UNESCO CONFERENCE ON ARTS AND EDUCATION

BRAIN, ART AND EDUCATION

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Good morning Mr. Matusuura, Mr. President and admired friends, ladies and gentlemen. It's a pleasure to be here. Thank you first of all for inviting me to contribute to this UNESCO conference on Arts Education. I arrived here yesterday from Los Angeles, and it is now exactly a quarter to two in the morning, Los Angeles time. My brain is not at its best at this hour but I will try not to put myself to sleep and especially not to put yourself to sleep. In fact I wish I could wake you up.

You may wonder from our title, 'Brain, Art and Education', why brain science has anything to do with the arts or with education. Of course, a simple answer would be that the brain has to do with everything we are, and everything we do, and so arts and education, being products of the human mind and implicitly of the human brain, have a strong connection. But the relevance of our reflections comes from the fact that we are (myself and my wife Hanna) both scientists and educators and that the science we practice, cognitive neuroscience, deals with the human mind and with the human brain in health and in disease. Education is critical to cultivating mind and brain and to maintaining their health.

Human history is made of change, and no one will deny that, for example, the period of the Enlightenment, the Industrial Revolution, or the social upheavals that surrounded World War II, changed the world and its economic engines quite profoundly. But it is arguable, perhaps, that the changes we are living through at this very moment and that have been put in place over the past two decades may have a larger magnitude and even a more profound human consequence. Call it the globalized economy or something else, the fact is that the nature of what human beings produce and consume has changed dramatically and that so has the way in which human beings communicate with each other and move about in the world. These changes are of course the result of scientific and technological progress in physics, engineering, biology and informatics, to name but a few. As a result, markets have changed and so has the composition of economic sectors in the arrangement of competition among nations and economic blocks. Given that all these developments were made possible by a workforce constituted by individuals with knowledge of facts and with technical skills, it is not surprising that the so-called knowledge economies require a larger pool of individuals, that are both knowledgeable and skilled. Without such individuals, economies cannot be sustained, let alone expand.

Given this undeniable state of affairs, it makes perfect sense for nations to invest in the teaching of “science and mathematics”, the kind of education, so it is said, that new societies most need. So far so good. Who could argue against more science and mathematics in education? No one, and practicing scientists certainly would not.

The problem arises, however, when we confront advocates of science and math education who also wish to *reduce* education in the arts and humanities. Here is their problematic argument: Time and resources are finite; therefore, we must concentrate on what is really needed; and what is really needed, so the argument goes, is to prepare a workforce capable of competing effectively and producing innovation on the world stage of the knowledge economies. The arts and humanities, it is said, had their time and place in the past. But regrettably (and for some, happily) they are no longer relevant.

Our view is that this position is based on a rather narrow and incorrect assessment of the current human predicament. Moreover, from a purely pragmatic standpoint, the position is shortsighted and promises to undermine the best intentions contained in “the science-

and-math only" education policies. Our prediction is, in fact, that such an education programme is likely to worsen the social ills we face today. It is also less likely to produce individuals capable of innovation than a more balanced curricular portfolio. Why do we think so?

Let me just jump to the core of our argument: math and science alone do not make citizens. And, given that the development of citizenship is already under siege, math and science alone are not sufficient.

Perhaps the problem begins with a misdiagnosed situation. Its quite obvious that populations have been redistributed by the forces of urban immigration and that the delivery of social services — schooling, health, and transportation, to name just a few — have been under all sorts of negative pressure. As both the size of the population and the speed of life increase, and as social services and budgets diminish, social pathologies, such as drug addiction and youth gangs, flourish in the school settings. By and large, in many real world schools, we are not talking about quiet places for contemplating the beauty of science and math. Schools, and by that

I mean teachers and students, are under attack. At the same time, the traditional home, the classic site of the principal component of the education of a citizen, has often been broken down by a variety of influences: fully-working parents, single parenthood, absence of grandparents in the home. Unsupervised home living for children is now a frequent occurrence it the real world, and we are not talking only about the underprivileged populations of urban blighted ghettos. We are talking about middle class children in both the advanced and the not so advanced economies. By the way, we are not suggesting by any means that the cure of this problem calls for a return to traditional families. But we must deal with the problem that has been created by these social developments.

Yet another issue: the speed of delivery of information has increased dramatically via an extremely diverse range of media; the internet and its related products, television news and entertainment, and video games, while parental and educational supervision and the influence of authority, be it familial, religious or political, has diminished or become altogether absent. Again, we are not suggesting that we revert to the past, only that we need to be aware

that these changes have taken place and have had grave consequences for the formation of individuals.

Underlying the drama of these changes is a growing disconnect between cognitive processing and emotional processing. And here let us say that our comments come from what we really know, i.e. our scientific work. There has been a traditional divide separating cognition from emotion. It has been classically claimed that cognition and emotion are two entirely different processes for the human mind and for the human brain. And that, somehow, a rational mind would be one in which cognitive skills developed to a maximum and emotional processing would be suppressed to a maximum because somehow, emotion would not be a good counselor of cognitive creativity.

We have to tell you that not only do we not agree with this claim but that everything that has occurred over the past 10 years of cognitive neuroscience reveals that this traditional split is entirely unjustified. In fact human minds and human brains result from a very complex cooperative working of both emotional and cognitive processes. We need both. When we think about the best that we can do in terms of

reasoning and creativity, we realize that emotion is literally in the loop of reason and decision making. One cannot have one without the other, although they do constitute different sets of processes and skills and do have a different origin in terms of evolution.

The fact that cognitive and emotional abilities have different roots in our biology is especially important. While emotional processing is evolutionarily old and slow (slow in the order of seconds and minutes), cognitive processing is exceedingly fast and happens in fractions of seconds in the order of miliseconds. In recent years, thanks to the tremendous speeding up of our life in terms of our movements on earth and in terms of the delivery of information through the media we now have available, the cognitive time scale has, in fact, been shortened. Children and adolescents are capable of processing information faster and faster. Anyone who has seen children grow up these days knows that they can multitask, and can operate in parallel on a variety of avenues of processing which for people of our generation was simply not possible (and is probably impossible given the way we “educated” our “older” brains). Now, while cognition speeds up relentlessly our emotional processing does not speed up in parallel. Our emotional processing takes its own

sweet time to organize itself and to respond to what is happening in the world. So we have a real disconnect and a divergence that is likely to be enhanced in years to come between cognitive processing, (that goes faster and faster and produces marvelous things, by and large, and some that are not so marvelous), and emotional processing that is inherently slow and may perhaps adapt to higher speeds, but only gradually, with some effort, as time goes. That's the way our brain is today. We are condemned, for the time being, to having one system of the brain evolve much faster and with enormous adaptability and one other system that will drag behind.

You might say, why worry about this disconnect that is now occurring between emotion and cognition. Unfortunately, we have to tell you that there are good reasons to worry. The first is that sound, moral behavior of the sort that constitutes the solid grounding for the citizenship requires the necessary participation of emotion. There is solid evidence for that.

The reason why this is so comes from the fact that emotions work as qualifiers for actions and for ideas. We have two parallel processing tracks: one in which we have ideas, thoughts, plans for actions, and

actual actions. And another track in which emotions serve as qualifiers, operate as the “adjectives” for what is happening in terms of the ideas and actions in the other track. Without these qualifiers we operate on purely rational terms without having a way of classifying, qualifying, and reflecting on what is happening in the world of ideas and actions.

And another important fact: current research indicates that the very grounding of moral development relies, from the point of view of evolution, on a set of social emotions that has long existed in humans probably all along the history of humanity, and have actually, been present, in simpler forms, in other species before humans. In conclusion, everyone in this room has their ideas and actions qualified by emotions, which should come in parallel with those ideas and actions; and the very grounding of what we recognize as social conventions and ethical rules has probably emerged on the background of social emotions and have long been present in evolution.

The evidence shows that even adults who have grown up entirely normally, have been fully developed, and have been solid citizens,

lose their fine moral compass after brain damage impairs their emotional systems. This is a fact. Recently, we have also demonstrated that this link even involves the solution of moral dilemmas.

All we have to do is read the headlines to know that there are allegedly normal people who do not appear to make sound moral judgments. But the interesting fact is that people whose emotional systems are broken down by neurological disease (or by a variety of emotional dysfunctions that could have a cultural source), produce *different* kinds of moral judgment. That is solid evidence for the connection between emotion and the construction of a citizen.

Perhaps even more importantly, we know that children who sustain damage to their emotional systems very early in life become unable to learn social conventions and ethical rules. It is not just a question, in those children, of deploying their moral knowledge appropriately. They appear not to learn the rules once their emotional system has been damaged. The lesson here is obvious: unless we allow the emotional system, through the agency of pleasure and pain, and of reward and punishment to intervene in the building up of knowledge

about other human beings and their actions, we are probably condemned to not creating the best possible citizens. The growing emotional, cognitive disconnect could turn individuals whose brains are otherwise neurologically intact, into individuals who may be morally unsound.

We would like to suggest that an education confined to science and math would not address this issue and might actually worsen matters. It is simply not possible to *mandate* children and adolescents to behave morally. This always makes me think of Mrs. Reagan. During the Reagan years, Mrs. Reagan, who was very genuinely interested in helping with the problem of drug addiction, was famous for saying that “we have a solution to the drug problem: just say no”. And this is very well intentioned, but it didn’t work. Not many adolescents who are told “to just say no” will do that. Moral behavior is acquired gradually in the setting of examples, actual examples or narrated examples, accompanied by reflection and exercise over certain problems, over their possible solutions and over their consequences. It turns out that a curriculum which features arts and humanities education is one way of conducting the moral exercises on which citizenship is grounded (I’m only saying one way

and not the only way). It is important to look at arts and humanities education not as a sidetrack, not as something that will only make young people knowledgeable in the appreciation of the visual arts or of music so that publics and audiences for such products can become available. That would be a good thing in itself, of course, but there's more to it than that. Arts and humanities education can be a playground for the development of good citizens. Why? For example, because the narratives about conflict, about suffering, about joy, about the ambiguities of human behavior and about the painful decisions required by justice, can be represented by math and described by science by certain sciences but cannot be *exercised* by math or science alone.

When we think of poetry, when we think of theatre — from the Greeks to Shakespeare and to contemporary theatre; when we think of the novel, or of film, the modern inheritor of narrative forms, all of them embody human problems and traits that can be used to shape the reflective mind, the mind that is most worth having. The same can be said of the visual arts. Think, for example, of the potential lessons contained in the contemplation of Picasso's, Guernica, or of Pollack's abstract expressionist paintings. The Guernica, which came to mind

when we were preparing these notes, and we noted that the Guernica is not a pamphlet, is not a mere description of an infamous act of state terrorism on a sunny afternoon in 1937. When you look at the painting, there are seven figures in the composition and they do not tell you at all what happened. They tell you about *emotional consequences*, about reflections. Discussed in the proper setting, this can lead the formative brain and mind to an appreciation of a particular situation and lead to an unforgettable experience. By the way, this happens equally strongly with abstract art (which can reflect not a readily referenced story, but rather a landscape of the interior, a landscape of the human soul); and with music — think, for example, about the practice of human civility that comes from playing in a chamber music group or from listening to such playing and observing what happens when musicians are obliged to respect each other, to observe the turn-taking required that by the composition, and realize, without any preaching, that music, while fundamentally abstract is filled with depictions of emotions, conflicts, resolution of conflicts, and acts of cooperation.

So, what are our conclusions at this point? First, education in science and mathematics is very much needed. We need it to master

new developments in manufacture, in marketing, in distribution of goods. It is impossible to imagine a lively economy (on the basis of which that proper citizen that I'm talking about must rely) without having a strong emphasis on math and science education. Besides, from a purely cultural standpoint, in order to understand the world we live in and not rely on superstition or unfounded beliefs, one needs math and science. Second, arts and humanities education can convey the moral structure that is required for a healthy society and is so challenged by current social developments. And third: arts and humanities education actually fosters the imagination that is necessary for innovation. Without the richness that comes from traditional narrative, and the traditional exercise and experience of arts and humanities, it is unlikely that human beings will develop the kind of imagination and of innovative, intuitive thinking that will lead to the creation of the new. To forget the arts and humanities in the new curricula is equivalent to sociocultural suicide.