the focus of our North American educational systems? Closer analysis suggests that it is not. The renowned educational theorist Kieran Egan argues that there are three major, incompatible educational ideas that have shared dominance for centuries with each one cycling in and out of favour at the expense of the other two: "that we must shape the young to the current norms and conventions of adult society, that we must teach them the knowledge that will ensure their thinking conforms with what is real and true about the world, and that we must encourage the development of each student's individual potential" (1997:3). As we will later examine, there is some overlap between intelligence and each of these three competing aims, but that is something different from intelligence being the main goal of education. This is not to say that we are educating children to be unintelligent, but as we will see, based on the model introduced in this text, we are certainly not educating them to realize the full potential of human intelligence either.

The second reason for making intelligence the focus is that our minds are less than ideal for our current environment, society, and economy. Having a little, but not enough, intelligence can create many problems. Human history is full of examples where we were smart enough to create a problem, but not smart enough to solve it, or perhaps it is the case that we were not smart enough to recognize the problem and act in time. Much like the sorcerer's apprentice, sometimes it takes far less effort to engage in a clever act

than it does to deal with the consequences. We will explore this issue in greater detail in the next chapter.

The good news is that humans have proven time and time again that through the development of mental tools such as writing we can enhance our intelligence and create incredible progress. Our current ability to understand our world, our minds, and our potential through the wisdom, knowledge, and tools our species has amassed puts us in the unique position where we now actually have the choice to intentionally increase our intelligence, or at least the intelligence of future generations, by transforming our educational system. The remainder of this text will explain one way that this can be accomplished.

As promised, Chapter 1 will examine some of the obstacles to intelligence by using the example of our relationship to the environment. Admittedly, this is a somewhat bleak chapter that one could skip over if they wanted to carry on with the positive tone from the Introduction and get to the solutions proposed in later chapters.

Chapter 2 sets the stage for a new aim for education by discussing the context in which it must function. Chapter 3 introduces an extended framework of intelligence, the Pentad Model, along with the associated concept of environmental intelligence (ENVI). The Pentad Model and ENVI can be seen as mental tools that we can use to help us better function in and understand the world.

The Pentad Model brings together several leading theories of and about intelligence by drawing out the main parts of each, demonstrating their compatibility, and combining them in a manner that provides a more complete view of intelligence. It presents a framework comprised of five levels of intelligence: anatomical, cognitive capacity, operations, cognitive tools, and cognitive habits and beliefs, that are ordered based on their relative educational malleability. These five levels are included on the basis that all five are necessary to achieve the abilities and activities present in the American Psychological Association (APA) definition of intelligence: the “ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, and to overcome obstacles by taking thought” (Neisser et al., 1996:77).

The Pentad Model provides a comprehensive view of intelligence; however, this required the incorporation of a new type of intelligence. As broad a picture as the existing theories provide when combined, they do not appear to adequately deal with the ability to adapt effectively to the environment, the second element of the APA definition. Moreover, concepts of intelligence that do not directly address our survival seem seriously

constrained. ENVI, then, is a crucial component of an inclusive framework of intelligence and involves the ability to monitor the natural environment and to use the resulting information to guide one's thinking and actions in order to maintain or improve the chances for survival.

Introducing a new conception of education that focuses on the process through which we develop and maximize the comprehensive form of intelligence presented by the Pentad Model and ENVI offers a useful guide for educational reform. It provides a meaningful, achievable, and comprehensive educational aim that is specific in its goal and compatible with traditional academic objectives. In the Conclusion, we explore some of the educational implications of this new approach.

## **CHAPTER 1: INADEQUATE INTELLIGENCE FOR CURRENT REALITIES**

In the Introduction, it was proposed that developing and maximizing our remarkable intelligence should be the focus of our educational system. Two reasons were given. The first reason was that this logically follows from our tremendous cognitive potential; that because our intelligence makes us so unique and so capable it should quite obviously be the goal for education. Despite this first straightforward reason being sufficient in its own right, there was also a second compelling reason that merits further discussion. That discussion provides the basis for this chapter.

The second reason was that our minds are less than ideal for our modern environment, society and economy. More specifically, we are not currently capitalizing enough on our cognitive potential to solve some of the problems we create. We could consider these cognitive limitations from the perspective of a nearly endless variety of social and economic follies ranging from the Crusades nearly a millennium ago to recent financial upheaval. Instead, with our friend John as our guide, our problematic relationship to the environment will provide the mainstay of our analysis. This seems to be a reasonable focus given that the ability to adapt to the environment is considered a central component of intelligence, not to mention the small matter that the survival of ourselves, our families, our societies, and our economy are ultimately entirely dependent on the environment.

We can begin then with a simple question: Is John a good man? To be clear, this is not meant as an involved philosophical question that delves into the multiple conceptions of what it means to be a good person, but rather a simple query tied into a common folk understanding of whether a person seems to be a reasonable, respectable, and virtuous individual, say, the kind of person we might wish to have living next door. To answer this we will need to know something about John.

It's mid-November in 1970 and John is rushing to the airport by taxi to leave on yet another business trip. He is running a bit behind because his neighbour needed a hand getting his lawnmower to start. Truth be told, John might have been looking for an excuse not to go. A devoted father and husband, his heart is always heavy at these times; it pains him to say goodbye to the wife and three children he adores, and his five year old daughter bursting into tears on the doorstep made him seriously consider cancelling the whole thing. The thought though that this trip will help him to expand his mining business and that the resulting revenues would help to buy the children even more Christmas presents, not to mention pay for the new Cadillac he is giving his wife as a gift, persuaded him that the right thing to do was to give his daughter one more hug and promise her to be home early next week before hopping in the cab. John will think about

his family frequently during his time away. As the plane roars down the runway, he settles into his first-class seat and wonders what their life will be like once he buys that new mansion in the suburbs he saw advertised the other day.

John is a successful individual who works hard to provide his wife and children with the highest level of material comfort. He likes to think of himself as a good man, and based on a reasonable assumption of the standards of 1970, many of us would likely agree with his assessment because he seems like a decent, diligent, devoted fellow who cares for his family. So, perhaps we can conclude that our John from 1970 is a good man. But what about a modern day version of John, an individual who engages in the exact same behaviour but several decades later? Can we still consider him to be a good man or has something happened in the decades since 1970 that might lead us to a somewhat different conclusion?

Most of the people who have been presented with this scenario indicate that they believe it is John's love and concern for his family that, more than anything else, make him a good man. Our modern day John still feels this love and concern so at first glance all appears to be well. The trouble though is that during the 1980s the world saw one of the most profoundly important changes in human history, and as a consequence, what proved successful in the past needs to be modified to meet current conditions. What possibly could have happened to purloin poor John's erstwhile claim to goodness?

Well, for one thing, according to the best available evidence, at some point in the 1980s human activities exceeded the biosphere's capacity. John and the rest of us are now consuming more resources and producing more waste and pollution than the Earth can handle. Those of us in the U.S. and Canada have a per capita average demand that is nearly five times higher than the existing global biocapacity.<sup>iii</sup> This is not some abstract problem. Over the past few decades substantial evidence has accumulated about the increasing challenges resulting from this global growth in human population and consumption. Serious economic, social and environmental issues now abound including, to name but a few: debt crises; considerable gaps between the rich and the poor; financial instability; social, religious and ethnic unrest; the threat of nuclear proliferation in developing countries; resource depletion including falling stocks of groundwater, old-growth forests, fish and soils; the loss of biodiversity and collapse of important ecosystems; rising accumulations of wastes and pollutants; toxic contamination; and health-threatening levels of air and water pollution (United Nations Environment Programme, 2002; World Resources Institute, United Nations Development Programme, United Nations Environment Programme & World Bank, 2000). These issues are interconnected and represent unsustainable patterns that must be improved if we wish to ensure the long-term health and continuation of the human species.<sup>iv</sup>

John's role in these issues, along with the role of each of us, is critical.<sup>v</sup> Our current individual patterns of consumption and waste are far from being sustainable.<sup>vi</sup> While U.S. and Canadian industries have been successful in reducing pollutants, the high consumption levels of citizens are undercutting the environmental progress made in the past 30 years (United Nations Environment Program, 2002). Consideration of the developing nations forces us to look even closer at our actions here in the U.S. and Canada. The people in developing nations look over at us and also want our lifestyle. Why should or would they want to continue to live at their current level while John and the rest of us live so extravagantly? If they get even halfway to our levels of consumption and waste, there is reason to believe that the result will be a worldwide ecological catastrophe – the pollution and resource depletion will overwhelm our supply of clean air and water (Goekler, 2000).

Accordingly, we need to alter our lifestyles both because our present actions already exceed what the Earth can sustainably provide and because we are setting the standard to which several billion of the planet's other inhabitants aspire. For these reasons, it is hard to justify acting as if our individual actions make no difference. It is now not enough to only judge an action by how it directly impacts the people involved. Instead, the action must be assessed in accordance with the global impacts it will have on our finite world. Perhaps every time we do something, we must imagine all 7 billion people (soon to be 9 billion) on this planet doing the same. This is the logical application of the golden rule and its ethical variants: 'Do unto others as you would have them do unto you.' When this is done, it becomes evident that many activities that may in isolation appear innocuous or even good – such as driving a luxury car or building a large suburban home – can be harmful on a global scale.

Contrary to popular misunderstanding, it is not the economy that provides us with goods but the environment.<sup>vii</sup> And it is into this same environment that all our wastes must flow. Thus to be ethical argues against continued unchecked growth and consumption as these work against the common good when we consider the rights of future generations, developing nations, other species and even ourselves to a healthy environment. Ultimately, what appears to be required is a continual consideration of the environmental impacts of our actions.<sup>viii</sup>

The work on ecological footprints (Wackernagel et al., 2002) provides us with a logical framework to consider the environmental impacts of our actions. As individuals, we should consider the objective of trying to find a balanced, efficient lifestyle that contains our ecological footprint – determined by our consumption patterns involving food, housing, transportation, consumer goods, and services – within globally sustainable limits while maximizing our satisfaction. So, instead of only living within an economic budget



it would appear that we also need to live within an environmental budget – the goal is not to restrict certain actions but to ensure that the total consumption does not exceed the available budget.

Despite the fact that we may never be able to know everything about the world around us, understanding our place within it and our relation to it is arguably within our grasp. We, both individually and collectively, can be aware of those forces impacting our lives and we can, if we choose, engage in behaviour that will sustain our existence. It was with this in mind that in 1992, upon reviewing decades of peer-reviewed scientific research, the majority of living Nobel Prize winners signed the “World Scientists’ Warning to Humanity” which states:

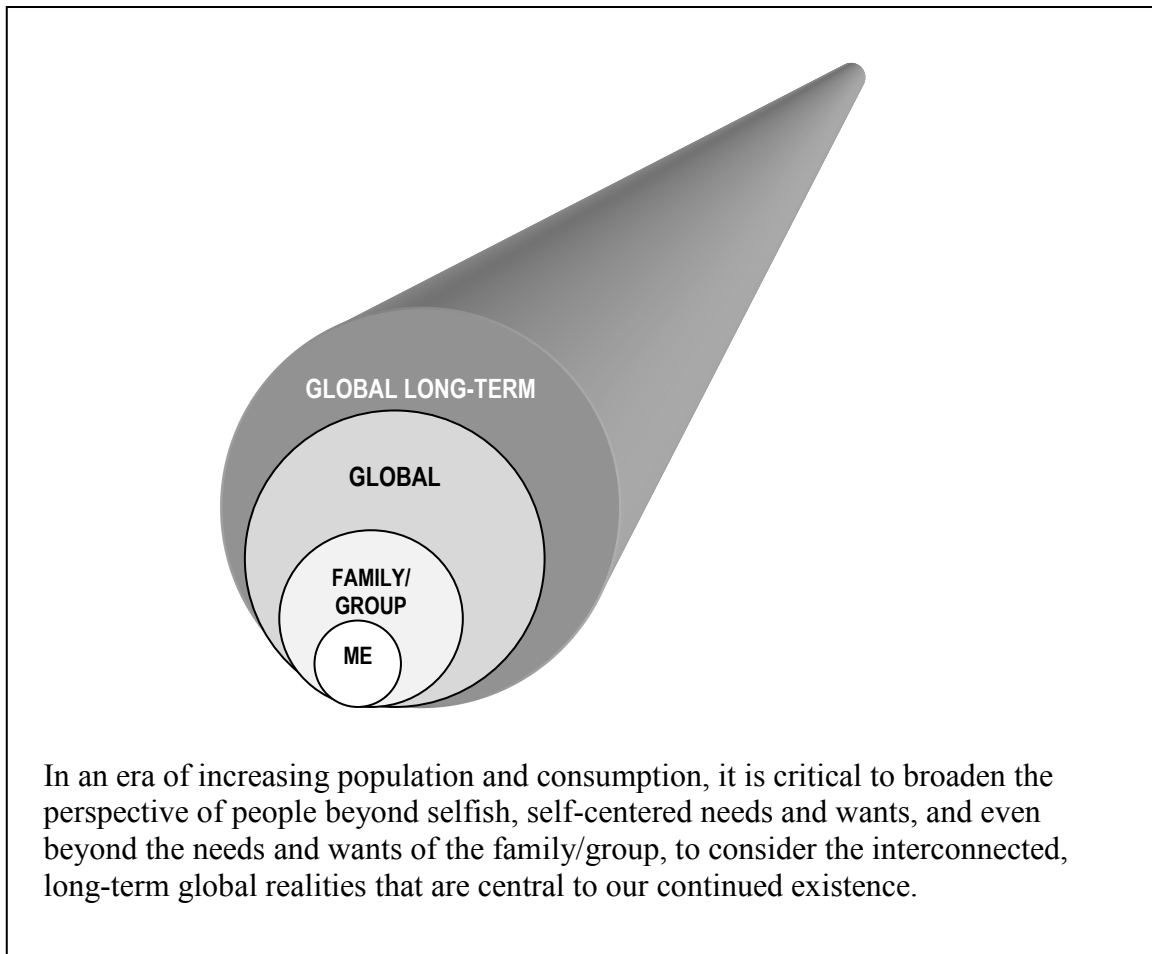
Human beings and the natural world are on a collision course. Human activities inflict harsh and often irreversible damage on the environment and on critical resources. If not checked, many of our current practices put at serious risk the future we wish for human society (Kendall, 1992).

In the decade since this warning was issued, further scientific research has found that, even though we have made some social and environmental improvement on a few fronts, numerous threats of serious or irreversible damage continue (United Nations Environment Programme, 2002).<sup>ix</sup>

Faced with this current interplay of social, economic, and environmental factors, for modern day John to truly care for his children and their future now requires him to not only factor in the immediate needs and wants of his family and himself, but also to consider the long-term consequences of his actions and the global impacts they will have on our finite world.

As the palaeontologist, evolutionary biologist, and historian of science Stephen Jay Gould points out: “we have become, by the power of a glorious evolutionary accident called intelligence, the stewards of life’s continuity on earth. We did not ask for this role, but we cannot abjure it. We may not be suited to it, but here we are” (1987:431). Perhaps John from 1970 did not have to worry as much about these issues, but the world, with its drastically increasing levels of human population and consumption, has changed since then even though modern day John, like many of us, has not yet caught up. To be clear, he is still a decent, well-intentioned man, but among other things, he is becoming aware of his impact on the environment very slowly and with much reluctance:

**FIGURE 1: THE NEED FOR A GLOBAL LONG-TERM PERSPECTIVE**



At present, the notion that our treatment of nature involves serious, avoidable crimes and dangers is still only very gradually seeping into public consciousness. Most of us still accept it only intermittently, and with a considerable sense of unreality. This slowness of perception is not unusual. Reading the letters and diaries of our forebears - even of very perceptive people - who lived at earlier times of rapid change, we see it constantly... Thick, solid layers of habit always protect our established ways of life against criticism. And, rather surprisingly, they do not just block moral criticism. They numb the sense of danger as well. People have always farmed contentedly on the slopes of volcanoes. Christians have not been stopped from sinning by the expectation of eternal damnation. The dangers of modern weapons have not made us give up war. Habit, in fact, has extraordinary force, a force greatly exceeding the wish for self-preservation (Midgley, 1996:121).

There are some key elements in this quote that effectively introduce the next section: there are failures involving understanding, perception, and action that impair our abilities to accurately predict outcomes and make advanced plans in response to complex situations that best meet our long-term interests. These abilities are key elements of intelligence. So, to put it another way, our intelligence has not kept up with modern realities. There is indeed considerable evidence to suggest that we are very capable of being clever and well-intentioned in the short-term. In fact, our ingenuity at solving technical problems up to and including space travel seems particularly impressive, and we no doubt have good intentions behind these endeavours. For that matter, there are likely good short-term intentions behind many of our actions whether they involve picking our children up from school in large vehicles we believe to be safe or, as is the case with John, buying the biggest house possible for his family. Where we fall down involves assessing and factoring in the long-term consequences. It would not be too far off the mark to say that while many of us tend to be nice, decent, and clever in the short-term, our actions are quite the opposite when viewed over a longer period.<sup>x</sup> Understanding why this is so and identifying the limiting factors that contribute to this sad situation is vital.

Going into a full description of all of the specific failings involving our intelligence would, unfortunately, take far too long and be far too depressing. Instead, we can overview some of these obstacles to intelligence while continuing to use our problematic relationship with the environment as an example. As mentioned, we could look at these obstacles from the perspective of a variety of social or economic problems as well, but the ability to adapt to the environment is considered a central component of intelligence (Neisser et al., 1996:77) so we will carry on with that theme.

As we will see, these obstacles impair all of the abilities in the APA definition of intelligence cited in the Introduction. The ‘short’ list that follows provides a brief introduction to some of these obstacles to intelligence. There are already other surveys of these sorts of issues (e.g., see Milbrath, 1995 for an overview from an environmental perspective) and Charles Taylor has also explored three of these obstacles in *The Malaises of Modernity*.<sup>xi</sup> Building on their work, the objective here is to present nine key obstacles in a straightforward framework (see Table 1.1) to overview how the average level of intelligence that we as citizens are developing through the educational system is less than ideal for our current environment, society and economy.

**TABLE 1.1: OBSTACLES TO INTELLIGENCE – THE NEFARIOUS NINE**

	<b>PROBLEMS WITH FOCUS, UNDERSTANDING, AND KNOWLEDGE</b>	<b>PROBLEMS WITH PERFINKING<sup>1</sup></b>	<b>PROBLEMS WITH DRIVE AND DIRECTION</b>
<b>Social, Cultural, Structural</b>	<p><b>Self-absorbed individualism, loss of meaning, and the lack of moral horizons</b></p> <p>↓ Inward focus contributes to ↓</p>	<p><b>Instrumental reason and the eclipse of ends</b></p> <p>↓ Narrow approach/analysis contributes to ↓</p>	<p><b>Soft despotism and the loss of freedom</b></p> <p>↓ Bureaucracies pushing us in the wrong direction contributes to ↓</p>
<b>Individual: Disconnect from reality</b>	<p><b>Ignorance, superficiality, and inattention</b></p> <p>↓ Ignorance contributes to ↓</p>	<p><b>Perfinkers falling prey to parasitic ideas and counterproductive belief systems</b></p> <p>↓ Being trapped in our belief systems contributes to ↓</p>	<p><b>Misguided motivations</b></p> <p>↓ Motivations pushing us in the wrong direction contributes to ↓</p>
<b>Individual: Failure to respond</b>	<p><b>Limited practical knowledge and understanding</b></p>	<p><b>Rather irrational beings clinging to the status quo</b></p>	<p><b>Lack of personal responsibility and the intention to act</b></p>

<sup>1</sup> The term ‘perfink’ was originated by David Krech to refer to how people perceive, feel, and think at once (Bruner, 1986).

## **OBSTACLE 1: SELF-ABSORBED INDIVIDUALISM, LOSS OF MEANING, AND THE LACK OF MORAL HORIZONS**

In 2007, “The Secret” swept through North America. Featured on Oprah, Larry King, and countless other shows, the video reached number one on the Amazon DVD chart while the book was number one on The New York Times bestseller list. The supposed ‘secret’ is that you can have anything you want in life – money, mansions, the perfect partner, the ideal body, a really good sandwich – as long as you understand the “law of attraction” where every thought you send out into the universe has a frequency that magnetically attracts the things on that same frequency and brings them to reality. Think about the multimillion dollar business empire or the private jet you want, or even getting a great parking spot, and the Universe will respond to your wishes and provide you with whatever you desire. This is really bad news if you were just run over by a Hummer or if a hammer dropped from a high-rise landed on your big toe though because evidently you created the situation by thinking it into being. Hummers and hammers aside, that the book and infomercial became such a phenomenon provides some insight into the presence of self-absorbed individualism in modern North American society.

“The Secret” was all about the individual getting to do and have whatever they want simply because they want it, as if no more is required than to behave like a demanding two year old with no need to worry about anyone else or the consequences of one’s actions. This notion of an isolated individual independently pursuing their own unconstrained life is naïve, not to mention being anti-social and anti-biological. From our need to learn cultural tools like language from others to our innate desire to belong to groups, we are extremely social and deeply interconnected beings. For that matter, collective behaviour is clearly helpful for survival and sexual reproduction. Disciplines including social psychology and sociology have developed a large body of research describing how intensely interactive we are with other members of our species and the distinct societies we create together. Nevertheless, messages stressing self-centered individualism are commonplace. Ads proclaim that ‘what you want is what you need’ while the drive towards increased individual rights acts to convince people that they should be allowed to live with fewer and fewer restrictions. The latter point manages at once to be both a beautiful idea and a dangerous proposition on a finite planet with an increasing population. All the assigned rights in the world serve little purpose without a supportive environment in which to exist, but it is not second nature to think about those matters in a culture where self-absorbed individualism is held out as a greater good.

This inward focus is further exacerbated by the structure of our cities and the fear of parents about the outside world, including a media-exploited fear of child abductions by complete strangers despite such cases being extremely rare. Children end up stuck indoors, uncomfortable with the outside world. Increasing numbers of us are also living

in large cities and are isolated from nature to the point that we fail to realize our dependence. Among other things, this collective isolation from the natural world lessens our “environmental sensitivity” which is mainly thought to be a function of an individual’s contact with relatively pristine environments over long periods of time (Hungerford and Volk, 1990). It is challenging to develop a connection with a natural world to which one has only a fleeting acquaintance. Traditionally, our lives were far more in tune with nature, but now when our beliefs and priorities work against our inherent relationship with the environment, there is an ‘unnatural’ loss and detachment, and a denial of a central aspect of who we are as a species.

All of this tends to lead to what Charles Taylor refers to as the “loss of meaning and fading of moral horizons” where people suffer from the lack of a higher purpose or passion and instead focus on themselves, their day-to-day lives and consumption, with no goal left but to a “pitiable comfort” (1991:4). This narrowing of focus leads to less concern with others and the societal challenges that result from large groups of disconnected people living together. It also leaves us with nothing greater than ourselves to provide meaning or to put life into context. When we are unable to see ourselves against a “horizon of significance,” such as the demands of nature or other people, that provide standards and values, our choices and actions can end up empty, meaningless, and ultimately counterproductive. Accordingly, this self-absorbed individualism works against our being truly intelligent, not to mention our survival, by diminishing our ability to consider the long-term consequences and impacts of our actions, and our ability to adapt to the greater social, economic, and environmental factors that will eventually affect our future.

*John works hard and enjoys the fact that his business is profitable and affords his family an abundant lifestyle. That said, he is currently annoyed, having just reluctantly paid his taxes. It is very clear to him that there are many governmental regulations and social programs that need to be reduced. Thankfully, he can try to forget about that while he spends the weekend with his family. John welcomes this time with his wife and kids as it provides him with a sense of comfort and purpose. His son has a baseball game at the local high school on Saturday afternoon and afterwards the whole family is going to drive to a store to look at a new home theatre. On Sunday they will view a few more homes with their realtor. The fact that the school his son attends and the roads they are driving on are provided by the government with the tax dollars he so resents paying does not occur to him.*

## **OBSTACLE 2: IGNORANCE, SUPERFICIALITY, AND INATTENTION**

Some 1,600 years ago, the Polynesians discovered a veritable paradise on Easter Island. Over time they developed a complex society made possible by the fertility of the island and its abundant natural resources. The population grew to about 7,000. As Jared Diamond (1995) tells it however, in a few centuries the Easter Islanders had wiped out their plants and animals. They had also destroyed the forests they needed for firewood, for canoes so they could fish, and as a habitat for birds that were also a food source. In time, their once complex society degenerated into disorder and, as indicated by the preferred taunt to share with one's enemy: 'The flesh of your mother sticks between my teeth,' cannibalism became rampant. Diamond asks why the Easter Islanders did not figure out what they were doing and stop it before it became too late, and if we should consider that Easter Island is Earth writ small.

It is not too challenging to look around today and find parallels to Easter Island. Vital issues including resource depletion, the loss of biodiversity and collapse of important ecosystems, toxic contamination, and health threatening levels of pollution go largely unheeded while individual levels of waste and the consumption of non-essential items continue to grow. While it is understandable that a child would fail to recognize the limits placed upon individuals as physically-determined earthly organisms who must share a finite pool of global resources with the rest of humanity and other species, adults presumably should be more aware. That we seem to not really be able to understand or respond to this and a host of other matters has led John Ralston Saul to suggest that our society is effectively unconscious:

But what could be cruder than a human being, who is limited to a narrow area of knowledge and practice and has the naiveté of a child in most other areas? This is one of the elements that accounts for our clinical state of unconsciousness (1995:15).

In the case of the environment, the issue is not so much an absence of general awareness. Indeed, many people in surveys indicate they are at least somewhat concerned about environmental issues. However, their understanding is largely superficial (Hungerford and Volk, 1990).

This lack of knowledge is not surprising given the sporadic nature of environmental education in North American schools. For that matter, David Orr (1991) contends that the environmental challenges we are facing are disproportionately the work of 'educated' people, individuals with BAs, BSs, LLBs, MBAs, and PhDs – these people tend to have relatively high incomes, high consumption patterns, and more environmentally-impacting jobs – who fail to appreciate that "they are only cogs in an ecological mechanism (and)

that if they will work with that mechanism their mental wealth and material wealth can expand indefinitely (and) if they refuse to work with it, it will ultimately grind them into dust" (Leopold, 1948 in Orr, 1991:102). With the school systems failing to educate about these issues, people are often left with only the media which tend to do little more than inundate them with information about general environmental problems. Understandably, the net result is a limited comprehension by individuals about the Earth, its systems, and the specific environmental ramifications of their personal actions.

To make matters even worse, environmental problems can develop slowly and steadily with public recognition not occurring until after irreparable damage has occurred; each day there are slightly fewer resources and slightly more demand, but the changes from yesterday are not that big and who can really remember what it was like ten years ago when we have our busy day-to-day lives to look after. Perhaps this is what happened to the Easter Islanders; one day they realized there were far too few trees left but by then it was too late. In the interim, they focused on what they evidently believed to be more pressing matters including the building of ever-larger statues. Today we tend to do the same.

Our minds "are continually active, fabricating an anxious, usually self-preoccupied, often falsifying veil which partially conceals the world" (Murdoch, 1970:84). Within this void, modern religious fundamentalism and economic determinism seem to have captured a considerable portion of our collective imagination and the focus of our attention. These ideologies present their views as absolute truths that should be accepted without question, and many seem content to embrace these distorted reflections of reality as truth, absolving themselves of any real responsibility in the process. Consequently, rather than genuinely focus on the environment that sustains us, we build ever-larger skyscrapers, malls and houses, and often turn our collective focus to things such as the current state of the economy and the lives of celebrities. Additionally, many seem content to embrace economic speculation and gossip about the rich and famous while dismissing educated opinions about the state of the environment. Furthermore, we appear to have created a consumer culture of artificially induced wants, a testament to the successful public relations and advertising industries. In this consumer culture, we tend to distract ourselves with a near endless supply of often non-essential products, and, in turn, use these items to define our sense of well-being. And through devices such as TVs, 'professional' sports, endless series of deadlines and irrationally busy work schedules, especially when unemployment is an issue, we seem to have effectively lulled ourselves, or perhaps been lulled by certain powerful interests, into an unquestioning, time-constrained, highly-stressed state. This ignorance, superficiality, and inattention clearly limits our intelligence by obstructing our abilities to learn, reason, understand complex



ideas, adapt effectively to the environment, and engage in the critical problem solving required to deal with our modern challenges.

*John has heard the news about a variety of environmental issues and, when he turns his mind to it, he worries about his children's future. However, despite being a clever individual with extensive expertise in his field, John, like many in influential public and private sector positions, is ignorant about ecological concepts such as carrying capacity and nutrient cycling, lacks in-depth knowledge about those environmental issues that are often only superficially reported in the news, and has little understanding of his own impact. In contrast, he seems to know a surprising amount about Britney Spears in addition to having an all too familiar awareness of Donald Trump's perspective on almost everything up to and including his opinion of Britney. John and his family see this gossip and speculation almost every night, in high definition no less, on their new 52" tv which recently replaced their 42" model that just wasn't doing the trick anymore.*

### **OBSTACLE 3: LIMITED PRACTICAL KNOWLEDGE AND UNDERSTANDING**

For some understandable reasons, SUVs became incredibly popular during the early 1990s. They felt safe and were big enough that you could carry around half the contents of your garage when required. Granted, their fuel economy was poor and they polluted more than most, but gas was fairly inexpensive at the time and various interest groups and ideologues were working hard to raise doubts about environmental issues. During the following two decades though, several relatively straightforward realities came to light that were reported in the media. It turned out that SUVs are significantly less safe than midsize cars and their bumpers are higher than the crash protections on most vehicles making them a threat to others on the road as well (Ross and Wenzel, 2002). There was also substantial evidence about the environmental and health problems associated with the significant pollution from vehicle exhaust and, for that matter, there has been persistent smog in many cities that can be readily seen. In addition, several wars have highlighted further encumbrances associated with needing increasing amounts of oil imported from the Middle East. In spite of this, sales of SUVs continued to grow dramatically during this time.

There are numerous reasons – beneficial to the individual, their family and society – to opt for more fuel-efficient vehicles, but there has been a widespread failure to respond to this and many other issues. Much like the Easter Islanders before, many continue to act in a way that threatens to drive us down a dangerous path even though clear signs, albeit ones that increase slowly and steadily, like air pollution are all around. There appear to be several reasons for these chronic shortcomings. While we are peppered by the media with information about general environmental problems, there is limited comprehension of the specific environmental consequences of our individual actions. The exhaust from our SUVs is not spewed inside the vehicle. Like most waste and pollution it is sent ‘out there,’ behind our backs, making our contribution seem invisible and insignificant. It is only when it is combined with everyone else’s contributions that the waste and pollution become noticeable and threatening. Accordingly, North Americans can be seen as both oppressors and oppressed with respect to environmental issues.

We are oppressors to the extent that our levels of consumption, waste and pollution exceed the global eco-productive land available per capita.<sup>xii</sup> While the existing global biocapacity is 1.9 hectares per person, the global average demand for 1999 totalled 2.3 hectares per person with the average demand in the US totalling 9.7 hectares per person (Wackernagel et al., 2002). This unsustainable consumption acts to the detriment of the global environment and the other people and life forms that inhabit it. We are also oppressed though, to the extent that we exist as individuals who are enmeshed in a plethora of dynamic and extremely complex social, political and economic systems that directly and indirectly promote short-term thinking and unsustainable levels of

consumption. We may live our lives with good intentions, but are then forced to face these overwhelming environmental issues we hear about in the news. To the extent that we feel wronged, we will be less inclined to question our own contribution or put the effort into determining what we need to do.

In the case of vehicle purchases, like so many other issues, it is not that hard to find out what should be done. Printed and online information abounds on how we can reduce our ecological footprints, and experts regularly talk about these matters. Still, the typical individual understanding of these issues and appropriate actions is incredibly low (Hungerford and Volk, 1990). Useful information is lost in the multitude of other information jostling for our attention and, in some cases, purposely drowned out by a multimedia marketing machine focused on short-term profits, regardless of the long-term consequences. Moreover, many of our everyday activities are done with little thought or analysis. Our brains have a limited capacity to process the multitude of information and stimuli around us. As a result, we often rely on other means such as intuition, habits, heuristics and biases to make decisions and judgments (Tversky and Kahneman, 1974), and given the general scarcity of knowledge and experience with environmentally-responsible actions, these shortcuts tend not to lead in that direction.

*John spends most of his day thinking about his family and his business, and racing around in an effort to accomplish everything. He rarely alters his actions in any significant way to make them more environmentally-responsible. Admittedly, he was dismayed today when he saw how bad the smog was in his neighbourhood as he was making sure his kids were safely secured in his wife's SUV so she could drop them off on the way to work, but a few moments later his mind was clear of this concern while he pondered his upcoming meeting while sitting alone in rush hour traffic. His train of thought was only broken by an ad on the radio that reminded him he needs to order his wife's new Escalade if he hopes to get it in the right colour in time for Christmas. All they have in stock right now is grey, and he is worried that would be dangerous because it would be hard to see against the perpetual haze that lingers over the city.*

#### **OBSTACLE 4: INSTRUMENTAL REASON AND THE ECLIPSE OF ENDS**

In "The Grip of Death," Michael Rowbotham has a few things to say about the present state of human affairs:

All around us, the failure of modern economics screams out to be addressed. The towering indifference of those shining offices scraping the sky above the menacing ghettos of Brooklyn; the speculative channeling of billions of pounds of volatile international finance, which can leave a country prosperous one week and plunged into decline the next; the ludicrous production of cheap goods of poor durability, so that jobs are "protected," and we can recycle the materials and make the goods all over again; the ridiculous export drives by which every country simultaneously attacks the economies of every other nation, under the pretence that such global free trade improves the general wellbeing; the staggering waste of a throwaway, quick-growth, all-new spiral of constant economic change; the outrageous financial debt which Third World countries have actually paid many times over, but which, due to interest, is now larger than ever before -- a debt which forces those impoverished nations to compete to supply goods already in surplus; the cynical manipulation of human emotions into buying fashion-obsessed trivia; the burgeoning transport demands of escalating economic growth and centralisation, with identical goods crisscrossing the globe, regardless of environmental cost; the fact that despite the incredible productive capacity of the modern economy, people are obliged to work harder, with ever greater efficiency, forever forced to adapt and retrain or face a life of indignity and misery as one of the unemployed (1998:5).

To the extent that these criticisms are true, it is important to determine why the economy has such a stranglehold on modern societies and what sort of thinking has led us in this direction. John Ralston Saul argues that over the last 25 years, "economics has been spectacularly unsuccessful in its attempts to apply its models and theories to the reality of our civilization. It's not that the economists' advice hasn't been taken. It has, in great detail, with great reverence. And in general, it has failed" (1995:4). A variety of reasons have been suggested for these shortcomings.

For one thing, economics oversimplifies things and tries to imitate scientific analysis through the gathering of circumstantial evidence. Economists generally cannot test economic phenomena in a lab so they tend to be limited to observing phenomena, trying to model them, and then recommending policies based on that limited understanding. They may develop detailed mathematical models, but those models can be full of assumptions and simplifications, ignore both known and unknown variables that influence the relationship, and ultimately fail to accurately represent reality.

As importantly, especially since so many variables are not factored in, economic analysis is based on moral and ideological judgements. Choices of theory, method, and a specific unit of description or measurement are also a choice of what to focus on and treat as significant. Moreover, once this ‘biased’ data is collected, the data by itself does not act as evidence. The real interpretation and meaning are found within the hypotheses that contain content that exceeds that of the data. Accordingly, the accuracy of some of the key assumptions underlying economics are increasingly being called into question. For instance, economists assume that people are rational, but considerable research outside of mainstream economics, including the Nobel Prize winning work of Daniel Kahneman, indicates that this is not the case. Still, these errors and assumptions continue to be made, repeated in the literature, and then accepted uncritically by other economists.

Perhaps the greatest error made in economics is the tendency to describe phenomena as static and isolated that are in reality dynamic and contextual. The global economy must function in a world with finite resources and biologically determined limits on consumption, growth, waste, and pollution. Nonetheless, prevailing pro-growth economic theory would have us believe that is of limited importance. The basis of the economy is purported to be human productivity, creativity and consumption, and it is assumed that these and the economy can grow endlessly. To further this delusion, fundamental features of the natural world like air, water, and soil are viewed as ‘externalities’ outside the economy and largely treated as valueless because they are provided by nature for free. These natural features provide the irreplaceable and interconnected life support system for human societies and economies. In truth, the economy is worthless without these so-called externalities, not the other way around.

Despite these considerable limitations, economics is highly imperialistic. Economists venture forth and indicate that they are giving a rational analysis in areas where they have at best limited understandings. They do this by trying to reduce reality into concepts such as economic efficiency, but this does not provide an adequate description of reality or guide us to the best course of action. CFCs, for instance, are remarkable from an economic efficiency perspective: they are cheap, easy to produce, and effective. However, their most important aspect, their devastating effects on the ozone layer, was completely unanticipated. As another example, the economist Brander argues that “much of the debate over environmental issues is confused, ideological, or purely emotional in its appeal” (1996:253). Ironically, he then proceeds to contribute to this by trying to make reality fit into his narrow economic analysis. For example, with respect to fish stocks he argues “it might make sense to harvest all of the stock immediately, invest the proceeds, and earn more from the investment than could have been earned by managing the resource on a sustainable basis” (1996:282). Brander’s apparent inability to see beyond a narrow, economic viewpoint evidently makes him oblivious to even basic

realities including: (i) the environment, not the economy, provides the life support systems and resources necessary for our continued existence, and (ii) biodiversity has profound implications for environmental health that we are only beginning to understand – depleting biodiversity has potentially catastrophic implications.

Regardless of the questionable efficacy of economic analysis and advice, the underlying thinking has become pervasive. Charles Taylor and others have pointed out that independent ends have been eclipsed by instrumental reason; things that should be decided by multiple criteria are instead primarily assessed in terms of maximum efficiency and the best cost-output ratio. From this perspective, other animals are seen as no more than raw materials, technology is seen as the ultimate solution, and we are apt to value an individual and their accomplishments by the price they carry in the marketplace. Importantly, instrumental reason seems to have taken over at both individual and institutional levels. Even if an individual is personally opposed to a given action, they may feel forced by their position to subordinate their will to institutionally-defined short-term objectives of maximizing output, minimizing cost, and posting the best financial results next quarter. It is not that instrumental reason is not useful or important, it is just not sufficient. Other values and considerations for assessing worth such as standards of decency and human survival need to be considered as well.

*John has left on his business trip to visit the gold mining operation up north. As the helicopter flies in it passes over their dilapidated tailings storage facilities. He suspects this should be improved to prevent seepage into the river, but it is not in their budget and they are in competition with other mines who are also dealing with their wastes in the least expensive way, including those in other parts of the world where there are no environmental regulations at all. Besides, he has heard of some businesses experimenting with a new technology that should be able to help clean any problems downstream. He can't worry about these matters now anyway, if they hope to keep up with projections and match last year's profit, they are going to need to find a way to process ninety more tons of ore each day.*

## **OBSTACLE 5: PERFINKERS FALLING PREY TO PARASITIC IDEAS AND COUNTER-PRODUCTIVE BELIEF SYSTEMS**

An ant crawls up a blade of grass and clings to the tip until swallowed by a passing ruminant. Not surprisingly, there is very little in this for the ant. Its suicidal behaviour results from its brain having been hijacked by a parasitic brain worm that has to get into the stomach of a sheep or a cow to continue its life cycle. Daniel Dennett (2002) argues that with people it is not worms but parasitic ideas that can hijack our brains and cause us to engage in behaviour incompatible with our own survival. The most compelling current case involves religious fundamentalism leading to suicide bombers, but throughout history people have subordinated their own genetic interest to non-religious ideas as well such as communism and capitalism. Dennett contends that most of the cultural spread of ideas today amounts to ‘infectious repetitus’ where compelling and often emotionally-charged ideas, both productive and counter-productive, spread from brain to brain, with technology greatly speeding up the process.<sup>xiii</sup> As a result, labels and ideas such as ‘freedom’ and the ‘free market’ are bandied about, passionately defended, and used to justify numerous actions despite the evident lack of analysis or understanding of the people using those terms. Presumably these ideas just seem right on some level, and as “perfinkers” who simultaneously perceive, feel, and think, and then act within the constraints of what they perfink (Bruner, 1986), that is enough for most people to complacently charge forward.

We are vulnerable to these ideas because it is impossible to deal with the multitude of information, forces, and motivations that we face on a continual basis, so instead we “develop beliefs that organize (our) world and give meanings to (our) experiences” (Dweck, 2000: xi). While we may not devote much time to thinking about our beliefs, these ideas impact the way that we see everything else and they help to determine our priorities and our actions. Given the crucial role these beliefs play, and since many were learned during childhood, it is difficult to change them. However compelling they are though, these beliefs are necessarily limited representations of the real world. We will explore the matter of beliefs and worldviews further in Chapter 3. For now, a cursory look at the belief that progress is some great, unstoppable force requiring incessantly increasing growth and consumption provides us with an indication of the scope of the problem:

For a couple of centuries we have been brought up to believe in progress - to expect that in principle things on earth were getting better under the guidance of our own civilization. Though we knew that we, as a culture, had moral faults, we thought that even there we were improving, and physically we certainly did not expect any very serious trouble. We were brought up to think that lapses, however bad, would be local and temporary (Midgley, 1996:119).

Indeed, over the past few decades some commentators have suggested that the last real goal for civilization was to learn how to fill leisure intelligently. Yet, we are now faced with a very different situation where the combination of our population and our consumption is, by most informed accounts, seriously threatening our continued existence. We are faced with a situation where many of our previously celebrated expectations, values and habits – ideals and priorities that we are used to – are now more appropriately viewed as dysfunctional. They artificially isolate us from our true nature and are at odds with the biological realities that make life possible.

As alluded to previously, one particularly invasive idea underlying all of this is the Human Exceptionality Paradigm (HEP) which is based on the assumptions that unlimited economic growth is of primary importance and that human activity is exempted from the laws of nature and not determined by natural resource limits or other ecological elements (Arcury and Christianson, 1990).<sup>xiv</sup> This paradigm is so prevalent in modern industrial societies that it is rarely questioned despite the substantial scientific evidence that demonstrates the inaccuracy of its assumptions.

The problem of parasitic ideas such as the HEP is further complicated by our tendency to process new information in a manner consistent with our existing beliefs by embracing evidence that supports our beliefs about the world and rejecting evidence that is inconsistent with our beliefs about the world (Lord et al., 1979). One consequence of this biased assimilation highly relevant to sustainability is that where we already have strong feelings about an issue, mixed evidence will result in our beliefs becoming more extreme. The complexity that naturally surrounds sustainability issues, the pervasiveness of powerful groups using propaganda to promote their interests, and the overall scientific illiteracy of the general population effectively guarantees that even highly significant evidence will be seen or presented as mixed. As a consequence, those who believe the assumptions underlying the HEP will tend to disregard contrary evidence, treat environmental issues as insignificant misinformation that should be ignored (Margolis, 1996), and ultimately engage in behaviour incompatible with their own survival.

Even when an individual does challenge the beliefs about progress and the HEP, modern society is structured in a way that promotes short-term thinking and unsustainable behaviour (e.g., urban sprawl encourages automobile use) so it is easy to find one's behaviour not conforming to one's attitudes or beliefs. As described by the theory of cognitive dissonance (Festinger, 1957), when cognitions are based on opinions and attitudes, they are open to change such that one's behaviours can influence their cognitions. It is easier to make an attitude or belief conform to one's behaviour than to deny performing the behaviour. Therefore, the present human/societal/environmental interaction appears to encourage unsustainable behaviours that discourage environmental



beliefs and/or allow these beliefs to co-exist with the idea that our individual actions are too insignificant to matter.

*John believes in progress. He believes that nature is primarily useful as a resource to be exploited for personal gain and that new technology will continue to provide the solutions to make this happen in the most efficient and effective manner possible. He believes that financial standing is critically important and that by working hard to provide his family with the most abundant lifestyle he is living the right way. This worldview is central to John's identity; it is all he ever knew so he rarely thinks about these beliefs or questions their validity or their origins. Besides, it would make little sense for him to waste his time analyzing these ideas when they so clearly describe the way things truly are.*

## **OBSTACLE 6: RATHER IRRATIONAL BEINGS CLINGING TO THE STATUS QUO**

Walking into a church in a town on the side of the Tungurahua volcano in Ecuador, a young college student is struck by a horrific mural depicting people being burned alive as a lava flow sweeps through a village. He is even more surprised when he finds out that the scene took place in the very town where he is now standing, that the volcano has erupted several times sending down its fiery avalanche at speeds up to several hundred kilometres per hour, and that the volcano is still active and considered a very high danger. When he asks a father standing nearby with his children why they risk living here, the man laughs and responds, "It's not a problem, the volcano faces the other way." A few months later, the volcano violently erupted killing six people, burying several communities under ash, and leaving thousands of people homeless.

Looking back through history provides fascinating insights into the darker and denser side of human nature. A small sampling of the more colossal blunders might include the Crusades; the Witch Hunts; and those instances of outrageous speculation that nearly ruined entire nations such as the ones that occurred in 18th century France and England or 17th century Holland, where a mania about tulips rose to such an extent that people were willing to trade up to twelve acres of land for a single bulb. In retrospect, the many and varied follies seem easy to dismiss as trivia from a bygone era. However, as the saying goes, those who ignore history are doomed to repeat it, and the underlying issues remain.

Greed, hatred, ignorance, and short-term thinking are hardly unknown in the modern world. We still tend to notice only what we want to, assume we are far more informed than we are, and ignore clear signs of problems. During the late 1990s, we replaced tulips with dot-com stocks, but created a very similar speculation-based bubble – even though many critics were pointing out the parallels and warning about the outcome during the dot-com rise. Prior to the collapse of the Roman Empire and the French Revolution, both sets of elites had plenty of warnings about the impending crises, but chose instead to insulate themselves from reality while acting in a self-satisfied and self-important manner. Today we have pompous media elites with millions of loyal followers attacking scientific findings that have the bad fortune of conflicting with the commentator's unsubstantiated ideology and beliefs. There is even a US senator who, evidence notwithstanding, has argued that certain environmental issues are a hoax perpetrated by the Weather Channel in order to attract viewers. The Socratic notion that true knowledge encourages doubt and the acknowledgment of how little we actually know is more than a little absent. No doubt the power brokers on Easter Island were equally self-assured in the path they were taking.

One reason that we farm contentedly on the side of volcanoes, engage in endless growth and consumption, and foul the environmental life support systems that we need to survive, despite repeated scientific warnings based on decades of research, is that we are far less rational than we might like to think. As mentioned, many of our everyday activities are made with little thought or analysis. Our brains have a limited capacity to process the multitude of information and stimuli around us so we often rely on other means such as intuition, habits, heuristics and biases to make decisions and judgments (Tversky and Kahneman, 1974). This leads to a variety of problems.

Nobel prize winning research has explored shortcomings with our judgements in cases of uncertainty (e.g., Tversky and Kahneman, 1982) and documented how we become attached to the status quo (Kahneman et al., 1991) and feel entitled to what we have including our current level of prosperity. Furthermore, we regard adverse changes from the status quo as much more significant than beneficial changes. Due to this 'loss aversion' (Tversky and Kahneman, 1991), we are relatively unwilling to sacrifice benefits we already possess in order to obtain other benefits. Not only do we treat the advantages we already possess as more valuable than the ones we do not, but we are more willing to gamble to avoid a loss than to obtain a benefit (Kahneman and Tversky, 1984). Finally, we also make riskier choices in the face of losses than in the face of gains. We are willing to tolerate existing risks; however, we would resist the exact same risks if they were new. Moreover, while we are unwilling to tolerate increases in risk, we are reluctant to pay for reductions in risk (Viscusi and Magat, 1987). These departures from rationality indicate that any ideas that involve a perceived loss from what we currently have will face resistance even if they ultimately make us better off.

For these reasons, moving away from our present habits and the status quo is very challenging for us; it creates uncertainty and injects ambiguity and risk into our lives. Furthermore, we like to see ourselves as rational beings so it is largely counterproductive to point out that we are now engaging in inconsistent or destructive behaviour. After all, our present points of view and behaviours are based on some degree of past success and make sense to us. This can make our dealing with the present reality that much more difficult:

Success can expose us to dangerous consequences. A kind of paradoxical claim to make about something we all reach for, yet it's true. Everybody battles for success; too few people are aware of its profound impact. Success tends to breed arrogance, complacency, and isolation. Success can close a mind faster than prejudice (De Pree, 1989:125).

It appears that ‘success’ in our corporate, economic, and technological affairs has helped close our minds to our true impact on the environment,<sup>xv</sup> the very entity that provides us with the life support systems, biodiversity and resources that enable us to have this ‘success’ in the first place. Accordingly, while fully rational beings would immediately make the changes required to re-align their values and behaviours to be more congruent with the realities of their physical existence on a finite planet, our sense of entitlement from past success and our departures from rationality have contributed to this process occurring very slowly and with considerable reluctance.

*The sight of his wife and kids in front of their large, and soon hopefully even larger, house, with two SUVs, a ski boat, and a mountain of (once loved but now rarely used) toys in the three car garage behind them, provides John with a certain sense of accomplishment. The upcoming economic downturn has him worried because he is pretty sure they would have a hard time living with less than they already have. Some friends have recently downsized so they can minimize their commute, afford to work a bit less, and spend more time with their kids, but John sees that as too much of a sacrifice. He knows he is financially overextended at this point but, although it has occurred to him that it might make more sense to use the money to pay down his debt and take out that extended business insurance policy his agent was recommending, he is determined to still get his wife that new Escalade.*

## **OBSTACLE 7: SOFT DESPOTISM AND THE LOSS OF FREEDOM**

Some commentators wonder whether we have lost political control over the choices that will determine our future:

Individual human will does not have the force it once had. At least since the beginning of this century, the other startling population explosion (other than the fecundity of humankind) has been the proliferation of bureaucratic institutions. Increasingly, the actors that shape the modern world – that pollute it, clean it up, or do most anything else – are manufacturing corporations, banks, agencies, legislative bodies, pension funds and so on. The institutions are of course comprised of individuals. But the genius of bureaucracy is to structure its individuals in a manner calculated to subordinate the individual will and spirit to the institutionally defined goals. A modern manufacturing plant turns people with personal concern for their children and the environment into workers who will cast out chemical wastes and weapons (Stone, 1993: 236).

It is not just the bureaucracies' ability to diminish individual will though that is problematic. These institutions can have such vast and complex organizational structures that they are unable to effectively adjust their goals and actions to changing conditions. When decisions tend to be made focused on the short-term – within electoral cycles in the public sector and quarterly cycles in the private sector – long-term costs and benefits can be expected to be overlooked in favour of plans with fast and highly visible results. Moreover, once those consequences do become readily apparent, these byzantine institutions may have too much mass and inertia to alter course in time to avoid serious obstacles and adapt to the varying circumstances. The deliberate plan that contributed to our consumptive lifestyle provides a telling example.

In the U.S., WWII helped boost the economy and end the Great Depression. With the war ending, the President's Council of Economic Advisors effectively made the case that the answer to keeping the economy going was to make endless consumption their way of life and the primary source of satisfaction. Durning (1991) contends that modern consumer society utilizes five cultural factors to encourage this to happen:

- 1) Social Pressures: As financial measures have replaced traditional virtues (e.g., integrity, honesty and skill) as indicators of social worth, social status is determined primarily by consumption-based comparisons with others.
- 2) Advertising: The expansion of advertising into every aspect of our daily lives promotes ever-increasing consumption.

- 3) Shopping: Shopping culture, as exemplified in mall design, encourages acquisitive impulses and draws commerce away from local merchants. Shopping has become a primary cultural activity.
- 4) Government: Government economic policies promote high consumption levels through taxes and policy. Globally, government policies undervalue renewable resources, ignore ecosystems, and under-price raw materials. Such policy goals, based on the assumption that “more is better,” misinterpret the ecological havoc of over-consumption as healthy growth.
- 5) Mass Market: Convenient, disposable, mass-market products overwhelm household and local community enterprises. Household purchases are geared toward items that save time but contribute to waste and ecological burdens.

Critics of North American society point out that we now live in a society where many children are being strongly influenced, and perpetually distracted, by the multimedia marketing and merchandising machine. Adults, likewise distracted, are often fixated on their own, economically focussed, narrow spheres of existence where, as some have noted, shopping malls have taken the place of community.

From an economic perspective this has been incredibly successful. Organizations such as the Union of Concerned Scientists state that even though the US and Canada have only 5% of the world’s population, they consume over: 25% of the world’s oil, 27% of the world’s aluminium and 33% of the world’s paper while driving over 33% of the world’s cars and creating over 75% of the world’s toxic waste (Goekler, 2000:45). Moreover, this consumption does not simply reflect the meeting of basic needs, but also unbridled materialism and an appetite for non-essential luxuries. The goal of making consumption a way of life has clearly been met, but other adverse consequences have now also become apparent.

As we might expect, there has been an inadequate response from most public and private institutions to the presumably unanticipated social and environmental adverse consequences: from the social, religious, and ethnic unrest resulting from too many poor having too little to even survive to the unsustainable resource depletion, toxic contamination, air and water pollution, and so on resulting from too much consumption by the rich. These bureaucratic institutions continue to make short-term decisions while realistic corrective action proposed by those who recognize the need for change is resisted by vested interests.<sup>xvi</sup> The ‘solutions’ suggested instead often involve little more than a slight variation on the status quo and, as proposed by the Bruntland Commission for instance, argue for even more consumption for everyone. Somewhere in this process

citizens ended up losing critical control over key issues. How did we allow this to happen?

Charles Taylor argues these problems flow from the self-absorbed individualism described previously. An inward focus isolates people from one another and enables them to get wrapped up in their own private lives, provided the government supplies the means required to make that possible. In this society, people will be less inclined to actively participate in government and are at risk of what Alexis de Tocqueville referred to as “soft despotism.” The deal is that citizens support politicians who pledge to provide them with what they want. In turn, the citizens must do whatever the government says is required to make this happen. The citizens voluntarily give up their liberty and can supposedly focus on their private lives and their wants, and not bother worrying about larger issues. Supporting regimes that will allegedly do what they want offers individuals the illusion that they are in charge, but this may not be the case:

[E]verything will be run by an “immense tutelary power,” over which people will have little control. The only defence against this, Tocqueville thinks, is a vigorous political culture in which participation is valued, at several levels of government and in voluntary associations as well. But the atomism of self-absorbed individuals militates against this. Once participation declines, once the lateral associations that were its vehicles wither away, the individual citizen is left alone in the face of the vast bureaucratic state and feels, correctly, powerless (Taylor, 1991:9-10).

To the extent we have relinquished our shared control over our future, we have minimized our potential to respond to changes in an effective and intelligent manner.

*John isn't really interested in politics. When he can, he tries to vote for whomever he believes will approach issues the way that he does, but he is not particularly interested in getting actively involved. A neighbour of his has encouraged him to attend the Tuesday night meetings of a local group that is concerned about a development proposed nearby on some of the most fertile farmland in the area. John recognizes that this may be an important issue, but he is so busy with work during the days that he would rather stay at home that night and watch American Idol with his family. The developer says he wants to do what is best for the community, and he is going to need to get governmental approval to proceed, so there seems little reason for John to participate.*

## **OBSTACLE 8: MISGUIDED MOTIVATIONS**

‘Twas the night before Christmas, or the start of the 2008 Christmas shopping season at least, and a crowd had started to form outside the New York Wal-Mart. A few minutes before the Black Friday sale’s scheduled 5am opening time, more than 2,000 shoppers were pressed against the entrance. As the workers got ready to unlock the doors the crowd surged forward breaking through the glass. A dozen or so people were knocked to the floor including an employee who was killed by the hundreds who trampled over him. It took several minutes to clear enough space around the man to attempt first aid and even then the police officers trying to administer help were jostled by shoppers dead set on getting their holiday shopping done at the cheapest prices. These were Christmas shoppers presumably there to purchase gifts to celebrate the life of a man who wore plain robes and preached about service, humility, unconditional love, and how he would return to judge people, particularly on how they treated the vulnerable.

As outlined previously, many North Americans have bought in to the notion of being consumers above all else. Stampeding someone to death in an effort to get a good deal on Christmas gifts, a rather extreme but telling example, provides some indication of the strong motivations that underlie our consumption. This is of the essence. The need to increase our understanding of human motivation – why people think and behave as they do – is crucial considering the serious economic, social and environmental challenges we face. Until we more fully appreciate what compels our actions, we are unlikely to develop worthwhile solutions. Developing a better understanding of the motivation underlying something like our unsustainable behaviour, however, is highly challenging. To start with, there are not just one or two behaviours that impact the extent that we are sustainable. Rather, almost all of our behaviours directly or indirectly impact the environment. Moreover, a great deal of these behaviours that impact the environment involve everyday activities that are made with little thought or analysis. In turn, there are many motivational elements underlying each of these behaviours.

One of the main challenges then is to comprehend the dynamic, complex, contextual and multi-dimensional nature of motivation. We need to more fully appreciate the multiple elements and interactions that comprise an individual’s ‘motivational snapshot’.<sup>xvii</sup> At any given time, there are a multiplicity of drives, goals and forces impacting our behaviours. Our motivation often involves a combination of biological (e.g., seeking food when we are starving), mental (e.g., achievement focussed when we are concentrating on a task while ignoring our hunger pangs) and external (e.g., working in order to make next month’s mortgage payment) factors.



Returning to our consumptive behaviours, since those are the actions that primarily impact the environment, the challenge becomes clearer. Everyday actions such as the food we eat, where we live, how we travel, the clothes we wear, the luxury items we purchase, and the wastes we produce may be impacted by numerous, potentially conflicting motivational factors and values. Research into these motivations has been approached from a variety of perspectives, with some experts now also exploring the extent that unbridled consumption is psychologically counterproductive.<sup>xviii</sup>

Early work by Scitovsky (1976) argues that consumption is impacted by several factors. The need to escape boredom and the desire for novelty lead to a growing number of new activities that become habits that create ever-increasing consumption. At the same time, there is an intense desire for belonging, for social acceptance and esteem, that leads to status-driven activities and consumption. More recent research has considered a wide variety of issues and factors underlying consumptive behaviour including: basic human needs (e.g., Seeley, 1992); family, interpersonal, and group influences (e.g., Beatty & Talpade, 1994); values (e.g., Claxton, McIntyre, Clow & Zemanek, 1997); personality (e.g., Kleine, Kleine & Kerman, 1993); coping and stress-reduction (e.g., Kasser & Sheldon, 2000); and the public and private meaning of possessions (e.g., Hunt, Kernan & Mitchell, 1996). This sample of studies outlines some of the numerous motivations contemporaneously impacting our consumption. The next consideration is whether high levels of consumption actually result in happiness or a sense of well-being. This is often believed to be the case, but an increasing body of research indicates that individual consumption and having more money to spend do not guarantee greater subjective well-being or happiness (e.g., Durning, 1991) and that happiness is more the result of mental state than material rewards (e.g., Csikszentmihalyi, 1999).

A review of the motivational processes involved in the growth of our material consumption provides us with insight into some of the drives underlying our unsustainable existence and the extent that, in addition to threatening our long-term existence, this unbridled consumption is psychologically counterproductive. Moreover, it becomes clear that even if an individual is aware that some of their internal motivations are pushing them in a dangerous direction and they are concerned about the environment, there is no guarantee that they will actually end up behaving in an environmentally responsible manner. If they are not determined and deliberate in their actions, the motivation resulting from their environmental concern may be overwhelmed by the numerous other motivations influencing their many behaviours that directly or indirectly impact the environment.

*John buys in to the commonly held notion of the 'good life' and has made endless consumption his way of life. In the belief that it will bring them happiness and satisfaction, he works hard to ensure that he and his family live a life surrounded by abundant material possessions. Although it tends to be short-lived, he feels a certain degree of satisfaction with each new purchase and he enjoys the admiring glances of his neighbours on the bigger ticket items. He remembers the immense joy the whole family felt when they bought their current house, but now it seems they all want something larger, and preferably with an even bigger garage, so that they have a place for all of their once prized possessions. Today John and his wife had a good laugh though at a George Carlin bit they heard on the radio as they drove from one open house to another:*

*A house is just a pile of stuff with a cover on it. You can see that when you're taking off in an airplane. You look down, you see everybody's got a little pile of stuff. All the little piles of stuff. And when you leave your house, you gotta lock it up. Wouldn't want somebody to come by and take some of your stuff. They always take the good stuff. They never bother with that crap you're saving. All they want is the shiny stuff. That's what your house is, a place to keep your stuff while you go out and get...more stuff!*

## **OBSTACLE 9: LACK OF PERSONAL RESPONSIBILITY AND THE INTENTION TO ACT**

In the end, seven people from the quiet town in rural Ontario would die and more than a thousand would fall gravely ill, plagued by bloody diarrhea, vomiting, cramps, fever, and the fear that their own end was near. Manure laden with e. coli bacteria from the tens of thousands of cows in nearby factory farms had washed into Walkerton's water supply and then made its way through people's faucets. Investigations revealed that several hands were dirty in this tragedy. Stan Koebel, the water manager, and his brother Frank, the water foreman, had lied, failed to regularly test water quality, routinely falsified safety records, and failed to properly notify the local Medical Officer when the outbreak occurred. Mike Harris, the former premier of Ontario, was quick to blame the Koebels and others for the tragedy, but the public inquiry that he called concluded that his administration was also responsible due to its deregulation of water quality testing and its cuts to the Ministry of the Environment that led to an unstable waterworks system. Ultimately, in addition to the human death and suffering, the Walkerton problem cost more than \$64 million to clean-up, a rather ironic outcome given that the goal was to cut costs (Perkel, 2002).

In the case of Walkerton it seems that nobody was adequately in charge. Some might see this as a good case to prove that governments are ineffective and that matters should be left to the private sector, but as it turns out that sort of thinking contributed significantly to the problem. The Harris government's "Common Sense Revolution" was predicated on the beliefs that the private sector can do things better and that any red tape, environmental regulations, and so on which interfere with the private sector need to be abolished. They axed almost half of the Ministry of the Environment budget and laid off more than a third of the front-line staff who took care of monitoring, enforcement, and research. Offices and agencies, including water testing facilities, were dismantled and closed. While this was going on, and prior to the Walkerton tragedy, the former medical officer of health and other experts and agencies had repeatedly warned the Harris government that their funding cuts were resulting in an unstable waterworks system that was putting the public health at risk, but secure in the simplistic certitude of their political ideology, the Harris government charged forward with their 'common sense' agenda.

To be clear, the aim here is neither to politicize environmental matters – too many others already seem dead-set on that foolish enterprise – nor to claim that a different political ideology or centralized governmental control is the panacea, as the dreadful environmental record of communist USSR readily attests. The point is that the assumption that someone else is adequately in control of environmental issues or that technology will solve the problem – a 'reliance on science' – is often misguided. In fact, concentrated political and economic control, and technological creations have caused

more environmental problems than they have solved (Suzuki, 2002). The people in Walkerton, like most people, counted on others and technology to provide them with the clean resources and waste disposal they needed to survive. This reliance proved to be disastrous for them as it may well for us all if we cannot learn to live sustainably on this planet. As discussed, one of the key challenges to living sustainably is that more or less all of our actions have not only economic and social implications, but environmental ones as well. If we choose to view the long-term existence of our species and the many others that are impacted by us as a necessity, we need to re-align our values and behaviours to be more congruent with the realities of our physical existence on a finite planet. To accomplish that will require people to be personally responsible and to not assume that someone else or technology – there is a reason that Albert Einstein said: “Technological progress is like an axe in the hands of a pathological criminal” – will take care of it for them.

Carrying on with Einstein for a moment, he provides a useful summary of this final obstacle with the observation that: "The world is a dangerous place to live; not because of the people who are evil, but because of the people who don't do anything about it." In the case of environmental matters, there are some explanations for why we fail to sufficiently take responsibility, for why we don't do anything about it. While we are inundated by the media with information about general environmental problems, there is limited individual understanding of the Earth, its systems, and the specific environmental ramifications of our individual actions. Both of these issues are problematical. The overwhelming amount of data about the environmental problems that we face can lead to feelings of hopelessness and helplessness (Sobel, 1995). The net result of this can be “cynicism and fear that prevent(s) people from addressing the very problems that are described” (Smith and Williams, 1999:1). In turn, the general ignorance about how the Earth functions and the uncertainty over the effects of our own behaviour on the environment creates a psychological barrier to taking action. While a reasonable person takes precautions to avoid the risk of disastrous losses, people are less reasonable at taking precautions where there is uncertainty. The lack of hard data about the role that each of us plays provides an excuse to discount our own contribution to the sustainability problem. This is further compounded by the human tendency to attribute personal faults to the situational context – to find excuses and explanations for one's actions based on one's circumstances – while identifying other's failings with individual errors or defects (Jones, 1979). For these reasons, among others, instead of doing what is required to ensure our long term survival, it seems it is all too easy and common to downplay our own contribution and responsibility to act.

*Among other things, John drives a lot. Being concerned about how much he drives is hardly his top priority, but even he acknowledges he spends far too much time stuck behind the wheel. When he thinks about it he realizes it is because he is so busy, he has to take the kids everywhere and his work requires it. The smog he sees, and the thought that his beloved children are breathing it, bothers him, but that clearly has more to do with people like his mother-in-law who drives around unnecessarily because she is incredibly lazy. John is not really aware of the direct and indirect environmental implications of spending so much time stuck in gridlock in particular or all of his actions in general, but he is very aware of his reasons, explanations and excuses for doing what we he does. Besides, to the extent that there are broad environmental problems it is not his fault. Instead, it is obviously caused by the mass of others, particularly those people who should clearly be aware of the problems they are causing, like the Chinese he heard about this morning who are opening a coal-fired power plant every week in their pollution-spewing drive towards economic growth.*

## CONCLUSION

The point of this chapter was to show that our intelligence has not kept up with modern realities, and that our minds are less than ideal for our current environment, society and economy. Granted, as an overview it was neither as short nor as comprehensive as one would have hoped. What it should do though is highlight some of the traps that we face involving focus, understanding, knowledge, perception, feeling, thinking, drive, direction, and so on. Among other things, these obstacles impair our ability to effectively respond to the complex situations around us in a way that best meets our long-term interests. The only solution to this conundrum it seems is to actively increase our individual intelligence to mitigate these limitations. For the reasons outlined earlier in this chapter, relying on governments, technology, or someone else to entirely deal with matters is problematical. Moreover, as discussed, regardless of whether we are talking about public sector, private sector, or personal responses, it still ultimately comes down to the individuals within those settings doing what is required. It still comes down to those individuals having the necessary intelligence.

As we have seen, having a little, but not enough, intelligence can create many problems. Accordingly, we need to realize more of our remarkable cognitive potential on the basis that a more intelligent person, to refer to a few of the obstacles mentioned, would be better able to appreciate the interconnected nature of reality and less susceptible to self-absorbed individualism, more capable of analyzing and rejecting counterproductive belief systems, and more adept at realizing the limitations of the assumption that someone else or technology can be relied upon to solve our problems. It should be clear from this discussion that the intelligence being advocated is not of a narrow nature, but more along the lines of the comprehensive definition developed by a task force of psychologists brought together by the APA: the “ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, and to overcome obstacles by taking thought” (Neisser et al., 1996:77).

The extraordinary opportunity now before us is based on one key idea: we have proven time and time again that through the development of mental tools such as writing we can enhance our intelligence and create incredible progress. Our current ability to understand our world, our minds, and our potential through the wisdom, knowledge, and tools our species has amassed puts us in the unique position where we now actually have the choice to intentionally increase our intelligence, or at least the intelligence of future generations, by transforming our educational system. The remainder of this text will explain one way that this can be accomplished.

## CHAPTER 2: A NEW AIM FOR EDUCATION

The things that lawyers know about,  
Are property and land.  
But why the leaves are on the trees;  
And why the waves disturb the seas;  
Why honey is the food of bees;  
Why horses have such tender knees;  
Why winters come when rivers freeze;  
Why faith is more than what one sees;  
And hope survives the worst disease;  
And charity is more than these,  
They do not understand.

**H.D.C. Pepler, excerpt from *The Devil's Dream***

These words appeared in the introduction to the Property Law text assigned during my first year of law school. The fact that I'm citing them a decade later suggests the profound impact they had at the time. Granted, when Pepler wrote this it was intended as a joke, but what was apparent then, and even more so now, is that it is entirely possible to proceed through an advanced degree without learning much beyond a very narrow degree of specialization. It was painfully clear to some of us there that we were being ill-equipped to deal with reality; although, this fault is hardly unique to a legal education. Regrettably, the failure to learn to think across disciplines occurs in many fields.

We can return to several issues mentioned in Chapter 1 about the field of Economics to further make this point. Specifically, given the influence of economists on many of the public policy decisions that impact our lives, there are good reasons to be concerned about their venturing forth and indicating that they are giving a rational analysis into areas where they have at best limited understandings. They do this by trying to reduce reality into economic concepts and, as a result, their assumptions, simplifications, and exclusion of outside variables that influence the relationship may lead to detailed mathematical models and neat graphs, but ultimately fail to accurately represent reality. An oft cited example of this involves the limitations of using Gross Domestic Product (GDP) as a common indicator for economic progress where destructive activities such as crime, pollution, natural disasters, and the depletion of natural resources are considered positive, while actually beneficial non-monetized activities such as volunteer work and caring for the elderly at home are ignored. We could proceed to systematically pick apart other aspects of Economics, or other disciplines for that matter, but the greater issue here is the educational systems that are educating people in disregard for reality. More precisely, we could say that these educational systems are failing to develop the immense human capacity for intelligence in a way that enables people to effectively respond to reality.

This intergenerational transmission of ignorance, or a woefully incomplete understanding to be more charitable, conducted in our educational systems is perhaps not surprising. Educators are brought up in the system, specialize in an area, and then are expected in turn to teach what they know and how they were taught. They tend to educate others without regard for reality to the extent that that is what and how they learned. To be sure, these are blanket condemnations that give short shrift to the exceptional educators out there who have broad ranging knowledge and understanding that enables them to weave their area of expertise into the complex canvas of reality. I fear though that these educators are indeed the exception, and that all too often the practice is to treat as static and isolated matters that in reality are dynamic and contextual.

It is worth quickly exploring what might otherwise be a glossed over point about the dynamic and contextual complexity in which we exist. This is an obvious point that is evidently overlooked; although, perhaps for understandable reasons. Buried in the endnotes of Chapter 1 there was a brief discussion of the fact that our world is comprised of a countless number of dynamic and extremely complex systems. These complex systems are an assortment of a virtually infinite number of variables that interact with each other to form a dynamic whole where cause and effect cannot be linearly connected across time and space (Davies, 1992). In complex, non-linear systems, the knowledge of conditions at a given point – not that a knowledge of a virtually infinite number of variables is really possible – does not allow us to predict subsequent conditions with certainty. This complexity increases even further when we consider that, far from being passive participants, our existence is, in and of itself, exceedingly elaborate.

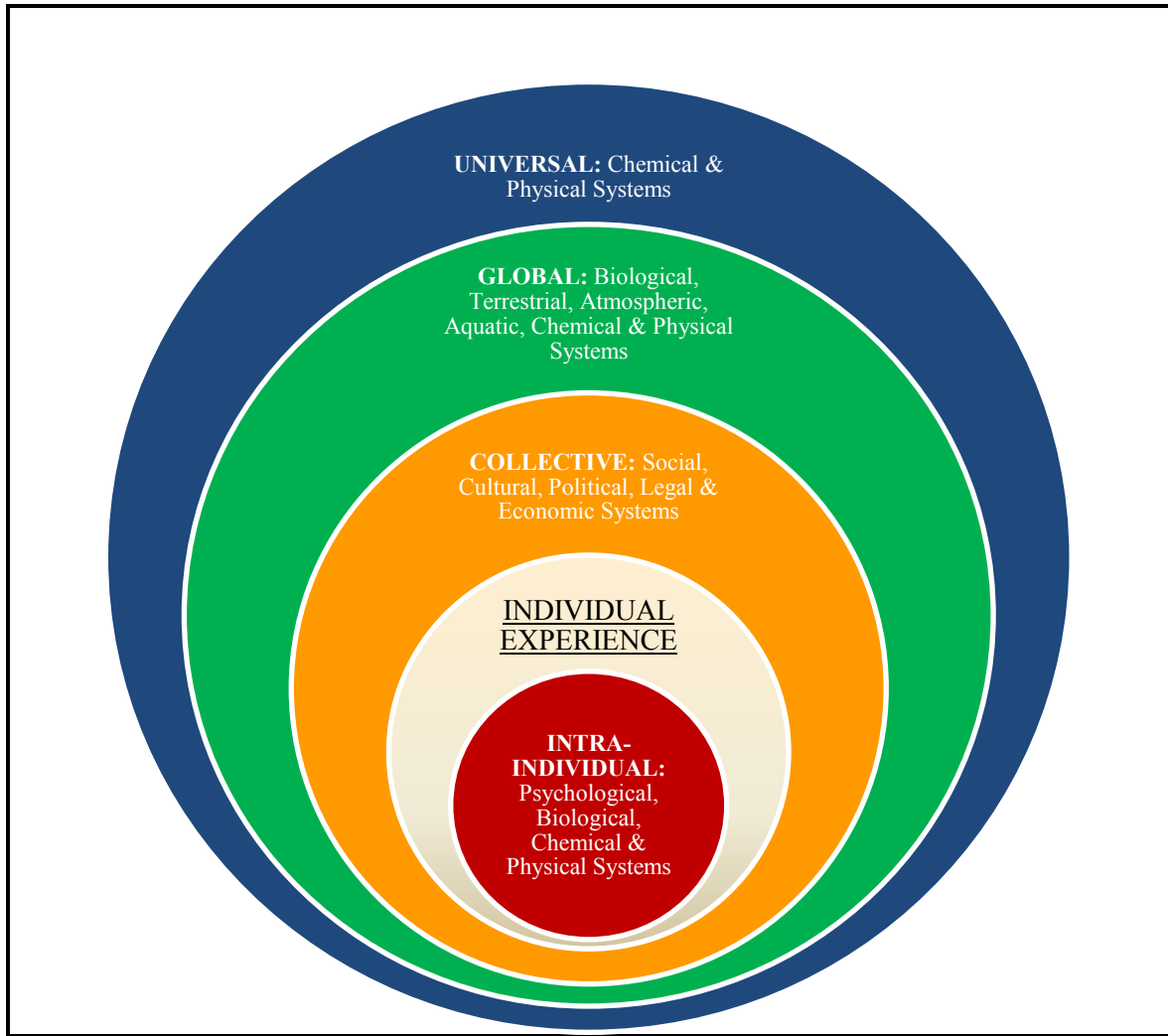
At collective levels we exist as families, communities, cultures, societies and nations, all multifaceted and involving a plethora of social, cultural, political, legal, and economic systems. These extensive, intricate, not readily discernible systems were not created by some omniscient designer, but have instead grown over time and are gradually altered to fit the changing demands of society. When problems arise with these systems we experience difficulties – such as the serious, interconnected economic, social and environmental issues that threaten our long-term health and existence – but without necessarily knowing why or how we should respond. At a more specific level, we exist as individuals who are not only enmeshed in all of the systems just described but are, in turn, also comprised of a vast number of complex psychological, biological, chemical, and physical systems, about many of which we are not cognizant. We can summarize these overlapping relationships in Figure 2.<sup>2</sup>

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<sup>2</sup> Figures 2 and 3, and several ideas in this section, are based on ongoing work by the author on the topic of motivation relating to achievement and to the environment. Figure 3 is a portion of a model under development that is currently referred to as the Convergent Model of Motivation.

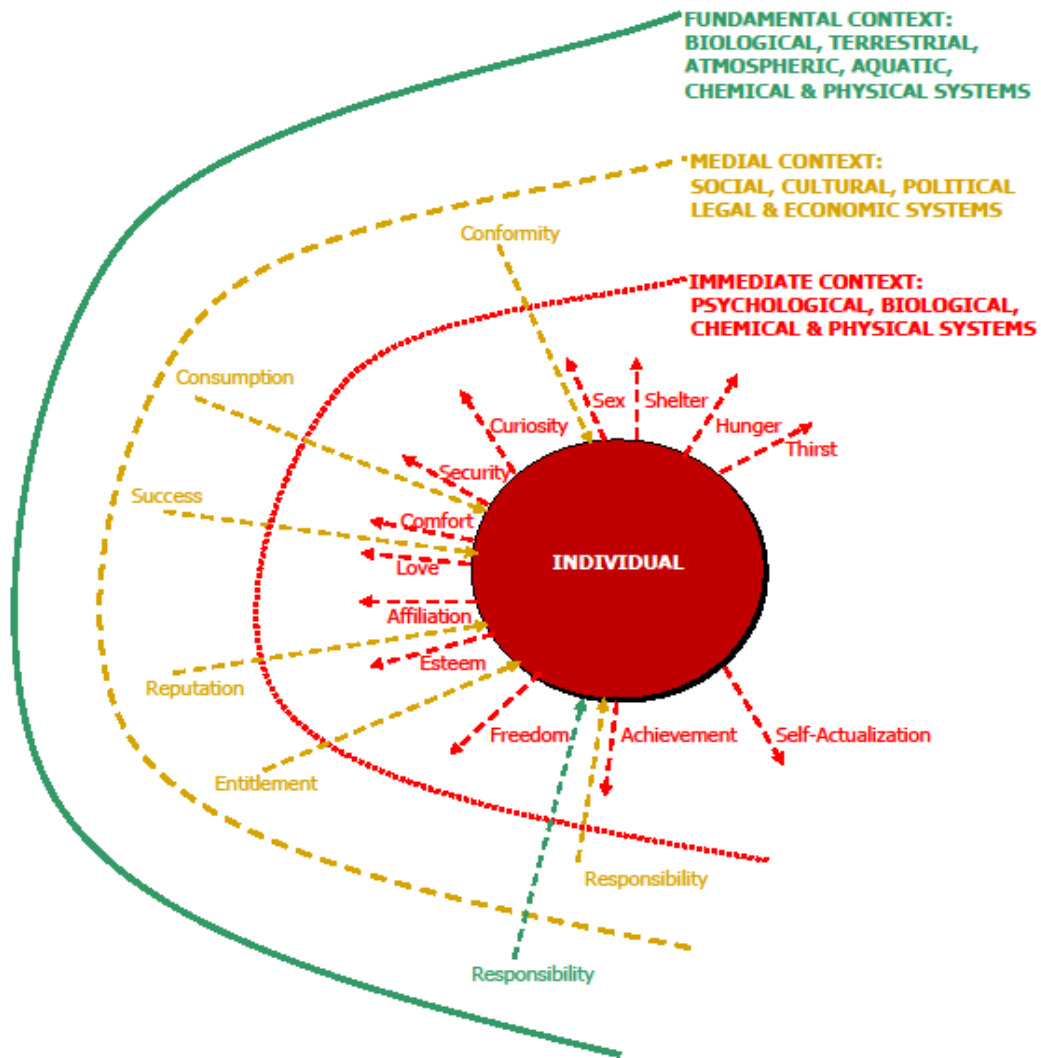


**FIGURE 2: THE DYNAMIC AND CONTEXTUAL NATURE OF OUR REALITY**



The second level in Figure 2 refers to the level at which our individual mind or consciousness experiences reality. The levels above and below this are far less accessible. Our experience of life as individuals does not necessarily make us aware of the numerous systems that exist inside and outside of ourselves. For that matter, knowing or even being aware of everything that is going on around us is clearly not within our grasp. Even the motivational forces and drives directly acting on us at any given point in time (see Figure 3) may evade us in the sense that we are neither truly aware of nor understand them, let alone, to further make the point, our having an awareness of the direct and indirect impacts of the innumerable other psychological, biological, chemical and physical systems happening internally, and social, cultural, political, legal, economic, biological, terrestrial, atmospheric, aquatic, chemical and physical systems happening externally.

**FIGURE 3: POTENTIAL MOTIVATIONAL FORCES AND DRIVES ACTING ON AN INDIVIDUAL**



In light of all of these internal and external complex systems, our cognitive limitations require a certain degree of simplification and isolation to make matters manageable for us. Thinking requires effort, and dealing with the intricacy and impenetrability of the reality around us quickly becomes overwhelming, so we should not be surprised by attempts to reduce things into simpler explanations. Accordingly, it is understandable that

we have disciplines that focus on small parts of the greater whole of reality. However, to return to the concern that opened this chapter, it is one thing to break reality into bite sized pieces and quite another to then act as if the pieces are all that matters. We are deluding ourselves when we try to focus on one aspect of our reality in isolation of the complex systems in which it is enmeshed, and then pretend that approach is sufficient.

It is not difficult to fall into the trap of finding an explanatory system or idea that seems to make sense of the complexity enveloping us and then assuming that it can be used to reduce everything into one single fundamental explanation. This creates the illusion that one can then sort and simplify everything into whatever they believe to be truly real. As the expression goes, if all you have is a hammer then everything looks like a nail. Likewise, if all you have available to you are a set of legal or economic concepts, or a set of general beliefs for that matter, then you will tend to view reality through those concepts or beliefs and try to make it fit. Not only is this approach inadequate, there are also potentially dangerous consequences.

Some commentators argue narrow specialization leads to collective ineffectiveness. While understanding a specialty is useful and may be financially rewarded, it is no longer sufficient, if it ever was. In Chapter 1, we mentioned John Ralston Saul's (1995) point that our society is effectively unconscious due to individuals having a narrow area of expertise while being largely naive in most other areas. To the extent that we are ignorant about most of reality, we cannot adequately deal with the critical problems we face. As a result, our existence is liable to get progressively more challenging with an increasing population competing over finite resources, but unaware individuals will ignore the issues until they become an immediate crisis, at which point it may be too late to effectively respond.

A further problem is that claims from supposed authorities that endorse a particular view about reality can change people's worldviews. The resulting danger is that people may start acting in a manner consistent with these new beliefs:

The stories we tell about self and the world have practical consequences. Rather than simply expressing reality, our stories escape their texts and help produce reality. We forget the human authorship of the social world, and because some people seem to live according to our stories we believe that these accounts must be externally and objectively true after all (McMahon, 1997:165).

Consequently, theorizing can act to legitimate the worldview it is hypothesizing thereby helping to produce the very empirical world it studies as independently given.<sup>xix</sup> One need only listen to the pundits and politicians continually telling us that we are effectively powerless in the face of the economy and market to see this in action on a daily basis.

When a worldview describes a fatalistic world full only of objects or impersonal processes, it may threaten our freedom to act as agents. As Carol Dweck (2000) argues, people's beliefs help determine how they will think, feel, and act in a situation. We not only believe what we see and hear, but we also see and hear what we believe. If we believe that we are passive participants who, for instance, are governed by the economy – and not the other way around – we are less likely to embrace our potential as active moral agents.

The combination of the intricacy of reality, the assumptions underlying our thought patterns and knowledge, and our subjectivity make reductive explanations and claims of neutrality problematic. We should now know enough about the remarkable complexity of our existence, and our limited understanding of it, to recognize that there is no academic discipline, theoretical approach, or set of beliefs that will provide a comprehensive answer to any given issue. Despite what their proponents may argue, none of them has a privileged access to reality. Instead, each provides only a limited perspective on our highly dynamic and complicated world. Mary Midgley illustrates this by comparing human knowledge to an aquarium:

[H]uman life [is] like an enormous, ill-lit aquarium which we never see fully from above, but only through various small windows unevenly distributed around it. Scientific windows - like historical ones - are just one important set among these. Fish and other strange creatures constantly swim away from particular windows... reappearing where different lighting can make them hard to recognize. Long experience, along with constant dashing around between windows, does give us a good deal of skill in tracking them. But if we refuse to put together the data from different windows, then we can be in real trouble (1994:123).

Ultimately, the insight resulting from any given discipline is partial and based on moral and ideological judgements,<sup>xx</sup> and the notion of a single, neutral, analytical approach is a myth.<sup>xxi</sup> The incomplete insight of any discipline then cannot independently provide an adequate description of reality or guide us to the best course of action; although, it may give the appearance that it can. Instead, useful solutions to the complex issues we face in our modern world will take the cooperative efforts of many individuals and approaches. As Midgley says, the “explanation of complex things has to proceed pluralistically and convergently, not by competition between specialists but by using many different ways of thought that converge on the topic and co-ordinating their findings” (1994:90). Certainly, the need for specialists to be able to think across disciplines seems reasonably clear, but this is not simply a problem with or for them.

Until now we have focused on difficulties with disciplines and specialists, but this also reveals problems with our overall educational system. For one thing, those with advanced degrees first passed through a Kindergarten to Grade 12 system. If those

systems had developed a broader perspective that was in keeping with reality then this would presumably have resulted in a more holistic, interdisciplinary approach at the higher levels. Instead, while K-12 systems may span multiple subjects they tend to be treated as just that, separate subjects dealt with at separate times by separate teachers without overlap or common purpose. Moreover, in the current climate focused on standardized testing and performance measures the subjects themselves become further reduced to a series of selected facts that need to be memorized for the short-term and then regurgitated for a test. This approach does not prepare students for what they will face in their future working lives let alone prepare them for dealing with the intricate reality that makes their lives possible.

To make this point clear on a practical level, we can revisit some of the issues raised in Chapter 1 and ask ourselves how much the average high school graduate knows about the rudimentary functioning of the world around them, how aware they are of the global life support systems that they need to survive, and how well they comprehend the impact of their own actions on these systems. Just focusing on the first element, knowledge of the functioning of the world in which they live, indicates the scope of the problem. How many graduates today could provide adequate answers to the following basic questions?

How do natural systems maintain an environment that can support life?

What is the relationship between the wellbeing of the natural environment and human health and living conditions?

What are ecosystems and their underlying structural and functional components?

What is the relevance of biodiversity and what are the modern trends and causes of species extinction?

What is carrying capacity, how does it apply to the human species, and what are the past, present and projected world population levels?

If all the students in law, economics, and public policy who eventually find their way into influential public and private sector positions had a reasonable amount of knowledge and understanding about the world in which they live then how much further ahead would we be today as a society? Instead, we are subject to the limitations of narrowness and the disconnect from reality every day. It leads to the obstacles to intelligence we outlined in Chapter 1 and the dire consequences of ignorance, irrationality, self-absorption, superficiality, the susceptibility to counterproductive beliefs, and so on. As our population grows on a finite planet we can no longer turn our minds away from reality.

Instead we need to prepare individuals to factor in and synthesize a variety of disciplines and perspectives if we hope to successfully deal with reality and develop solutions that will enable us to thrive in what will be an increasingly challenging future. As Aldo Leopold (1948) asked, "If education does not teach us these things, then what is education for?"

Leopold's question identifies a key point. In my casual surveys of hundreds of people there is no overall consensus as to what education is for, and even within families there are widely varying responses. As an example, at a recent function, I separately asked each member of a family in attendance about their take on the aim or purpose of education. The mother, fixing me with an intent look, made it quite clear that education was very important so that her children could get a good job, preferably becoming doctors, and then earn respect and a good income so they could do whatever they wanted. The father hurriedly made a comment about the point of education involving learning knowledge and how to do things before referring me to his wife for a supposedly better answer. The son in Grade 9 shrugged his shoulders and grumbled that he went to school because he had to, all the while glaring at me as if it were somehow my fault just because I dared to ask the question. The daughter in Grade 12 also seemed to think it was an odd question and pointed out the aim of high school education was to get good grades so that she could get into university; although, she did add that seeing her friends everyday made it more worthwhile.

The varied comments of this family are typical of my surveys, and the literature confirms that this dissonance about the aims of education is widespread, including among educators (Marple, 1999). As mentioned in the Introduction, Kieran Egan contends that three major educational ideas have shared dominance for centuries: "that we must shape the young to the current norms and conventions of adult society, that we must teach them the knowledge that will ensure their thinking conforms with what is real and true about the world, and that we must encourage the development of each student's individual potential" (1997:3). He argues that although these three aims are usually thought to be consistent and mutually supportive, they are actually incompatible with one another. Nonetheless, each one tends to find new advocates throughout the decades so that one idea is heralded as the panacea while the other two are relegated to the back burner. This lasts until the idea in vogue is demoted by one of the other ideas taking its turn to be proclaimed as the great new solution, and so the cycle continues.

A multiplicity of different goals for different people is one thing, but a situation where conflicting ideas get chronically rehashed, and many students may be doing little more than going through the motions without knowing why they are there, presents a substantial problem. Students deserve a clear and convincing reason for why they are expected to spend so much of their youth sitting in classrooms. There are many reasons

then to attempt to identify a new aim for education. It would replace the present uncertainty with a clearer goal to strive towards and it would allow educators and students to prioritize accordingly. It would also contribute a greater sense of meaning and purpose to educational endeavours. In turn, an aim to work towards and an understanding of the purpose of the journey should act to increase personal responsibility and motivation. Moreover, the sense of accomplishment from making progress along the way should likewise act to increase motivation and further improve performance while building confidence and self-esteem.

Some might be worried about efforts to find a sufficiently universal aim, but as identified, governing goals for education already exist, albeit ones that are conflicting and clearly insufficient. As Egan points out, if these ideas were going to work then they would have worked by now given the various permutations that have been tried over the decades. While each idea has merit, evidently none of them is adequate on its own. Unless and until someone can make a compelling case for an educational system that could operate without some form of purpose or goal it is imperative that we develop a new and compelling aim for education.

Education is ultimately about how we want to live and how we want our children to live. It should reflect the greatest human potential and inspire students to realize their abundant capabilities. Heesoon Bai (2006:7) argues that, “Modern education is fundamentally committed to the cultivation of autonomy as human agency... Through education, we want our fellow individuals to think for themselves and to make reasoned ethical decisions.” This is not a new goal.

Plato’s *Republic* (1976), written more than two thousand years ago, was primarily concerned with how we should live, and developing a society that would enable people to realize their potential. He argued that the typical person largely focuses on imprecise beliefs about reality, a point we touched on in Chapter 1 and will expand upon in Chapter 3. In contrast, the philosopher (and others employing a systematic and, ideally, testable mode of inquiry) is better able to see things for what they really are. Plato thought the majority of people are so enamoured with their imprecise beliefs about reality that they will attack and persecute those who better understand reality, and if he were to now experience many of the political opinion shows today on television or radio his worst fears would no doubt be confirmed. His solution for this unfortunate state of affairs was an educational system that, through the progress of their minds towards the ‘Form of the Good,’ would enable people to have the autonomy to escape from their distorted reflections and opinions about reality. For Plato, this education included the pursuit of justice, wisdom and morality that, in turn, would lead to happiness and well-being.

While the system Plato described is not practicable, his educational ideas are strongly influential to this day and, not surprisingly, the key elements of autonomy, freedom, and regard for reality are critical functions of our approach as well. For our purposes, Iris Murdoch (1970) does an effective job of bringing these elements together. In her view, the task to come to see the world as it truly is, or at least as accurately as possible, is central to virtue and to the only freedom truly available to us. Goodness then is a form of realism, an experience of accurate vision that, where appropriate, leads to action. As such, our freedom relates to our efforts to focus our attention and see things as they really are, to try to see reality as justly and accurately as we can. A good person, then, cannot live in a ‘private dream world’ but rather must recognize the existence, needs, and rights of others. Consequently, freedom and goodness are connected with our efforts to move beyond self-centered aims and impulses, to pierce the ‘veil of selfish consciousness’, in order to see and to interact with the world as it really is.

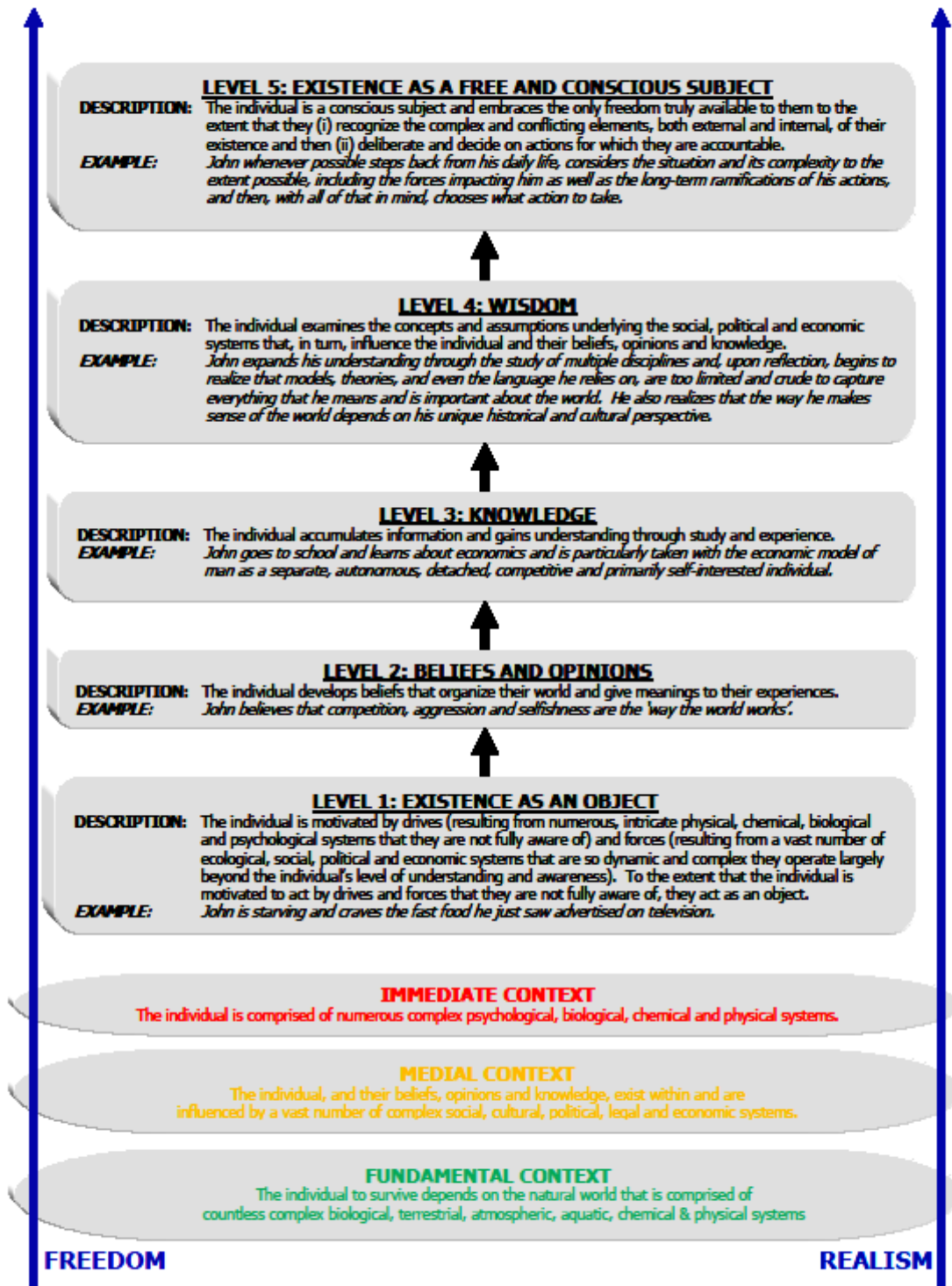
Midgley helps us to elaborate on this by writing that: “human freedom centres on being a creature able, in some degree, to act as a whole in dealing with its conflicting desires” (1994:168). Human beings are both objects of nature and subjects that can and must choose what to do, physically determined earthly organisms and active moral agents. To the extent that we are objects, caught up in the processes around us, we are an integral part of the natural world motivated by drives and forces beyond our control. As subjects, we are active agents – beings with minds who mind about things – and we are distinct from the natural world to the extent that we are aware of ourselves, others, and the actions we choose to take in dealing with our complex existence.

Our freedom then has two main elements: (i) recognizing the complex and conflicting elements, both external and internal, of our existence and then (ii) deliberating and deciding on actions for which we are accountable. Recognizing the conflicting elements of our existence is no easy task. As outlined, we are social beings – situated within families, communities, and cultural and natural settings – influenced by our heredity and our environment. We are connected to one another, to a shared past and future, and to the rest of the human and natural world. In this global context, we morally decide on actions by stepping back from the situation or issue and considering it in as much of its complexity as possible.

This potential for autonomy, freedom, and realism is what separates us from other animals, and makes us unique. In Figure 4 we show a progression where each higher level represents an increase in these traits. The levels should be self-explanatory with each level containing all the levels below it so that a person at the fifth level also draws upon wisdom, knowledge, beliefs, and opinions while experiencing life to some extent as an object of nature. Notably, the second level corresponds with Plato’s typical person



**FIGURE 4: DEGREES OF REALISM AND FREEDOM**



whose thoughts and actions are dictated by beliefs and opinions that are not subject to greater scrutiny, will likely be misguided, and most certainly will be incomplete. Our friend John from Chapter 1 largely exists at this level, although, in Figure 4 we show his development through each of the levels. One challenge for a new aim for education is to encourage individuals to live up to their potential as conscious subjects who embrace reality and the freedom available to them to the greatest extent possible. If Plato and many commentators since are correct that most people live and die clinging to misguided beliefs then this function is well deserving of our attention. To be clear, increased autonomy, freedom and realism are not the aims we are proposing, they in fact relate to the second and third aims in Egan's list, but they are consequences to follow from the pursuit of our aim.

The key to our unique potential for autonomy, freedom, and realism is our intelligence. It is our neural functions and cognitive capacity that enable us to be aware of and reflect on ourselves and our actions, and provide us with the potential to use mental tools, languages, theories, art and so on to better make sense of our lives and the world. Likewise, it is our intelligence that enables us to realize our potential for freedom by using this awareness and understanding to step back from our lives and then deliberate and decide on our actions. The more an individual builds upon their wide-ranging potential for intelligence, the better will be their awareness, understanding and ability to think and reflect. Accordingly, the aim we are advocating for education focuses on developing and maximizing the comprehensive form of intelligence presented by the Pentad Model, which will be introduced in the following chapter.

This aim is of considerable academic and intellectual importance to the extent it develops the immense human capacity for intelligence in a way that enables people to effectively respond to reality, think across disciplines, understand complex ideas, adapt effectively to the environment, learn from experience, engage in various forms of reasoning, overcome obstacles by taking thought and, among other things, be less susceptible to self-absorbed individualism and more capable of analyzing and rejecting counterproductive belief systems. The aim is also of considerable practical benefit for the challenges for our species ahead. Comprehensive intelligence has ensured that our species has survived and thrived. The multi-stage planning made possible by higher levels of intelligence enabled us to predict certain consequences of our actions, understand dangers, and then take the necessary actions. We appear to have lost some of these capabilities today or, at the very least, the challenges now before us are considerably more substantial. That said, there is something we can do about this situation. We have the opportunity to deliberately increase our intelligence as a species by transforming our educational system.

Bringing about this sort of change will require effort, but it is also full of possibility:

The more we learn about what we are, the more options we will discern about what to try to become. Americans have long honored the “self-made man,” but now that we are actually learning enough to be able to remake ourselves into something new, many flinch. Many would apparently rather bumble around with their eyes closed, trusting in tradition, than look around to see what’s about to happen. Yes, it is unnerving; yes, it can be scary. After all, there are entirely new mistakes we are now empowered to make for the first time. But it’s the beginning of a great new adventure for our knowing species. And it’s much more exciting, as well as safer, if we open our eyes (Dennett, 2003:6).

We occupy a unique position on this planet with the ability to tap into an incredibly profound and rich experience, and the ability to effect dramatic global impacts with long-term implications. These abilities have a shared basis in our intelligence that sets us apart from every other species of which we are aware. With this in mind, our educational system should have as its purpose the development of this unique intelligence with its capacities that enable us to occupy the position that we do. We will elaborate on what we mean by intelligence in the following chapters and introduce the Pentad Model as a framework to guide this process.

## CHAPTER 3: THE PENTAD MODEL

What do we mean by intelligence? Answers to this question frequently equate intelligence with IQ, but this presents problems. A former U.S. President was often criticized for being somewhat less than exceptionally intelligent. According to his critics this was evident in a variety of factors ranging from his C average performance at university to his public speaking. There is some evidence though to suggest that, based on his reported SAT score of 1206, he might have an IQ around 124, which is in the top 6 percent. Robert Sternberg on the other hand, an eminent scholar, a Professor at Yale University, and a former President of the American Psychological Association, did horribly on IQ tests as a child. For that matter, James Watson, a Nobel prize winner praised for achieving one of the greatest scientific breakthroughs of all time for his part in discovering the structure of DNA, reportedly has an IQ around 115. In this case, the individuals with the lower IQ might be considered to be the more intelligent. Assuming the U.S. President's critics were onto something beyond mere partisanship, how can we explain this situation?

At the risk of getting ourselves into further difficulty, we can think about the issue of IQ in terms of two computers. The first computer has a faster processor but it is running an old operating system, say Windows 3.1, and very few programs including an outdated word processor. The old operating system is very limiting and does not utilize the capabilities of the fast processor. The lack of programs further restricts its usefulness. It should be clear that at this point there is very little that one can do with this computer despite its high speed processor. In marked contrast, the second computer has a slower processor but it is running an advanced operating system and multiple programs enabling word processing, accounting, statistics, engineering simulations, graphic design, video editing, and so on. In spite of its slower processor, there are many more things that can be accomplished with the second computer. It has been loaded with software that makes it far more useful.

For the moment we can think of IQ as being somewhat like the performance of a computer processor. There is greater potential with a higher IQ just like there is with a faster processor, but to take advantage of this potential requires something along the lines of an effective operating system and multiple programs. If we think back to Figure 4 in Chapter 2, we can imagine an illiterate high school dropout with an IQ of 140 who is stuck operating at the level of beliefs and opinions, and spends his time dealing and using drugs, will be far less capable than a doctor with an IQ of 110 who strives towards knowledge and wisdom and has developed some expertise in math, biology, chemistry and philosophy, speaks multiple languages, and can play a mean polka on the accordion. The dropout might have more cognitive potential than the doctor, but in this case he has failed to develop that potential.

There are limitations to using a computer analogy to explain something like intelligence, yet at the same time this analogy does help to make the point that intelligence is best conceived as something more comprehensive than an IQ score. Moreover, as shown in Table 3.1 there are key elements of intelligence that can be seen as somewhat similar to operating systems and programs. Specifically, the types of cognitive tools, understandings, beliefs, theories, abilities and so on that we acquire help to determine the extent that we develop our intelligence. To continue with our analogy, this is the software that we must load onto the hardware of our brain to maximize its effectiveness and to realize its potential for intelligence.

This way of speaking may seem odd to those who would argue that we are an intelligent species by nature, and that each of us is born with a fixed amount of intelligence. Without getting too caught up in semantics, that interpretation seems too narrow, not to mention counterproductive. It is too narrow to the extent that the cleverness – referring to our skill to deal with matters in a short timeframe – with which we are born is not sufficient to meet, as one example, the previously referred to APA definition of intelligence that involves longer-term capacities such as adapting effectively to the environment and learning from experience (Neisser et al., 1996:77). The successful performance of these abilities requires the addition of what we have casually referred to as software. For instance, as argued in the Introduction, one can imagine that the ability to understand complex ideas, especially those generated by others, requires the development of language with the syntax required to convey mental models, with increasingly complex ideas requiring increasingly complex language and mental models.

We are not necessarily born intelligent then, but rather we are born with an immense capacity for intelligence that will get realized to a greater or lesser extent depending on effort and opportunities. This is why the idea that we have a fixed amount of intelligence is counterproductive. To subscribe to this view is to sell ourselves short and to downplay our potential. It is not enough to be born with a certain IQ. Instead, the development of intelligence is perhaps best viewed as resulting from a combination of an individual's biological potential, the effort they apply, and the beliefs, cognitive tools, and opportunities for learning to which they are exposed. Intelligence is increasable and requires effort and software, or what we referred to earlier as mental tools, to be properly realized. In the remainder of this chapter, we will outline a comprehensive model that can be used in our educational systems to guide the development of students' intelligence.

## ***THE PENTAD MODEL***

Human intelligence is a largely contested concept. This chapter will not attempt to explore the many competing theories of and understandings about intelligence in any great detail as this has been done many times already. Instead, a framework based on different levels of human intelligence, the Pentad Model, will be introduced. This model brings together several leading theories. Although this involves taking some liberties with these theories, it appears possible to draw out the main parts of each and combine them in a manner that provides a more complete view of intelligence.

As shown in Table 3.1, the Pentad Model includes five levels of intelligence: anatomical, cognitive capacity, operations, cognitive tools, and cognitive habits and beliefs. The anatomical level describes the physical components and structure such as the cells and neural connections, or what we could refer to as the hardware, inside each of us that makes intelligence possible. This elaborate hardware results in our having remarkable processing and computational abilities which are represented at the cognitive capacity level. This cognitive capacity can be applied to some key capabilities and functions, or multiple intelligences as Howard Gardner (1983) refers to them, that comprise the operations level. These capabilities and functions (or multiple intelligences) can be enhanced by various cognitive tools and kinds of understanding that enlarge our powers to think and comprehend and, as expected, make up the cognitive tools level. At this point then in our model of intelligence we have an anatomical structure that produces cognitive capacity which can be directed towards multiple functions that can be improved through numerous thinking tools. The final level deals with the cognitive habits and beliefs that can impact each of the other levels.

**TABLE 3.1: PENTAD MODEL OF INTELLIGENCE**

<b>LEVEL OF ANALYSIS</b>	<b>COMPONENT OF HUMAN INTELLIGENCE</b>
<b>Anatomical</b>	The physical structure (e.g., cells, axons, dendrites, and neural connections) required to develop intelligence.
<b>Cognitive Capacity</b>	The processing/computational ability (a function of neural connections) required to carry out a task; it is assessed primarily through psychometric measures of intelligence ('g').
<b>Operations</b>	The multiple abilities: linguistic, logical-mathematical, musical, spatial, bodily-kinaesthetic, inter-personal, intra-personal, and environmental that an individual can develop using their brain with its cognitive capacity.
<b>Cognitive Tools</b>	The thinking tools that an individual must take from culture and add to their mind to fully develop its potential for intelligence; without the addition of these tools (e.g., story, metaphor, forming images) each of the multiple abilities listed above will exist in an incomplete state.
<b>Cognitive Habits and Beliefs</b>	The cognitive habits (e.g., perseverance) and beliefs (e.g., challenges are inevitable) required by an individual to fully develop their potential for intelligence.

Adapted from Dweck (2000), Egan (1997), Gardner (1983), Garlick (2002), and Stanovich (2002)

## ANATOMICAL

The need for the Pentad Model to include the anatomical level should not be hard to understand. Without the critical structure of the brain, or for that matter the body that provides the life support systems for that brain, intelligence cannot exist. This appears to be readily recognized given that very intelligent people are commonly referred to as ‘brains’ while the term ‘brain dead’ does not sound too promising with respect to engaging in multistage planning, various forms of reasoning, a rousing game of chess, or any of the other activities that require intelligence. It is important then for the model to acknowledge the internal structure and components that make intelligence possible.

Despite the fundamental importance of the anatomical level though, we will not spend too much time on it or the cognitive capacity level as we are far more interested in the software over which we have some control as opposed to the hardware of the brain over which we have far less control. Granted, we can take pains to not repeatedly land on our heads, expose ourselves to concussions, or otherwise damage the delicate organ between our ears, but we have no control over which brain is inside when we are delivered into this world. The strengths and weaknesses of our mental processor is something we can quite rightly blame on our parents. Not even building a time machine and going back to pick smarter parents in an effort to be the recipient of better genetic material will help because then, of course, you would not be you, and most people are presumably not interested in negating their existence just so that someone else can have a better brain. So, now that we have that sorted out, we can start to return to our focus on maximizing the intelligence of the brains with which we are born. Before we do that though, there are a few quick points about the anatomical level that, although comprehensively dealt with in countless other sources, merit a brief mention now.

The anatomy of the human brain is incredibly complex. Thousands of miles of billions of nerve cells with trillions of connections between them operate in conjunction with trillions of supportive cells and blood vessels while electrochemical waves travel through leading to the release of dozens of chemical neurotransmitters. The result of all of this is amazing. As Marian Diamond would say to begin her popular lectures at UC Berkeley:

My subject is the brain because when I was 15 I saw my first human brain, and I said those cells can create ideas. And that just blew my mind, literally, and I’ve studied them ever since... It’s a little 3 pound mass that I can hold in one hand and yet it can conceive of a universe a billion light years across. Little cells. Aren’t you amazed? Aren’t you respectful for what you carry in the top of your heads? You should be, and each of your brains is unique. There’s never been a brain like yours on this Earth before.”



In addition to the understandable sense of wonder at our brains and their potential, this raises another crucial point because as we move from the anatomical level to the other levels in the Pentad Model the small matter of consciousness arises. Somehow neuron firings and electrochemical waves result in self-awareness, subjective personal experiences, and the potential for an individual to act as an active agent. This is quite a leap:

Of course it is true that researchers have lately made huge and fascinating discoveries about the neural processes involved in thought and perception. They have evidently hoped that, by filling in this story – by tracing a continuous neural process – they can build up a context which will make the transition to conscious perception itself equally smooth and unremarkable, thereby solving ‘the problem of consciousness’. But this is simply building a smooth road to the edge of the Grand Canyon. What comes next is a change of a totally different kind. The Grand Canyon is still part of the natural world, but roads cannot be bulldozed across it. There is no possible kind of build-up that could make it less of a jolt to move from talking about how nerves work to the first-person experience of – say – a sudden toothache or a blaze of light. This move is not a further stage of the same process (Midgley, 1994:101).

Almost all of the elements of intelligence that we will focus on in this text relate to the consciousness side of the equation. Still, it is important to keep in mind the anatomic marvels and mystery on the other side of the equation and to remain cognizant of the significant jump between them.

We can conclude this brief section then by noting that of particular interest to us at this level are the billions of interconnected nerve cells that manage our thoughts, senses, emotions and movements, and the insight that reasoning capacities appear to be a function of these neural connections. Research in neuroscience and cognitive science suggests that different intellectual abilities are based on different neural circuits (i.e., specific connections are critical for different abilities) that are open to change, and that an adaptation mechanism that responds to environmental input is required to develop such connections (Garlick, 2002). Consequently, one means to the development of the ‘anatomical’ level of intelligence involves exposure to diverse environmental stimulation and demands. Notably though, this primarily applies during childhood. The nervous systems’ capacity to develop and change connections in response to environmental cues appears to largely end at maturity which may explain why the increase in reasoning capacities is also observed to stop at this time. This indicates that there is a critical learning period, at least for certain aspects of intelligence.

## COGNITIVE CAPACITY

The cognitive capacity level has historically received the most focus from researchers exploring intelligence. The neural circuits mentioned above provide the human brain with processing and computational abilities that enable functions such as consciousness, perception, reflexivity, reason, memory, imagination, creativity, will, and problem solving. We are able to mentally manipulate, store, and recall information; learn from experience; form concepts and model reality; be aware of ourselves and our relationship to the world; experience powerful emotions; create ideas and images of things not directly seen or experienced; make decisions; commit to a specific course of action; and so on. These capacities vary significantly between individuals; for instance, there are individual differences in information processing capacity (Voorhies & Scandura, 1977), and testing individuals for some of these capacities is commonplace.

Human cognitive capacity is primarily evaluated with psychometric measures such as IQ tests, which have been developed to assess the general factor of intelligence ('g'), and other related standardized tests including the Scholastic Assessment Test (SAT) and the Graduate Record Exam (GRE). IQ tests tend to be quite accurate in terms of measuring analytical and verbal skills in a reliable way. Moreover, IQ is strongly related to many important academic, occupational, economic, and social outcomes where a high IQ provides an advantage in life because most endeavours require some reasoning and decision-making. As importantly, standardized testing contributes to a more impartial admissions process for colleges and universities where IQ can be relied upon rather than familial status and prior academic experiences that may have been limited due to socio-economic factors. Despite these benefits there are also many concerns.

We reviewed some of the issues and challenges to relying on IQ at the beginning of this chapter. IQ tests, and the extent that they actually measure intelligence, are the subject of considerable debate, not the least of which involves the fact that the concept of IQ has been used in the past to justify political agendas and controversial policies involving class, race and eugenics. Critics like Robert Sternberg (1985) point out that IQ tests fail to measure key elements critical to life success and problem solving such as creativity and practical knowledge, and that a key source of the problem is that IQ tests, and schools also, have too narrow a focus on analytical skills:

[T]he kinds of tasks used in conventional tests of intelligence are largely arbitrary and lacking in any theoretical basis. The revolutionaries... believe that *g* is an artifact of the narrow range of kinds of tests conventionally used to measure intelligence. In their view, the general factor would disappear if the tests were more widely conceived and based on a broad, well-specified theory of intelligence. Thus, these researchers believe that what traditionalists believe they know is a result of the traditionalists' asking too narrow a question. The revolutionaries see the so-called intelligence quotient-the IQ-as neither a quotient nor an indicator of intelligence, broadly defined (1996:78).

It is problematic to try to reduce an individual's potential to a single number and Baron (1988) argues that the focus on IQ has led to the widely held erroneous belief that this cognitive capacity is the only reliable determinant of effective thinking. One strength of the Pentad Model is that cognitive capacity is shown to be only one of five levels of intelligence, that is, it is a necessary but not sufficient component and that other levels are indeed required for effective thinking.

To the extent that cognitive capacity, as one level of the model, is a crucial aspect of intelligence, it is important to consider how it can be developed. This raises the issue of the nature-nurture controversy, the significant debate over the extent that IQ is the result of heredity or environment. The general consensus today is that both nature and nurture impact IQ although the proportion that each contributes is still open to question with heritability estimates ranging from 0.4 to 0.8 being tempered by the realization that environment impacts genes and genes impact environment (Neisser et al., 1995). Even if IQ is highly heritable that does not mean we are born with unchangeable levels of cognitive capacity; it can still be affected by the environment or by learning, for example, both proper nutrition and musical training can increase IQ (Qian et al., 2005; Schellenberg, 2004). The research by Garlick (2002) cited previously also presents a way to resolve the nature-nurture debate by suggesting that the general measure of intelligence may in fact reflect neural plasticity, the differing ability of people's neural connections to adapt in response to environmental stimulation. Thus, as above, the exposure to diverse environmental stimulation and demands during childhood should help to develop the appropriate changes in neural connections that are required for improved mental processing and computational ability, and indeed this is likely what is occurring in musical training.<sup>xxii</sup> This corresponds with the research that suggests that although cognitive capacity does not seem improvable in the short term, long-term practice seems somewhat effective (Baron, 1985).

As a final point, when more research is available, the Pentad Model might need to be revised to incorporate Sternberg's triarchic theory of intelligence that contends that there are two other major aspects of intelligence – creative and practical – in addition to the analytical aspect concentrated on by IQ tests. According to the triarchic theory, these

three main types of intelligence: componential, experiential, and contextual, combine and work together (Sternberg, 1985, 1988), while being relatively independent of one another (Sternberg, 1996). Componential intelligence deals with the individual's internal world and involves those cognitive processes and structures most closely related to traditional psychometric measures of intelligence. Contextual intelligence deals with the individual's external world and involves practical intelligence and the processes used to adapt to environmental and cultural demands. Experiential intelligence deals with the relationship between the individual's internal and external worlds. Encompassing the notions of creativity and insight, experiential intelligence involves the effects of experience on intelligence and the individual's ability to handle both novel situations and familiar situations where the involved processes have become relatively automatic. This theory argues that a comprehensive account of intelligence needs to consider the interaction amongst an individual's internal mental processes, the environmental and cultural factors that constitute their external world, and their experience. For now we will keep IQ as the focus of the cognitive capacity level due to the considerable research supporting its existence and its correlation to multiple forms of achievement, but further research on Sternberg's theory merits close attention.

## OPERATIONS

Within the brushstroke of Emily Carr, the resonance of Oscar Peterson, the leadership of Mahatma Gandhi, the speech of Martin Luther King, the equations of Albert Einstein, and the musings of Margaret Mead we can find exceptional examples of some of the things that we can turn our minds towards. Our species has the potential to perform a remarkable set of abilities. The Operations level deals with these different types of abilities and functions to which our mental processing and computational capacities can be applied.

This level of the Pentad Model is based on Howard Gardner's (1983) theory of multiple intelligences which focuses on at least seven different sets of abilities including: linguistic, logical-mathematical, musical, spatial, bodily-kinaesthetic, interpersonal, and intrapersonal. Before we describe these intelligences or abilities we need to consider how well this level flows from the Cognitive Capacity level. Granted, it is not critical that the transition be seamless. Each level of the Pentad Model could be viewed as a separate observation window looking into an aquarium full of intelligence, to revisit a quote from Mary Midgley used in Chapter 2, such that each level or window provides an important but somewhat disconnected perspective on intelligence.

On the other hand, if the Pentad Model is viewed such that one level flows into another then the multiple intelligences that comprise the Operations level must flow from the cognitive capacity described in the level above. As discussed, for now this cognitive capacity level is more focused on the narrower analytic ability related to IQ, but there is also the potential to include the creative and practical aspects of intelligence proposed by Sternberg's triarchic theory of intelligence. For the record, Gardner does argue against the notion that there is a single human intelligence that we are born with, that cannot be changed, and that can be assessed by standard psychometric measures. However, although Gardner argues that each intelligence is conceptually independent, it would not be surprising to find that they are all dependent on underlying features of cognitive capacity such as speed of processing and working memory, and indeed they tend to be significantly reliant on the general factor of intelligence (Visser et al., 2006). This suggests that there is in fact a general intelligence as well as the more specific multiple intelligences. In this case then we can posit that the multiple intelligences at the Operations level do logically flow from general intelligence at the Cognitive Capacity level. One possible explanation for why this is so requires us to return once again to Garlick's research.

Garlick (2002) provides us with a way to understand how the notion of the general factor of intelligence ('g') can co-exist with the series of intelligences that Gardner has demonstrated have functions identified in specific locations of the brain. If reasoning

capacity is a function of neural connections and ‘g’ is a measure of individuals’ differing adaptability of neural connections in response to environmental stimulation, then the ‘g’ factor – each person’s amount of neural plasticity – would be present throughout the specific locations of the brain relevant to each intelligence. In turn, this would impact the reasoning capacities of each of the separate intelligences and explain the correlation between them and ‘g’. Other potential explanations notwithstanding, the research tying the multiple intelligences in with a more general intelligence along with the neural plasticity explanation are sufficient for our purposes to demonstrate how the model could flow from one level to the next.

One final issue to address prior to exploring the Operations level and Gardner’s theory in greater detail is the use of the term ‘multiple intelligences.’ This has been a source of contention for multiple critics of this theory who argue that what are being referred to as intelligences are better thought of as abilities. Indeed, even Gardner defines them as “an ability or set of abilities that permits an individual to solve problems or fashion products that are of consequence in a particular cultural setting” (Walters and Gardner, 1986: 165). In the Pentad Model, the multiple intelligences are not viewed as separate ‘intelligences’ per se, but are rather seen as the key capabilities and functions to which an individual’s cognitive capacity can be applied. As one of five levels of the model then, the ‘multiple intelligences’ constitute intelligence when they are viewed in combination with the other levels of the model. When approached in this fashion, Gardner’s theory provides a useful classification of these abilities.

Gardner argues against the notion that there is a single human intelligence that we are born with, that cannot be changed, and that can be assessed by standard psychometric measures. Instead, his system is composed of a number of conceptually separate intelligences or what we will agree are more appropriately defined as sets of abilities. In 1983, Gardner proposed seven intelligences:

- Linguistic intelligence is used in language skills and abilities, including the understanding and the production of both spoken and written language, the ability to learn languages, and the use of language as a means to remember information or to accomplish certain goals. Strong linguistic intelligence would assist lawyers, public speakers, writers, poets, and so on with examples including Martin Luther King Jr., Maya Angelou and Noam Chomsky.
- Logical-mathematical intelligence is used in math and quantitative skills, including logical reasoning; collecting, organizing, analyzing and interpreting data; seeing patterns and relationships; reaching conclusions and making predictions; and solving abstract problems of a logical or mathematical nature.

This intelligence is especially useful for scientists, mathematicians, engineers, statisticians, analysts, philosophers, and anyone who needed to engage in thoughtful problem solving with individuals excelling in this trait including Albert Einstein, Marie Curie and Alfred North Whitehead.

- Musical intelligence is used in the performance, composition, and appreciation of music and musical patterns, including the ability to recognize and compose musical pitches, tones, and rhythms. Strong musical intelligence would be particularly important to musicians, composers, music producers, acoustic engineers, and so on with leading examples of this ability include Wolfgang Amadeus Mozart, Joni Mitchell, and Aretha Franklin.
- Spatial intelligence is used in navigation, moving around the environment, or forming, recognizing, manipulating and recreating forms, patterns, and mental models. Proficiency at this visual thinking would assist people working in wide spaces such as pilots and sailors and those working in narrower spaces such as architects, chess players, and , of course, artists who need to express their ideas through painting, drawing or sculpting. Gifted examples of this intelligence include Pablo Picasso, Frida Kahlo, and Garry Kasparov.
- Bodily-kinaesthetic is used in control of bodily movements, including the skill and dexterity required in handling objects, in order to solve problems or fashion products. This intelligence would assist dancers, actors, athletes, surgeons, craftspeople, mechanics, and so on, with gifted individuals including Kristi Yamaguchi, Michael Jordan, and Anna Pavlova.
- Interpersonal intelligence is used to understand the behaviour of other people and interact with them by reading and responding to their motivations, emotions, desires, and intentions. This intelligence is especially useful for counsellors, salespeople, teachers, actors, religious and political leaders with individuals excelling in this trait including Margaret Mead, Mahatma Gandhi, and Meryl Streep.
- Intrapersonal intelligence is used to understand one's own inner states, motivations, abilities, and behaviour, including having an effective working model of oneself that can be used to self-regulate. While it is useful to all, this intelligence is harder to discern by virtue of its being inwardly-focused, but we can assume by their writings that Sigmund Freud, Mary Midgley, and Jean Paul Sartre had strengths in this area.

Schools have traditionally focused on and highly valued the first two sets of abilities with the others either addressed in specialized programs such as music and dance or not directly addressed at all.

The theory of multiple intelligences provides a broader conceptualization of intelligence than the notion of IQ by arguing that each individual has a different profile of capacities and potentials that enables them to contribute to society through their own strengths. Accordingly, the theory is not based solely on standard intelligence tests. Instead, Gardner considered a range of factors and argued that each intelligence should have elements such as its own symbol system, an identifiable set of unique procedures and practices, a function identified in a specific location in the human brain, and a record of cases of prodigies and exceptional individuals. As such, the theory is based on considerable scientific evidence from a variety of fields.

One key contribution of Gardner's theory is its argument that people are capable of drawing on multiple sets of abilities for solving problems or designing products that are of consequence and value in a particular context. While human beings typically have access to each of these intelligences and all are needed to ideally function in society, each individual has a different profile of intelligences as a result of genetics and environment. The theory is also open to the possibility that there are additional intelligences that can be used to expand these profiles:

All evidence now points to the brain as being a highly differentiated organ: Specific capacities, ranging from the perception of the angle of a line to the production of a particular linguistic sound, are linked to specific neural networks. From this perspective, it makes much more sense to think of the brain as harboring an indefinite number of intellectual capacities, whose relationship to one another needs to be clarified (Gardner, 1999:20).

According to Gardner, from the beginning he "readily conceded that the decision to enumerate seven (intelligences) entailed neither logical nor scientific necessity" (1999:47) and he has considered other potential intelligences since including naturalist, existential, spiritual and moral, with naturalist being the only one that 'merits addition to the list of the original seven intelligences' (Gardner 1999:52). In the remainder of this section, we will introduce an alternate eighth intelligence. This will be done for two reasons. First, to make the case that this alternate intelligence captures critical elements that are not included in naturalist intelligence. Second, exploring this alternate intelligence in some detail as a case study will enable us to explore the theory of multiple intelligences more thoroughly, especially the range of eight criteria that each intelligence must satisfy.



## **ENVIRONMENTAL INTELLIGENCE**

In 1995, Gardner introduced naturalist intelligence, an eighth intelligence that involves pattern recognition, sensitivity to characteristics of and changes in the natural world, and the ability to discern, identify and classify living things. This intelligence was of value in our evolutionary past as hunters, gatherers, and farmers relied on it, for instance, to determine what plants and animals were edible. The apparent limitation of the concept of naturalist intelligence is that the ability to identify and classify patterns in nature does not appear to be broad enough.

Environmental intelligence (ENVI) in contrast encompasses the abilities of naturalistic intelligence while also including several elements and abilities of particular relevance to current cultural needs. ENVI involves the ability to monitor the environment and to use the resulting information to guide one's thinking and actions in order to maintain or improve the chances for survival. Constant sensitivity to, and monitoring and analysis of, the environment is critical for an individual to detect local and global trends and events that can prove to be opportunities or threats. This intelligence encompasses the ability to learn about: environmental realities, their ecological and human implications, and strategies to live effectively within the environment and to help resolve environmental issues. It also goes beyond an outward focus to include having an effective working model of one's relationship to the environment that enables one to consider their place in the world and to use such information to regulate their life. ENVI also includes the capacity to understand: the broad, integrated way that things are interconnected, the extent that relationships – from subatomic to social to ecological – are a fundamental feature of human existence, and the reality that the relationship between an individual and the environment should be highly interactive if continued existence is desired.

A set of tasks relevant to ENVI can be identified from four elements adapted from Hungerford and Volk's (1990) work into the key variables involved in environmental citizenship behaviour. These elements, representing a combination of awareness, abilities and knowledge, include:

- Environmental Sensitivity – an empathetic perspective toward the environment
- Knowledge About Issues – an understanding of the nature of environmental issues and their ecological and human implications
- Personal Investment In Issues And The Environment – a strong identification with environmental issues because they are extremely

important at a personal level and the individual feels they have a proprietary interest in or responsibility towards the environment

- Knowledge Of And Skill In Using Environmental Action Strategies – an understanding of and proficiency in strategies that can be used to help resolve environmental issues

With this initial overview in mind, we can consider Gardner's theory and ENVI in greater detail.

To qualify as an additional 'multiple intelligence,' ENVI must, as a prerequisite, allow an individual to find and solve problems of importance within certain cultural settings. The description of ENVI as the ability to monitor the environment and to use the resulting information to guide one's thinking and actions in order to maintain or improve the chances for survival satisfies this condition. ENVI also has to satisfy the range of criteria for the multiple intelligences set forth by Gardner (1983). There appears to be some flexibility however, as Gardner has said that this evaluation is "reminiscent more of an artistic judgement than of a scientific assessment" (1983:62). This range of eight criteria is considered below.

- 1. Isolation as a Brain Function:** Specific locations of the brain have been identified that correspond to the function of each of the intelligences. This line of inquiry was supported by research that showed that individuals could lose a specific intelligence through disease or injury without the loss of the other intelligences. In these preliminary stages, this aspect of ENVI has yet to be evaluated. However, it is worth considering whether the current widespread absence or loss of ENVI as it relates to the natural environment might be the result of a general stunted development resulting from the widespread isolation from the natural world, the perpetual immersion/distraction in manmade and virtual 'worlds,' and so on. Given these 'realities,' for lack of a better term, it should not be surprising that the neural connections underlying this part of ENVI are not being fully developed in a sizable portion of the population. This criteria merits further attention, but given its evolutionary importance, it seems probable that the ability to monitor the environment and to respond effectively stems from specifically developed locations of the brain. In this case though, the exceptional individuals would be the minority of individuals who, due to upbringing and experiences, have not lost or failed to develop this intelligence.
- 2. Existence of Prodigies, Idiot Savants, and Exceptional Individuals:** Research that identifies individuals who either excel at or lack a given intellectual capacity

provides a valuable source of information about the extent that an intelligence is independent. In unique cases, there are highly developed specific human abilities and examples of the intelligence. In terms of ENVI, many children appear inclined to explore and appreciate the natural world; however, some individuals demonstrate a heightened sensitivity early on coupled with a motivation to increase their knowledge and take action. Initial interviews and questionnaire-based research into ENVI has provided some useful data. For instance, Simon Jackson, who at age 7 began an environmental campaign after seeing his first bear and by age 13 had started what would become the world's largest environmental youth organization, provides an example of a prodigy and an exceptional individual. He was motivated at an early age to educate himself about environmental realities and their ecological and human implications, and throughout his life he has engaged in innovative strategies to help resolve environmental issues on a global level in addition to monitoring and regulating his own life on a personal level.

- 3. Identifiable Core Operation or Set of Operations:** Each intelligence operates in complex environments and usually interacts with one or more of the other intelligences. Nevertheless, for analytical purposes, it is important to delineate a unique set of capacities that appear central for each of the intelligences. These capacities generally involve basic information-processing operations that are activated by relevant kinds of internally or externally presented information.

General processes were identified for ENVI at the beginning of this section and include elements such as:

- the ability to monitor the environment and to use the resulting information to guide one's thinking and actions in order to maintain or improve the chances for survival,
- the ability to learn about environmental realities and strategies to live an environmentally sustainable existence, and
- the capacity to understand the broad, integrated way that things are interconnected and the extent the relationship between an individual and the environment should be highly interactive if continued existence is desired.

Breaking these general processes into core information-processing operations might yield capacities including sensitivity to features and changes in the environment and the command of ecological rules.

**4. Distinctive Developmental History along with Expert “End-State”**

**Performance:** Intelligences can often be introduced in terms of an end-state – “a socially recognized and valued role that appears to rely heavily on a particular intellectual capacity” (Gardner, 1999:48). In the case of ENVI, the environmentalist, with their demonstration of the general processes identified above, can be seen to represent this socially acknowledged and sometimes appreciated role. Importantly, environmentalists can not easily be seen as the end state of any of the original seven intelligences indicating that this additional form of intelligence is required.

In addition to the end-state, a pattern of identifiable developmental stages of human growth and learning exists for each intelligence culminating in a final mastery level. Consistent with the developmental pattern of the other intelligences, an environmentalist can be viewed on a scale ranging from novice to expert. Initially, no formal instruction is required for the individual to develop environmental sensitivity (Hungerford and Volk, 1990). However, formal fields of study such as ecology and environmental studies have evolved for the advancement and implementation of the environmentalists’ knowledge and skills. When the general processes listed previously are considered, it is conceivable that they develop in stages with the ability to monitor the environment leading into the ability to learn about environmental realities and strategies which, in turn, would lead to the capacity to understand the interconnected, interactive nature of life. A state of expert end performance would be attained when, with all the core operations developed, the person actively engages in an environmentally sustainable lifestyle.

- 5. Evolutionary History and Plausibility:** There is evidence throughout the history of human evolution that our species has developed intelligence over time through experience. Selection pressures associated with the ability to adapt to the environment would logically have necessitated the development of ENVI. Consequently, as it was fundamental for both intelligence and survival, ENVI was clearly of central value in our evolutionary past and was evident to a varying degree in the practices and traditions of a wide variety of indigenous cultures. For instance, the Haisla Nation Kitlope Declaration demonstrates a clear appreciation for the interactive, interconnected nature of the relationship between people and their environment:

We, the Henaaksiala of Huduwachsdu have known, loved, and guarded the Kitlope Valley for untold, uncounted centuries. Here, our people have been born, have lived out their lives, and returned to the Earth, at one with the land. For we do not own this land so much as the land owns us. The land is part of us; and we are part of the land. It is given to us only as a trust: to live within its boundaries in beauty and harmony; to nourish our bodies and our spirits with its gifts; and to protect it from harm. We have a solemn, sacred duty to keep faith with those who came before us, who guarded and protected this land for us; we must do no less for ourselves and for those who come after.

Presently, however, ENVI as it relates to the natural environment appears to be largely latent around the world. Gardner allows for this in his refined definition of intelligence:

I now conceptualize an intelligence as a *biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture*. This modest change in wording is important because it suggests that intelligences are not things that can be seen or counted. Instead, they are potentials – presumably, neural ones – that will or will not be activated, depending on the values of a particular culture, the opportunities available in that culture, and the personal decisions made by individuals and/or their families, schoolteachers, and others (Gardner, 1999:33-34).

Consistent with the points raised by Gardner, there are several possible interrelated reasons that ENVI as it relates to the natural environment now appears to often not be activated. For most of the history of human evolution there was little reason to be concerned about the broad, integrated nature of the global environment. It is only in the past few decades that the global human population has exceeded the sustainable limits of the planet (Wackernagel et al., 2002). Our values, expectations, habits, and behaviours still reflect the decades and centuries prior to this where an increasingly specialized and urban lifestyle meant that an awareness of the natural environment was not necessary for survival.

A second related reason is that the Western model of economic growth based on instrumentalism and increasing levels of consumption is being spread through globalization. This model, with its narrow economics-based understanding, generally fails to consider the natural environment despite its being the material base of the economy and the life support system of humans. The enormous influence of the market economy and its brand of economic determinism act to obscure and discount the increasing scientific knowledge about the severity of

environmental issues. Overall, then, these issues coupled with the increasing challenges resulting from the global growth in human population and consumption indicate that we are presently faced with a critical point in the development of ENVI.

6. **Support from Experimental Psychological Tasks:** Each intelligence can be distinguished by specific tasks that can be carried out, observed, and measured. These tasks have been outlined in the previous descriptions of ENVI. Equally importantly though, to the extent that the tasks associated with one intelligence do not interfere with the tasks from another, there is the possibility that they are utilizing separate mental capacities. This, in turn, provides further support that they are indeed from discrete intelligences. This aspect of ENVI has yet to be evaluated; however, it is conceivable that relevant operations such as the sensitivity to features and changes in the environment could be carried out while we are conversing (linguistic intelligence) or moving around the environment (spatial intelligence).
7. **Supported from Psychometric Findings:** Psychometric instruments have typically been used to measure specific types of ability such as IQ. However, the theory of multiple intelligences accepts that psychometric tests can be developed with the potential to evaluate each of the intelligences. The ENVI-Q, a preliminary instrument to measure ENVI and associated thinking dispositions, has been developed and administered to a sample population.
8. **Encoded into a Symbol System:** Each intelligence has its own set of societal and personal symbol systems (e.g., language, numbers, images) that are important in capturing and conveying types of meanings and in completing each intelligence's relevant set of tasks. There are a variety of such symbol systems associated with ENVI including forms of language (e.g., sustainability, eco-friendly, green), numbers (e.g., pollution indexes, rate of species and biodiversity loss, ecological footprints for individuals, cities, countries and the planet), and images/metaphors (e.g., Mother Earth, Earth as a Living Organism (Gaia), Spaceship Earth) that readily capture the meanings of relevant events and issues.

Although preliminary, ENVI appears to present a plausible eighth intelligence that addresses environmental adaptation as well as existential considerations.<sup>xxiii</sup> Notably though, as evidenced by its potential to be considered the core aspect of intelligence (i.e., the common definition of intelligence as the ability to adapt to the environment), ENVI arguably deserves particular attention.<sup>xxiv</sup> This is especially true in light of the environmental issues facing us today and the obstacles to intelligence outlined in Chapter

1. We might point out that an Operations Level that fails to include it would be clearly lacking. Having considerable cognitive capacity that is not applied to supporting the integrated, global, ecological relationships that enable our survival seems to fall short. Being clever but dead seems rather less than intelligent. The importance of ENVI could also be considered more indirectly: intelligence is dependent on our brains which are dependent on our bodies which are dependent on the environment and life support systems of the planet.

ENVI and the seven original multiple intelligences that comprise the Operations level provide a practical overview of some of the key abilities and functions to which our cognitive capacity can be applied. The primary relevance of Gardner's theory to the Pentad Model is its argument that individuals are capable of utilizing multiple sets of abilities to solve problems and contribute to society. These potentials include the linguistic and logical-mathematical abilities that are traditionally equated with intelligence, but extend beyond to include musical, spatial, bodily-kinaesthetic, interpersonal, intrapersonal and, as just presented, environmental abilities as well. While individuals may have different propensities and profiles of these abilities due to genetics and environment, these abilities can typically be enhanced by anyone through learning and practice that engages the symbol systems and develops the relevant procedures, practices, skills and capacities.

## COGNITIVE TOOLS

In the Introduction we considered the key role that tools play in our lives. Tools enable us to do things that we otherwise could not. A hand tool like a screwdriver enables us to drive multiple screws in a short period of time, a task that would be difficult, if not impossible, without that tool. A mental tool like language aids our thinking and enables us to do a nearly infinite number of things to the point that our lives would be hard to imagine without it. To be sure, referring to something like language as a tool is a rather strange idea that deserves closer attention, but theorists like Lev Vygotsky and Kieran Egan have made a compelling case.

The main point about these mental tools is that we are able as a species to store symbolic ideas and information outside of our brains. This symbolic material can be stored in books, in films, on the Internet, in oral stories that are passed from one generation to the next, and so on. It makes up what we call culture, and within it we can find the thoughts and data from past and present generations ranging from the practical to the visionary, from mundane records to the greatest scientific, philosophic, and artistic insights. Since it is so obvious and ever-present, it is easy to fail to appreciate the critical importance of having this wealth of information readily available at our fingertips. This cultural pantry full of ideas though should not be undervalued.

During our lives we have the opportunity to learn, to use, and possibly to contribute to these ideas and collections of information. The option to start with the great insights of those that have come before rather than figuring out everything from scratch is an incredible advantage. If every one of us had to re-invent for ourselves the entirety of human knowledge – language, philosophy, math, biology, ecology, chemistry, physics, anthropology, archaeology, geography, psychology, sociology, medicine, agriculture, architecture, engineering, technology, law, music, art, social skills, and everything else – we would not get very far. Moreover, many abilities of the brain that we might take for granted need to be learned from and developed within a culture. To put this in perspective, children who have lived isolated from human contact since an early age have no understanding of human language; not surprisingly, they have not learned how to speak, read or write. To develop, these mental tools must be taken from culture and internalized.

The benefit to each of us as individuals then is that over the centuries our ancestors have created an abundance of inventions and developments that when combined provide us with a fairly elaborate way to think and communicate about the world. To reflect their potential to help us think these are referred to as cognitive tools (thinking tools). Our culture stores these cognitive tools for us and makes them available in a variety of ways so that we can learn them. I was reminded the other day how useful these tools are when



I found myself alone with a person from another culture. The fact that we did not share a language led to both of us awkwardly motioning and nodding in a feeble effort to express ourselves. We could not effectively share ideas or information. If either of us had something important to tell the other about the hungry lions that happened by every night at dusk or the friendly neighbourhood mugger who hides in the alleyway the next street over, we would have been out of luck. Having a shared way to think and communicate has its advantages.

Language and the like are tools then in the sense that they are these existing things that we can reach out with our minds to grasp and then learn to use to better accomplish something. While the hand tool called a screwdriver is useful to reassemble the car dashboard that you just dismantled to replace a bulb, the cognitive tool called language is useful to explain to your displeased spouse what possessed you to take it apart in the first place. Being skilled at using the screwdriver to fix the problem and at using language to explain yourself and fix the ‘misunderstanding’ will serve you well in this situation and should save you a fair amount of trouble.

Learning a language is a major example of how these cultural insights and material can impact our lives, but even picking up a smaller idea, like how to count or how to use a comma to help organize writing and make its meaning more clear, can make a world of difference in how we function. Once more, it is because of this utility that we refer to these as tools: the insights and information that exist in our culture can be learned by us in order to enhance the effectiveness of our minds and to enable us to better function in the world and to understand it in new and profound ways. Accordingly, we can argue that the human mind is constructed from the brain plus culture with all its cognitive tools.

Given their tremendous usefulness, it is not surprising that these cognitive tools get passed on from generation to generation and, as we learn about and use them, we come to see them as an extension of ourselves and start to think about what else we can do with them:

A new tool doesn't only enable us to perform some specific task; it changes our image of what we can do and even what we are. Once we invent a tool for some purpose we become alert to what else we can do with it. Long ago, our first tools were not invented with the idea of building metal machines that fly or huge skyscrapers or space vehicles, but the accumulation of tools and imagined possibilities for their use has led to these constructions. Our en-tooled body becomes transformed in our imaginations in its potency and possibilities. If we think of our accumulated store of external symbols as a kind of tool-kit for the brain, we may use Vygotsky's analogy to explore how the brain becomes transformed by its incorporation of such tools. So literacy, for example, allowed us to leave records and retrieve them later, but, after millennia of development, it

has transformed our lives immeasurably. Once the tool of writing was invented for recording quantities of stored grain and wine, humans began to explore what other uses it could be put to. This is a bloodless way of briefly and abstractly sketching something that has been complicit in all modern human lives, and in our joys, fears, plans, and so on. While we begin with simple utility, we stretch our symbolic tools in the direction of unsuspected possibilities. ... Tools plus imagination make new worlds (Egan, 2006:1).

The rich opportunity to expand our minds that is presented by the cognitive tools we can learn from our culture provides the basis for the fourth level of the Pentad Model. Before we explore these tools further we should briefly revisit the previous level of the model to explain where we are going with this and the role performed by these tools.

### **Multiple Intelligences and Cognitive Tools**

As we all hopefully recall, the third level was the domain of those multiple intelligences or abilities. With respect to them, Howard Gardner writes that they: “are potentials – presumably, neural ones – that will or will not be activated, depending upon the values of a particular culture, the opportunities available in that culture, and the personal decisions made by individuals and/or their families, schoolteachers, and others” (1999:33-34). Activating these potentials is the focus for this level of the Pentad Model, and cognitive tools are the key.

In our discussion of cognitive tools, we have been considering the opportunities available in culture in the form of insights and information that can be learned by us in order to help us think and do things more effectively. These are critical to the development of intelligence. Appropriate cognitive tools must be taken from culture and added to the mind to enlarge our powers to think and comprehend, and to fully develop each of the multiple intelligences. Without the addition of these tools each multiple intelligence will exist in an incomplete state. We can explore this point further using linguistic intelligence as an example.<sup>xxv</sup>

Of the seven intelligences or sets of abilities proposed by Gardner in 1983, linguistic intelligence, along with the logical-mathematical intelligence used in math and quantitative skills, has traditionally been the focus in schools. Linguistic intelligence is used in language skills and abilities, including the understanding and the production of both spoken and written language, the ability to learn languages, and the use of language as a means to remember information or to accomplish certain goals.

Firmly in the realm of linguistic intelligence, the richest elaboration of cognitive tools and their role in learning is found in the work of Kieran Egan (1997, 2005) who looks at

the tools that come along with language. Egan proposes that each of us can progress through a series of kinds of understanding that represent increasingly complex ways that we learn to use language. As shown in Table 3.2 this series essentially recapitulates the progress of our species from the pre-linguistic grunts and gestures that Ug used around the fire pit to the complicated theoretic and reflexive language that we use today in our efforts to comprehend the world.

**TABLE 3.2: INCREASINGLY COMPLEX LANGUAGE USAGE, KINDS OF UNDERSTANDING AND THEIR DEVELOPMENTAL ORDER**

<b>Kinds of Understanding</b>
<b>Somatic Understanding (Pre-linguistic)</b>
<b>Mythic Understanding (Oral language)</b>
<b>Romantic Understanding (Written language)</b>
<b>Philosophic Understanding (Theoretic use of language)</b>
<b>Ironic Understanding (Reflexive use of language)</b>

Adapted from Egan (1997)

Each kind of understanding is a somewhat distinctive way of thinking that enables us to make sense of the world in different ways, and each is useful for different purposes. They work best when developed in the sequence in which they were originally compiled, and then combined. The trick in all of this then is for individuals to work at preserving the kinds of understanding already learned while developing each new one. To explain them in greater detail, we will look at the first few decades of life of a girl named Sara.

The first kind of understanding, called Somatic understanding, refers to the physical, pre-linguistic way that Sara comes to know the world around her while she is an infant. She makes sense of her experiences through the information provided by her senses of sight, hearing, touch, taste, and smell, and crucially with the emotions that these are tied up with. She also experiences the world and sensations of balance, movement, tension, pain, pleasure, and so on, through the way her body physically relates to the objects and persons she encounters.

As Sara grows older and learns an oral language, her understanding of the world expands and she begins to develop the second kind of understanding called Mythic understanding. In this phase of her life, she is no longer limited to making sense of the world through

direct physical experience. Instead, Sara can now rely on language to discuss, represent, and understand even things she has not experienced in person.

Several years later, Sara begins to learn and understand her experience through written language. At this point, she is developing the third kind of understanding called Romantic understanding. During this time, she begins to realize her independence and separateness from a world that appears increasingly complex. She relates readily to extremes of reality, associates with heroes, and seeks to make sense of the world in human terms.

While she is a teenager, Sara begins to focus more on the connections among things. She begins to see that there are laws and theories that can bring together, and help her make sense of, what she originally thought were disconnected details and experiences. In this stage of her life, Sara is developing the systematic understanding of the world called Philosophic understanding.

After a few more years pass, Sara begins to realize that there are limits to her systematic thinking. She starts to appreciate that theories, and even the language she relies on, are too limited and crude to capture everything that she means and is important about the world. She also recognizes that the way she makes sense of the world depends on her unique historical and cultural perspective. At this point, Sara is in the process of developing the fifth kind of understanding called Ironic understanding.

As an adult, Sara has developed all five of these kinds of understanding. She recognizes that each one makes a distinctive contribution to her understanding, and that they work best if they can be combined. The critical point here is that, as Egan (1997) argues, an individual like Sara would not “naturally” develop each kind of understanding at a particular age in some steady and inevitable process. Instead, they primarily result from our learning to use an array of the cognitive tools invented and developed by our ancestors for making sense of the world and acting more effectively within it such as:


































- stories that helped people to remember things by making knowledge more engaging;
- binary oppositions like good/bad that helped people to organize and categorize knowledge;
- metaphors that enabled people to understand one thing by seeing it in terms of another.

For instance, we have been using the metaphor of a ‘cognitive tool’ in this section to help explain the relevance and utility of the symbolic ideas and information we find in our

culture by seeing them as tools. At some point in human history, one or more individuals figured out that using what we now call metaphors made the task of understanding something like this much easier. This stellar idea took off and now metaphors are quite natural to us.

Earlier on we mentioned how language can be seen as a vast cognitive tool, but Egan suggests that it might be better to think of language as a large tool kit with the task being to add smaller tools like metaphors to it in order to maximize its usefulness. When we think about linguistic intelligence then and how it is tied into language skills and abilities, including the use of language as a means to remember information or to accomplish certain goals, it becomes clear that cognitive tools such as stories and metaphors are central to its effective and efficient functioning. While an individual may have more or less of a predisposition to linguistic intelligence, or any other of the multiple intelligences for that matter, these abilities can be improved through learning and practice that engages the relevant symbolic ideas and information and develops the applicable skills and processes. Table 3.3 shows the key sets of tools that Egan contends we have available for developing linguistic intelligence.

**TABLE 3.3: THE SETS OF COGNITIVE TOOLS INDIVIDUALS SHOULD ACQUIRE TO DEVELOP EACH KIND OF UNDERSTANDING**

Somatic Understanding	Mythic Understanding	Romantic Understanding	Philosophic Understanding	Ironic Understanding
<ul style="list-style-type: none"> <li> bodily senses</li> <li> emotional responses &amp; attachments</li> <li> rhythm &amp; musicality</li> <li> gesture &amp; communication</li> <li> referencing</li> <li> intentionality</li> </ul>	<ul style="list-style-type: none"> <li> story</li> <li> metaphor</li> <li> abstract binary opposites</li> <li> rhyme, meter, &amp; pattern</li> <li> joking &amp; humour</li> <li> forming images</li> <li> sense of mystery</li> <li> games, drama &amp; play</li> </ul>	<ul style="list-style-type: none"> <li> sense of reality</li> <li> extremes &amp; limits of reality</li> <li> association with heroes</li> <li> wonder</li> <li> humanizing of meaning</li> <li> collections &amp; hobbies</li> <li> revolt &amp; idealism</li> <li> context change</li> </ul>	<ul style="list-style-type: none"> <li> drive for generality</li> <li> processes</li> <li> lure of certainty</li> <li> general schemes &amp; anomalies</li> <li> flexibility of theory</li> <li> search for authority &amp; truth</li> </ul>	<ul style="list-style-type: none"> <li> limits of theory</li> <li> reflexivity &amp; identity</li> <li> coalescence</li> <li> particularity</li> <li> radical epistemic doubt</li> </ul>

Adapted from Egan (1997)

Given their importance to the development of intelligence, it is essential to maximize our set of cognitive tools and our types of understanding as far as possible given the tools our culture has developed. However, simple contact with cognitive tools is not enough. The proper use of a tool requires skill and practice, and often the guidance of those already proficient.

### **Cognitive Tool Development**

Cognitive tools are all around and most of us have internalized quite a few. Frequently this is done without paying much attention. We are exposed to the tool, pick it up, and then start using it because, after all, they are very useful. Although it is in learning to use them effectively and in a mindful manner that their true benefit is revealed, the ineffective use of cognitive tools happens all the time. A common example involves the cognitive tool of abstract binary opposites:

Here is another cognitive tool that people seem unable to avoid learning. ... It is as though we first have to divide things into opposites in order to get an initial grasp on them; so we easily divide the world into good/bad, high/low, earth/sky, hot/cold, courage/cowardice, and so endlessly on. Holding onto such opposites instead of recognizing the complexity of the world can create problems (Egan, 2005:16).

The tool itself is not the problem. Abstract binary opposites allow us to show a difference in an emotionally powerful way, and they are extremely effective in helping us to organize and categorize knowledge. However, the limitations of this tool and the extent that it oversimplifies things are habitually overlooked. The misuse of this cognitive tool now seems to be a mainstay in North American politics and commentary where multifaceted domestic and international situations are simplified into good vs. bad and hostile divisions are drawn between conservatives vs. liberals (us vs. them), as if these simplistic, misunderstood and routinely misapplied labels are sufficient to address the infinite complexity of reality.

One of the problems is that cognitive tools hide out in the open. As shown in the list found in Table 3.3, they tend to be familiar items that are central to our lives. They appear to have always been there (how challenging it is to think of a world without stories or metaphors) so we tend not to focus on them any more than we do on the oxygen in the air we breathe. For that matter, we can draw a comparison here to something like breathing that we do constantly, but often without a detailed grasp of the physiology involved or any practice in advanced techniques.

Moving from air to errors, while cognitive tools are everywhere and used regularly, that does not mean they are well understood so their misuse can be missed by the person

using them as well as by observers. In contrast, the ineffective use of other sorts of tools, like hand tools, is relatively easy to spot. If a worker at a construction site tries to hammer nails by banging on the nail head with a screwdriver, or tries to drive screws by hitting them with a hammer, then the incorrect use of the tool can be quickly recognized (are our eyes more readily discerning than our minds?). Granted, in each case the misuse of the tool might still somewhat work: the hammer might push the screw into wood and the binary opposite of us vs. them might identify a real division between two groups. However, the screw will not be properly secured in the case of the hand tool and the groups will not be properly described in the case of the cognitive tool. The answer in both situations is the same; people need to be trained to properly use tools.

Perhaps we can put this into a sharper perspective. During my high school years, around the Palaeolithic era, an acquaintance who hosted the occasional gathering had a samurai sword at his house. The way some people used to swing it around while leaping about it is a wonder that nobody lost an arm, or a head for that matter. A trained martial artist would not have been overly impressed to see the way they ineptly swung the sword while chopping at apples that they threw at one another from a backyard tree. The thing is though, the people swinging the sword didn't really know any better and they didn't have proper training, so they muddled through in a way that they probably thought was impressive at the time. It no doubt seemed correct to them.

It appears that many of us use cognitive tools in a manner similar to the way that sword was used. Cognitive tools are picked up somewhere, swung wildly around, and the person doing it thinks they are doing well as bits of logic and language are crudely smashed to pieces. To be honest, this seems an apt description for the inept nonsense that now frequently passes for news and punditry. Not surprisingly though, that approach to cognitive tools doesn't really work.

In order to help us to think and do things more effectively, and to fully develop our potential for intelligence, what is required is a systematic training in the use of these cognitive tools that highlights their strengths, weaknesses, and proper application. It also turns out that we are able to not only teach about these tools but, in the process, also effectively teach with them in an emotionally engaging way. We will explore this in further detail in the Conclusion.

## COGNITIVE HABITS AND BELIEFS

One evening while I paced around the house, my brow furrowed in bewilderment, my wife asked what was troubling me. “It’s the final level of the Pentad Model,” I told her “it’s not clear how it should be defined.” Now, sorry to say for her, she is rather familiar with the model having suffered through several drafts of this text, and she gave me an analogy to consider. A lawyer by trade, she is also an aspiring chef with a real passion for food, the Food Network close by, and stacks of cookbooks throughout the house in the multiple languages she knows, so it is perhaps not surprising that she suggested something involving food. “Your model is like soup, with the cognitive capacity being like the stock and the other levels being like the ingredients that are added to the stock!” she stated in the decisive tone that lawyers and TV chefs like to use. Admittedly, this initially seemed to me to be a bizarre comparison. Granted, despite a fondness for food, thinking in culinary terms never would have occurred to me given that I am anything but a culinary talent and can’t quite stomach the thought of spending two hours preparing something that will be consumed in fifteen minutes. Nevertheless, after some thought and elaboration, this soup idea sounded appetizing (see Table 3.4).

Not surprisingly, the soup analogy mirrors the computer analogy that began this chapter by making the point that IQ or cognitive capacity alone is not enough. The quantity of water does ultimately determine how much soup one can make and the amount of cognitive capacity does ultimately determine how much intelligence one can develop, but the amount of water sitting in the pot or the amount of cognitive capacity sitting in one’s head is hardly the only issue. Even a cup of water can be turned into a delicious soup if a good recipe and good ingredients are used. Likewise, rather than worrying about the amount of cognitive capacity one possesses, we would be better off making the most of what is available. From what I’ve seen, our collective inability to take full advantage of our cognitive potential is a bigger issue than an insufficient amount of this potential. Accordingly, with the Pentad Model our focus is on adding those ingredients that will enable anyone to develop and maximize their intelligence.

Like all analogies, comparing the Pentad Model to soup runs the risk of coming off a bit half-baked; however, it does provide a cutting edge way, without mincing words, of thinking about the development of intelligence. It also provides a way, how successfully you will have to decide, to introduce the final level. Returning to the table then, if we add all the right ingredients but they are just left to sit there in cold water then we will not end up with soup. Heat is required and without it (assuming for the moment that we are not making gazpachio) we will run into trouble. If we continue to knead this analogy we can see that the development of intelligence runs into a somewhat comparable issue. Certain cognitive habits and beliefs are required and their absence, or the presence of contrary habits and beliefs, leads to difficulties. We are using the term ‘cognitive habits’ here to



refer to the methods and strategies involving thinking and other mental operations that are routinely used by an individual and tend to produce certain outcomes (e.g., persevering in the face of challenges). Cognitive habits tend to have associated beliefs (e.g., the belief that challenges faced are an inevitable part of the process of learning), and one link between them at least seems largely straightforward. Icek Ajzen (1988) argues that because an individual's beliefs represent the information that they have about themselves and the world around them, it follows that their behaviour is ultimately determined by this information.

**TABLE 3.4: INTELLIGENCE SOUP**

<b>Pentad Model</b>	<b>Soup</b>
<p><b>Anatomical level</b></p> <ul style="list-style-type: none"> <li>➤ physical structure required to develop intelligence; without the brain and neural connections there would be no intelligence</li> </ul>	<p><b>Cooking Pot</b></p> <ul style="list-style-type: none"> <li>➤ physical structure required to make the soup; without the pot there would be no soup just ingredients left lying on the counter</li> </ul>
<p><b>Cognitive Capacity level</b></p> <ul style="list-style-type: none"> <li>➤ foundation that the intelligence is built upon since everything starts from the cognitive capacity; without this capacity the levels below could not develop</li> </ul>	<p><b>Water</b></p> <ul style="list-style-type: none"> <li>➤ foundation that the soup will be built upon since everything is added to the water; without this water the types of soup and ingredients are irrelevant</li> </ul>
<p><b>Operations level</b></p> <ul style="list-style-type: none"> <li>➤ multiple intelligences that can be developed from the brain with its cognitive capacity; these sets of abilities (e.g., linguistic, musical, environmental) outline the general operations of the mind</li> </ul>	<p><b>Types of Soup</b></p> <ul style="list-style-type: none"> <li>➤ multiple types of soup that can be made from the pot full of water; these recipes (e.g., minestrone, split pea, gumbo) outline the options before us for making soup</li> </ul>
<p><b>Cognitive Tools level</b></p> <ul style="list-style-type: none"> <li>➤ appropriate cognitive tools that must be taken from culture (a pantry of ideas) and added to the mind to fully develop each of the multiple intelligences; without the addition of these tools (e.g., story, metaphor, forming images) each multiple intelligence will exist in an incomplete, watered-down state</li> </ul>	<p><b>Ingredients</b></p> <ul style="list-style-type: none"> <li>➤ appropriate ingredients that must be taken from the pantry/refrigerator/garden and added to the water to properly make each type of soup; without the addition of these ingredients (e.g., tomatoes, carrots, celery) there will be no soup, just a pot full of water</li> </ul>
<p><b>Cognitive Habits and Beliefs level</b></p> <ul style="list-style-type: none"> <li>➤ to fully develop intelligence certain cognitive habits and beliefs are required; without these habits (e.g., perseverance) and beliefs (e.g., challenges are inevitable) the other levels will be adversely impacted</li> </ul>	<p><b>Heat</b></p> <ul style="list-style-type: none"> <li>➤ to create each type of soup it needs to be heated and cooked; without the heat the soup will not properly form, instead we will be left with isolated ingredients floating around in cold water</li> </ul>

These cognitive habits and beliefs are the heat that enable us to cook up a full serving of intelligence. This required heat is not a one-time thing. Every time we want to fully realize our intelligence we need to rely on these cognitive habits and beliefs. For instance, for reasons outlined in Chapter 2, to take advantage of our ability to understand complex ideas – the first element of the APA definition of intelligence (Neisser et al., 1996) – we must persevere every time; giving up easily is not compatible with understanding complex ideas. We can explore these issues further while we peel off the layers of this level of the Pentad Model.

While some of the overdone puns above may be indigestion inducing, so too is the fact that traditional approaches to intelligence almost exclusively focus on cognitive capacity while disregarding the cognitive habits and beliefs, not to mention the cognitive tools described in the prior section, that impact our capacity to realize our potential for intelligence. This exclusion is problematic given the “consistent empirical finding in the literature – that thinking dispositions can predict performance on reasoning and rational thinking tasks even after individual differences in measures of general cognitive ability have been partialled out” (Stanovich, 2002:130). If these thinking dispositions or cognitive habits are so critical to reasoning, and the ability to engage in various forms of reasoning is another core element of the APA definition of intelligence (Neisser et al., 1996), then it only stands to reason that cognitive habits are a key component of intelligence. As we shall soon see, certain beliefs encourage and are associated with various cognitive habits and they also play a dramatic role.

For these reasons, it should not be too surprising that the Cognitive Habits and Beliefs level is a significant component in the Pentad Model. Let’s begin exploring this level by considering worldviews and beliefs, and how they impact the way that we see everything else and help to determine our priorities and our actions. We raised some of these points earlier in this text, but we can now elaborate further.

### **Meaning Systems, Worldviews, and Beliefs**

As individuals we are impacted by numerous external forces, overwhelmed by information, and driven by many motivations and interests. As it is impossible to thoroughly process all of this information or to pursue all these motivations and interests arbitrarily, we attempt instead to bring them together with some sort of guiding framework or worldview made up of our beliefs. These beliefs, supported by feelings of certainty, are the things that we are confident are true or real. We may or may not be aware of these beliefs, but we could not function without them. If everything we did had to be analyzed from scratch it would take forever to do even the simplest of tasks. Beliefs enable us to predict and make sense of the events around us and allow us to give some

sense of certainty and structure to our lives. Carol Dweck suitably sums up the issue and highlights its relevance to this level of the model:

[P]eople develop beliefs that organize their world and give meaning to their experiences. These beliefs may be called “meaning systems,” and different people create different meaning systems. ... [P]eople’s beliefs about themselves (their self-theories) can create different psychological worlds, leading them to think, feel, and act differently in identical situations. The idea that people’s beliefs or theories form a meaning system has a venerable history in philosophy and psychology... In fact, Piaget, the titan of cognitive developmental psychology, realized near the end of his life that simply focusing on logical thinking and its development is not enough. He came to believe that the meaning systems that people adopted were as important or even more important in shaping their thinking (2000:xi-xii).

While we may not devote much time to thinking about our beliefs about reality and our relation to it, these beliefs impact the way that we see everything else and they help to determine our priorities and our behaviour.<sup>xxvi</sup> It is through the unique filter of our beliefs that we interact with and understand the world, and provide subjective meanings to our experiences. We are not impacted as much by our life experiences then as we are by the way that we interpret these events. That is to say, we do not perceive reality directly: although we believe what we see and hear, we also see and hear what we believe.

We can think of beliefs as being like rose or other coloured glasses that are constantly on and give us an altered view of reality; mental David Copperfields that can focus our attention at certain spots on the stage and create convincing illusions. Thus, according to this meaning systems approach, it is our beliefs about the meaning of our life experiences, not the events themselves, that ultimately affect us and lead to our thoughts and feelings, and our actions. A person who loves dogs and believes they are “man’s best friend” will react far differently to a puppy bounding towards them than a person who believes dogs are dangerous and scary. Faced with the very same situation we can create a meaning that motivates and enables us, and we can also create a meaning that debilitates us and leads to a self-fulfilling prophecy. In this case, the scared person who runs screaming from the welcoming puppy and gets chased will likely confirm their belief, in their mind at least.

Developing motivating, enabling beliefs and avoiding debilitating, inaccurate beliefs appears to be critically important, but demanding. The challenges are many. If our beliefs – which are necessarily limited representations of reality – tend to form based on our interpretations of past experiences and the particular information we have picked up during our lives, it is quite clear that these interpretations and this information may or may not be accurate or, for that matter, based on any sort of conscious, logical analysis.

Moreover, it is easy to assume that these beliefs are accurate because we view reality through them; they are the ‘reality’ we think we know. Not surprisingly then, it is easier to spot someone else’s mistaken beliefs than our own. Furthermore, both intentionally and unintentionally, we process new information in a manner consistent with our existing beliefs about the world. This makes our belief structures relatively stable and resistant to change leading to the tendency to embrace evidence that supports our beliefs about the world and reject evidence that is inconsistent with our beliefs about the world (Lord et al., 1979).<sup>xxvii</sup> Notably though, while this bias acts to increase the difficulty of developing accurate beliefs, it also means that once developed they will be more stable. Faced with all of this, a concerted effort is required to foster accurate or functional beliefs.<sup>xxviii</sup>

### **Intelligence, Beliefs, Cognitive Habits, and Goal Theory**

Returning to the issue of intelligence, there is some key research on motivation that effectively brings relevant goals, cognitive habits, and beliefs together in one coherent model. Goal theory considers the reasons (goals) that individuals become engaged with a task and the causes and consequences of various goal orientations. As Carol Dweck elaborates: “In our model, people have goals. These goals lead them to initiate behaviour and influence the nature of their behaviour, as well as what they think about and feel as they pursue and engage in this behaviour” (Dweck, 2000:141). In turn, the goals are impacted by the individual’s core beliefs:

These beliefs are also an integral part of people’s motivational systems in that they can strongly influence the goals people choose to pursue, how intrinsic versus extrinsic their motivation tends to be, and the interest they maintain in an activity over time, the vigour with which they pursue the tasks in their lives, and much more (Dweck, 2000:132-133).

Much of the research has focused on achievement motivation and is based on the distinction between learning goals (“mastery” or “task” goals) and performance goals (“ego” goals) (Ames, 1992).<sup>xxix</sup> These goals have associated beliefs and cognitive habits. Individuals who are more concerned with personal progress through learning, solving problems, mastering a task and/or improving performance have learning goals. These people embrace challenging tasks, generate effective strategies in the face of obstacles, do not fear mistakes because they believe they can learn from them, and believe that success results from effort. In contrast, individuals have performance goals when they are more concerned with receiving public recognition for superior performance and appearing smart and competent than actually mastering the task. Preoccupied with what others think of them, these people prefer less challenging tasks, avoid confronting obstacles, and fear making mistakes. They believe that success results more from ability than effort and may also think that ability and effort are inversely related.

As mentioned, these learning and performance goals result from different core beliefs or self-theories held by individuals. In this case, two contrasting self-theories about intelligence are crucial:

The two theories seem to create entirely different frameworks for students. Once students adopt a theory of intelligence, it affects what they value, how they approach intellectual tasks, and how they interpret and respond to what happens to them (Dweck, 2000:37).

The belief that intelligence is a fixed, uncontrollable trait is referred to as an entity theory and it “raises students’ concerns about how smart they are, it creates anxiety about challenges, and it makes failures into a measure of their fixed intelligence” (Dweck, 2000:37). This leads towards performance goals tied to documenting and demonstrating one’s intelligence because if one believes they have a given amount of intelligence that cannot be changed their primary objective could understandably be trying to prove to oneself and others that they have enough. Appearing intelligent and not looking dumb become critically important. This can tie in with a broader view of the self and a sense of “contingent self-worth” where one feels like a worthy person “only when they have succeeded, and they feel deficient or worthless when they fail” (Dweck, 2000:114). The tendency then is to pursue simple successes that don’t require effort. It becomes important to avoid challenges that might lead to failures or expose shortcomings because these might reveal limitations in what they believe to be their fixed, unchangeable intelligence. The other theory is largely the opposite.

The belief that intelligence is indeed controllable and increasable through effort and learning is referred to as an incremental theory. In contrast to the entity theory, this belief tends to lead to learning goals focused on developing one’s intelligence and generates an interest in challenge and learning. Accordingly, obstacles are dealt with far differently than by those with a fixed view of intelligence: “Setbacks in this framework become an expected part of long-term learning and mastery and are therefore not really failures. Instead they are cues for renewed effort and new strategies” (Dweck, 2000:38). There are also differences in the need to prove one’s intelligence. Individuals who believe intelligence can be developed may acknowledge that there are differences between how quickly people can learn and so on, but their focus is on the idea that it is increasable rather than some fixed trait (Mueller & Dweck, 1997 in Dweck, 2000). This encourages learning rather than trying to prove something:

After all, if your intelligence can be increased why not do that? Why waste time worrying about looking smart or dumb, when you could be becoming smarter? And in fact students with this view will readily sacrifice opportunities to look smart in favor of opportunities to learn something new. Even students with an incremental theory and *low* confidence in their intelligence thrive on challenge, throwing themselves wholeheartedly into difficult tasks – and sticking with them. (Dweck, 2000:3).

We summarize the results of this research in Table 3.5. As shown in the table, having an entity theory is linked to performance goals leading to one of two maladaptive patterns. The first pattern involves ego-oriented individuals who have high confidence in their intelligence and believe they are smart. The second pattern involves our helpless individuals who have low confidence in their intelligence. Having an incremental theory, however, is linked to learning/developmental goals that lead to an adaptive pattern of mastery-oriented behaviour. As mentioned, this last pattern is optimal and is associated with key cognitive habits and beliefs involved in the full realization of intelligence. These are listed in Table 3.6.

**TABLE 3.5: MODEL OF BELIEF SYSTEMS AND GOALS IN ACHIEVEMENT MOTIVATION**

<b>Core Beliefs and Self-Theories</b>	<b>Goal Orientation and Associated Beliefs</b>	<b>Perceived Present Ability</b>	<b>Cognitive Habits and Behaviour Patterns</b>
<p><b>Entity</b> Intelligence is a fixed trait based on inherent, unchangeable qualities; thus, it is there or it is not and no amount of effort can change that reality. In fact, these individuals tend to view high effort as a sign of a problem because they believe that if you have got what it takes then things will come easily.</p>	<p><b>Performance</b> Goal is to gain positive judgements and avoid negative judgements about one's intelligence; to feel and look as if one is intelligent. Focus is on self and external evaluations of self which can lead to impaired performance on cognitive tasks and spontaneously expressed negative feelings about the task. Competence is assessed based on performance relative to others or by external feedback, and high effort indicates low ability.</p>	<p><b>High</b></p> <hr/> <p><b>Low</b></p>	<p><b>Ego oriented</b> These individuals have high confidence in their intelligence. However, they believe that effort and ability are inversely related and/or they are more interested in proving to themselves and others that they are intelligent than actually learning or challenging themselves; therefore, they primarily engage in lower difficulty/lower effort/high visibility behaviour.</p> <hr/> <p><b>Helpless</b> These helpless individuals have low confidence in their intelligence and this, coupled with the often overwhelming associated challenges, results in their engaging in limited opportunities for learning. They will avoid real effort or persistence at becoming smarter because they believe (i) you cannot improve something that is unchangeable and (ii) that if they are truly meant to be intelligent that it should come easily with little effort.</p>
<p><b>Incremental</b> Intelligence is increasable with effort and effective strategies. These individuals view the challenges faced as an inevitable part of the process.</p>	<p><b>Learning/Development</b> Goal is to increase one's intelligence by learning new things or mastering new skills. Focus is on process of completing a task and using effective problem-solving strategies which often leads to greater pleasure and emotional involvement in the task. Competence is assessed based on engaging fully with a task, meeting challenges with high effort, putting knowledge to good use, and learning or mastering new things.</p>	<p><b>High or Low</b></p>	<p><b>Mastery oriented</b> Whether or not they have high confidence in their intelligence, because they believe it is increasable, these individuals will, with high persistence, apply the effort required and seek effective strategies to increase their intelligence.</p>

Adapted from Dweck (2000)

**TABLE 3.6: KEY COGNITIVE HABITS AND BELIEFS**

<b>Cognitive Habits</b>	<b>Beliefs</b>
<ul style="list-style-type: none"> <li>➤ Works to increase intelligence</li> </ul>	<ul style="list-style-type: none"> <li>➤ Intelligence is increasable through learning and effort</li> <li>➤ Current performance is not a measure of long-term potential but rather an indication of where you are and what you need to do now</li> </ul>
<ul style="list-style-type: none"> <li>➤ Embraces opportunities for learning and seeks challenges</li> </ul>	<ul style="list-style-type: none"> <li>➤ Learning new skills and knowledge, and increasing understanding, are rewarding and fulfilling</li> <li>➤ Taking on challenges provides opportunities to grow and to live life to the fullest</li> <li>➤ Performing to the limits of one’s potential, regardless of what those limits are, is the key to happiness</li> </ul>
<ul style="list-style-type: none"> <li>➤ Values effort</li> </ul>	<ul style="list-style-type: none"> <li>➤ Success results from effort, and everyone needs sustained effort to realize their potential</li> <li>➤ Higher levels of effort lead to higher levels of understanding and mastery</li> <li>➤ Effort gives meaning to life, and means that something is important to you and you are willing to work for it</li> </ul>
<ul style="list-style-type: none"> <li>➤ Perseveres in the face of obstacles and adopts a positive, realistic attitude</li> </ul>	<ul style="list-style-type: none"> <li>➤ Difficulty is to be expected in worthwhile activities, and confronting and overcoming obstacles is an inevitable part of the process of learning</li> <li>➤ Obstacles can be conquered with suitable effort and strategies</li> <li>➤ Mistakes should not be feared because they can be informative and helpful</li> </ul>
<ul style="list-style-type: none"> <li>➤ Engages in critical, open-minded thinking and effective problem solving strategies                             <ul style="list-style-type: none"> <li>• active meta-cognitive strategies (e.g., reviewing material not understood, asking questions during work, making connection between current problems and past problems)</li> <li>• active learning strategies (e.g., setting goals, planning, organizing material)</li> <li>• deep processing strategies (e.g., discriminating important info from unimportant info, trying to figure out how new info fits with existing knowledge, monitoring comprehension)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ Understanding reality as accurately as possible is important and this involves constant learning and revision of one’s current understanding</li> <li>➤ New evidence and possibilities should be carefully considered to determine whether current beliefs are supported or need to be amended</li> <li>➤ Seeking alternative strategies for accomplishing a task is effective and exciting</li> <li>➤ Identifying and developing the approaches and skills required to pursue life goals is critical</li> <li>➤ Stepping back from a situation, analyzing the options, and then deciding on the best action is an optimal approach</li> </ul>

Adapted from Dweck (2000)



The research on goal theory and achievement has proven useful across multiple situations and cultures, and has demonstrated that much of behaviour is influenced by the beliefs that people hold, and that these beliefs that cause people to act in certain ways can be changed (Dweck, 2000). As discussed, learning goals flow from the core belief that intelligence is increasable and encompass key associated beliefs and cognitive habits involving working to increase intelligence, embracing learning and challenges, applying effort, persevering, thinking critically and using effective problem solving strategies. These habits and beliefs impact an individual's mental performance and overall functioning, and they are critical to one's realizing their full potential for intelligence.

The association between these cognitive habits and the APA definition of intelligence on which we have been relying: "the ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, and to overcome obstacles by taking thought" (Neisser et al., 1996:77), is largely straightforward. As mentioned, understanding complex ideas requires persevering in addition to embracing learning, applying effort, thinking critically, and so forth. This overlap carries on between the other elements of the APA definition and the cognitive habits, for instance: adapting effectively to the environment requires embracing learning and challenges, overcoming obstacles by taking thought requires using effective problem solving strategies, and so on. Perhaps not surprisingly, various researchers (e.g., Dweck & Sorich, 1999) have found that these cognitive habits and beliefs lead to higher grades and achievement test scores whereas individuals with a fixed view of intelligence are more inclined to avoid effort and challenge and to give up those valuable learning opportunities necessary to develop their cognitive potential.

We can conclude this section with the same point that we started it and this chapter: IQ is not enough. In fact, Dweck and her colleagues have repeatedly found that high ability students tend to be the most concerned about failure, the most inclined to fall apart in the face of obstacles, and often averse to challenges (Licht & Dweck, 1984a). Moreover, in contrast with popular beliefs, neither success in school (Licht & Dweck, 1984a) nor confidence in one's intelligence (Zhao, Dweck & Mueller, 1998 in Dweck, 2000) is the answer as neither increases the hunger for challenges or the ability to deal with failure. To be sure, untapped ability accomplishes little. To maximize their potential and their intelligence then, all individuals regardless of ability can greatly benefit from these key cognitive habits and beliefs. They are deservedly the final section of the Pentad Model.

## CONCLUSION, CONCERNS, AND CLARIFICATIONS

The Pentad Model integrates several existing theories and helps to expand our understanding of this highly valued, yet often contentious trait. Moreover, some leading researchers in the field such as Howard Gardner seem amenable to such efforts:

Just in the past half century, our understanding of the human mind and the human brain has been fundamentally altered. For example, we now understand that the human mind, reflecting the structure of the brain, is composed of many separate modules or faculties. At the same time, in the light of scientific and technological changes, the needs and desires of cultures all over the world have undergone equally dramatic shifts. We are faced with a stark choice: either to continue with the traditional views of intelligence and how it should be measured or to come up with a different, and better, way of conceptualizing the human intellect (1999:3).

The Pentad Model strives towards the latter which will no doubt lead to several concerns that will require some clarification. Initial reviewers have raised a variety of questions and comments. A sample of these is included below along with some answers that will hopefully shed more light on what we had in mind, so to speak.

**Q: Elitism:** Shouldn't we be concerned about the consequences that might result from having intelligence as our educational focus? Aren't notions of intelligence elitist on the basis that 'intelligence' is not equally distributed among human beings?

**A:** The elitism you mention is a problem to the extent that notions of intelligence are used by the more 'intelligent' and 'educated' people in power as a means to devalue and exclude those on the margins and to justify the exploitation of others. However, on closer inspection this is not a legitimate criticism of the Pentad Model.

Intelligence can only be considered elitist if one thinks it is fixed. While one could fashion an argument that notions of intelligence tied to IQ are elitist due to their considerable genetic component, the Pentad Model goes well beyond the genetic component and importantly emphasizes effort and environment. Thus, the Pentad Model does not describe some static trait that people are born with and instead helps to broaden our understanding of intelligence beyond the potentially elitist, narrow notions that are often used today. Like most concepts that attempt to embrace the complexity of human intelligence, the Pentad Model is understood to be a collection of abilities and awareness that is largely increasable.

In sum, we do not need to deny reality. The cognitive capacity that is supposed to be measured by IQ is an important component of intelligence. However, while genetic differences in cognitive capacity appear to be an unavoidable reality, the narrow use of

the term intelligence is certainly not. The understanding that intelligence is not fixed but increasable makes the notion of intelligence no more elitist than the ability to paint, sing, dance, or for that matter, any other ability that is increasable within an individual's natural potential. Intelligence is increasable with effort and education.

**Q: Instrumentalism:** Aren't there further problems with a focus on intelligence? The issues with instrumentalism – where all other aspects of life are subordinated to growth, profit, production and consumption with little heed to the consequences – and its relation to social and environmental problems are well documented. Instrumentalism, in turn, can be linked to rationalist anthropocentrism and the duality of mind and matter, with superior rationality and intelligence being used as a justification for the domination of everything else. Isn't the focus on intelligence just going to reinforce the problematic sense of superiority and self-importance tied in with our higher intelligence?

**A:** There is nothing here to suggest that our intelligence should be used in an effort to separate us from the rest of the world. In fact, quite the opposite, the claim made in this text is that the comprehensive form of intelligence being advocated will enable us to better understand the world around us, the complex systems in which we are enmeshed, and our relation to everything else. Notably, the problematic sense of superiority and self-importance you mention already exists in great abundance despite the fact that our potential for intelligence is significantly untapped. It is our overall lack of intelligence that deludes us into thinking this way and perhaps the most effective way to get beyond this misconception will ironically require greater intelligence.

The increased awareness and understanding that follows from the Pentad Model should act to increase humility and our participatory, selfless, sustained/sustainable attention to, and sense of appreciation and responsibility for, the long-term survival of the interconnected web of life of which we are part. In turn, the realization that we are not really separate and alone in some mechanical universe should work against our insatiable desire to dominate, possess, and consume the life out of everything around us. Also, the multi-stage planning made possible by higher levels of intelligence enables us to better predict certain consequences of our actions, understand the dangers that follow from instrumentalism, and then take the necessary actions. Further, as discussed above, the Pentad Model presents a conception of intelligence where it is largely increasable. It is not some fixed trait that should be used to assign value. For that matter, with apologies to Descartes, an advanced, more comprehensive intelligence is enabling us to both find out more about the intelligence of other species and through fields such as biomimicry to look to the non-human world to learn better answers than humans have been able to develop to a variety of complex problems in engineering and other disciplines (Benyus, 1997).

**Q: Individualism:** How does this conception of intelligence relate to individualism? Isn't the capacity of the individual mind overrated? What about distributed intelligence, and the interaction and collaboration among individuals whereby complex activities are distributed among many minds? Doesn't the real value of human intelligence take place beyond what happens in an individual's mind?

**A:** Certainly the notion of individualism appears overrated. Despite the popularity in Western societies of the idea of the independent, self-reliant, and personally responsible individual, there are good reasons to question this take on human nature. Research from many disciplines demonstrates that people are highly social, interconnected beings and the idea of the isolated individual is illusory. Figures 2 and 3 in Chapter 2 depict how the experience of life as an individual does not necessarily make one aware of the direct and indirect impacts of the innumerable psychological, biological, chemical and physical systems happening internally; social, cultural, political, legal, economic, biological, terrestrial, atmospheric, aquatic, chemical and physical systems happening externally; or even a trivial component of this such as the motivational forces and drives acting on us at any given point in time. The illusion of unconnected individuals is presumably tied up with this inability to be aware of everything that is going on in and around us. For that matter, we have discussed how reliant we are on shared cultural tools such as language, the roles played by both genetics and the environment on our behaviour and intelligence, our innate desire to belong to groups, and so on. This all leads to the conclusion that we are deeply interactive and interconnected, with the idea that we are somehow isolated and independent being naive.

These concerns about individualism coupled with pleasant thoughts about interaction, collaboration, and the potential for distributed intelligence should not however lead us into the mistake of skipping a step. Distributed intelligence is useful to the extent that it brings together the capacities of multiple individuals' intelligences, but this combination will only be as good as the constituents of which it is comprised. Accordingly, maximizing students' individual intelligence as outlined in the Pentad Model is a necessary focus. As discussed, to accomplish this though does require a significant collective, interdependent component whereby cognitive tools, habits and beliefs flow from culture to the individual. The development of individual intelligence then is vitally important, but it is not an isolated undertaking by any means and certainly does not take place entirely inside an individual's head.

**Q: Embodied:** Does the Pentad Model view individuals as disembodied brains or does it address the role of our bodies?

**A:** The human body quite clearly plays a central role in intelligence through its senses; its emotions that provide the basic orientors, organizers and shapers of thought and experience; its tendencies towards rhythm, pattern and musicality; and the other ways it interrelates with our minds (Egan, 1997). Elements relating to the body beyond our brains are found in multiple levels of the Pentad Model including the Bodily-kinaesthetic intelligence at the Operations level and the Somatic understanding at the Cognitive Tools level, with the latter referring to the physical, pre-linguistic way that we come to know the world and make sense of our experiences through the information provided by our senses and emotions, and the way our body physically relates to the objects and persons we encounter.

**Q: Morality:** You examine what it takes to be a good person in your discussion of human intelligence not keeping up with modern economic, social, and environmental realities. Why have you introduced morality but then not included it in your model?

**A:** There is indeed some discussion about what it takes to be a good person which leads to the conclusion about the need for a global long-term perspective (i.e., to move beyond selfish, self-centered needs and wants) to meet our long-term interests and ensure our survival. This long-term perspective was argued to be uncommon due to failures involving our abilities to accurately predict outcomes and make advanced plans in response to complex situations. These abilities are key elements of intelligence hence the argument that the intelligence of many has not kept up with reality and the decision to overview some of the relevant obstacles to intelligence involving focus, understanding, knowledge, perception, feeling, thinking, drive, direction, and so on. The solution then was the need to actively increase our individual intelligence to enable us to produce something good. Accordingly, there is no reason to conflate intelligence with morality and ignore the established disjunction between description and prescription. Intelligence is in and of itself neither moral nor immoral, and it can be applied in a good or bad way. Without conflating them though we can certainly embrace the essential juxtaposition of intelligence with moral inclination:

(T)he task for the new millennium is not merely to hone our various intelligences and use them properly. We must figure out how intelligence and morality can work together to create a world in which a great variety of people will want to live. After all, a society led by “smart” people still might blow up itself or the rest of the world. Intelligence is valuable but, as Ralph Waldo Emerson famously remarked, “Character is more important than intellect.” That insight applies at both the individual and the societal levels (Gardner, 1999:4).

It should be quite clear that our focus in an educational context will be to encourage both the development of the comprehensive form of intelligence described by the Pentad Model and its being put to constructive use as a crucial component of the effective

citizenship behaviour required for humanity to effectively live together while supporting the integrated, global, economic, social and ecological relationships that will enable us to survive and thrive.

**Q: Validity:** You appear to accept some of the underlying theories of your Pentad Model at face value instead of critiquing them at length in this text. Along the same lines, how valid is this model when it does not have direct empirical support?

**A:** For the reasons described in the Preface, the approach for this text was to embrace the role of a generalist with a focus on interdisciplinary thought and writing at a level practical for decision makers. The objective was to develop a viable solution to a significant problem and then share it in a highly accessible way that combines the breadth required to be relevant with just enough detail to get the point across. This approach will likely be disconcerting to those academics who have been rewarded by educational systems for their being “brilliant when it comes to remembering and even analyzing ideas” despite the fact “they seem to lack even an ounce of creativity” (Sternberg, 1996:205). We are not exactly describing a rare breed:

Who hasn't encountered the scholars whose brilliance seems to lie only in their ability to tear other people's ideas to shreds and not in their ability to come up with any significant ideas of their own (Sternberg, 1996:210)?

Accordingly, there is no shortage of detailed critiques on these underlying theories that have been produced and re-produced countless times by academics looking to publish rather than perish. The goal here was to avoid this low-hanging fruit and, as mentioned, focus instead on putting in the effort to develop a constructive solution and to make it as understandable as possible. This involved more of an oblique critical analysis where theories were examined, and then useful elements were extracted and combined in order to provide a more complete view of intelligence. That said, where some concepts (e.g., IQ) had to be included in their entirety they were critiqued out of necessity.

At this preliminary stage, there are a variety of legitimate questions about the validity of the Pentad Model and some of its components such as ENVI that will need to be addressed through further research. Where possible these theoretical gaps have been acknowledged throughout the paper. In addition, the concept of ENVI may also face criticism from, among others, various psychometric interests who will be ideologically opposed to any further arguments based on the theory of multiple intelligences. Concerns such as these have hopefully been at least partially addressed in this paper where it was argued that ENVI can be viewed as both a core aspect of a general concept of intelligence as well as a plausible candidate for an eighth multiple intelligence. Nevertheless, some of these issues will remain if, in some cases, for no other reason than:

For the first time in many years, the intelligence establishment is clearly on the defensive, and it seems likely that the twenty-first century will usher in fresh new ways of thinking about intelligence (Gardner, 1999:19).

Beyond such theoretical matters though, there is a different concern about the validity of these ways of thinking about intelligence, whether fresh or old.

In his discussion of Ironic understanding, Kieran Egan cautions us against the belief that our general schemes, such as the models and concepts we use to understand intelligence, can reveal the truth about reality. Our minds and our languages are inadequate to represent the world, the conceptual resources available to us are too limited and crude. With this in mind, he proposes an approach that combines this Ironic understanding with the theoretic generalizing capacity of what he refers to as Philosophic understanding:

The intellectual capacities that constitute Philosophic understanding enable us to bring very complex knowledge into coherent general schemes. The Philosopher tends to believe that general schemes can mirror reality and deliver a true account of the nature of things. What Ironic understanding will absorb of Philosophic understanding are those abstract theoretic capacities that can bring intellectual order to complex phenomena. What Ironic understanding will not absorb is the belief that general schemes can uncomplicatedly mirror the truth about reality. ... The contribution of Ironic understanding is to keep constantly to the fore the inadequacy of the categories and their characterizations to the reality they try to represent, and the contribution of Philosophic understanding is to attempt constantly to capture as much of the complexity of that reality as possible within some coherent general scheme (1997:155-157).

This approach presents us with a more flexible way to understand our efforts to think about and conceptualize intelligence. Proceeding in this manner, we can see that ideally the Pentad Model will help to bring some intellectual order to the complex topic of intelligence. Nevertheless, it does not need to be seen as a secure representation of reality or a vessel of objective truth to be utilized as a way to represent reality for particular purposes at a given time. In this respect, the validity of the Pentad Model results from the extent that it can be viewed as presenting us with a focus to create a curriculum and pedagogic tools in North America during a time of unprecedented global growth in human population and consumption.

In the concluding chapter, we will explore some of the educational implications of an approach that focuses on the development of the comprehensive form of intelligence described by the Pentad Model. It is time to revisit the notion of an intelligence score and the structure of schools.

## **CONCLUSION: EDUCATIONAL IMPLICATIONS OF THE PENTAD MODEL**

We can think about four main challenges for education:

**Challenge 1 – Tedious:** Too many students are bored by school and, far worse, they end up losing their natural curiosity and imagination in the process. The curriculum seems irrelevant and, to be fair, during their lives they will forget much of what they learned. For every Ken Jennings on “Jeopardy” there are thousands of people who would fail miserably on even a show like “Are You Smarter Than A 5<sup>th</sup> Grader?” This problem is only exacerbated by the issues of poverty, violence, drugs, and other chronic social obstacles.

**Challenge 2 – Disoriented:** There is a lack of clarity about the aim of education which leads to confusion and conflict. Long-standing and incompatible ideas involving socialization, academic cultivation, and individual development are being repeatedly rehashed as they cycle in and out of favour, but there is little reason to think they will work now after they have been tried throughout the decades with little success.

**Challenge 3 – Superficial:** Students are not being equipped to think deeply or to adequately understand issues. The typical K-12 curriculum attempts to cover too much material and the focus on standardized testing means that subjects tend to be further reduced to a series of selected facts that are memorized for the short-term and then generally forgotten. Students are left without any deep understanding and little sense of wonder or love of learning.

**Challenge 4 – Disconnected from reality:** Students are not being equipped to deal with reality or to think across disciplines. It is understandable that we have disciplines that focus on small parts of the complexity of reality; however, it is not enough to focus on one specialty while being largely naive in most other areas. While K-12 systems may span multiple subjects, they tend to be treated as just that: separate subjects dealt with at separate times by separate teachers without overlap or common purpose.

These challenges were contemplated alongside insights into educational philosophy and achievement motivation to produce four objectives for education:



**Objective 1 – Education needs to motivate and inspire:** The desire to learn, seek challenges, and overcome obstacles through effort, strategy and perseverance ought to be a direct result of attending school. The key role played by our meaning systems and beliefs needs to be recognized and incorporated into the process, and, given its profound impact on achievement, the critical understanding that intelligence is increasable should feature prominently.

**Objective 2 – Education needs a clear aim:** There should be an understandable and persuasive reason for why we expect children to spend so much of their time at school. A clear aim would replace the present uncertainty with a reasonable goal to strive towards and it would allow educators and students to prioritize accordingly.

**Objective 3 – Education needs to develop a depth of understanding in students and to equip them to deal with reality:** To fully participate in the complex world around them students should be able to understand issues in detail from a variety of different perspectives. The idea is not to overwhelm students with information, but to provide them with the thinking tools and strategies required to approach a topic and comprehend it on a reasonable level. Students need to be prepared for dealing with the intricate reality that makes their lives possible and for the multi-disciplinary efforts that are required to produce useful solutions to the complex issues we face in our modern world.

**Objective 4 – Education needs to foster individual freedom, autonomy, and realism:** To the greatest extent possible, individuals should live up to their potential as conscious subjects who embrace reality and the freedom available to them. Given that other social institutions may be more focused on socialization or indoctrination, schools present the best opportunity to develop the potential for the freedom, autonomy, and realism that makes us unique.

The solution we have been exploring to address these challenges and meet these objectives is to present a new aim for education. The Pentad Model brings together several leading theories of and about intelligence by drawing out the main parts of each and combining them in a manner capable of providing a more complete view of intelligence. It presents a framework comprised of five levels of intelligence: anatomical, cognitive capacity, operations, cognitive tools, and cognitive habits and beliefs. The anatomical level describes the physical components and structure, such as the cells and neural connections, inside each of us that makes intelligence possible. This elaborate anatomical hardware results in our having remarkable processing and computational abilities which are represented at the cognitive capacity level. This cognitive capacity

can be applied to some key capabilities and functions (Howard Gardner's multiple intelligences/abilities) that comprise the operations level. These multiple intelligences/abilities can be enhanced by various thinking tools and kinds of understanding at the cognitive tools level. Finally, the functioning of the whole system is impacted by the cognitive habits and beliefs of the individual.

Our current ability to understand our world, our minds, and our potential through the wisdom, knowledge, and tools our species has amassed puts us in the unique position where we now actually have the choice to intentionally increase our intelligence, or at least the intelligence of future generations, by transforming our educational system. Introducing a new conception of education that focuses on the process through which we develop and maximize the comprehensive form of intelligence presented by the Pentad Model offers a useful guide for educational reform that should enable us to fulfil our four objectives for education:

**Objective 1 – Education needs to motivate and inspire:** According to the Pentad Model, we are born with an immense potential capacity for intelligence that will get realized to a greater or lesser extent depending on effort and opportunities. It is a combination of an individual's biological potential, the effort they apply, the beliefs and cognitive tools they master, and the opportunities for learning to which they are exposed that lead to the development of intelligence. Accordingly, this model and aim for education make it explicit that intelligence is increasable. The research reviewed in Chapter 3 highlights the intense impact on achievement motivation that flows from this understanding about the malleability of intelligence. In addition, the other motivating, enabling beliefs and cognitive habits that support the desire to learn, seek challenges, and overcome obstacles through effort, strategy and perseverance comprise the final level of the Pentad Model.

**Objective 2 – Education needs a clear aim:** The re-conceiving of education using the Pentad Model provides a meaningful, achievable, and comprehensive educational aim to strive towards. The objective of working through the model to develop any number of the multiple intelligences/abilities in the operations level by developing the cognitive tools, habits, and beliefs in the following levels provides a clear journey with an understandable purpose. The process would contribute a greater sense of meaning to educational endeavours instead of having students going through the motions without necessarily knowing why they are there. Working towards a clear goal with an appreciation of the rationale for doing so should act to increase personal responsibility and motivation. Moreover, the sense of accomplishment from making progress along the way should act to

further increase motivation and improve performance while building confidence and self-esteem.

This aim is also compatible with the long-standing educational ideas of socialization, academic cultivation, and individual development. It promotes appropriate socialization by shaping individuals to environmentally and socially responsible norms while encouraging the development of interpersonal and environmental intelligence. In keeping with more traditional, intellectual development, it supports the development of linguistic and logical-mathematical intelligence as well as the cultivation of the understanding and knowledge that will enable individuals to appreciate what is and is not true about the world. This new approach to education is also quite clearly premised on the development of each individual's potential.

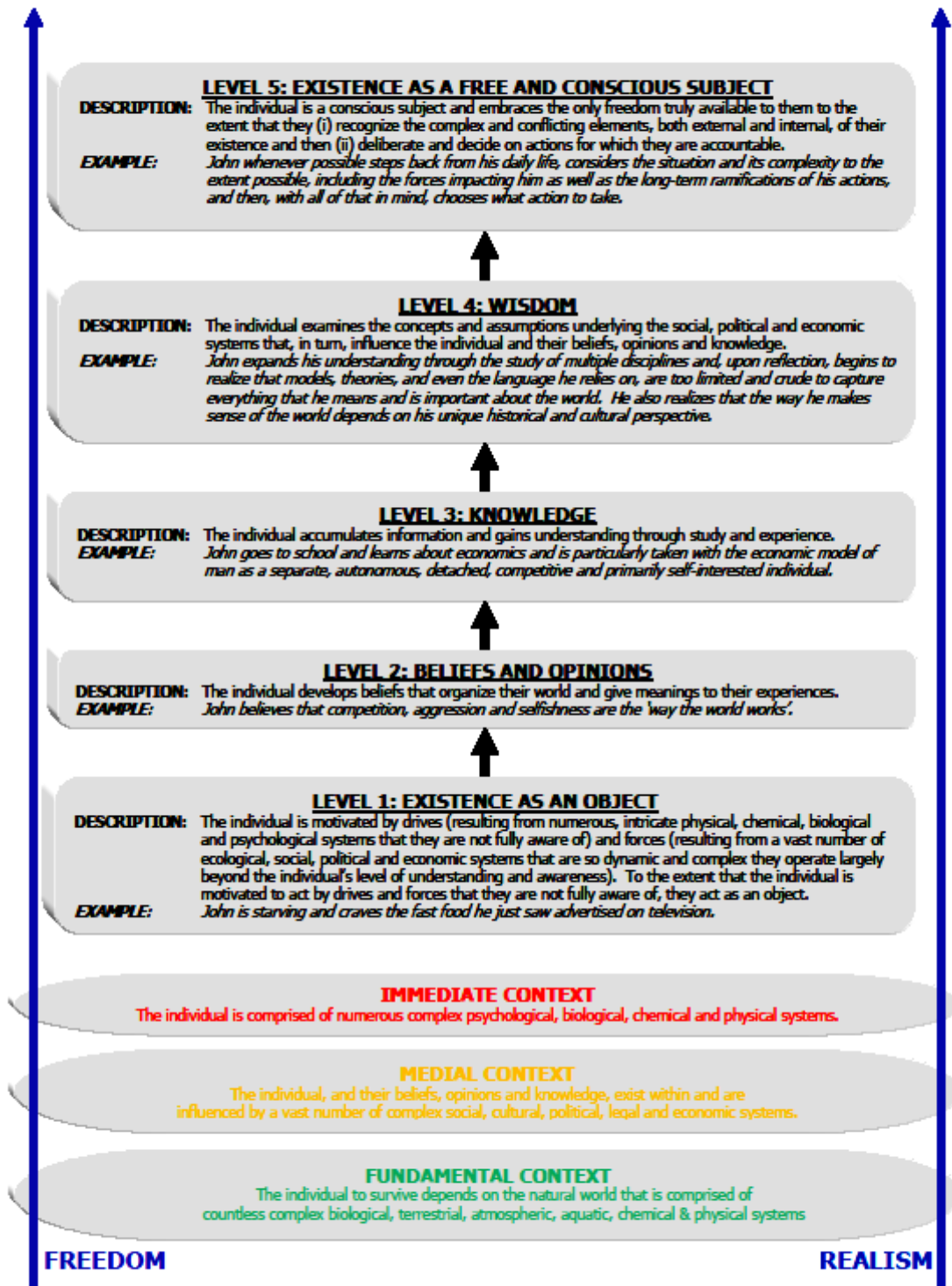
**Objective 3 – Education needs to develop a depth of understanding in students and to equip them to deal with reality:** The aim for education involving the Pentad Model has considerable academic and intellectual merit to the extent that it develops the immense human capacity for intelligence in a way that enables people to effectively respond to reality, think across disciplines, understand complex ideas, adapt effectively to the environment, learn from experience, engage in various forms of reasoning, overcome obstacles by taking thought and, among other things, be less susceptible to self-absorbed individualism and more capable of analyzing and rejecting counterproductive belief systems. Emphasizing the development of cognitive tools that expand understanding rather than focusing on overwhelming students with information they will inevitably forget is critical. Moreover, focusing on the development of cognitive tools, habits and beliefs across multiple intelligences/abilities and across disciplines will support students' abilities to understand issues in detail from a variety of different perspectives.

This approach is also of considerable practical benefit for the future challenges our species will face. Comprehensive intelligence has ensured that we have survived and thrived. The multi-stage planning made possible by higher levels of intelligence enabled us to predict certain consequences of our actions, understand dangers, and then take the necessary actions. Making the development and advancement of comprehensive intelligence the aim will provide the foundation required to produce useful solutions to the complex issues we face in our modern world.

**Objective 4 – Education needs to foster individual freedom, autonomy, and realism:** Figure 4 from Chapter 2 (copied below) shows a progression where each higher level represents an increase in these traits, with each level containing all the levels below. As touched upon in the discussions about the other objectives, the key to our unique potential for freedom, autonomy, and realism is the comprehensive form of intelligence presented by the Pentad Model. It is our neural functions and cognitive capacity that enable us to be aware of and reflect on ourselves and our actions, and provide us with the potential to use mental tools, languages, theories, art and so on to better make sense of our lives and the world. Likewise, it is our intelligence that enables us to realize our potential for freedom by using this awareness and understanding to step back from our lives and then deliberate and decide on our actions. The more an individual builds upon their wide-ranging potential for intelligence, the better will be their awareness, understanding, and ability to think and reflect.

We occupy a unique position on this planet with the ability to tap into an incredibly profound and rich experience, and the ability to effect dramatic global impacts with long-term implications. These abilities have a shared basis in our intelligence that sets us apart from every other species. With this in mind, our educational system should have as its purpose the development of this unique intelligence with its capacities that enable us to occupy the position that we do. Before we briefly consider how a new conception of education based on the Pentad Model might look in practice, we need to take a quick detour and ask ourselves whether we should keep score.

FIGURE 4: DEGREES OF REALISM AND FREEDOM



## INTELLIGENCE SCORES

If we are going to assign a number to our intelligence then it should at least reflect our potential for a comprehensive intelligence. As highlighted by the Pentad Model, an IQ score that only reveals the cognitive capacity portion of intelligence is too limited and limiting. For one thing, a person is more or less stuck with that IQ score no matter what they do. This sends a dreadful message about intelligence and achievement:

Some years ago I read about an eminent scientist who, several years after winning the Nobel prize, found out his IQ. Somehow his early school records came into his possession and on them was his IQ score. What struck him immediately was this: The number was too low to have enabled his accomplishments. Someone with that IQ could not possibly have made the groundbreaking discoveries he had made. He freely admitted that had he known his IQ, he would never have dreamed of embarking on his scientific career (Dweck, 2000:59).

The scientist's assertion that he would have written off what turned out to be a successful career based on a clearly inadequate IQ score is telling. From the perspective of the Pentad Model, to get a better sense of this scientist's potential we would move beyond mere cognitive capacity to instead think of intelligence in terms of an anatomical structure that produces cognitive capacity which can be directed towards multiple functions that can be improved through numerous cognitive tools, with the overall functioning being impacted by cognitive habits and beliefs.

**TABLE 4.1: PENTAD MODEL INTELLIGENCE SCALE (PMIS)**

<b>Operations</b>	<b>Formula</b>
Linguistic Intelligence Score (LIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$
Logical-mathematical Intelligence Score (LMIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$
Musical Intelligence Score (MIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$
Spatial Intelligence Score (SIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$
Bodily-kinaesthetic Intelligence Score (BIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$
Inter-personal Intelligence Score (IIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$
Intra-personal Intelligence Score (IRIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$
Environmental Intelligence Score (EIS)	$IQ \times \text{Percentage of relevant cognitive tools mastered (scale 0 – 100)}$ $\times \text{Percentage of effective cognitive habits developed (scale 0.5 – 1)}$

If we still believe that assigning numbers to individuals' intelligence is important we could utilize a formula along the lines of that shown in Table 4.1. The Pentad Model Intelligence Scale (PMIS) would involve scores for each of the eight multiple intelligences/abilities that comprise the operations level of the Pentad Model. Each score would be based on the person's i) IQ multiplied by ii) the percentage of relevant cognitive tools they had mastered (on a scale from 0 to 100) multiplied by iii) the percentage of positive cognitive habits they had developed (on a scale from 0.5 to 1). These elements are overviewed below:

- i) IQ: This standardized score can be obtained through the use of the appropriate Wechsler intelligence scale.
- ii) Cognitive Tools: We can use linguistic intelligence as an example to elaborate on what we mean by relevant cognitive tools. As reviewed in Chapter 3, Kieran Egan has developed the most comprehensive list of the cognitive tools associated with language. As shown in Table 4.2, there are 33 that would need to be evaluated to assess linguistic intelligence. Accordingly, an individual who had developed all of the cognitive tools associated with Somatic, Mythic and Romantic Understandings, but none of those associated with Philosophic or Ironic Understandings would have mastered 22 out of 33 relevant cognitive tools or 67%. Given their key role, these cognitive tools would be represented in the formula on a scale from 0 to 100.

**TABLE 4.2: COGNITIVE TOOLS TO DEVELOP LINGUISTIC INTELLIGENCE**

<b>Somatic Understanding</b>	<b>Mythic Understanding</b>	<b>Romantic Understanding</b>	<b>Philosophic Understanding</b>	<b>Ironic Understanding</b>
1) bodily senses	7) story	15) sense of reality	23) drive for generality	29) limits of theory
2) emotional responses & attachments	8) metaphor	16) extremes & limits of reality	24) processes	30) reflexivity & identity
3) rhythm & musicality	9) abstract binary opposites	17) association with heroes	25) lure of certainty	31) coalescence
4) gesture & communication	10) rhyme, meter, & pattern	18) wonder	26) general schemes & anomalies	32) particularity
5) referencing	11) joking & humour	19) humanizing of meaning	27) flexibility of theory	33) radical epistemic doubt
6) intentionality	12) forming images	20) collections & hobbies	28) search for authority & truth	
	13) sense of mystery	21) revolt & idealism		
	14) games, drama & play	22) context change		

Adapted from Egan (1997)

iii) Cognitive Habits: The research of Carol Dweck discussed at the end of Chapter 3 describes 5 key cognitive habits (listed in table 4.3) required for achievement and the full realization of one’s potential for intelligence. Unlike the cognitive tools, where each tool advances understanding and further develops the multiple intelligence/ability, these habits are less involved in the development and more involved in the motivation required to enable that development. The presence of these habits is required while their absence, or the presence of contrary habits, can be debilitating and lead to difficulties and adverse impacts that prevent this development. Accordingly, the percentage of required cognitive habits is factored in on a scale from 0.5 to 1 so that all the habits present results in no restrictions while a deficiency does register as an overall impairment.

**TABLE 4.3: COGNITIVE HABITS SUPPORTIVE OF THE DEVELOPMENT OF INTELLIGENCE**

Key Cognitive Habits
1) Works to increase intelligence
2) Embraces opportunities for learning and seeks challenges
3) Values effort
4) Perseveres in the face of obstacles and adopts a positive, realistic attitude
5) Engages in critical, open-minded thinking and effective problem solving strategies including active meta-cognitive strategies, active learning strategies, and deep processing strategies

Adapted from Dweck (2000)

There are multiple advantages to this approach. At the beginning of Chapter 3 we reviewed a couple of examples where individuals with a lower IQ were evidently more intelligent than those with a higher IQ. The PMIS helps to explain how this could be possible. We can continue with our focus on linguistic intelligence to present two examples:

Person 1: This individual has a very high IQ of 130, has mastered 22 out of 33 (67%) relevant cognitive tools, and has developed 3 out of 5 key cognitive habits. The Linguistic Intelligence Score (LIS) would be  $130 \times 67 \times 0.8 = 6968$ .

Person 2: This individual has a more modest IQ of 110, has mastered 29 out of 33 (88%) relevant cognitive tools, and has developed all 5 key cognitive habits. The Linguistic Intelligence Score (LIS) would be  $110 \times 88 \times 1 = 9680$ .

Their complete profiles are found in Table 4.4. In these examples, the higher IQ individual would be considered the less intelligent (i.e., less able to understand complex ideas, engage in various forms of reasoning, etc.) of the two in all but one category. This



is so because the PMIS reflects learning and effort, and highlights the fact that a comprehensive take on intelligence involves multiple intelligences/abilities, cognitive tools, and cognitive habits and beliefs in addition to an IQ score.

**TABLE 4.4: PENTAD MODEL INTELLIGENCE SCALE (PMIS) RESULTS**

<b>Pentad Model Intelligence Scale (PMIS)</b>	<b>Person 1</b>	<b>Person 2</b>
Linguistic Intelligence Score (LIS)	$130 \times 67 \times 0.8 = \mathbf{6968}$	$110 \times 88 \times 1 = \mathbf{9680}$
Logical-mathematical Intelligence Score (LMIS)	$130 \times 65 \times 0.8 = \mathbf{6760}$	$110 \times 85 \times 1 = \mathbf{9350}$
Musical Intelligence Score (MIS)	$130 \times 48 \times 0.8 = \mathbf{4992}$	$110 \times 90 \times 1 = \mathbf{9900}$
Spatial Intelligence Score (SIS)	$130 \times 75 \times 0.8 = \mathbf{7800}$	$110 \times 73 \times 1 = \mathbf{8030}$
Bodily-kinaesthetic Intelligence Score (BIS)	$130 \times 83 \times 0.8 = \mathbf{8632}$	$110 \times 62 \times 1 = \mathbf{6820}$
Inter-personal Intelligence Score (IIS)	$130 \times 64 \times 0.8 = \mathbf{6656}$	$110 \times 85 \times 1 = \mathbf{9350}$
Intra-personal Intelligence Score (IRIS)	$130 \times 61 \times 0.8 = \mathbf{6344}$	$110 \times 82 \times 1 = \mathbf{9020}$
Environmental Intelligence Score (EIS)	$130 \times 59 \times 0.8 = \mathbf{6136}$	$110 \times 83 \times 1 = \mathbf{9130}$

The purpose here is not necessarily to advocate for the further testing that would be required by the PMIS, but to highlight two critical points that should be considered if we are going to assign a number to a person’s intelligence. First, the number should be reflective of our potential to develop a comprehensive intelligence. Second, the number should be motivating and improvable. It should inspire future potential successes to keep striving instead of giving up due to a narrow score outside of their control. The PMIS meets these objectives by factoring in our multiple intelligences/abilities and the impact on them of our cognitive capacities, cognitive tools, and cognitive habits.

The PMIS also manages to be more readily relatable. Let’s put this in perspective. More than a few people are highly motivated by video games where they learn and practice various skills to earn tremendously high scores. I don’t suspect a game that generally assigned a score between 85 to 115 regardless of what one did would be particularly popular or inspiring. Even worse, as we have seen, the score in such a game could be low enough that a potential Nobel Prize winner would write off their chances or it could be high enough that an otherwise gifted individual would avoid the risks and challenges necessary to learn in an effort to preserve their high score. In contrast, a typical person has the potential to earn a score of 10,000 on each of the 8 categories of the PMIS by learning and practicing various skills, tools, and habits. The critical motivational understanding that intelligence is increasable with effort is made clear.

## Conclusion: Educational Implications of the Pentad Model

While bringing up video games, and the PMIS for that matter, might be somewhat light-hearted, the thought of adapting some of these ideas to create a new structure for schools and approach to education is worthy of serious contemplation. Instead of the ongoing incremental changes, it might be time to try something completely different.

## **FUTURE DIRECTIONS: HOW IT ALL MIGHT LOOK FROM 30,000 FEET**

Two main considerations follow from our contemplation of the PMIS. First, the overall objective in this educational approach is to work through the Pentad Model to develop any number of the multiple intelligences/abilities in the operations level by developing the cognitive tools, habits and beliefs in the following levels. Second, our schools should be structured differently to achieve this objective. If we are going to move away from packing students' heads full of information about various isolated subjects then the need to maintain a structure based on those subjects is called into question.

We should consider an educational structure where there are teachers for the various grades/ages/levels of each of the multiple intelligences/abilities. So, instead of English class, science class, math class, PE, and so on the topics would be Linguistic Intelligence, Logical-mathematical Intelligence, Musical Intelligence, Spatial Intelligence, Bodily-kinaesthetic Intelligence, Interpersonal Intelligence, Intrapersonal Intelligence, and Environmental Intelligence. Teachers could use much of the same content and subject matter, but the focus would be on developing each of the intelligences. Accordingly, their main priority would be to develop the cognitive tools by using them to structure and teach the lessons, and to develop the appropriate cognitive habits and beliefs at the same time. Table 4.5 overviews how the Pentad Model would look from the perspective of a Linguistic Intelligence teacher with the relevant cognitive tools, habits, and beliefs expanded. Figure 5 shows how this teacher would use the sets of cognitive tools to structure and teach a topic. The fostering of the cognitive habits and beliefs would be a concurrent and ongoing process.

As we have reviewed, significant benefits should flow from this approach. The aim of developing and maximizing the comprehensive form of intelligence presented by the Pentad Model offers a meaningful, achievable, and motivational educational goal to strive towards while being congruent with traditional educational ideas. It would present students with an opportunity to develop a depth of understanding and better equip them to deal with reality while fostering individual freedom, autonomy, and realism.

The real value of the Pentad Model as an aim for education might well be that it provides a very clear and understandable way to bring together what would otherwise be isolated, but valuable ideas and research on matters ranging from cognitive tools to self-theories to the complex reality that provides the fundamental context for our lives. The vital importance of all of these elements was clear when this theoretical process was started, but it was not at all obvious how or why any of them could or should fit together. The hope is that now, after repeated revisions, the composition of the Pentad Model looks obvious and seamless. Ideally, to paraphrase Oliver Wendell Holmes, the Pentad Model is a bit of simplicity on the other side of complexity.

**TABLE 4.5: PENTAD MODEL OUTLINE FOR LINGUISTIC INTELLIGENCE**

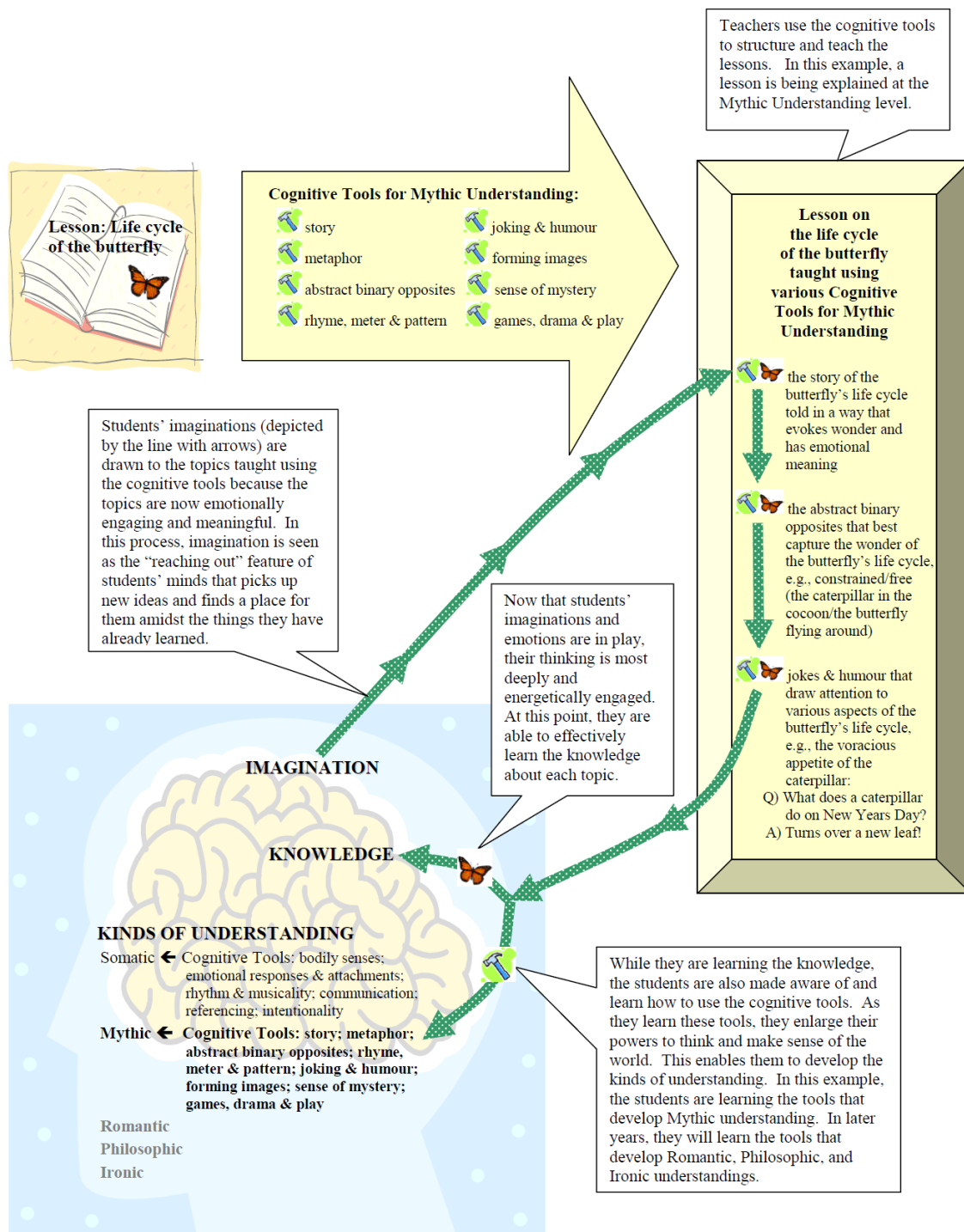
<b>PENTAD MODEL LEVELS AND EDUCATIONAL FOCUS</b>				
<b>Anatomical</b> – Physical structure				
<b>Cognitive Capacity</b> – Processing/computational ability				
<b>Operations -- Primary Focus: Linguistic</b> Secondary Focus: Logical-mathematical, Musical, Spatial, Bodily-kinaesthetic, Inter-personal, Intra-personal, and Environmental				
<b>Cognitive Tools – Educational Focus: Age/Grade Dependent</b>				
Somatic Understanding	Mythic Understanding	Romantic Understanding	Philosophic Understanding	Ironic Understanding
1) bodily senses 2) emotional responses & attachments 3) rhythm & musicality 4) gesture & communication 5) referencing 6) intentionality	7) story 8) metaphor 9) abstract binary opposites 10) rhyme, meter, & pattern 11) joking & humour 12) forming images 13) sense of mystery 14) games, drama & play	15) sense of reality 16) extremes & limits of reality 17) association with heroes 18) wonder 19) humanizing of meaning 20) collections & hobbies 21) revolt & idealism 22) context change	23) drive for generality 24) processes 25) lure of certainty 26) general schemes & anomalies 27) flexibility of theory 28) search for authority & truth	29) limits of theory 30) reflexivity & identity 31) coalescence 32) particularity 33) radical epistemic doubt
<b>Cognitive Habits and Beliefs – Educational Focus</b>				
<b>Cognitive Habits</b>		<b>Beliefs</b>		
➤ Works to increase intelligence		➤ Intelligence is increasable through learning and effort ➤ Current performance is not a measure of long-term potential but rather an indication of where you are and what you need to do now		

Conclusion: Educational Implications of the Pentad Model

<ul style="list-style-type: none"> <li>➤ Embraces opportunities for learning and seeks challenges</li> </ul>	<ul style="list-style-type: none"> <li>➤ Learning new skills and knowledge, and increasing understanding, are rewarding and fulfilling</li> <li>➤ Taking on challenges provides opportunities to grow and to live life to the fullest</li> <li>➤ Performing to the limits of one's potential, regardless of what those limits are, is the key to happiness</li> </ul>
<ul style="list-style-type: none"> <li>➤ Values effort</li> </ul>	<ul style="list-style-type: none"> <li>➤ Success results from effort, and everyone needs sustained effort to realize their potential</li> <li>➤ Higher levels of effort lead to higher levels of understanding and mastery</li> <li>➤ Effort gives meaning to life, and means that something is important to you and you are willing to work for it</li> </ul>
<ul style="list-style-type: none"> <li>➤ Perseveres in the face of obstacles and adopts a positive, realistic attitude</li> </ul>	<ul style="list-style-type: none"> <li>➤ Difficulty is to be expected in worthwhile activities, and confronting and overcoming obstacles is an inevitable part of the process of learning</li> <li>➤ Obstacles can be conquered with suitable effort and strategies</li> <li>➤ Mistakes should not be feared because they can be informative and helpful</li> </ul>
<ul style="list-style-type: none"> <li>➤ Engages in critical, open-minded thinking and effective problem solving strategies             <ul style="list-style-type: none"> <li>• active meta-cognitive strategies (e.g., reviewing material not understood, asking questions during work, making connection between current problems and past problems)</li> <li>• active learning strategies (e.g., setting goals, planning, organizing material)</li> <li>• deep processing strategies (e.g., discriminating important info from unimportant info, trying to figure out how new info fits with existing knowledge, monitoring comprehension)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ Understanding reality as accurately as possible is important and this involves constant learning and revision of one's current understanding</li> <li>➤ New evidence and possibilities should be carefully considered to determine whether current beliefs are supported or need to be amended</li> <li>➤ Seeking alternative strategies for accomplishing a task is effective and exciting</li> <li>➤ Identifying and developing the approaches and skills required to pursue life goals is critical</li> <li>➤ Stepping back from a situation, analyzing the options, and then deciding on the best action is an optimal approach</li> </ul>

Adapted from Dweck (2000), Egan (1997), Gardner (1983), Garlick (2002), and Stanovich (2002)

**FIGURE 5: THE IMAGINATIVE EDUCATION APPROACH TO TEACHING WITH COGNITIVE TOOLS**



Adapted from Egan (1997)

## ENDNOTES

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<sup>i</sup> Using the example of the common debating society remark that ‘When you get right down to it, a human body is just five dollars worth of chemicals’, Mary Midgley demonstrates the inanity of arguing that there is one ultimate description:

If the officials who are supposed to provide bodies for dissection at the medical school decide just to send in crates of chemicals, there will be trouble. However carefully they weigh these crates and however sure they may be that social and biological descriptions are only superficial and provisional approximations, they will not have sent what was ordered (1994:55).

The problem is not that the chemical description is incorrect, but that it only provides one aspect of many.

<sup>ii</sup> In 1996, Allan Sokal, a professor of physics, had an article reviewed by and accepted for publication in a leading journal of cultural studies. The problem was the article was a hoax that, although designed to sound good, was nonsensical from the first paragraph onwards. In a follow up piece that was rejected by that journal, but accepted by others (see *Dissent* 43(4):93-99), he described his strategy:

Like the genre it is meant to satirize -- myriad exemplars of which can be found in my reference list -- my article is a mélange of truths, half-truths, quarter-truths, falsehoods, non sequiturs, and syntactically correct sentences that have no meaning whatsoever. (Sadly, there are only a handful of the latter: I tried hard to produce them, but I found that, save for rare bursts of inspiration, I just didn't have the knack.) I also employed some other strategies that are well-established (albeit sometimes inadvertently) in the genre: appeals to authority in lieu of logic; speculative theories passed off as established science; strained and even absurd analogies; rhetoric that sounds good but whose meaning is ambiguous; and confusion between the technical and everyday senses of English words.

<sup>iii</sup> Research into the ecological impact of humanity as measured by the area of biologically productive land and water required to produce the resources consumed and to assimilate the wastes generated under the predominant management and production practices in any given year enables us to quantify the scope of the problem (Wackernagel et al., 2002). While humanity's demand for natural capital corresponded to 70% of the earth's biological productivity in 1961, this percentage grew to 120% by 1999. Reserving 12% of the biologically productive area for conservation, as advised in the Brundtland Report, increases the current overshoot from 20% to nearly 40%. Looked at on a per capita basis, the existing global biocapacity is 1.9 global hectares per person whereas the global average demand for 1999 adds up to 2.3 global hectares per person. The average demand is significantly higher in industrialized countries such as the United States and the United Kingdom (9.7 and 5.4 global hectares per person, respectively).

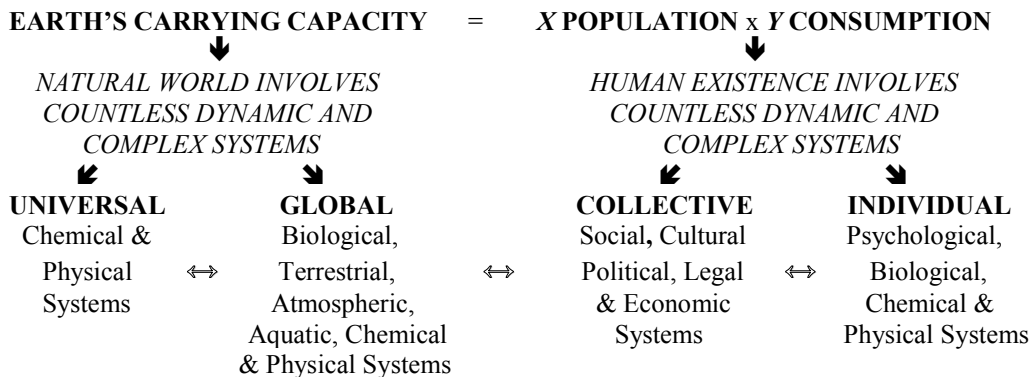
<sup>iv</sup> That we now find it necessary to talk about sustainability indicates the critical importance of these issues. The subject of sustainability, which relates to our very ability to perpetuate the existence of the human race, will be one of the pivotal issues this century. Although it has been defined in numerous ways, for our purposes sustainability refers to “the maintenance over the long term of the health and viability of human societies and the natural environment of which they are part” (Robinson and Van Bers, 1996:9). It involves finding a balance between the

impacts resulting from human activity and the capacity of the natural world to sustain life. Sustainability may very well turn out to be the ultimate test of human potential. It is interesting to consider why sustainability is such a challenge. After all, why should something as universally endorsed as the continued existence of our species present such an ordeal? To approach this we can contemplate the universe. Nigel Calder once wrote, “In its broad features, (the universe) is far less complicated than the Earth, one of its most trivial constituents.” As shown in the figure below, a similar case can be made for sustainability. At the broad level, the problem and the solution are simple. We live in a finite world that places physical limits on us. The Earth has a certain carrying capacity that can support population X at consumption level Y. Therefore, we need only determine what a sustainable level of consumption is for our globally dominant species and then live within those physical limits. However, at more specific levels, the issues become far more complicated.

For one thing, the functioning of the world around us is not readily discernible. Our planet is comprised of a countless number of dynamic and extremely complex systems. These complex systems are an assortment of a virtually infinite number of variables that interact with each other to form a dynamic whole where cause and effect cannot be linearly connected across time and space. In complex, non-linear systems, the knowledge of conditions at a given point - not that a knowledge of a virtually infinite number of variables is really possible - does not allow us to predict subsequent conditions with certainty. Even the intricate nature of the ecosystems that we live in largely exceeds our understanding. Thus, our limited comprehension of the incredible complexity of the natural world makes an exact determination of its carrying capacity extremely challenging. Naturally, though, the complexity increases even further when we consider that, far from being passive participants, our existence is, in and of itself, exceedingly elaborate.

At collective levels we exist as families, communities, cultures, societies and nations, all multifaceted and involving a plethora of social, cultural, political, legal, and economic systems. At a more specific level, we exist as individuals who are not only enmeshed in all of the systems just described but are, in turn, also comprised of a vast number of complex systems. Each of these systems impacts our ever-changing population and consumption levels.

**SUSTAINABILITY ISSUE – COMPLEXITY INCREASES WITH SPECIFICITY**



Consequently, although the general problem with and solution for sustainability are fairly straightforward, the incredible number of diverse systems and factors involved makes dealing with the issues in a pragmatic and comprehensive fashion very challenging. The issues impacting



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sustainability are entangled with the myriad other issues, demands and drives of human life. The social change required by sustainability must involve all of these systems.

<sup>v</sup> Achieving a sustainable existence will require wide-ranging social change. There are at least twelve levels of human behaviour that can contribute to this:

1. individual self-control of everyday activity (e.g., using transit)
2. individual planning and design (e.g., living near work, living in a green home)
3. individual consumption decisions (e.g., buying a hybrid vehicle, shopping for local products)
4. individual action intended to influence (e.g., politics, environmental activism)
5. group control of everyday activity of individuals (e.g., social conformance - pressure to recycle)
6. group level planning and design (e.g., community groups making smart growth recommendations, company building a green office tower)
7. group consumption decisions (e.g., organic delivery service, ethical mutual funds)
8. group action intended to influence (e.g., environmental groups protesting clearcutting)
9. governmental control of everyday activity of individuals (e.g., bottle returns, gas taxes, promoting transit use, requiring individual tree cutting permits)
10. governmental planning and design (e.g., green urban design, planning efficient transit)
11. governmental consumption decisions (e.g., using recycled paper in all offices)
12. governmental control of consumption options (e.g., environmental laws and policies: leaded gas ban, setting emission levels, international agreements)

Additional international levels could be added; however, many of the twelve levels listed can occur at, impact, or be impacted by, the global level. For example, individual or group consumption decisions involving the purchase of hybrid cars will influence multinationals such as GM. Item 8 could involve an organization such as Greenpeace International. Finally, government level decisions will often have cross-border impacts.

The twelve levels lead to two basic types of required change: individual and institutional/collective. The individual change will require greater personal responsibility, and support for and performance of the necessary activities such as reducing consumption levels. The institutional and collective changes will require such things as the improvement of: existing governance structures, public policy instruments, and urban planning. Absent either of these types of change, the achievement of sustainability seems unlikely.

Some argue that institutional and collective changes should be the focus (e.g., Robinson and Van Bers, 1996). The usual logic behind this is that environmental concerns are global and that one individual who chooses to, for instance, not use a car will presumably have a limited impact on pollution. In contrast, collective change can have a large impact on environmental issues. However, the role of the individual needs considerably more attention. The typical 'ecological footprint' of individuals in the U.S. and Canada does indeed have measurable impacts and is well above sustainable levels on a global per capita basis (Wackernagel et al., 2002).

For that matter, even if we were to decide that collective changes should still be the main priority, these changes will still ultimately rely upon individual action. Individuals are required to bring about institutional and collective changes as: individuals working within the public sector, external policy entrepreneurs, participants in influential groups and/or individuals demanding

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such changes. As an additional challenge, the efficacy of many public institutions is limited by the modern realities of globalization and fiscal restraints. As evidenced by the public sector trends towards alternative service delivery mechanisms such as partnerships, the role of individuals and the private sector is becoming increasingly important. To some extent, individuals banding together will be more successful in influencing global entities such as multi-national corporations – for instance the cases of Mitsubishi and Ikea – than modern governments which are swayed by powerful financial and business interests.

Individuals must also choose to support and participate in the institutional and collective changes for them to become a reality. This is consistent with Hume's paradox: although the population may submit to the rulers, the power is always in the hands of the governed. While such things as governmental regulations can lead to behavioural change, this is only consistently true when there is adequate monitoring and enforcement. However, in many cases dealing with the environment, government policies are poorly enforced. As we come full circle – from individual to institutional to individual – both the interrelated nature of the system and the importance of personal responsibility and accountability become clear. As Aldo Leopold wrote: "The real substance of conservation lies not in the physical projects of governments but in the mental processes of citizens."

<sup>vi</sup> Research indicates that the global productive land available per capita is 1.9 hectares while the ecological footprint – the amount of ecosystem (land and water) that we are appropriating based on the resources we consume and the wastes we produce – of the average Northern American is 9.7 hectares or nearly five times more than is available globally on a per capita basis (Wackernagel et al., 2002)

<sup>vii</sup> As Nelson (1994) writes: "We are rapidly building a world in which the questions of health and peace and prosperity sooner or later will be moot because we will have crippled the very engine of life that makes it all possible... The economy is a wholly-owned subsidiary of the environment. All economic activity is dependent upon the environment with its underlying resource base. When the environment is finally forced to file under Chapter 11 because its resource base has been polluted, drained, cut down, dissipated, and irretrievably compromised, the economy goes down to bankruptcy with it. The economy, in reality, is just a subset of the ecological system."

<sup>viii</sup> This is as true from the perspective of Plato, 'how ought we to live' as it is from that of Thomas Nagel who wrote: 'the central problem of ethics; how the lives, interests, and welfare of others make claims on us and how these claims are to be reconciled with the aim of living our own lives.'

<sup>ix</sup> Although these assessments of environmental matters represent the broad consensus of the scientific community, we do not have absolute knowledge about these issues. We still have much to learn about the enormous ecological diversity that surrounds us. Furthermore, the nature of our enquiry into the natural world is such that for every question we succeed in answering, many more questions arise. Nevertheless, it is illogical to believe that socially and environmentally protective – let alone restorative and regenerative – actions are without merit until there is no uncertainty about the issues. In dynamic and extremely complex environmental systems, the only conclusive proof of catastrophic environmental failure is such failure, an inanely risky threshold. This is important because some economists and other non-experts choose to venture into the extremely complex, unsettled literature of environmental science, critique a fraction of what is to

be found there, and then come out confident that their simple, dismissive summary of ecological concerns represents the truth – all the while ignoring the analysis and conclusions of experts in the field. Ironically, these ‘cautious’ cynics then frequently follow this by endorsing our making crucial, societal decisions based on simplistic and highly questionable economic speculation. In contrast, the Precautionary Principle states that in situations where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective methods to prevent environmental degradation.

<sup>x</sup> David Orr distinguishes between intelligence (long-term and aiming toward wholeness) and cleverness (short-term and tending to break reality into pieces) and states: “Cleverness is personified by the functionally rational technician armed with knowhow and methods, but without a clue about the higher ends to which technique should be subservient” (1991:100). Thus, we would need to factor in other values and considerations for assessing worth such as standards of decency, human survival, creativity and wholeness, not to mention the need to learn to manage ourselves.

<sup>xi</sup> Underlying all complex societies are intricate, unplanned social, political and economic systems that are not readily discernible. These extensive systems were not created by some omniscient designer, but have instead grown over time and are gradually altered to fit the changing demands of society. When problems arise with these systems we experience difficulties – such as the serious, interconnected economic, social and environmental issues that threaten our long-term health and existence – but without necessarily knowing why:

When the concepts we are living by work badly... they just quietly distort and obstruct our thinking. We often don’t consciously notice this obscure malfunction, any more than we consciously notice the discomfort of an unvarying bad smell or of a cold that creeps on gradually. We may indeed complain that life is going badly – that our actions and relationships are not turning out as we intend. But it can be very hard to see why this is happening, or what to do about it... Bending thought round to look critically at itself is quite hard. When things do go badly, however, we have to do this. We must then somehow readjust our underlying concepts; we must shift the set of assumptions that we were brought up with (Midgley, 1996:1-2).

Charles Taylor (1991) has considered some of the more problematical concepts underlying our contemporary culture and society. He identifies three ‘malaises’ of modernity: i) individualism, the loss of meaning and the fading of moral horizons, ii) the primacy of instrumental reason and the eclipse of ends, and iii) ‘soft’ despotism and the loss of freedom, that provide us with a framework to explore some of the ways that culture and society mediate human relationships with nature.

Taylor argues that when we examine these ‘malaises’ we find higher ideals behind the debased practices. Thus, we need to move away from the debased elements of modernity and steer developments towards their greatest promise by recovering the higher ‘moral’ ideals and retrieving shared standards and values.

<sup>xii</sup> There is evidence that human activities have exceeded the biosphere's capacity since the 1980s (Wackernagel et al., 2002). While humanity's demand for natural capital corresponded to 70% of the earth's biological productivity in 1961, this percentage grew to 120% by 1999.

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<sup>xiii</sup> Dynamic Social Impact Theory (Latané, 1996) posits that individuals mutually influence each other about a wide variety of beliefs and behaviours. In addition, people differ in their ability to influence others. Some people will be more persuasive and will convince more people to agree with them as they communicate with their neighbours and others in close proximity. Over time, this process of mutual influence results in the appearance of different clusters of beliefs and behaviours.

<sup>xiv</sup> Higher levels of interest in the environment are often attributed to changes in attitudes toward the environment and to the emergence of what is known as the New Environmental Paradigm (NEP). The NEP can be defined as a vision of the world consisting of ideas such as the inevitability of accepting limits to human growth, the importance of conserving a balance in nature, the need to develop a sustainable economy, and the need to review the idea that nature exists solely to satisfy human needs (Dunlap and Van Liere, 1978). These ideas represent a shift from materialistic values to post-materialistic values and oppose the traditional model, the Human Exceptionality Paradigm (HEP). The HEP is based on the assumptions that humans are exempted from the laws of nature and that human activity is not determined by ecological elements but by technological ability, a fundamental element for unlimited growth and development (Arcury and Christianson, 1990).

These paradigms reflect different values that individuals hold. Values are "an enduring belief that a specific mode of conduct or end state of existence is personally or socially preferable to an opposite or converse mode of conduct or end state of existence" (Rokeach, 1973:5). Value systems shape our attitudes and beliefs and create differences in our perspectives on significant issues. There are three main value systems relating to individuals' relationships with the environment: ecocentric, anthropocentric/homocentric, and egocentric/material progress.

The ecocentric ethic relates to the NEP. This value system is based on the understanding that the environment is important in and of itself, and is also concerned with protection of the environment for the survival of both human and non-human species. Consequently, the ecocentric viewpoint judges acts according to their effects on the biosphere (Gardner & Stern, 1996) and rejects the unquestioned exploitation of resources to create wealth. Individuals with this value system believe in making sacrifices for the environment in order to prevent its degradation and to benefit the entire biosphere.

The anthropocentric or homocentric ethic is more closely related to the HEP than the NEP and holds the good of the human species above other values. Nature is valued primarily in terms of the material profit that it provides humans and any human sacrifice for the sole good of non-human species is opposed (Gardner & Stern, 1996). The anthropocentric viewpoint, therefore, is a form of developmentalism where ideas of progress and human welfare are the most important factors.

The egocentric or material progress ethic relates most strongly with the developmentalist ideas of the HEP. In this system, the pursuit of self-interest is placed above all other values (Gardner & Stern, 1996). The material progress viewpoint is based on the assumption that material growth is of primary importance and that the way to accomplish this is through technological development and the exploitation of nature. This value system rejects the idea that human growth has boundaries affected by natural resource limits and the notion that we need to take into account the effects of our actions on non-human species. Individuals with this value system are most

interested in pursuing monetary goals and they see financial standing and economic growth as being of greatest importance.

Not surprisingly, research into these value systems has found that the ecocentric ethic is related to environmental attitudes and behaviours whereas the anthropocentric/homocentric ethic and egocentric/material progress ethic are not (e.g., Thompson and Barton, 1994). It is crucial then to determine how these value systems develop.

Rokeach (1973) states that values are learned through a socialization process whereby the values of each person are influenced by personality development, personal experience, social context and culture. Therefore, the adoption of a particular value system is the result of socialization by multiple institutions and influences that may change over time such as family, friends and peers, and the mass media. Rokeach also argues that members of a society share the same pool of values and only differ in their rank ordering of these individual values. Nevertheless, changing value systems is a challenging process.

According to Gardner and Stern (1996), values are long lasting and, as a result, any change or shift in the dominant values in a society will be a slow process. They argue that it is hard for adults to modify their ways of thinking about human-environment relations. However, the presence of the NEP suggests that this process is underway.

<sup>xv</sup> Although we make many crucial decisions based on highly questionable economic speculation, many dominant political and economic interests would have us believe that socially and environmentally protective - let alone restorative and regenerative - actions are without merit until there is no uncertainty about the issues. Naturally though, social and environmental systems are dynamic and extremely complex. In these systems, the only conclusive proof of catastrophic environmental failure is such failure, an ineluctably risky threshold. In contrast, the Precautionary Principle, states that in situations where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective methods to prevent environmental degradation. Instead of questioning socially and environmentally protective actions, perhaps we should ask ourselves where our mainly unplanned race of economic growth is going. What are we racing from and to where?

<sup>xvi</sup> Noam Chomsky maintains that competing priorities between ecological, social, and economic objectives are consistently resolved in favour of business interests, all appearances to the contrary being superficial:

In any country, there's some group that has the real power. It's not a big secret where power is in the United States. It basically lies in the hands of the people who determine investment decisions - what's produced, what's distributed. They staff the government, by and large, choose the planners, and set the general conditions for the doctrinal system (1995-1:98).

The United States is so deeply in hock to the international financial community (because of the debt) that they have a lock on US policy. If something happens here - say, increasing workers' salaries - that the bondholders don't like and will cut down their short-term profit, they'll just start withdrawing from the US bond market.

So social policy, even in a country as rich and powerful as the United States (which is the richest and most powerful of them all), is mortgaged to the international wealthy sectors

here and abroad... Until you get to the source of power, which ultimately is investment decisions, other changes are cosmetic and can only take place in a limited way. If they go too far, the investors will just make other choices, and there's nothing much you can do about it. (1995-2:18-19).

This capital mobility is further aided by our present information age where bond traders and speculators can move trillions of dollars in a matter of seconds; however, it is also tempered by several factors such as the need for there to be suitable investment possibilities in other countries. Overall though, the structural power of capital and the powerful ability of businesses to pressure governments - leading to short-term, profit maximizing public policies - can act as significant obstacles to sustainability.

<sup>xvii</sup> A 'motivational snapshot' refers to all the factors and influences, both situational and dispositional, influencing an individual's motivation at any given time.

<sup>xviii</sup> Research into internal factors that considers why we think about material items and consume in the way that we do is important. Due to the strong influence of the context, this research also needs to explore the substantial overlap and interactions between these external and internal factors. For instance, our needs and wants seem to grow along with the economy, particularly where we develop a complex structure of needs around one invention. The computer is a prime example of an item that was considered a luxury just twenty years ago, but is now, along with a multitude of accessories, considered an essential tool for school and business.

Research into the motivation underlying our consumption has been approached from a variety of perspectives. Early work by Scitovsky (1976) argues that consumption is impacted by several factors. To start with, an individual's level of arousal influences their general feelings of well-being and their motivation. There is an optimum level of arousal and stimulation: sub-optimal levels lead to boredom while excessive levels lead to anxiety and strain. The state of comfort and lack of stimulation that we experience when our basic needs are satisfied leads to boredom. This boredom can be dealt with by engaging in a wide variety of activities, including consumptive ones, for which there is an optimum – generally intermediate – level of novelty and complexity. In turn, the pleasure that an individual feels is also impacted by arousal level and results from the relief of discomfort or the satisfaction of needs. Thus eating, for example, is a source of pleasure and continues to be so even after the hunger needs have been met. The desire for novelty is a principal source of pleasure for those who are comfortable.

The need to escape boredom and the desire for novelty lead to new activities that become habits that are both gratifying to satisfy and painful to stop. These habits are continued to avoid this pain; however, their initial novelty and gratification wears off leading once again to the desire for novelty and more new activities. Satisfying our habits, therefore, can create ever-increasing consumption, particularly as many new activities become habitual and expected. At the same time, there is an intense desire for belonging, for social acceptance and esteem, that leads to status-driven activities and consumption: "the unchanged desire for respectability must be translated therefore into an ever-rising expenditure on the tokens of respectability" (Scitovsky, 1976:117). The more that these habits and status-driven activities involve material consumption, e.g., buying luxury items, the greater the overall impact on the environment.

More recent research has considered a wide variety of issues. A sample of these studies by category is listed below.

**NEEDS:** Seeley (1992) builds on Maslow's Theory of Motivation and his insight that, although the outward behaviour of humans may be different (modified by learning, tradition, and culture), there is a set of basic human needs that serve as the motivating force for all behaviour. Maslow organized this vast set of human needs into five general categories: physiological needs, safety needs, belongingness needs, esteem needs and self-actualization, and created the 'prepotent hierarchy of needs.' This hierarchy contends that there is a universal internal ranking of the need categories that, in conjunction with the degree of need satisfaction, determines the order in which the needs will motivate behavior. For each successive level of the need hierarchy, needs arise as motivators, become satisfied, and are replaced by new needs. Seeley argues that (i) the desire to satisfy our needs is the primary motivator of human behaviour, (ii) some of these needs can be satisfied through consumptive behaviour, and (iii) the desire to consume is in its ultimate basis the same as the desire for love, companionship, recognition, or any of the other emotional and physical requirements that we accept as human needs.

**MEANING:** One body of research argues that the value of possessions exists in the public and private meaning they have for individuals and that materialistic individuals can be perceived, as well as perceive other people, in terms of their possessions (Hunt, Kernan & Mitchell, 1996; Richins, 1994). Other studies have considered the impact of motivation, product meaning and the consumption context on individual's consumption decisions (Ligas, 2000).

**SOCIAL:** Family, interpersonal, and group influences on consumptive behaviour have been studied. Family appears to be an important influence on purchase incidence and choice (Beatty & Talpade, 1994; Schaninger and Danko, 1993). Wilkes (1995) showed that as households pass from one stage of the life cycle to another, their expenditure patterns change. Additional research has examined changing social roles and their impact on consumption (Lavin, 1995; Oropesa, 1993).

**VALUES:** Claxton, McIntyre, Clow, and Zemanek (1997) found that values may relate to consumptive behaviour; and that personality and cognitive style differences may relate to both values and consumptive behaviour. Sen and Morwitz (1996) reported that a businesses' position on a social issue and the manner in which the position was communicated impacted consumer consumption behaviours.

**PERSONALITY:** Research in the area of personality has focused on issues such as self identity (Kleine, Kleine & Kerman, 1993) as well as defining and measuring traits such as materialism (Hunt, Kernan & Mitchell, 1996), material possession attachment (Klein, Klein & Allen, 1995), vanity (Netemeyer, Burton & Lichtenstein, 1995), and compulsiveness (Faber, Christenson & DeZwaan, 1995).

**COPING:** Shopping and consumption-related behaviours have been studied as stress-reduction mechanisms. Sneath (1997) studied the impact of stressful life events on consumers' impulsive and compulsive buying behaviours. Gould and Barak (1988) demonstrated the wide scope of public self-consciousness in relation to everyday perceptions and consumptive behaviours. Kasser and Sheldon (2000) found that feelings of insecurity (related to mortality) produce materialistic behaviour; specifically, higher future financial expectations (overall worth and the amount to be spent on pleasurable, luxury items) as well as more greed and resource consumption in a simulation.

This sample of studies provides numerous explanations for the motivation underlying our consumption. The next consideration is whether high levels of consumption actually make us better off, that is, does it result in happiness or a sense of well-being. This is often believed to be the case, but as Csikszentmihalyi (1999:821) argues:

Perhaps because the heyday of utilitarian philosophy coincided with the start of the enormous forward strides in public health and in the manufacturing and distribution of goods, the majority of those who thought about such things assumed that increases in pleasure and happiness would come from increased affluence, from greater control over the material environment. The great self-confidence of the Western technological nations, and especially of the United States, was in large part because of the belief that materialism – the prolongation of a healthy life, the acquisition of wealth, the ownership of consumer goods – would be the royal road to a happy life. However, the virtual monopoly of materialism as the dominant ideology has come at the price of a trivialization that has robbed it of much of the truth it once contained. In current use, it amounts to little more than a thoughtless hedonism, a call to do one's thing regardless of consequences, a belief that whatever feels good at the moment must be worth doing.

This current view that self-centred materialism, premised on accumulating as many earthly goods as possible, is the fundamental goal of life is substantially different from the original understanding of materialists who advocated the pursuit of happiness through prudence and who recognized the importance of wisdom, virtue, self-discipline and the delay of gratification. Recent research suggests that this ancient insight, dating back at least 2,300 years to the Greek philosopher Epicurus, was accurate.

Our modern society, while experiencing a period of unprecedented material wealth and comfort, has encountered dramatic increases in violent crimes, broken families and drug addiction. Ayres (1998) argues that: "What is most wrong about the "growth syndrome" ... is that growth of the kind now occurring in the US and Europe is no longer making people happier or improving their real standard of living." Numerous studies indicate that individual consumption and having more money to spend do not guarantee greater subjective well-being (Durning, 1991; Milbrath, 1993; Myers, 1993) and that happiness is more the result of mental state than material rewards (Csikszentmihalyi, 1999).

According to Csikszentmihalyi (1999), there are four main reasons why material rewards do not necessarily make people happy. The first two reasons are more psychological, while the last two are socio-cultural. First, similar to the findings of Scitovsky (1976) reviewed previously, our minds use a strategy of escalating expectations to evaluate success. People tend to not be satisfied for long with what they possess or what they have achieved because they become quickly habituated and start desiring the next level.

Second, as more psychic energy is invested in material goals, there is less available to pursue other goals that offer social and emotional benefits. As one's income and the value of their time increases, the opportunity cost of doing anything other than making financial or material gain – even activities involving the relationships that are central to our existence as social animals – is perceived to be too high. However, these material rewards are not adequate on their own to make us happy.



Third, when resources are unevenly distributed, people tend to evaluate their material position in comparison with those who have the most instead of in terms of what they need to be comfortable. The growing disparity in wealth makes even the reasonably affluent unhappy because they feel poor when they compare themselves to those who have the most. The fascination with celebrities and the ‘lifestyles of the rich and famous’ undoubtedly exacerbates this situation.

Finally, we are apt to value an individual and their accomplishments by the price they carry in the marketplace. This tendency to assess almost everything we do in terms of its financial worth has diminished the importance of other lifestyle choices and values – such as the wisdom, virtue and self-discipline mentioned previously – that may, in fact, be more congruent with our ability to achieve happiness.

This review of the motivational processes involved in the growth of our material consumption provides us with insight into (i) some of the reasons underlying our unsustainable existence and (ii) the extent that, in addition to threatening our long-term existence, this unbridled consumption is psychologically counterproductive.

<sup>xix</sup> In addition to various social scientists, several modern physicists have come to a similar conclusion about our interactions with reality:

The physicist John Archibald Wheeler has been an eloquent proponent of the participative universe, a place where the act of looking for certain information evokes the information we go looking for - and eliminates our simultaneous opportunity to observe other information. For Wheeler, the whole universe is a participatory process, where we create not only the present with our observations, but the past as well. It is the existence of observers who notice what is going on that imparts reality to the origin of everything (Gribbin, 1984:212).

Thus, we are constantly creating the world, evoking it by participating in its interactions.

<sup>xx</sup> Choices of method and a specific unit of description or measurement are also a choice of what to focus on and treat as significant. Each discipline and, in turn, each theory within that discipline necessarily favour selected information while excluding the rest:

there are no side effects, only effects. The definition of some of the results of the process under study as unimportant is done in terms of the intent of the investigator rather than the reality of the process (Benson in Lowe, 1993:13).

Moreover, once the data from this inevitably biased process is collected, the data by itself does not act as evidence. Rather, it is within the hypotheses that the real interpretation and meaning are found. The statements comprising hypotheses contain content that exceeds that of the data. Marion Lowe writes: “The same data can support different and conflicting hypotheses when analyzed based on different background assumptions” (1993:9).

<sup>xxi</sup> This is not to suggest that science is not valuable, but that its limitations should also be acknowledged. The need for an endeavour like science can be traced back some 2500 years to the Greek philosophers’ objective of having a logical set of rules to live by. These philosophers sought to do away with the confusion, misunderstanding and conflict that were so typical of

human interactions. Their goal was to formalize human reasoning by providing irrefutable rules of human logic and thereby create a set of assumptions or axioms that all reasonable people would accept. In turn, all conflicts or issues could be resolved by the application of such rules and axioms.

The complete satisfaction of this goal is likely impossible as our world is comprised of countless complex systems. These systems are an assortment of a virtually infinite number of variables that interact with each other to form a dynamic whole where cause and effect cannot be linearly connected across time and space. In complex, non-linear systems, the knowledge of conditions at a given point - not that a knowledge of a virtually infinite number of variables is really possible - does not allow us to predict subsequent conditions with certainty. Nevertheless, an accurate view of complex systems may be possible if, instead of taking a linear approach, we aim to discover key principles. As Margaret Wheatley explains: "In many systems, scientists now understand that order and conformity and shape are created not by complex controls, but by the presence of a few guiding formulae or principles. The survival and growth of systems that range in size from large ecosystems down to tiny leaves are made possible by the combination of key patterns or principles that express the system's overall identity..." (1994:11).

Thus, it may be possible to develop some accurate understanding of the world around us, perhaps not on the level of a specific set of comprehensive rules to which the Greek philosophers aspired nor at a level that will enable us to understand the multiple nuances of our complex existence, but rather at the level of guiding principles. And the best way to discover these principles is through science. To start with, the scientific process enables us to somewhat transcend our individual limitations. If the universe is comprised of a nearly infinite number of energy-based interactions, then, compared to this totality, our individual experiences are virtually infinitesimal. Even when our comparison is limited to the domain of human existence, each person's experience is one out of billions. Under these circumstances, our individual knowledge of the world is necessarily limited. The scientific process – involving global research, peer review and the repetition of studies as well as a method to come into contact with the world from the perspectives of others – provides us with an opportunity to expand our knowledge and understanding beyond the confines of our own direct experience.

Furthermore, science, along with mathematics and logic-based philosophy, has come the closest to attaining the ideals of the Greek philosophers. As Paul Davies writes:

(S)cience is an immensely powerful procedure for helping us to understand the complex universe in which we live. History has shown that its successes are legion, and scarcely a week passes without some new progress being made. The attraction of the scientific method goes beyond its enormous power and scope, however. There is also its uncompromising honesty. Every new discovery, every theory is required to pass rigorous tests of approval by the scientific community before it is accepted. Of course, in practice, scientists do not always follow the textbook strategies. Sometimes influential scientists sustain dubious theories long after they have been discredited. Occasionally scientists cheat. But these are aberrations. Generally, science leads us in the direction of reliable knowledge (1992:14).

Davies also identifies: "the greatest scientific miracle of all: *science works*" (1992: 20), that he attributes to our living in a rational, ordered cosmos where we can obtain reliable knowledge through our ability to reason.

<sup>xxii</sup> This may also help to explain the Flynn effect, where IQ scores have been increasing on average 3 points per decade for the past 50 years. We are living in increasingly complex and stimulating times -- or at least there is more media exposure, computer and video game use, and information overload tied in with Internet exposure -- so we are receiving more of the environmental stimulation and demands during childhood that should help to develop the appropriate changes in neural connections that are required for improved mental processing and computational ability.

<sup>xxiii</sup> The concept of ENVI relates to the previously mentioned distinction between intelligence (long-term and aims toward wholeness and higher ends) and cleverness (short-term and tends to break reality into bits and pieces) articulated by David Orr. To deal with long-term considerations and higher ends, ENVI entails an existential consideration of why we are here and relates to the foundational quest for human agency that underlies eastern and western philosophy: "how shall human beings apprehend the world and their place within it so as to lead more responsible lives" (Bai, 2006:1). As Bai explains, this involves autonomous individuals thinking for themselves and making reasoned ethical decisions. In this respect, while ENVI meets multiple criteria to be considered a type of intelligence, it also lends itself to the essential juxtaposition of intelligence with moral inclination:

(T)he task for the new millennium is not merely to hone our various intelligences and use them properly. We must figure out how intelligence and morality can work together to create a world in which a great variety of people will want to live. After all, a society led by "smart" people still might blow up itself or the rest of the world. Intelligence is valuable but, as Ralph Waldo Emerson famously remarked, "Character is more important than intellect." That insight applies at both the individual and the societal levels (Gardner, 1999:4).

This is not to say the ENVI is disconnected from the established disjunction between description and prescription. Indeed, as is the case with the other intelligences, ENVI is in and of itself neither moral nor immoral, and can be applied in a good (e.g., living effectively with the environment in a socially responsible manner) or bad (e.g., improving one's chance for survival by eliminating others) way. Our focus in an educational context will clearly be to encourage both its development and its being put to constructive use as a crucial component of the effective citizenship behaviour required for humanity to achieve sustainability.

<sup>xxiv</sup> In addition to being considered the core aspect of intelligence and/or the eighth multiple intelligence, there are multiple ways that ENVI can be aligned with other theories of intelligence. The different types of intelligences uncovered by psychologists are generally grouped into three clusters: abstract intelligence (the ability to understand and manipulate with verbal and mathematic symbols), concrete intelligence (the ability to understand and manipulate with objects), and social intelligence (the ability to understand and relate to people) (Ruisel, 1992). Although ENVI relates to all three clusters, it overlaps most strongly with social intelligence.

To start with, both social intelligence and ENVI are essential components of good citizenship. On a finite planet with increasing rates of population growth and consumption, it is vital that we have the ability to effectively live together while supporting the integrated, global, ecological relationships that enable our survival. In addition, research into different types of social intelligence, in particular emotional intelligence, provides further evidence that ENVI is indeed a form of intelligence.

Emotional intelligence is “a type of social intelligence that involves the ability to monitor one's own and others' emotions, to discriminate among them, and to use the information to guide one's thinking and actions" (Mayer and Salovey, 1993:433). ENVI has common characteristics with emotional intelligence. Previously, four tasks associated with ENVI were identified that were adapted from Hungerford and Volk's (1990) work into the key variables involved in environmental citizenship behaviour. As shown in the table below, these tasks are consistent with the elements of emotional intelligence put forth by Salovey and Mayer (1990).

<b>Environmental Intelligence (ENVI)</b>	<b>Emotional Intelligence</b>
<i>Environmental Sensitivity</i> – an empathetic perspective toward the environment	<i>Empathy</i> – sensitivity to others' feelings and concerns
<i>Knowledge About Issues</i> – an understanding of the nature of environmental issues and their ecological and human implications	<i>Self-Awareness</i> – knowledge about yourself
<i>Personal Investment In Issues And The Environment</i> – a strong identification with environmental issues because they are extremely important at a personal level and the individual feels they have a proprietary interest in or responsibility towards the environment	<i>Motivating Oneself</i> – personal investment and the ability to channel emotions in the service of a goal
<i>Knowledge Of And Skill In Using Environmental Action Strategies</i> – an understanding of and proficiency in strategies that can be used to help resolve environmental issues	<i>Managing Emotions</i> – knowledge of and skill in handling feelings so that they are appropriate
	<i>Handling Relationships</i> – knowledge of and skill in social competence and abilities

<sup>xxxv</sup> Linguistic intelligence provides the logical starting point for this analysis given that there are some good reasons to argue that it provides a framework for the other intelligences. While hopefully avoiding the conviction that understanding is always linguistic and instead recognizing the richness of non-linguistic meaning and experience, it is still the case that our worldviews and experiences are framed by language:

Language is the medium extraordinaire of concepts: it is a carrier of concepts. As such, in philosophers' deft hands, language manipulates concepts, thereby enacting ontological shifts. In this way, language is an ontological "lever" for shifting worlds. This sort of appreciation of the supreme importance of language to our apperception of reality has been the hallmark of philosophy. Recall the oft-quoted line from Wittgenstein: "*The limits of my language mean the limits of my world.* The inseparable, intimate connection between word and world has been the subject of sustained contemplation from Plato to Rorty (Bai, 2006:11).

Perhaps Wittgenstein ever so slightly overstates the case. Feral children know more than they have words for; the limits of their language do not represent the limits of their minds. Still, as discussed in the Introduction, the development of syntax provided an effective mental system to structure and express nested concepts and the relationships between items, and all of the higher cognitive functions such as multistage planning, logic, and complex music are examples of structured thought (Calvin, 2004). Calvin argues that syntax is a capstone to a group of other abilities and that some of the areas in the brain related to these abilities overlap with the areas of the brain related to language/syntax. Therefore, the creative explosion that led to our modern human intelligence and versatility might very well have resulted from increasingly complex language being picked up by mentally flexible children.

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In addition to potentially being the genesis of our modern multiple intelligences, language plays a central role in their ongoing development in individuals. To intelligently participate in life requires the ability to appreciate the underlying order of things, and to act in a manner that takes into account this order and reasonably predicts upcoming events/situations/scenarios. So, even highly physical activities involving bodily intelligence will be advanced by understanding the game/activity on multiple levels. A dancer who has an emotional connection with the music, but who also understands what other dancers have done before as well as appreciating the deeper meaning in the communication will presumably be a better dancer. Likewise, a basketball, soccer, hockey, etc. player who understands the theory, probability, physics, and so on behind certain plays will presumably be a better player. The most effective way to learn and understand these matters is through that “medium extraordinaire of concepts” that we call (not to put too fine of a point on it) language.

<sup>xxvi</sup> The understanding that beliefs are important is anything but new. In fact, the relevance of beliefs to behaviour and the need for beliefs that recognize the global impact of our actions were identified by Buddha some 2500 years ago:

The thought manifests as the word  
The word manifests as the deed  
The deed develops into habit  
And habit hardens into character  
So watch the thought and its ways with care  
And let it spring from love  
Born out of concern for all beings

<sup>xxvii</sup> The tendency to embrace evidence that supports our beliefs about the world and reject evidence that is inconsistent with our beliefs about the world may appear irrational, but there is more to this story. According to the “knowledge projection argument,” if our beliefs provide us with a fairly accurate view of reality then “projecting our beliefs onto new data will lead to faster accumulation of knowledge (Stanovich in Sternberg, 2002:147). Moreover, the beliefs that make up our guiding framework or worldview tend to be interconnected so there could be significant implications to rejecting one of these beliefs; if revising a belief could call into question the worldview that we use to give some sense of certainty and structure to our lives then it is understandable that we would subject evidence that contradicts our beliefs to greater scrutiny (Evans, Over & Manktelow, 1993). The danger though is when contradictory evidence is not just subject to the closest possible scrutiny but is instead outright rejected regardless of its veracity. As an example, the aggressive denunciation of contradictory evidence regardless of its merits presently seems to be the central dynamic in US politics and among the talk show pundits that litter the airwaves. Extensive peer-reviewed research and documented facts are frequently dismissed and ridiculed while demonstrably absurd opinions, conspiracy theories, misrepresentations, and talking points are preached to a willing group of followers. When an individual, whether as a preacher or a follower, becomes engrossed by these inaccurate beliefs and misrepresentations then they can become trapped in a fantasy land of falsehoods:

The knowledge projection tendency, efficacious in the aggregate, may have the effect of isolating certain individuals on “islands of false beliefs” from which – because of the knowledge projection tendency – they are unable to escape. In short, there may be a type of knowledge isolation effect when projection is used in particularly ill-suited circumstances. Thus, knowledge projection, which in the aggregate might lead to more rapid induction of new true beliefs, may be a trap in cases where people, in effect, keep reaching into a bag of beliefs which are largely false, using these beliefs to structure their evaluation of evidence, and hence more quickly adding incorrect beliefs to the bag for further projection (Stanovich in Sternberg, 2002:148-149).

This ever present trap may be the greatest challenge facing efforts to bring about worthwhile individual and societal advancement. Issues such as those involving protecting the air and water we need to survive that have no business being politicized, and were not politicized for most of our existence, suddenly become hotbeds of misinformation, passionately held opinions, and foolish political games leading to pettiness, animosity, inaction, and significant threats to health and survival. When substantial numbers of people become marooned on “islands of false beliefs” to the extent that beliefs and ideology take precedence over integrity and survival, the risks associated with our belief systems become apparent. This may not be so much a situation of ‘cutting off one’s nose to spite one’s face’ as it is of cutting off one’s face to spite one’s nose.

<sup>xxviii</sup> We need to quickly address this notion of ‘accurate beliefs.’ To begin, there is a distinction that we need to draw between the imprecise beliefs about reality that countless philosophers from Plato onwards have cautioned us about and the accurate beliefs we are now discussing. So, what is an accurate belief and how will we know one when we see it? Clearly, believing the belief is accurate will not suffice since the tendency of people is to assume that their beliefs are accurate whether they are or not. Rather, it seems the best option available to us is to turn to research and logic to assess the accuracy of beliefs. For that matter, because we are primarily interested here in those beliefs that support the development of intelligence we might be better to simply refer to these as functional beliefs, with the emphasis less on accuracy which is harder to prove and more on efficacy as supported by a systematic and, ideally, testable mode of inquiry.

<sup>xxix</sup> The connection between learning goals and performance goals is a bit more involved than a simple binary opposite. There can be an overlap between the learning goal and performance goal orientations. For instance, an individual’s pursuit of personal progress and task mastery (learning goal orientation) in a university program is not mutually exclusive of their recognizing that high performance in such a degree could lead to their receiving praise and recognition for their accomplishments (performance goal orientation). The issue then becomes which orientation takes precedence when they are both present but are in conflict. Learning is often challenging and requires effort and persevering, and the two goals lead to very different results. Learning goals lead to embracing this challenge, applying the required effort and persevering. Performance goals lead away from this effort and risk in an effort to look smart without risk of failure. Approximately half the population appears to believe the learning goal orientation is more important and compelling with the remainder endorsing the performance goal orientation (Dweck, 2000).

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