A Multiplicity of Intelligences: In tribute to Professor Luigi Vignolo

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As a psychologist, I was surprised by the huge public interest in The Bell Curve, the book on human intelligence by psychologist Richard Herrnstein and policy analyst Charles Murray (1994). Most of the ideas in the book were ones that were familiar not only to social scientists but also to the general public. Indeed, Berkeley educational psychologist Arthur Jensen (1969) and Richard Herrnstein (1973) himself had written popularly about the very same ideas a quarter of century before. Perhaps, I reasoned, ever quarter century a new generation of Americans—and perhaps individuals from other lands-- desires to be acquainted with The Psychologist's Orthodoxy about intelligence.

Thanks to the energies and convictions of a few researchers, the major precepts of "intelligence theory" had been put forth by the second decade of the century. According to this orthodoxy, there is a single intelligence, often called *g* for general intelligence. Individuals are born with a certain intelligence or potential intelligence; this intelligence is difficult to change; and psychologists can assess one's intelligence (or IQ) using short-answer tests, and, perhaps, other "purer" measures, such as the time it takes to react to a flashing light or the presence of a certain pattern of brain waves.

Soon after this "hedgehog" orthodoxy had been proposed, more "foxlike" critics arose. From outside of psychology, commentators like Walter Lippmann (1976) challenged the

kinds of items used to assess intelligence, contending that intelligence was more complex and less fixed than the psychometricians had proposed. From within psychology, scientists questioned the notion of a single overarching intelligence. According to their analyses, intelligence is better thought of as a set of several factors. According to the University of Chicago's L. L. Thurstone (1938), it makes more sense to think of seven largely independent "vectors of the mind." The University of Southern California's J. P. Guilford (1967) enunciated 120 factors, later inflated to 150. Scottish investigator Godfrey Thomson (1939) spoke about a large number of loosely coupled faculties. And in our own day, Yale's Robert Sternberg (1985) has proposed a triarchic theory of intellect: these arches encompass a component that deals with standard computational skill, a component that is sensitive to contextual factors, and a component that deals with novelty.

Somewhat surprisingly, all of these commentators—whether in favor of or opposed to the notion of single intelligence—share one feature. They all believe that the nature of intelligence will be determined by the devising of tests and the analysis of data thus secured. Perhaps, reason monists like Herrnstein and Murray, performance on a variety of tests will yield a strong general factor of intelligence. And indeed, there is evidence for such a "positive manifold" across tests. Perhaps, counter the pluralists like Thurstone and Sternberg, the right set of tests will demonstrate that the mind consists of a number of relatively independent factors, with strength in one area failing to predict strength or weakness in other areas.

But where is it written that intelligence needs to be determined on the basis of tests? Were we incapable of making judgments about intellect before Alfred Binet and Francis Galton

cobbled together the first set of psychometric items a century ago? If the dozens of IQ tests in use around the world were suddenly to disappear, would we no longer be able to make assessments of intellect?

Twenty-five years ago, posing just these questions, I embarked on a distinctly different path toward the investigation of intellect. I had been conducting research with two groups: children who were talented in one or more art form; adults who had suffered from a stroke that compromised certain capacities while sparing others. Every day I saw individuals with scattered profiles of strengths and weaknesses; and I was impressed by the fact that a strength, or a deficit, could cohabit comfortably with different profiles of abilities and disabilities across the variety of humankind. It seemed to me that the data of neurospsychology were a powerful critique of the notion that there exists but a single intelligence. (REFERENCE TO WORK OF VIGNOLO)

On the basis of such data, I arrived at a firm intuition: Human beings are better thought of as possessing a number of relatively independent faculties, rather than as having a certain amount of intellectual horsepower (or IQ) that can be simply channeled in one or another direction. I decided to search for a better formulation of human intelligence. I proposed a new definition: an intelligence is a psychobiological potential to process information so as to solve problems or to fashion products that are valued in at least one cultural context. In my focus on fashioning products and my sensitivity to cultural values, I departed from orthodox psychometric approaches such as that adopted by Herrnstein, Murray and their predecessors.

To proceed from an intuition to a definition to a set of human intelligences, I developed a set of criteria. These criteria were drawn from several sources:

◦ psychology: the existence of a distinct developmental history for a capacity; the existence of correlations (or lack of correlations) between certain capacities;

◦ observations of unusual human beings: individuals who were prodigies, *idiot savants*, or who exhibited learning disabilities;

◦ anthropology: ethnographic records of how different abilities are developed, ignored, or prized in different cultures;

◦ cultural studies: the existence of symbol systems that encode certain kinds of meanings;

◦ the biological sciences: evidence that a capacity is represented in particular neural structures; evidence of a distinct evolutionary history for a particular capacity.

Armed with these criteria, I considered many capacities, ranging from those based in the senses to those having to do with planning to such possibilities as sense of humor or sexual prowess. To the extent that a candidate ability met all or most of the criteria handily, it gained plausibility as an intelligence. In 1983, I concluded that seven candidate intelligences met the criteria sufficiently well: linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal (Gardner 1983). Most standard measures of intelligence primarily probe linguistic and logical intelligence; some survey spatial intelligence; the remaining four are almost entirely ignored. In 1995, invoking new data that fit the criteria, I added an eighth intelligence—that of the naturalist: I am also considering the possibility of a ninth or existential intelligence—one that captures the human proclivity to raise and ponder fundamental questions about existence, life, death, finitude (see Gardner 1999, chapters 4 and 5). Whether existential intelligence gets to join the inner sanctum

depends on whether convincing evidence accrues about the distinct neural basis of such an intelligence.

The theory of multiple intelligences (MI theory, as it has come to be called) makes two strong claims. The first claim is that all human beings possess all of these intelligences: indeed, they can be considered a definition of *homo sapiens*, cognitively speaking. The second claim is that, just as we all look different and have different personalities and temperaments, we also exhibit different profiles of intelligences. No two individuals, not even identical twins or clones, have exactly the same amalgam of intelligences, foregrounding the same strengths and weaknesses. This is because, even in the case of identical genetic heritage, individuals undergo different experiences and also seek to distinguish their profiles from one another.

Within psychology, the theory of multiple intelligences has generated controversy. Many researchers are nervous about the movement away from standard tests, and the adoption of a set of criteria that are unfamiliar and less susceptible to quantification. Herrnstein and Murray called it a "radical theory." Some have questioned whether the theory is empirical. However, this criticism misses the mark. MI theory is based completely on empirical evidence. The number of intelligences, their delineation, their subcomponents are all subject to alteration in the light of new findings. Indeed, the naturalist intelligence could only be asserted after evidence had accrued that parts of the temporal lobe are dedicated to the naming and recognition of natural kinds, as opposed to manmade "artificial" objects (Damasio and Damasio, 1995; Warrington and Shallice 1984). Much of the evidence for the personal intelligences has come from research in recent decades on emotional intelligence

(Goleman 1995) and on the development in children of a "theory of mind" (Astington 1993). And the intriguing finding that musical experiences may enhance spatial capacities raises the possibility that musical and spatial intelligences may draw on certain common abilities—for example, the capacity to handle complex architectonic structures (Rauscher, Shaw, and Ky 1993).

It is also worth noting that the movement toward multiple intelligences is quite consistent with trends in related sciences. Neuroscience recognizes the modular nature of the brain; evolutionary psychology is based on the notion that different capacities have evolved in specific environments for specific purposes; and artificial intelligence increasingly embraces expert systems rather than general problem-solving mechanisms. Indeed, within science, the believers in a single IQ or general intelligence are increasingly isolated, their positions more likely to be embraced by those, like Herrnstein and Murray, who have an ideological axe to grind.

If psychologists expressed skepticism about the theory of multiple intelligences, educators around the world have embraced the idea. MI theory not only comports with their intuitions that children are smart in different kinds of ways; the theory also holds out hope that more students can be reached more effectively, if their favored ways of knowing are taken into account in curriculum, instruction, and assessment. In many parts of the world, a virtual cottage industry has arisen to create MI schools, classrooms, curricula, texts, computer systems, and the like. Most of this work is well-intentioned and some of it has proved quite effective in motivating students and in giving them a sense of involvement in intellectual life. However, various misconceptions have arisen: for example, that every topic

should be taught in seven or eight ways; or that the purpose of school is to identify (and broadcast) students' intelligences, possibly by administering an octet of new standardized tests. I have begun to speak out about some of these less advisable beliefs and practices (Gardner 1999a).

MI theory is best thought of as a tool, rather than as an educational goal. Educators need to determine, in conjunction with their communities, the goals that they are seeking. Once these goals have been articulated, then MI theory can provide powerful support. In my view, schools should seek to develop individuals of a certain sort—civic-minded, sensitive to the arts, deeply rooted in the disciplines. And schools should probe pivotal topics with sufficient depth so that students end up with a comprehensive understanding of these topics. Approaches founded on multiple intelligences theory have demonstrated considerable promise in helping schools to achieve these goals (Kornhaber, Fierros, and Veenema, 2003).

Experts interested in intelligence have debated certain topics for nearly a century: Is there one intelligence or more than one? Can intelligence(s) be altered? Is intelligence inborn or acquired? It would take a brave seer to predict that these debates will disappear. (In fact, if I am correct, a latter-day Herrnstein or Murray will author her own variation on The Bell Curve around 2020.) As the person most closely associated with the theory of multiple intelligence, I record three wishes for this line of work:

1. A broader but not infinitely expanded view of intelligence. It is high time that intelligence be broadened to include a range of human computational capacities, including those that deal with music, other persons, skill in deciphering the natural world. However, it is

important that intelligence should not be conflated with other virtues, such as creativity, wisdom, or morality.

I also contend that intelligence should not be so broadened that it crosses the line from description to prescription. I endorse the notion of emotional intelligence when it denotes the capacity to compute information about one's own or others' emotional life. However, when the term comes to encompass the kinds of persons we hope to develop, then we have crossed the line into a value system—and that should not be part of our conception of intelligence. Thus, when Daniel Goleman stresses the importance of empathy as part of emotional intelligence, I go along with him. But Goleman also urges that individuals care for one another, thus crossing an important boundary. The possession of the capacity to feel another's suffering is not the same as the decision to come to her aid. Indeed, a sadistic individual might use her knowledge of another's psyche to inflict pain.

2. A shift away from standardized short answer "proxy" instruments to real-life demonstrations or virtual simulations. During a certain historical period, it may have been necessary to assess individuals by administering items that are themselves of little interest (e.g., repeating numbers backwards) but that are thought to correlate with skills or habits of importance. Nowadays, however, given the advent of computers and virtual technologies, it is possible to look directly at individuals' performances—to see how they can argue, debate, look at data, critique experiments, execute works of art, and so on. As much as possible, we should train students directly in these valued activities and we should assess how they carry out valued performances under realistic conditions. The need for ersatz instruments, whose relation to real world performance is often tenuous at best, should wane.

3. The use of multiple intelligences' ideas for more effective pedagogy and assessment. I have little sympathy with educational efforts that seek simply to "train" the intelligences or to use the intelligences in trivial ways (e.g., singing math times tables, playing Bach while one is doing geometry). For me, the educational power of multiple intelligences is exhibited when these faculties are drawn on to help students master consequential disciplinary materials.

In The Disciplined Mind (1999b), I focus on three rich topics: the theory of evolution (as an example of scientific truth); the music of Mozart (as an example of artistic beauty); and the Holocaust (as an example of immorality in recent history). In each case, I show how the topic can be introduced to students, through a variety of entry points (drawing respectively on several intelligences); how the subject can be made more familiar through the use of analogies and metaphors drawn from diverse domains; and how the core ideas of the topic can be captured not through a single symbolic language but rather through a number of complementary model languages or representations. Pursuing this approach, the individual who understands evolutionary theory can think in terms of a historical narrative, a logical syllogism, a quantitative examination of evolving populations in different niches, a diagram of species delineation, a dramatic sense of the struggle among individuals (or genes or populations) and so on. The individual who can think of evolution in only one way–using only one model language--actually has a tenuous command of the principal ideas.

The issue of who owns intelligence has been an important one in our society for some time -- and it promises to be a crucial and controversial one for the foreseeable future. For too long, the rest of society has been content to leave intelligence in the hands of

psychometricians. Often these testmakers have a narrow, overly scholastic view of intellect; they rely on a set of instruments that are destined to valorize certain capacities, while ignoring those that do not lend themselves to ready formulation and testing. And in the hands of those with a political axe to grind, they often skate close to the dangerous territory of eugenics. MI theory represents at once an effort to base the conception of intelligence on a much broader scientfic basis; to offer a set of tools to educators that will allow more individuals to master substantive materials in an effective way; and to help each individual achieve his or her human potential at the workplace, in avocations, and in the service of the wider world.

References

Astington, J. (1993) The child's discovery of the mind. Cambridge:Harvard University Prss.

Damasio, A. and H Damasio (June 1955) Recent trends in cognitive neuroscience. Lecture presented at the Center for Advanced Study in the Behavioral Science, Stanford, California.

Gardner, H. (1983) Frames of mind: The theory of multiple intelligences. New York: Basic Books. New Editions: 1993, 2004.

Gardner, H. (1999a) Intelligence reframed: Multiple intelligences for the 21st century. New York: Basic Books.

Gardner, H. (1999b) The disciplined mind. New York: Simon and Schuster.

Goleman, D. (1995) Emotional intelligence. New York: Bantam Books.

Guilford, J. P. (1967) The nature of human intelligence. New York: McGraw Hill.

Herrnstein, R. (1973) IQ in the meritocracy. Boston: Little, Brown.

Herrnstein, R. and Murray, C. (1994) The bell curve. New York: Free Press.

Jensen, A. (1969) How much can we boost IQ and scholastic achievement? Harvard Educational Review 39 (1) 1-123.

Kornhaber, M., Fierros, E., and Veenema, S. (2003) Multiple intelligences Best ideas form research and practice. Boston: Allyn and Bacon.

Lippmann, W. (1976) Readings from the Lippmann-Terman debate. In N.J. Block and G. Dworkin (Eds) The IQ controversy: Critical readings. New York: Pantheon. Originally published in 1922-23.

Rauscher, F., Shaw, G. L. and Ky, K.N. (1993) Music and spatial task performance. Nature 365, 6447, p. 611.

Sternberg, R. J. (1985) Beyond IQ: A triarchic theory of human intelligence. New York: Cambridge University Press.

Thomson, G. (1939) The factorial analysis of human ability. Boston: Houghton Mifflin.

Thurstone, L. L. (1938) Primary mental abilities. Chicago: University of Chicago Press.

Warrington, E. and T. Shallice (1984) Category-specific semantic impairments. Brain 107, 829-854.