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The Role of Human Learning in the Information Age:

Challenges and Opportunities for Latin America and the Rest of Us

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The Role of Humanity in the Information Age: an Ibero-American Perspective

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Beethoven latinoamericano

I was listening this morning to Beethoven's Opus 18 Number 6, the last of a series of six early string quartets written between 1798 and 1800, which the composer ends with the movement: "*La Malinconia: Adagio – Allegretto quasi Allegro*." The "*Malinconia*" (melancholy) is a slow and moving introduction to a sequence of events in the entire last movement of the quartet, which move back and forth between sadness, grief and tragedy on the one hand, and, on the other, attempts to overcome the darker aspects of life, though never quite successfully, with expressions, at times helpless attempts, of lightheartedness, joy and euphoria in the "*Allegretto quasi Allegro*," which keeps getting interrupted by relapses into the theme of melancholy. While listening to the searching undulations of the "*Malinconia*," which Beethoven explicitly asks to be executed "*colla piu gran delicatezza*" (with the utmost subtleness), descending into the unknown of who we are, occasionally coming up with flashes of insight, but ultimately leaving the listener with feelings of 'So what! Does it really matter?' yet engaging him emotionally, one cannot help being reminded of César Vallejo's (1968/1939) poetic opening lines,

> Considerando en frío, imparcialmente,
> que el hombre es triste, tose y, sin embargo,
> se complace en su pecho colorado;

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que el único que hace es componerse
de días;
que es lóbrego mamífero y se peina . . .

after which the poet goes on to mention, one after the other, all those seemingly unimportant, even ridiculous things we do, in order to finally conclude:

Le hago una seña
viene,
y le doy un abrazo, emocionado.
¡Qué más da! Emocionado . . . Emocionado . . .

Beethoven wrote his Opus 18 Number 6 at a time when he was becoming increasingly aware of the devastating circumstance that he was losing his hearing ability. In 1801 he first wrote about this condition, which had plagued him then for several years, to a friend. A year later, in the Heiligenstadt Testament, he revealed it to his brothers Karl and Johann, but otherwise he tried to hide it. The perception of, real or imagined, impending loss is probably for all human beings the painful route to consciousness. When we are born and are still unaware that there is anything that can be lost, consciousness is absent. As soon as we discover the reality of loss, the fact that things may go away, our consciousness grows.

The thought resonates with Susan Greenfield's (2000) ideas about the growth of consciousness, which considers emotions to be the building blocks of consciousness. The mind plays an important role in the process. Greenfield defines mind as "the seething morass of cell circuitry that has been configured by personal experiences and is constantly being updated as we live out each moment" (p. 13). In other words, it is the "personalization of the physical brain" (p. 14) through our experiences. It expresses itself in an overall disposition, an overall way of being in the world (Visser, 2002a and 2002b), which, as experience accumulates, evolves accordingly.

The more there is to lose, that is, the more we become more than ourselves, experiencing the beauty of who we are and of the world in which we partake, the more painfully we realize how fragile it all is.

The awesome event of human learning

The above introduction to this chapter on human learning for a book about the role of humanity in the information age from an Ibero-American perspective is not a fancy way to capture the reader's attention. It is a deliberate reference to an aspect of human development that has, in my opinion, remained undervalued in the mainstream thinking about what it means to be learning, namely the development of the mind. Through my explorations in the domain of human learning, both as a practitioner and as a researcher, I have become more and more convinced that the emphasis on competency development, so pervasive in almost all instructional practice, while valid and relevant in its own limited right, is not – and should not be – the major concern when we think about creating and developing the conditions of human learning.

Mind that I am talking about *human* learning. Learning in humans is different from learning in other animals and also from so-called machine learning, the learning behavior that computers are able to display. As is well known, the human brain is distinct from the brain of other animals, including the primates (see e.g. Greenfield, 1997, and the Editors of Scientific American, 1999). Computers, however sophisticated they may be in comparison with what we may have thought possible, say, 20 years ago, are unable to do more than what we program them to do. Admittedly, they may be designed and programmed to be better than humans at rapidly and accurately executing rule-based operations, allowing them to respond swiftly and adequately in critical situations where humans are at a loss, but they cannot get an idea, be daydreaming, develop some profound insight, or come to the realization that, all of a sudden, they view the world in an entirely different light.

"HAL could never exist," concludes Schank (1997, p. 189) about the imaginary computer that was responsible, in the movie *2001: A Space Odyssey*, for keeping an eye on the various details of the space mission until it eventually started developing a mind of its own. Why could it never exist? As Schank explains, we know from the detail provided

in the movie that HAL became operational on a particular date in 1992 at the HAL lab in Urbana, Illinois, and that it owed its intelligence to having been instructed by a Mr. Langley. Among other things, Mr. Langley had taught HAL to sing a song. However impressive this may have seemed at the time the movie was made, acquiring the ability to perform such tricks has nothing to do with intelligent behavior. Intelligent behavior is contingent upon being able to interpret new experience against the backdrop and in the context of accumulated *lived* earlier experience. The emphasis is on the word "lived." It means that we are talking here about experience that the learning entity has undergone *and reflected on*. In other words, this is experience that the learning entity, machine or human, must have been asking itself questions about and that it will have experimented with.

Experimenting with something, varying the parameters of something that happens, looking for replication as well as for how what happens changes if some condition is altered, is, in fact, a way of asking questions about that same thing. This is exactly what one can see human beings do almost from the time they are born, and perhaps even before that, when they are still in the womb. Gopnik, Meltzoff, and Kuhl (1999) argue and provide evidence to the effect that: "Babies and young children think, observe, and reason. They consider evidence, draw conclusions, do experiments, solve problems, and search for the truth" (p. 13). They behave intuitively in ways similar to how scientists operate consciously. In fact, thanks to the vast timespan through which life evolved on earth, newborn humans come endowed with genetically preprogrammed abilities such as the aptitude to acquire the tongue of the environment in which they grow up (see for instance Pinker, 1994) and the capacity to learn and to improve their learning while they learn. In this respect they are essentially different from machines, which, quite appropriately therefore, Greenfield (2000) defines as "systems that are not the product of a fertilized egg" (p. 31), in other words, systems that have no evolutionary history. Moreover, machines, according to this definition, don't have parents and they don't have siblings either. This deprives them of one of the most essential functions that characterize the learning process, namely intentional interaction. In the case of humans this function is particularly important and relevant as the other humans with which learners interact are

themselves also learners who are endowed not only with the ability to learn but also with the capacity to reflect on their learning. This same capacity also allows them to reflect, cognitively and emotionally, on the learning processes that take place in the human beings with which they interact. Everyone can see that the disposition to engage in such reflection is particularly strongly present in the dialogic relationship between mother and child. Or, to quote Gopnik, Meltzoff and Kuhl (1999) again: "Babies have the universe's best system of tech support: mothers" (p. 7). These researchers therefore suggest that it makes sense to consider this tech support system not as a separate autonomous entity but rather as part and parcel of what in computational terms could be seen as a real network, one "held together by language and love, instead of by optic fiber" (p. 7). Naturally, the way one starts off in life will have implications for how one continues. While the infant-mother network may over time reconfigure and acquire different dimensions, it is the start of a life of networking with other human beings and non-human learning entities as well as with other networks, such as when an individual starts interacting with another family, rather than a single member of that family, or with, for instance, a professional or spiritual community. So essential is this networking business that I believe it should be a key concept in the definition of human learning. I come back to this issue later in this chapter.

"Babies and children have powerful learning mechanisms that allow them to spontaneously revise, reshape, and restructure their knowledge," say Gopnik, Meltzoff, and Kuhl (1999, p. 7), something that machines are disgracefully poor, if not totally incompetent, at doing. It is important to be aware of the abilities we are born with and that we nurture in early life as there is such a tremendously essential continuity in the process of our becoming. The idea of the child as a human in the making, a *tabula rasa* (blank slate) to be inscribed – or a computer to be trained by some Mr. Langley while being prepared to become operational – is more and more at odds with our increasing knowledge about human learning.

Bransford, Brown and Cocking (1999) summarize[2] what we currently know about the learning capacities of young children in four key domains. They highlight in the first place what any observant parent can see: young children are predisposed to learn and have clear biases and desires as to what, at a particular moment, they want to learn and what will fail to get them engaged, simply because it doesn't correspond with one of their privileged domains of interest such as language, number, or causality. In the second place they mention that young children, contrary to what was previously believed, are capable of reflecting on their own learning and thus to engage in learning intentionally as well as strategically. In other words, young children have the capacity of metacognition, which they will further develop throughout their lives, as long as no one stops them from doing so. This capacity allows them to stimulate their innate motivation as well as their creativity at continuously improving their learning. Young children also have – so we are assured by Bransford, Brown and Cocking's summary of a third key area of knowledge about early learning – ideas about themselves as learners, about what it means to be learning and what it is to understand something. They vary, though, in the way they see themselves as learners, emotionally and cognitively, as well as in their preferences for what kind or kinds of intelligence they wish to use and develop in the process. Gardner's (1983 & 1991) pleas to take this reality into account in the practice of education are well known. In the fourth place, the already referred summary draws our attention to the importance of community in early learning. As I already mentioned, one of the most interesting features of human learning is that it takes place and develops in interaction with others, who all have the capacity of both intuitive and conscious reflection on their own and other people's learning behavior. While in a healthy family environment the reality of such interaction is normally fully recognized, it is utterly surprising how long it has taken for formal education to discover the validity and value of the concept *learning community* and how hard it often still is to give real meaning to this concept within existing educational practice. As the idea of community is not restricted to seeing each other face to face, but equally, and sometimes more forcefully extends to mediated ways of human interaction, in which for instance radio, TV, and particularly the Internet play a

[2] Bransford, Brown and Cocking's (1999) summary is based on the work of numerous researchers referenced in the cited text, which readers are advised to consult for in-depth reading on specific elements of the summary.

more and more important role, the lack of serious societal concern with and care for the learning environments that such media engender is equally surprising.

Life in symbolic space

It is our language ability that clearly distinguishes us from other animals [Pinker (1994) and Deacon (1997) provide different perspectives to explain the distinction] as well as from machines that talk, even if the latter can utter intelligible phrases expressed through vocabulary and grammer that we are familiar with. The crux is that the evolution of language in humans gave rise to the emergence of the propensity to interact with the environment in *mindful* ways, namely through the creation and use of symbols. By using symbols humans can transcend themselves, thus being able to query their own behavior, leading them to progressively understand themselves and the universe to which they belong. Using symbols, they can recreate worlds in their mind. Listen, for instance, to these words:

> Oh, Wilkamayu de sonoros hilos
> cuando rompes tus truenos lineales
> en blanca espuma, como herida nieve,
> cuando tu vendaval acantilado
> canta y castiga despertando al cielo,
> qué idioma traes a la oreja apenas
> desarraigada de tu espuma andina?

Expressing himself this way, Pablo Neruda (1955) not only describes the larger context of which he sees himself and his fellow human beings to be part, he elevates it to a symbolic level that allows him to query it and, in doing so, to ask questions about himself.

Using symbols, too, humans can create sonorous monuments, such as Franz Liszt's *Années de Pèlerinage*, forging progressively into an integrated whole the diverse experiences of one person's life over almost half a century, beginning with the specific circumstance of a turbulent love affair and a passage through the beauty of nature, followed by the contemplation of the grandeur of human creation, and eventually leading

to a profound religious experience in which the composer explores his belonging to things bigger than himself, no longer tied to the beauty of physical landscapes or constructions of the human spirit, but transcending the bounds of his own existence. Thus, those 'years of pilgrimage' mentioned in the title of Liszt's work,

> ne se limitent donc en rien aux quelques mois d'une jeunesse tapageuse, mais s'étendent plutôt aux soixante-quinze années d'existence de Liszt, qui n'aura eu d'autre vie que celle du pèlerin, c'est-à-dire de l'éternel étranger (selon l'étymologie du latin *pelegrinus*), toujours en chemin, en poursuite, sur les voies de la vie comme sur celles de l'esprit, sans connaître de la quête que la nécessité. (Galliari, 2002, no page number)[3].

The above two references to Neruda and Liszt are examples of how we place all that we are within a comprehensive meta-context from which we can observe ourselves and our world. They are also instances – but instances that clearly reveal dynamic flow rather than static existence – of how we continually construct our life's project at a symbolic level. Schank (1997) asserts in this connection that "people are storehouses of favorite stories waiting to be told, and that inputs from others serve principally as reminders to dislodge those stories and trigger their presentation" (p. 185). I should add that they are storehouses of which the content is constantly being reassessed, revalidated, reshuffled, updated and perfected as we lead our lives. Language is the crucial faculty through which we are able to do this, but it is language in different guises as the above two examples demonstrate in which words and music are the respective ingredients.

In fact, the symbol systems we use are multiple. Burnett (in press), for instance, suggests that "just as the human mind is wired for language, it is also wired for images. In fact, language, images and sounds are inherent parts of human thought and the human body, as well as generative sites for the thinking, feeling process." Cassirer (1953), in a work originally published in German in 1923, gives an extensive and compelling account

[3] Translation: "are therefore in no way limited to the few months of a tumultuous youth, but they rather extend to the seventy five years of the existence of Liszt, who would have no other life than that of the pilgrim, that is to say of the eternal stranger (according to the etymology of the latin *pelegrinus*), always on the road, in pursuit, on the paths of life as well as those of the spirit, not knowing about his quest more than its necessity."

of man's use of symbolic forms in language, myth, religion, art and science. In another work, some 20 years later, first published in 1944, he says: "Rather than investigate the origin and development of perceptual space, we must analyze *symbolic space*" (Cassirer, 1970, p. 47). In making this assertion, he points out how it is this issue that separates the human and the animal world. While we are very much inferior to animals when it comes to living in what Cassirer calls "organic space" (p. 48) (the *space of action*), having to acquire all manner of skills with which other animals are simply born, this deficit has been compensated for in humans by the capacity to arrive, "by a very complex and difficult process of thought . . . at the idea of *abstract space*" (p. 48). It is this idea, says Cassirer, "which clears the way for man not only to a new field of knowledge but to an entirely new direction of his cultural life" (p. 48). It is this idea also that allows humans to solve problems using the mind.

The mind

The root of the word *mind* is the Anglo-Saxon "gemynd," which means memory. However, it is important to make a clear distinction between the use of the term memory in the language of computer technology and its use as it relates to the consciousness of human beings. In the former sense, memory stands for the capacity to store information in ways in which it can be retrieved as is. The human mind, though, works differently as it attributes meaning to what enters into memory. Cassirer (1970) thus asserts: "Memory implies a process of recognition and identification, an ideational process of a very complex sort" (p. 55) and furthermore specifies: "Symbolic memory is the process by which man not only repeats his past experience but also reconstructs this experience. Imagination becomes a necessary element of true recollection (p. 57).

Bronowski (1978) places the process of imagination, mentioned above with reference to Cassirer (1970), in the context of the evolution of human beings, particularly as it relates to the cardinal place occupied by the sense of sight in how we evolved as organisms able to acquire knowledge about the world around us. Our ability to see, that is to discriminate contours, colors, and contrasts with great finesse, is indeed highly

developed. This extraordinary ability, however, is not achieved thanks to the perfection of our eyes as compared to those of other animals. Quite to the contrary, our eyes are constructed such that they can give only rather course information about the visible world around us.The fact that, nevertheless, we see straight lines, sharp curves, clear contrasts and well distinguished colors is due to how the eye is pre-wired to search for exactly those things. That feature, though, explains Bronowski, comes with a price. We start seeing the world in the perspective of the things we are always looking for.

Bronowski (1978) concludes his excursion into how we see as follows: "We stand at a peak in visual discrimination; we are utterly dependent on it. And I want to end by saying that we are dependent on it not only in looking outward but in looking inward" (p. 18). What does that mean? Well, according again to Bronowski, we have evolved to think of things as we see them, and we see those things as we imagine them, as we have grown to enhance the course signals of the outer world we receive through our imperfect eyes and turn them into images of perfect contours, contrasts and colors. This same unique ability, then, that humans have to imagine as an enhancement of their imperfect sight has dispositioned them to develop it further so as to foresee things, to visualize alternatives, to plan, to reconstruct things in the mind, seeking to make them perfect, aspiring to their beauty.

We see this power of imagination and the search for beauty clearly at work not only in the arts, but perhaps even more so in the sciences. Listen to what the mathematician Henri Poincaré (cited in Chandrasekhar, 1987), who lived from 1854 to 1912, writes about it in one of his essays:

> The Scientist does not study nature because it is useful to do so. He studies it because he takes pleasure in it; and he takes pleasure in it because it is beautiful. If nature were not beautiful, it would not be worth knowing and life would not be worth living. . . . I mean the intimate beauty which comes from the harmonious order of its parts and which a pure intelligence can grasp. (p. 59)

Cited from the same source and with an even clearer reference to the idea of images held in mind, whose beauty we try to satisfy, here are the words of the physicist Wolfgang Pauli, who lived half a century after Poincaré. Pauli reflects on a statement by Johannes

Kepler in his *Harmonice Mundi*, a work completed by Kepler in 1618, in which Kepler suggests that "all pure Ideas, or archetypical patterns of harmony, . . . are inherently present in those who are capable of apprehending them" (p. 66, 67). So here is what Pauli has to say:

> The bridge, leading from the initially unordered data of experience to the Ideas, consists in certain primeval images pre-existing in the soul—the archetypes of Kepler. These primeval images should not be located in consciousness or related to specific rationally formulizable ideas. It is a question, rather, of forms belonging to the unconscious region of the human soul, images of powerful emotional content, which are not thought, but beheld, as it were, pictorially. The delight one feels, on becoming aware of a new piece of knowledge, arises from the way such pre-existing images fall into congruence with the behavior of the external objects. (p. 67)

This is a beautiful example of how our life in symbolic space allows us to be of one mind with those who lived before us, those who share our existence in the here and now, and those who will follow us. Such sharing in the mindful experience of other human beings is even more forcefully expressed, again cited from Chandrasekhar's quotation, in Boltzman's reacting to one of Maxwell's papers on the dynamic theory of gases:

> Even as a musician can recognize his Mozart, Beethoven, or Schubert after hearing the first few bars, so can a mathematician recognize his Cauchy, Gauss, Jacobi, Helmholtz, or Kirchhoff after the first few pages. The French writers reveal themselves by their extreme formal elegance, while the English, especially Maxwell, by their dramatic sense. Who, for example, is not familiar with Maxwell's memoirs on his dynamical theory of gases? . . .The variations of the velocities are, at first, developed majestically; then from one side enter the equations of state; and from the other side the equations of motion in a central field. Ever higher soars the chaos of formulae. Suddenly, we hear, as from kettle drums, the four beats "put n = 5." The evil spirit *V* (the relative velocity of the two molecules) vanishes; and, even as in music, a hitherto dominating figure in the bass is suddenly silenced, that which had seemed unsuperable has been overcome as if by a stroke of magic. . . . This is not the time to ask why this or that substitution. If you are not swept along with the development, lay aside the paper. Maxwell does not write programme music with explanatory notes. . . . One

> result after another follows in quick succession till at last, as the unexpected climax, we arrive at the conditions for thermal equilibrium together with the expressions for the transport coefficients. The curtain then falls!

In this section I have dwelled quite lengthily on, and quoted some ample excerpts from, the rich heritage of what, in my view, really matters in science: the quest for unparalleled beauty. I have done so because of my conviction that there is an urgent need to reinvent the scientific mind in it's present day context. I do not mean with the scientific mind the tendency of blindly pursuing knowledge outside the framework of emotions that human beings can share and collaboratively reflect on, such as their sense of beauty. Quite to the contrary, I mean to say that the scientific mind is – and should be – embedded in such emotions. Only, much of today's technoscientific[4] culture has broken away from a tradition that was clearly present in centuries past and that has, fortunately, survived, albeit as a minority perspective, in the thinking of some of its greatest representatives until today. Kepler, referred to above, was, according to Koestler (1959), the last representative of this great tradition in conceiving his *Harmony of the World* and the work of which it was the continuation, the *Cosmic Mystery*.

> What Kepler attempted here is, simply, to bare the ultimate secret of the universe in an all-embracing synthesis of geometry, music, astrology, astronomy and epistemology. It was the first attempt of this kind since Plato, and it is the last to our day. After Kepler, fragmentation of experience sets in again, science is divorced from religion, religion from art, substance from form, matter from mind. (p. 389)

Indeed, for several centuries since Kepler, science – the art of getting to know – has had a problematic relationship with the mind. Proper scientific inquiry assumed processes that excluded, as much as possible, intentionality. For that reason, the knower had to be seen as separate from what was to be known. Descartes, who lived from 1596 to 1650, i.e. not long after Kepler, has had a great influence on the establishment of such a dualistic world view. In his terminology, *res cogitans*, the matters of the mind, belong to a world that is distinct from the outside world, which is inhabited by the *res extensa*.

[4] Latour (1999) defines technoscience as "a fusion of science, organization, and industry" (p. 203).

This way of looking at oneself as a knowing subject that is separate from the world it wants to know has permeated the scientific endeavor for more than three centuries since Descartes formulated the idea, challenged by but a few. In the opening line to an essay that otherwise deals with the deep motivations underlying the art of painting, Merleau-Ponty (1964) thus refers to science as a human activity that, in contrast to the arts, manipulates things but refuses to inhabit them.

In spite of the unprecedented scientific progress since Descartes, particularly in the domain of the physical sciences, two relatively recent developments motivate a fundamental reconsideration of the Cartesian stance, bringing the mind back into nature. One of those developments has to do with changing views emanating from physical science itself (at least among a number of its practitioners) as well as regarding how we now view the role of the physical sciences in (re)-connecting human beings to the experience of reality. I make special reference in this connection to the work of Nicolescu (2000, 2002a), and that of Heisenberg, Pauli and Bohr (cited in Nicolescu, 2000) earlier in the 20th century. In fact, Bohr, in an essay dated 1955, referred to the seemingly surprising phenomenon that the study of the atom "not only has deepened our insight into a new domain of experience, but has thrown new light on general problems of knowledge" (Bohr, 1987, p. 83). Obviously, this was only surprising against the backdrop of three centuries of cartesianism. Considering such a historical reality it was no small "tour the force" on the part of Bohr and thinkers like him to realize that the science of the atom had "in all stages of its development concerned profound problems of knowledge" (p. 84). To come to that realization the scientists of Bohr's days often had to go far back into the history of science in order to uncover the hidden assumptions of what the scientific enterprise had entailed all along.

The second development I was referring to above started during the later part of the 20th century when technologies and methods emerged allowing our very humanity, or what we thought it was, to become the object of scientific inquiry and thus also an object of potential human intervention. This includes the new insights we are getting into the workings of the brain as well as into our genetic make-up. Subject and object are, so to

say, looking each other in the eye; they can no longer be kept apart. Edelman (1992) thus concludes:

> There must be ways to put the mind back into nature that are concordant with how it got there in the first place. These ways must heed what we have learned from the theory of evolution. In the course of evolution, bodies came to have minds. But it is not enough to say that the mind is embodied; one must say how. To do that we have to take a look at the brain and the nervous system and at the structural and functional problems they present. (p. 15)

Consciousness

This leads the discussion back to the starting point of this chapter: consciousness. We have been witnessing a dramatic increase in our knowledge about the brain over the past decades. Yet brain researchers generally recognize that we are still largely ignorant regarding the most basic questions that relate to who we think we are and what it means to be conscious. If one assumes, though, that somehow the brain has to do with our ability to ask such questions, then "any 'theory of the brain' must include the ability to make the theory itself" (Greenfield, et al., 1999, p. 43).

We are no doubt looking at an area of the development of knowledge that looks confusing because of seemingly contradictory assumptions underlying the interpretation of the scientific process itself and of the knowledge it generates, touching upon such important notions as the free will. Or, as Greenfield et al. point out:

> "[W]e cannot doubt the importance of consciousness and choice in our lives. At the same time, few would deny that every thought in our brains corresponds to a physical 'brain state.' It is not easy to reconcile these two beliefs; but if we cannot reconcile them, it must mean that there is a problem in our understanding of ourselves or the world, or of both." (p. 43)

Views differ on whether consciousness is a feature exclusive to humans or whether it is shared throughout the animal kingdom and perhaps beyond. Even while looking at a single human being, it also remains a question where consciousness starts. Is it already

present in the embryo? If so, was it there at conception? It seems prudent here to emphasize the need to ask – and continually refine – such questions rather than to be concerned with the fact that we cannot (yet) answer them. It also seems reasonable to view consciousness, as Greenfield (2000) does, "as a continuum: not as a sudden blinding light but rather as a dimmer switch" (p. 168). In other words, there are degrees of consciousness. It's not simply on or off. Whatever the position one wishes to assume in this debate, most people would have no great problem recognizing that consciousness takes on a particularly poignant role in human life and that human learning thrives on it. One must be conscious to engage in the kind of learning that humans do and the more conscious the better. If indeed, as Greenfield's model suggests, emotions are the building blocks of consciousness, then it is utterly wrong to design processes for the facilitation of learning, such as those that take place in schools, that either ignore or insufficiently attend to the affective dimension of human behavior.

Learning as disposition to dialogue for constructive interaction with change

Learning is one of those concepts about which most people tacitly assume that we all understand what it means. Rarely do people define it explicitly and, when asked to explain what it is, they often find it difficult to do so. Among communities and societies where schooling is a significant event in people's lives, the perceptions about learning are largely determined by key features of the schooling process such as obtaining grades, diplomas, certificates and the like; processing information presented in authoritative texts to the extent of being able to respond adequately to evaluation exercises regarding attained previously defined learning outcomes, those of a cognitive nature usually being valued more highly and seen as more essential than outcomes in the psychomotor and affective domains; being taught by someone qualified to do so; and serving time in structures that look like schools. Implicit or explicit definitions of learning based on the above notions quite obviously contain the hidden message that learning is reserved for those whose conditions allow them to become and remain literate and numerate and to those societies whose economies can afford the required schooling infrastructure. This is

grossly unfair considering the inequitable distribution of wealth in the world and the fact that there are 830 million illiterate people in the world.

A consequence of the above bias towards school-based learning is that those who are professionally involved in human learning, whether through research, via developmental or design activities, by way of crafting policies, or through the planning and execution of particular interventions, do so usually from the perspective that instruction is the major mechanism to make learning happen and to make it happen effectively. While there is much to say in favor of having adequate schooling infrastructure in a country – provided, of course, that conditions are in place to ensure that such infrastructure will be used adequately for quality educational purposes that benefit all citizens in an equitable manner – the above focus also leads to serious under-attention to exploring, and socially investing in, other modalities of learning and in developing other environments of learning. I contend that this is a serious problem and a sad failure to respond to opportunities and to draw on human imagination and creativity in addressing existing problems and using available resources.

Based on the above observation, I conclude that there is an urgent need to start looking at human learning with different eyes, particularly to elevate the concept above the restricted view at which it is usually contemplated. Learning, as one readily realizes, has to do with adaptive behavior. At least the following four levels of human adaptive behavior can be distinguished:

Level 1: Interaction with threats and opportunities in the environment through genetically transmitted preprogrammed responses, e.g. fight and flight responses.

Level 2: Acquisition of essential environment-specific abilities, such as mastery of the mother tongue, driven by an inherited predisposition to do so.

Level 3: Deliberate acquisition of specific skills, knowledge, habits and propensities, motivated by individual choices or societal expectations, usually by exposing oneself to a purposely designed instructional – or self-instructional – process.

Level 4: The development and maintenance of a lifelong disposition to dialogue with one's environment for the purpose of constructively interacting with change in that environment.

The above four levels of learning-related adaptive behavior in human beings represent a progression of increasingly higher levels of consciousness about one's role in life and in the world. Hereafter I elaborate on each of them.

At the most basic level we find that an organism is able to react to changes and opportunities in its environment through preprogrammed responses that are genetically transmitted from generation to generation and that are reflective of the evolutionary history of that organism. Fight and flight responses pertain to this domain. So do the behaviors related to feeding and sexual reproduction. While such behaviors may be perfected over time through some form of learning, the level of perfection with which they appear in the organism at the stage of development at which the organism has reached the level of maturity appropriate for the display of the behavior, is such that these behaviors are basically adequate to start with. In the case of humans, more serious learning is, however, involved in developing attitudes and values, as well as related coginitive and motor skills and the ability to moderate emotion, that allow them to embed such atavistic responses in socially accepted patterns of human interaction and to display the behaviors in ways that are socially appreciated. The latter kind of learning typically takes place at both the individual level and at the level of communities and socio-cultural contexts to which people pertain. For instance, as far as human fight and flight responses are concerned, entire nations and political groupings of nations and cultural groupings of peoples are involved in this learning process. One sees this reflected in, for instance, the work of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the preamble of whose constitution asserts: "Since wars begin in the minds of men, it is in the minds of men that the defenses of peace must be constructed." Clearly, the mind referred to here is not only the mind of individuals but particularly also the mindset expressed in national and international power structures and cultural dispositions. Thus, a concept such as "a culture of peace" has emerged in recent times. A look at the relevant Web pages of UNESCO (no date) and the Fundación Cultura de Paz

(no date) reveals how such concepts are being positioned in relation to human behavior at a planetary level.

A second level of adaptive behavior in human beings is equally related to what is genetically transmitted from one generation to the next. However, in this case it is not the expression of particular patterns of behavior that is being genetically transmitted but rather the predisposition to acquire the behavior. Pinker (1994), for instance, argues that such a predisposition, which he calls the language instinct, exists in human beings for the development of their linguistic abilities; Burnett (in press) makes similar assumptions regarding the human ability to process images. Having, at birth, the predisposition to acquire specific behavior rather than the behavior itself has the obvious advantage of enhanced adaptability to conditions prevalent in the environment in which one is born. Thus we humans acquire the tongue spoken by our mothers rather than some sort of generic human language. The – possibly also instinctive – predisposition of mothers to elicit the acquisition of the mother tongue in their infants through a form of communication that starts at the level of so-called motherese and then gradually and quickly develops towards mature use of the native language through interaction with an increasing number of other human beings in the infant's environment is crucial to how this works. The mechanism embeds every human being in his or her own linguistic environment. Given what I referred to earlier regarding the link between language and the human ability to operate in symbolic space, the diversity of languages still present on the planet earth should be considered acutely important for the development of the mind at the level of humanity as a whole. There is a simple reason for this. Such diversity, namely, allows for interaction among different symbol spaces. Just as in the biosphere diversity is the *conditio sine qua non* for continued growth and the emergence of new forms of life, so is the diversity of thinking patterns and symbol systems as expressed in linguistic plurality an essential condition for the generation of newness in how we, as humans, experience the world around us and interact with it. The importance of the preservation and continued development of linguistic diversity, including stemming the current trend of rapid disappearance of languages, can therefore not be overstated.

A third distinct level of adaptive behavior, and thus of learning, involves the deliberate acquisition of specific skills, knowledge, habits, and propensities for purposes defined by the personal and social choices people make regarding what they see as their role in life. Gagné (1985) has made a major contribution to our thinking about this level of learning – and about the conditions through which it can best be facilitated – by categorizing learning outcomes at this particular level into five different domains, namely those of motor skills; verbal information; intellectual skills; cognitive strategies; and attitudes. Gagné (2000) asserts that these domains are "orthogonal to content" (p. 91), i.e. they do not coincide with the unhelpful (from the point of view of the learning process) proclivity to divide learning up according to content areas such as history, language, arithmetic, or masonry. Instead, they have been identified using as a criterion that, from the perspective of a researcher, "*within* . . . [them] *generalizations of findings can be made*" (p. 91). In other words, if within a particular domain certain principles can be discovered regarding how people learn and how their learning can best be facilitated, those principles apply across that entire domain, independent of such things as subject-matter, age, or particular conditions that surround the situation in which one learns (e.g. a classroom or a distance education environment). It is this third level of learning that gets most prominently identified with what people generally think that learning is, namely that which one does in school, or, slightly more widely defined, that which results from some instructional process. There is no doubt that this Level 3 learning is important. However, as I argue in this chapter, it is merely an important part of a wider learning concept and it is essential to seek to connect learning at the four different levels that are here being specified. Another reason why this third level stands out in people's perception of learning is that it is a very visible and usually explicitly organized activity in which human beings engage during significantly lengthy periods of their life. While reaching maturity they become increasingly more conscious of their participation in it and will, ideally, adapt their Level 3 learning activity to important life choices they then start making.

The fourth level at which one can distinguish human adaptive behavior situates learning in the perspective of lifespan development and in relation to the most

fundamental questions human beings ask themselves about themselves and about those who share their passage through life with them: Why are we here? What is this world, the universe we are part of? What meaning do we want to give to our existence? It is the ability to ask such questions that elevates the human species above the rest of the living world and that gives humans a risky edge in the evolutionary process over the rest of nature. Humans have developed a socially shared and historically evolved sense of what is right and wrong, good and bad, beautiful and ugly. They use it in the conscious process of developing themselves as individuals and as humanity as a whole, constantly intervening with their environment while doing so. Over the, in evolutionary terms, short time span (several million years) that hominids and humans have populated the earth they have gradually become involved in ever more intensive ways in processes of changing their environment and adapting to, or sometimes coping with, the changes they themselves cause. At this level of adaptive behavior, humans, as well as the social entities they constitute, must be seen to be integrated in all kinds of complex adaptive structures or systems at different levels of organizational convolution. Learning, then, at this level is no longer restricted to the acquisition from time to time of some particular skill or piece of knowledge. Rather, it translates into a permanent disposition to be in dialogue with one's changing environment – human, social, biological and physical – for the purpose of interacting constructively with that same environment.[5] Only in this sense, as I have argued elsewhere (Visser, 2001), can learning be seen as truly lifelong. It is to be noted, also, that Level 4 learning is not separate from learning at the other three levels. Quite to the contrary, learning at those other levels can well be seen to take place as an expression of the overall disposition to dialogue referred to under Level 4.

The human mind in the information age

In this final segment I explore implications of a broad view of human learning, based on an integrated perspective of the four levels discussed above. As the title of both this chapter and the book as a whole suggests, this exploration takes place against the

[5] The complete formal definition of learning at this level reads as follows: *"Human learning is the disposition of human beings, and of the social entities to which they pertain, to engage in continuous dialogue with the human, social, biological and physical environment, so as to generate intelligent behavior to interact constructively with change"* (J. Visser, 2001, p. 453).

backdrop of the so-called information age. I must therefore first explain what I see as the major characteristics of the information age and highlight those parameters of human existence at the onset of the third millenium that call for a fresh look at human learning.

The most obvious interpretation of the term “information age” is that it is the age in which the ability to have access to, to process, and to control flows of information has become a key factor of accomplishment for individuals and communities. It is equally obvious that the concept started emerging in parallel with and as a consequence of the quite dramatic technological development that has introduced computer technology in a unbiquitous manner in homes and offices. It has created networking mechanisms that allow people not only to share information but to collaboratively create knowledge through communication processes that no longer require the participants to be at the same time in the same place. In addition to the rapid development of computer technology, the information age is, from a technology point of view, also characterized by the introduction of rocket launched satellites and extensive fibre optic cable networks that span te globe. From the perspective of the developed world these changes look quite fantastic. It should be noted, though, that the extent to which each of the six billion citizens of the earth can all benefit – not as recipients but as actors – from opportunities afforded by these technologies, is still sadly limited. It should also be noted that a large proportion of the technological empire is in the hands of those whose prime interest it is to make financial gains, a motivation that often runs counter to concerns with and careful thoughts about the quality of life for all of humanity.

A second important condition that characterizes this particular juncture in time that we call the information age is, in my view, the explosive demographic growth we have witnessed over the past decades. It has caused the world population, which took millions of years to reach three billion in 1960, to double in the less than four decades following it, becoming six billion in the year 1999. And we are still growing. One doesn’t have to be a genius to recognize that there is a problem, and a growing one at that, for which no particular solution is in sight. A small planet, like ours, has only limited resources to cater for the needs of the rising number of its inhabitants. Increased levels of

technological intervention are required to cope with the problems that result from such rapid growth. Those technological interventions usually create new problems – such as pollution – for the solution of which yet other technological interventions are required, and so on. As a consequence, the speed at which we have to invent new ways and new instruments to stay ahead of ourselves becomes ever greater. The information age therefore also happens to be a time in which change has become so fast that it impacts in a serious manner at several of the levels of learning and adaptive behavior discussed above. Most obvious is the change in perspective of members of a new generation now as compared to the outlook a young person would have had some 40 or 50 years ago, when one still went to school once and learned all that was necessary in preparation for the rest of one's life, and that was it. In contrast, young people now face a much more dynamic challenge, namely the fact that the only thing they can be certain about is uncertainty. Life for them will be highly unpredictable in the long run so that the best preparation they can get is one that instills in them the capacity to continually learn and to do so autonomously. Among the important things they have to apply their learning to is how to deal with problems they have never met before.

A third aspect that merits highlighting is the rapidly increasing perceived complexity of the world in which we live. This is in part a consequence of the advent of ubiquitous communication technology as well as of the increasingly rapid growth discussed above. As members of the human species we have rapidly become a very large number cramped into a relatively small space doing ever more things in an ever shorter timespan, connecting to each other through our ever more sophisticated means of communication all the time, and able to observe in real time, from wherever we are, the effects of our existence on earth, wherever things are happening, via our television screens. We have become so intertwined with each other that, if something happens somewhere, it seems to touch upon us all. Whereas past generations, particularly during the industrial age, could perceive of the world as largely linear, those who live now are required to appreciate and be able to live with complexity.

A fourth characteristic of our time is reflected in the potential we have to inflict harm on each other and ourselves, which has grown to extraordinary levels. This situation had already become problematic during the cold war, when a limited number of nuclear powers built up an arsenal of devices of mass destruction that could, if employed, annihilate the entire human population. The expertise to manufacture such weapons and the ability to obtain the necessary raw materials for them have since spread to other parts of the world, creating a potentially volatile situation that calls for elevated levels of wisdom in the management of international affairs. The same obviously holds for biological and chemical weapons. The situation is compounded by the fact that small groups of people and even individuals now have the power to destabilize the world through acts such as those that could be witnessed on September 11, 2001. In the same category, though less disastrous, fall acts like spreading computer viruses, able to interfere with operations worldwide, the creation of which is among the abilities of high school kids. It requires a level of consciousness among all human beings, particularly a clear sense of ethics and aesthetics, to keep them from displaying such harmful behaviors, both small scale and large scale. This is the area that I referred to above under the description of Level 1 learning as it relates to the need to moderate atavistic impulses through well-developed frameworks of attitudes and values and associated skills and cognitions.

A fifth feature of our age concerns the extent to which we are able to intervene in our very humanity. Spohrer (2002) says about this:

> It is not surprising that at this time of rapid change we choose to ask the question 'What is the meaning of learning.' By the middle of this century we may well be asking 'What is the meaning of being human?' as our grandchildren develop the capabilities to create new intelligent species of biological, digital, and hybrid life-forms. (p.34)

And after some extrapolation regarding the growth of technological power 10 to 20 years ahead, he concludes:

> Our ability to augment our biological and mental processes with information technology will only increase the rate of change, further changing our conception of the meaning of learning except, perhaps, in the most general terms. Learning

> to set responsible goals, and learning to use technology wisely to achieve those goals, will continue to be important metalearning skills. Without an ability to see the future, we will have to take chances and gamble on the outcomes of our actions. (p. 34)

It is thus necessary to keep an open eye and to be able to observe critically what happens in the world around us, seeing what goes wrong somewhere and using it as a lesson to adjust elsewhere.

A sixth aspect that should command our attention regarding the conditions of our time is not new. It has existed for a very long time, for far too long a time, in fact, but it is more acute now than ever. I am referring here to the shameful inability of humankind to develop true expressions of solidarity. We continue to live in a world of great inequality, lacking the resolve to correct the situation. This creates a level of potential instability which, apart from creating a global mindset of hypocricy and complacency on the part of the privileged and feelings of utter frustration among the less privileged, exacerbates the dangers referred to earlier that result from the increased ability to inflict deliberate harm on each other. The situation calls for the development of ethical consciousness and wisdom at levels higher than what is commonly found among present-day decision makers and those to whom they are responsible and on whose behalf they act.

So, what then are my recommendations for the development of human learning in the information age? The realization that I am writing this chapter for a book that aims at representing an Ibero-American perspective has inspired me to try my hand and mind on the matters here discussed having close at hand the memories of my frequent encounters with and profound absorption in the Ibero-American geography, literature, music, visual arts, linguistic expression, and ways of thinking, feeling and being that I have come to love since I first made contact with the continent some 35 years ago. But I am not an Ibero-American, nor am I a European, an African, a North American, or a Middle-Easterner for that matter. If I am to identify with any of those realities that I have been part of during different stages of my life, I should recognize that I am part of all of them and they all have claimed a piece of my soul. While I juggle the memories of the different

parts of the world that have become engrained in who I am, because I lived in them and they lived in me, I represent a perspective that is profoundly and decidedly one that recognizes the immense value of diversity and complexity.

I therefore believe that in this age of ours we must, as far as human learning is concerned, first and foremost attend to the development of the mind in contrast to the often exclusive attention given to the development of competency. To understand what I am saying here I refer back to what I wrote in the opening section of this chapter about the mind as an overall disposition, an overall way of being in the world. The mind, in this sense, is never static, never complete. It constantly evolves as new experiences of interacting with the world around us continue to shape and reshape it in a cumulative fashion.

In fact, what is at stake here is the need to find a healthy balance between mind and competency, one that gives prominence to the mind, but that recognizes that both mind and competency are equally essential. To be clear, one cannot do without the other. The mind cannot work properly without basic competencies being in place. On the other hand, putting competencies in place without at the same time developing an overall mindset that guides the use of these competencies, means putting humanity at risk of engineering its own demise.

In this increasingly interconnected and complex world of ours it is essential that the mind of every individual, as well as the social mindset of every community, reflect the diversity and complexity of that world. Going back to Greenfield's (2000) model of the development of consciousness and the mind referred to earlier, which sees the mind as the personalization of the brain by exposing it to experience, this means that human beings must not be curtailed in their opportunities to be exposed to diversity and complexity of experience. I draw various conclusions from this observation.

In the first place, and considering the influential role of the mass communication media in people's lives, it should be a significant concern that the models presented by

the media become more and more uniform. They particularly become more uniform as a consequence of the pervasive penetration worldwide – encouraged by market motives – of an ever smaller number of very strong players, who, in their efforts to compete with each other while playing it safe, all tend to heed to the lowest common denominator and not to risk venturing too far away from proven success models. Thus, reflecting on the meaning of learning in the wake of the events of September 11, 2001, Lederman (2002) speaks of the necessity of "a war on ignorance and on the noise and anti-thinking that fills the bandwidths" (p. 62). In a similar vein and in the context of the same collaborative reflexion, Nicolescu (2002b) warns against the rise of "binary thinking" (p. 36), something that one certainly cannot hold the media exclusively responsible for, but to which, as I see it, the culture of anti-thinking, uniform models, and noise is likely to both contribute and to be the product of. I add to these comments that the level of information glut created by the pervasive penetration of media into our lives makes it difficult for most people to selectively construct experiences in symbolic space that shape the mind. The challenge we are facing is obviously one that can be condensed in the following two questions: (1) What can we do, how can we use the incredible capacity of the mind, to help us live with the potentially negative consequences of what we have created in terms of powerful instruments and processes to communicate with each other and to store, retrieve, process, transmit, enhance, and reuse information? and (2) What can we do to mobilize the power of these same instruments and processes to make them benefit the depth of our understanding of ourselves and the world in which we live so that wise choices ensue for how humanity will forge ahead? Finding answers to these questions likely requires extending the search beyond the realm of the media as such to the social and economic interests that drive their use.

In the second place I note that another environment that contributes significantly to people's learning, that of the school in the broadest sense of the word, including not only the school *per se* but all manner of deliberate well-structured processes to which we choose to be exposed in the course of our lives for the purpose of acquiring skills, knowledge, habits and propensities (i.e. Level 3 adaptive behavior as mentioned earlier), is in need of rethinking. We have great expertise at designing and developing processes

that allow people to become competent in the various domains I just mentioned. However, we largely forego the opportunity, and have therefore not really figured out how to use it effectively should we use it, to prepare people while being schooled for the use of those competencies having in mind constructive interaction with change (Level 4 adaptive behavior). A starting point for formulating relevant questions in this area and to start searching for answers may be found in the emerging practice to conceive of and structure learning experiences grounded in the interaction with problems that are perceived as relevant by the learners themselves. This obviously assumes that learning human beings retain and develop their innate capacity to problematize their world.

The last sentence of the preceding paragraph leads to a third concluding thought. There are all manner of abilities that we are born with, particularly those that are essential for adaptive behavior at the Levels 1 and 2 discussed earlier, the latter not only including Pinker's (1994) language instinct but equally such things as the innate desire to explore and comprehend one's environment that can clearly be seen to be present in babies and infants (Gopnik, Meltzoff, & Kuhl, 1999), but that later seem to disappear because they are no longer being encouraged. Considering what the world looks like now as compared to several decades ago, it seems reasonable to suggest that for the generations that will henceforth populate the earth it is essential that such abilities not only be maintained but be developed to levels not required by past generations. The study of the brain and its dramatic development at the very early stages of life is still very much in its infancy. What we know, though, seems to suggest that the window of opportunity available to care for human mental and emotional development at a time that starts before birth and then covers the first weeks, months and years following it, is an absolutely crucial one and that it is largely under-explored. Its importance stands in stark contrast with the ways in which in some cultures attention for the developmental needs of the newly born seems to come second place to many interests that merely serve the immediate desires of those whose role it is to provide for the growth of the next generation.

My fourth and final concluding thought is that at this stage of evolution of humanity it is about time that we start looking at learning as something more than what

we do in school. Earlier in this chapter I have identified and described in some detail four levels at which human beings display and develop adaptive behavior. The first and second level of adaptive behavior, which deal with preprogrammed responses and the development of abilities that are prompted by innate dispositions, are normally taken for granted, at least as long as nature seems to be doing its work properly. The third level, that of the deliberate acquisition of skills, knowledge, habits and propensities through exposure to schooling and instructional processes, most individuals and societies put a great effort into. However, because the concern with learning at that level has become such a mainstay of the business that society conducts, less and less serious thinking seems to have gone into it over time. Very little has changed over the centuries regarding what happens in the classrooms (e.g. Papert, 1993). Consequently, now that information technology and science are so fundamentally changing the parameters of human existence, we are hardly able to use these advances to influence instructional practices in other ways than by replicating what we always did by new means. At the fourth level of human adaptive behavior, we find the greatest challenge. At that level we define learning as a lifelong dialogue undertaken for the purpose of constructively interacting with our ever changing environment. Level 4 is therefore the all comprehensive level at which learning should be contemplated. It places human beings squarely on the spot, not as actors outside the world that they constantly transform but as organic parts of that same world. From the perspective of that consideration it is clear that human learning in the information age should be dealt with as a complex phenomenon in which adaptive behavior is expressed in an integrated fashion that comprises all four levels. To do so requires the mind, this most personal expression of who we are, to transcend its state of mere being and to become conscious of itself.

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