FREQUENTLY ASKED QUESTIONS—MULTIPLE INTELLIGENCES AND RELATED EDUCATIONAL TOPICS

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Introduction:

Almost every day, I receive questions about multiple intelligences theory. Some of the questions concern the theory itself, though many more deal with recommended practices or with questionable applications. The questions come from professors, teachers, parents, college students, high school students, and elementary school students; they emanate from many states and many lands. The questions used to arrive primarily by letter and phone; now, of course, they arrive as well by FAX and by e-mail. And whenever I speak publicly about the theory, whether in person or on radio or television, a new set of questions greets me upon my return to the office.

I field questions about other topics as well. Sometimes these are answered at www.goodworkproject.org or www.pz.harvard.edu (see the bottom of this page for further references).

Initially, I sought to answer each question individually. There were not that many; I learned from and enjoyed the process. More recently, however, it has become impossible to answer all of the questions individually, even with staff help. Routinely, I refer individuals to my writings or those of other persons familiar with the theory. I have drafted generic letters that answer the most frequent questions—for example, "Is there a test for multiple intelligences?" (Answer, "Not one that I endorse"); and "Are there multiple intelligence high schools? (Answer, "Many but each has been developed by a group of practitioners, not by me"). When an interesting and novel question arises, I sometimes write an answer of some length and then include it in a future publication.

In the pages that follow, I respond to questions raised frequently by those interested in the theory. I also respond to some other frequently asked questions about my work. Some of these answers were initially developed in conjunction with Joseph Walters and Margaux Wexberg, to whom I give thanks. Others draw on material from my books *Multiple Intelligences: The Theory in Practice*, and *Intelligence Reframed.*

Terminology:

Q. I am confused by terminology. Is intelligence a product, a process, a content, a style or all of the above?

A. I wish that this were a simple matter. Fundamentally, an intelligence refers to a biopsychological potential of our species to process certain kinds of information in certain kinds of way. As such, it clearly involves processes that are carried out by dedicated neural networks. No doubt each of the intelligences has its characteristic neural processes, with most of them quite similar across human beings. Some of the processes might prove to be

more customized to an individual.

The intelligence itself is not a content, but it is geared to specific contents. That is, the linguistic intelligence is activated when individuals encounter the sounds of language or when they wish to communicate something verbally to another person. However, the linguistic intelligence is not dedicated only to sound. It can be mobilized as well by visual information, when an individual decodes written text; and in deaf individuals, linguistic intelligence is mobilized by signs (including syntactically-arranged sets of signs) that are seen or felt.

From an evolutionary point of view, it seems probable that each intelligence evolved to deal with certain kinds of contents in a predictable world. However, once such a capacity has emerged, there is nothing that mandates that it must remain tied to the original inspiring content. As the term has it, the capacity can be *exapted* for other purposes. I assume, for example, that mechanisms related to the recognition of species in nature are now regularly used in recognizing commercial products (the so-called naturalist intelligence is used in the cultural world). Also some of the most powerful human systems—like written language—came about not directly through evolution but through the yoking of visual-spatial and linguistic capacities which had evolved for different purposes.

Speaking more loosely, we can describe certain products—for example maps, drawings, architectural plans—as involving a particular intelligence: in this case, of course, spatial intelligence. However, we must be aware that this characterization entails an inference on the part of an observer. It might be that an individual could accomplish architectural plans or fashion a piece of sculpture using a different (non-spatial) set of intelligences. Until such time as we can actually designate neural circuitry as representing one or another intelligence "in action", we cannot know for sure which intelligence or intelligences are actually being invoked on a specific occasion.

About Learning Styles: Educators are prone to collapse the terms intelligence and style. For informal matters, that is no great sin. However, style and intelligence are really fundamentally different psychological constructs. Styles refer to the customary way in which an individual approaches a range of materials—for example, a playful or a planful style. Intelligence refers to the computational power of a mental system: for example, a person whose linguistic intelligence is strong is able readily to compute information that involves language. Speak of styles, speak of intelligences, but don't conflate the two if you can help it. For further discussion of this point, see Chapter 6, myth #3, in my book Intelligence Reframed.

Q. You use the word “domain” a lot. What is a domain and how does it relate to an intelligence?

A. I am glad you asked this question. A domain is a new construct, developed by my colleague David Feldman. It refers to any organized activity in society, where individuals can be ranked in terms of expertise. Any occupation, any art or craft or sport, is a domain. The domains in a society can be thought of as the kinds of roles listed in the Yellow Pages of

a phone book—anything from Accounting to Zoology.

As I use it, the term intelligence refers to a set of human computational capacities. As humans, we have the ability to 'compute' language, number, social relations, spatial relations etc. We cannot directly see the intelligences. We observe them at work by observing individuals carrying out various kinds of behaviors and tasks. When a person sings, we assume that she is using at least her musical intelligence. When she dances, we assume that she is using at least her bodily and spatial intelligences.

You can see, then, that we really only observe individuals working in domains. We infer the intelligences on the basis of our best guess about the intelligences that are involved. But we cannot know for sure. The aforementioned dancer might well be relying heavily on her linguistic or intrapersonal intelligences—along with or instead of her bodily or spatial intelligences.

Through psychological and neurological research, it is possible to gather more compelling evidence about which intelligences are being used in a behavior or task. More casual observation has to be tentative.

For more on domains and disciplines, See *Intelligence Reframed,* Chapter 6, Myth #2.

Q. Isn't it odd to speak of skill in gym or on the playing field as an intelligence? And wouldn't this mean that individuals with physical defects are mentally retarded?

A. I don't find it odd to speak of the bodily skill used by, say, an athlete, a dancer, or a surgeon as embodying intelligence. The performances of these individuals are valued in many societies and they involve an enormous amount of computation, practice, expertise. Snobbishness about use of the body reflects the Cartesian split between mind/body and a concomitant degradation of processes that seem less- or non-mental; however, contemporary neuroscience has sought to bridge this gap and to document the cognition involved in action (and, for that matter, in emotion).

As for the issue of retardation, it is true that the loss of a certain physical capacity could cause an individual to have problems in the bodily-kinesthetic area, just as loss of hearing or sight could cause problems with, respectively, linguistic or spatial capacities. As in those cases, therapists are challenged to substitute other systems, be they other bodily mechanisms or artificial prosthetics.

Indeed, computer scientists have already produced robots that carry out physical actions as well as other kinds of prosthetics that can substitute for impaired sensory or motor capacities. In the future, individuals with such impairments will be able to use these devices in order to carry out just those actions that unimpaired individuals execute with their bodies. The once notable gap between physically impaired and unimpaired may disappear.

Should one still use the term "intelligence" in such cases? It depends on the role played by the individual. If the machine simply substitutes for the individual, then it is the machine,

rather than the individual, that is displaying intelligence. But if the individual herself is programming the machine, or making consequential decisions, then the individual herself is exercising a particular intelligence: the computer is a tool in her hands.

Indeed, the same line of reasoning can be invoked with respect to music. Composition used to pre-suppose instrumental and notational skills: now computers can substitute for both. The analyst must locate the source of the intelligence: does it inhere in the programmer, the program, or the user of the program?

Q. How does intelligence relate to creativity?

A. Having studied intelligence, and proposed a pluralistic view of intelligence, I turned my attention to creativity. Not surprisingly, I ascertain that there are many forms of creativity. Domains involving characteristic combinations of intelligences also exhibit characteristic forms of creativity. So, for example, creativity in physics turns out to be quite different from creativity in poetry or politics or psychology. Generalizations about creativity are destined to be weak; the devil lies in the details about the creative domain in questions.

A few more comments about creativity. First of all, one cannot be creative unless one has mastered a domain—that process can take up to ten years. Second of all, creativity probably has more to do with personality than with sheer intellectual power. Individuals who enjoy taking risks, who are not afraid of failure, who are attracted by the unknown, who are uncomfortable with the status quo are the ones who are likely to make creative discoveries. Finally, as stressed by my colleague Mihaly Csikszentmihalyi, creativity should not be viewed simply as a characteristic of an individual. Rather, creativity emerges from the interaction of three entities: l) the individual, with his given talents, personality, and motivation; 2) the domain—the discipline or craft in which the individual is working; 3) the field—the set of individuals and social institutions that render judgments about quality and originality.

I have written a great deal about creativity. See my books *Creating Minds, Extraordinary Minds,* and *Changing Minds.* See also chapter 8 of *Intelligence Reframed* and Chapter 4 of *Multiple Intelligences: The Theory in Practice.*

The Theory:

Q. Is Multiple Intelligences really a theory? Could it be confirmed or disconfirmed by experiment?

A. The term "theory" oscillates between two quite different meanings. Among physical scientists, the term is reserved for an explicit set of propositions which are linked conceptually and whose individual and joint validity can be assessed through systematic experimentation. Among lay persons, the term is used promiscuously, to refer to any set of ideas put forth orally or in writing—as the man on the corner says, "I've got a theory about that."

"Multiple Intelligences" falls somewhere in between these two uses. There is no systematic set of propositions which could be voted up or down by a board of scientists. On the other hand, the theory is not simply a set of notions that I dreamed up one day. Rather, I offer a definition, a set of criteria for what counts as an intelligence, data that speak to the plausibility of each individual intelligence, and methods for revising the formulation. The criteria are laid out in chapter 4 of *Frames of Mind.*

In many sciences, theories occupy this intermediary status. Certainly, theories in the social sciences attempt to be as systematic as possible yet they are rarely proved or disproved in a decisive way. And broad theories in the natural sciences, like evolution or plate tectonics, are similarly immune from a single, simple test. Rather, they gain or lose plausibility on the basis of an accumulation of many findings over a long period of time.

This is how I think about MI theory. I've put forth a candidate set of intelligences that are said to have their own characteristic processes and to be reasonably independent of one another. Over time, the particular intelligences nominated, and their degree of dependence or independence of one another, will be more firmly established.

Individuals in search of a decisive "thumbs up" or "thumbs down" vote on any theory of intelligence are naive. Still, it is important to indicate the kinds of consideration that will lend greater or lesser plausibility to the theory. Suppose that it was discovered that a certain region of the brain in fact subserved more than one intelligence; or that individuals who were strong in one intelligence were invariably impaired in another intelligence; or that symbol systems that were ostensibly associated with one intelligence actually drew on the same cognitive processes as another intelligence. Each of these lines of evidence would cast doubt on the validity of the overall theory, though, following appropriate revision, there might continue to be some validity to the theory. We do not reject Piaget's overall theory of cognitive development just because some of its specific claims have been undermined by subsequent research.

Q. How does MI theory relate to the psychometricians' notion of 'g' or general intelligence?

A. MI theory questions not the existence but the province and explanatory power of g. 'g' is a statistical outcome and its strength varies to some extent on the assumptions that are built into the factorial model being employed. We do not really understand what is measured by 'g'—it could be anything from sheer intellect to motivation to skill in following instructions to the ability to shift facilely from one kind of problem to another.

I am uncomfortable with the assumption inherent in g: that an individual who has a high 'g' could be equally accomplished in any intellectual area. MI theory is an extended argument against this all-purpose view of intellect. For additional discussion see *Intelligence Reframed,* Chapter 6, Myth #5.

Q. Are the origins of our variations in intelligence biological or cultural? Do particular cultures tend to evidence particular strengths?

A. The extent to which intelligences develop is a joint product of biological (genetic potential), the emphasis a culture places on an activity, the excellence of the instruction, and the motivation of the individual. Any individual can strengthen an intelligence if she is well-motivated; if her ambient culture values that intelligence; if there are human and artifactual resources (i.e. texts, computer programs) on which she can draw.

Q. What is the status of the naturalist intelligence and the existential/spiritual intelligence?

A. I wrote about the naturalist intelligence in Chapter 4 of *Intelligence Reframed.* I have nothing to add to that discussion. I wrote about my doubts about a spiritual intelligence in the same essay. I am continuing to gather data about the existential intelligence and hope to have an 'update' in the next few years.

Assessment:

Q. Could one construct a set of tests for each of the intelligences?

A. At one time, I thought it would be possible to create a set of tests of each intelligence—an intelligence-fair version, to be sure—and then simply to determine the correlation between the scores on the several tests. I now believe that this would be an extremely difficult feat to accomplish. Indeed, I think it could only be accomplished if one were to develop *several* measures for each intelligence, and then make sure that individuals were comfortable in dealing with the materials and methods through which each intelligence were measured. And so, for example, spatial intelligence would be a product of one's performances in such activities as finding one's way around an unfamiliar terrain, playing chess, reading blueprints, and remembering the arrangement of objects in a recently vacated room.

Were such a measurement of intelligence to be done, the findings would be of scientific interest—at least to me! However, one reason why I have moved away from the creation of such measures is that they may lead to new forms of labeling and stigmatization. As I argue in the latter chapters, the intelligences should be mobilized to help individuals learn important content and not used as a way of categorizing individuals. To use the language of one of my critics, I do not want to inspire the creation of a new set of "losers."

Q. Speaking of the harder sciences, does the brain evidence continue to support your theory?

A. In brain sciences, a decade is a long time, and the theory of multiple intelligences was developed over two decades ago. We now know much more about the functioning and development of the nervous system. I find the neurological evidence to be amazingly supportive of the general thrust of MI theory. The evidence supports the particular intelligences that I described and provides elegant evidence of the fine structure of such capacities as linguistic, mathematical, and musical processing.

It is sometimes said that the brain is a very flexible organ, subject to the events of early

experience, and that that fact calls into question the theory of multiple intelligences. This remark is not pertinent. The fact of "neural plasticity" is independent of the issue of different intelligences. A multiple intelligences theory demands that linguistic processing occurs via a different set of neural mechanisms than does spatial or interpersonal processing. The fact that the processing may occur in somewhat different regions of the brain across individuals, by virtue of their early experience, is interesting to know but not relevant to the identification of intelligences *per se*.

Indeed, suppose that, in one person, musical processing occurred in region A and spatial processing in Region B. Suppose, further, that these representations were reversed in another person. MI theory would not thereby be affected. Even if musical intelligences were represented in regions A, B, and C, in one person, and regions D, E, and F, in a second person, that still would not affect the theory. If, however, musical and spatial processing were identically represented in a population of persons, that fact would suggest that we are dealing with one intelligence, and not with two separate intelligences.

Q. What do other scholars think of MI theory?

A. As can be anticipated, there is a wide spectrum of opinion, both within psychology and across the biological and behavioral sciences. Those involved in standard psychometrics are almost always critical of the theory; among those psychologists who are not psychometricians, there is openness to the expansion of the concept and measurement of intelligence. Still, psychologists like neat measures of their constructs and there is frustration that the "new" intelligences are not as readily measured as the standard ones. Also, psychologists really think of intelligence as ‘scholastic capacity’ while I am trying to expand the notion of intelligence to extend to all manner of human cognitive capacities.

Scholars are not known for responding generously to new theories, and so I have not been surprised at the considerable criticism leveled at MI theory. Perhaps a more reliable index of reception is the extent to which the theory is cited in scholarly articles and textbooks. Over the years, the theory has been mentioned in innumerable articles and in most texts that touch on issues of intelligence. These references are generally respectful.

Most gratifying has been the response by scholars in the "harder" sciences (such as biology) on the one hand, and in more distant fields (such as the arts and humanities) on the other. The idea of multiple intelligences has considerable appeal across the disciplines, and my particular choice of intelligences is often endorsed. If one wanted to critique the theory, one could point out that these individuals are not expert in the psychology of intelligence. If one wanted to praise the theory, one could point out that these scholars have less of an ax to grind.

Q. Is a rapprochement possible between MI and competing theories?

A. Certainly, to some extent. Aspects of the theory are compatible with propositions put forth by other theorists. I am comfortable with the biocultural approach defended by Stephen Ceci; the emphasis on media and symbol systems adopted by David Olson; the cultural

sensitivity emphasized by Patricia Greenfield; the multi-factorial stance of earlier scholars like L. L. Thurstone. More broadly speaking, the modular approach put forth by psychologists like Steven Pinker, Leda Cosmides and John Tooby, linguists like Noam Chomsky, and anthropologists like Stephen Mithen is quite consonant with the recognition of distinct intelligences.

Recently, the most widely discussed approach to intelligence is the "triarchic" model put forth by Robert Sternberg. Sternberg and I agree more on our criticism of standard intelligence theory than on the directions that new theoretical work should follow. That is, we reject the focus on a single scholastic intelligence that is measured by a certain kind of short answer test. Sternberg proposes three different facets of intelligence—which he labels the componential, the experiential, and the contextual; and he has gone on to devise various measures for each.

Along with most other theorists in this area, Sternberg does not attend to the particular contents with which intelligence operates. That is, it is immaterial to his theory whether the individual is processing words or pictures or bodily information or material from the personal or natural world. Rather, more sympathetic to a "horizontal" view of mind, he assumes that the same components will operate, irrespective of the kind of material that is being processed. Here our intuitions and claims differ fundamentally.

I applaud Sternberg's effort to develop new measures of intelligence. Such measures cannot but help broaden our notions of human capacities. I wish, however, that his new measures were more adventurous. In my view, Sternberg adheres too closely to the kinds of linguistic and logical items that have traditionally dominated intelligence testing; and I predict his new measures will end up correlating quite highly with standard tests and with one another.

In these emphases, Sternberg reveals that he is much more of a psychologist and a psychometrician than I am. And this may explain why his work has been of greater interest to psychologists, while mine has captured the interest of educators and the lay public.

The Structure of Intelligences and their Combination:

Q. Need the intelligences be entirely independent?

A. The theory is simpler, both conceptually and biologically, if the various intelligences are totally independent of one another. Yet there is no necessity that each intelligence be independent of the others; and it may turn out empirically that certain intelligences are more closely tied together than are others, at least in particular cultural settings.

The independence of intelligences makes a good working hypothesis. It can only be tested by using appropriate measures in different cultural settings (see Assessment, above). Otherwise we might prematurely jump to the conclusion that two intelligences are tied together, when in fact the apparent correlation is an artifact of a particular measure in a particular culture.

The reason for underscoring independence is to alert individuals to the possibility that strength in one area does not necessarily signal strength in other areas—and the same goes, of course, for weakness. At a practical level, individuals will show pairs of strengths and weaknesses. Life is interesting, however, because these couples are not predictable...no more predictable than the romantic attraction (or aversion) between two individuals.

Q. How do you know that the intelligences represent the right-sized unit of analysis? Can't each of the intelligences be broken down indefinitely, for example?

A. I question the notion that there is a single, uniquely correct unit of analysis in an area as complex as intelligence. For certain purposes—for example, determining whether a retarded person is capable of benefiting from schooling—a single measure like IQ *might* suffice. On the other hand, if one wants to model what is involved in particular musical tasks, like performing or composing, it is evident that a single construct of "musical intelligence" is far too gross.

In writing about the multiple intelligences, I have always noted that each intelligence is itself comprised of constituent units. There are several musical, linguistic, and spatial subintelligences; and for certain analytic or training purposes, it may be important to dissect intelligence at this level of fineness.

I justify my small set of intelligences on the basis of parsimony and usefulness. If I were to write about dozens of subintelligences, I might well be more accurate in a scientific sense. Yet this move would cause the construct to be unwieldy for educational uses. Moreover, there is evidence to suggest that the subintelligences often work together and support one another; and for that reason, too, it makes sense to speak of 8 or 9 intelligences, rather than 1 or 100.

Q. What about the often noted connection between mathematical and musical intelligences?

A. There is no doubt that individuals who are mathematically talented often show an interest in music. I think that this linkage occurs because mathematicians are interested in patterns, and music offers itself as a goldmine of harmonic, metric, and compositional patterns. Interest, however, is not the same as skill or talent; a mathematician's interest in music does not predict that she will necessarily play well or be an acute critic of the performances of others.

Of equal importance, the imputed link rarely works the other way. We do not expect of randomly chosen musicians that they will be interested, let alone skilled, in mathematics. There may also be a bias in the kind of music at issue. Those involved in classical music are far more likely to be oriented toward science and mathematics than those involved in jazz, rock, rap, and other popular forms.

These observed correlations and lack of correlation suggests another factor at work. In certain families and perhaps also certain ethnic groups, there is a strong emphasis placed on scholastic and artistic accomplishment. Youngsters are expected to do well in school and

also to perform creditably on an instrument. These twin goals yield a population with many youngsters who stand out in math and music. There may be other common underlying factors, such as willingness to drill regularly, an inclination toward precision in dealing with marks on a piece of paper, and a desire to attain high standards. One would have to sample a wide variety of skills—from being punctual to writing cogent essays—before jumping to the conclusion that a privileged connection exists between musical and mathematical intelligence.

Q. What about capacities that cut across the different intelligences, such as memory?

A. I am skeptical about the existence of horizontal faculties—faculties like memory or attention or perception that are alleged to operate equivalently across all kinds of content. In my view one of the most important discoveries in the cognitive and brain sciences is that the mind is better viewed in a *vertical* way: as a set of faculties geared to particular contents in the external world and in human experience.

Looking more specifically at memory, considerable neuropsychological evidence documents different kinds of memory: immediate memory, short term memory, long term memory, semantic (or generic) memory, and episodic memory (memory for particular events), procedural memory (knowing how) and propositional memory (knowing that). These memories reflect different psychological processes and are served by different neural centers. There is convincing neuropsychological evidence that linguistic memory can be separated from musical memory, memory for shapes, faces, bodily movements and the like. The notion of a single unitary memory falls apart under closer inspection.

It is instructive to consider what one means in speaking of "memory". Usually this statement means that the person in question has a good linguistic memory—he or she can remember names, dates, definitions. We generally do not have a clue about whether such a person is equally facile at remembering visual patterns, musical patterns, bodily movements, or the way that he or other persons felt at a recent social event. Each of these skills may have its own mnemonic process, quite unrelated to the others.

Q. How can diverse and independent intelligences function effectively without a leader or executive?

A. A theory that does not posit an executive function has certain advantages over one that does. Such a theory is simpler; it also avoids the specter of infinite regression—the question of who or what is in charge of the executive? Nor does effective work require an executive. Many groups—be they artistic or athletic—perform well without a designated leaders; and an increasing number of work teams are organized heterarchically rather than hierarchically. Complexity theory documents how well organized entities can arise naturally without the need for a ‘master plan.’

The question of an executive—what I have sometimes called a "Central Intelligences Agency"—needs to be considered on the theoretical and practical planes. On the theoretical plane, the question is whether behavior is better modeled as the result of some kind of

executive function. That executive function could be "smart"—intentionally making well-motivated decisions—or "dumb"—simply a traffic cop that ensures that two antagonistic processes are not going off simultaneously. Considerable evidence suggests that such executive functions are handled by structures in the frontal lobe. The "modeler" must then decide whether to consider this a separate intelligence, or an emergent from other intelligences, such as the intrapersonal intelligence. At present, I lean toward the latter alternative.

At a practical level, we need to ask how individuals can best organize their activities and their lives. Here there are vast and interesting individual differences. Some individuals are quite reflective and "meta-cognitive": they are immersed in self-conscious planning, and this planning can be of considerable aid in accomplishing goals. Other individuals are more intuitive: they know what they want to do and they just accomplish their business when they find themselves in the appropriate context. It is said that Dante and Shakespeare had minds so fine that they were never violated by a thought. If this statement has meaning, it suggests that neither craftsman devoted much time to obsessing about what to do, when to do it, and how to do it; he just waited until he was prepared to commence his creations, and then did his job as well as he could.

Ultimately, I have no objection if individuals find it useful to invoke some kind of an executive function. For modeling purposes, I find it useful to see whether one can explain human behavior in the absence of such hierarchical considerations; or whether the hierarchy can emerge naturally, as part of everyday functioning, rather than by invoking a separate executive intelligence.

Q. What of a general capacity called "critical thinking?" Isn't this important in today's society? Shouldn't we have courses that help youngsters to develop such a faculty?

A. As with the executive function, I am not irredeemably opposed to the notion of critical thinking. Indeed, I would like myself, my children, my students, and my friends to think critically, and anything that can aid in that process should be encouraged.

I doubt, however, that there is a particular species of thinking called "critical thinking." As I've suggested with reference to memory and other putative "cross-the-board" capacities, closer analysis calls their existence into question. Particular domains seem to entail their own idiosyncratic forms of thinking and critique. Musicians, historians, taxonomic biologists, choreographers, computer programmers, and literary critics all value critical thinking. But the *kind* of thinking required to analyze a fugue is simply of a different order from that involved in observing and categorizing different species, or editing a poem, or debugging a program, or creating and revising a new dance. There is little reason to think that training of critical thinking in one of these domains is of the same order as training of critical thinking in another domain; nor would I expect appreciable "savings" or "transfer" when one broaches a new domain. That is because each of these domains exhibits its own particular objects, moves, and logic of implications.

To be sure there may be certain habits of thought that are useful across domains. One can

get purchase from so-called "weak moves" like taking one's time, considering alternatives, brainstorming, eliciting critical feedback from sympathetic peers, putting work aside for while when she hits a snag, and so forth. Such habits of mind ought to be cultivated early and widely. But even these habits must be practiced explicitly in every domain where they are applicable; indeed, they are called "weak" precisely because they do not in themselves get you very far. It is unrealistic to expect that the individual who takes her time in, say, investing in the stock market will necessarily do so when completing her homework or falling in love.

For these reasons, I do not place much stock in courses that feature critical thinking per se. I much prefer that critical thinking be featured in each and every course or activity where it could prove valuable. Courses that help individuals to draw on these lessons can be helpful; courses that are expected to substitute for, or render unnecessary, the modeling of critical thinking in particular domains strike me as a waste of time. Ultimately, the surest road to critical thought "across the board" is a regimen where critical thinking is inculcated in one discipline and domain after another.

I often encounter the greatest resistance to this perspective when I speak to mathematicians or logicians. To these individuals, thinking *is* thinking wherever you encounter it; if one knows how to be logical, one should be able to apply logic everywhere. (And if you don't, life is hopeless!) No doubt mathematics and logic merit our admiration precisely because those domains strive for the greatest generality for the propositions and patterns that they feature. However, neither in their practice nor in their person do such individuals epitomize what they believe. Often these individuals prove to be quite impractical or illogical in their own personal lives. Or, equally suspect, they seek to apply logical approaches in areas where they are manifestly inappropriate, such as in pursuing a love relation; in dealing with a difficult student, child, or colleague; or even, as we have seen with reference to both Vietnam and the Middle East, when foreign policy is set in light of Rand Corporation-style algorithms. Psycho-logic turns out to be quite a different affair from mathematical logic.

Q. Is there an artistic intelligence?

A. Strictly speaking, there is no artistic intelligence. Rather, intelligences function artistically—or nonartistically—to the extent that they exploit certain properties of a symbol system. Should an individual use language in an ordinary expository way, as I am doing here, he is not using the linguistic intelligence in an aesthetic way. If, however, language is used metaphorically, expressively, or in a such a way as to call attention to its formal or sound properties, then it is being used artistically. By the same token, "spatial intelligence" can be exploited aesthetically by a sculptor or painter, non-aesthetically by a geometer or a surgeon. Even music intelligence can function non-aesthetically, as when bugle calls in the armed services are used to summon individuals to a meal or the raising or lowering of the flag; and many patterns designed by mathematicians for mathematical purposes have ended up on display in art galleries.

Whether an intelligence is deployed for aesthetic purposes represents a decision made by an individual and/or her culture. An individual can decide to use linguistic intelligence in the

manner of a lawyer, a salesperson, a poet, or an orator. However, cultures also highlight or thwart artistic uses of intelligences. In some cultures, almost everyone writes poetry, dances, or plays an instrument; in contrast, Plato sought to eliminate poetry from his Republic while Stalin scrutinized every poem as if it were a diplomatic note.

Of course, informally, it is perfectly all right to speak of artistic intelligences. I do this myself, particularly as a shorthand for those intelligences that are frequently mobilized for artistic ends. In this context it is worth noting that multiple intelligences ideas have grown comfortably in schools which highlight the arts; and "MI" ideas seem an uncomfortable stretch in schools where the arts have been minimalized or marginalized.

Group Differences:

Q. Are intelligences the same in quality or quantity across groups? For instance, do men exhibit profiles of intelligence that differ from women? And how about different racial or ethnic groups?

A. This is a potentially explosive question. I suspect that if intelligence-fair tests were developed, they would elicit differences across gender and other readily identifiable groups. Even should such differences be found, however, it is unclear how to interpret them. Women might perform worse than men on spatial tasks in the West; but if there existed an environment where spatial orientation were important for survival, then such differences might disappear or even by reversed. Apparently, this erasure of gender differences happens among the Eskimos. By the same token, the gender difference regularly found in mathematics scores on standardized tests in the West is reduced in Asian populations, where, indeed, Asian women often score better than do Western men.

Additionally, there exists the intriguing question of whether men and women use their intelligences in identical ways. In lower mammals, there is evidence that spatial orientation is mediated by landmarks for females and by body position for males; there are suggestions that a similar difference may be found in human beings. And there is the question of whether men and women prioritize intelligences in the same way. Carol Gilligan's pioneering work on moral judgments suggests that women play a higher premium on interpersonal considerations, while men are more likely to draw on logical-mathematical thinking.

In my own work, I have elected not to pursue this question. So often, apparent group differences have been exploited for politically dubious ends—as happened once with Multiple Intelligence Theory. (A state in Australia issued documents claiming that people of different ethnic and racial backgrounds had different profiles of intelligence. I am glad to say that the educational program in question was cancelled). I prefer not to provide additional ammunition for such efforts. In any event, should investigations demonstrate replicable differences among groups, I would regard these differences as starting points for imaginative efforts at remediation, rather than proof of inherent limitations within a group.

Q. Does the theory of multiple intelligences apply to other species and to artificial intelligence?

A. This is an intriguing subject. I've suggested that my list of intelligences is one way of characterizing human intellect. However, it also offers a set of categories which be applied to other entities that might be deemed intelligent.

One could conduct an inventory of intelligences and then apply them to other organisms. Such an inventory might reveal that rodents have considerable spatial intelligence, that primates have superior bodily-kinesthetic intelligence, and that birds exhibit musical intelligence. Perhaps some species—like bats or dolphins—exhibit intelligences that are unknown or not developed in human beings. And certain intelligences—like intrapersonal or existential—may be the exclusive purview of human beings. In *A Year at the Races* (2004) the novelist Jane Smiley has applied MI theory to an analysis of the intelligences of horses.

We already know that highly intelligent computer programs have been created. There are programs that compose music, carry out complex calculations, defeat chess champions in mind-to-mind combat. Whether computers can also develop personal intelligences is a subject of considerable dispute. Many experts in artificial intelligence believe that it is just a matter of time before computers exhibit intelligence about human entities. I personally feel that this is a category error. One cannot have conceptions of persons in the absence of membership in a community with certain values; and it seems to me an undue stretch to attribute such a status to computers. However, in some years, both humans and computers may chuckle at my ignorance.

Intelligence and the Life Course:

Q. What happens to multiple intelligences during later life?

A. In many ways, the multiple intelligences seem a particular gift of childhood. When we observe children, we can readily see them making use of their several intelligences. Indeed, one of the reasons for my enthusiasm about children's museums is their evident cultivation of a plethora of intelligences. Nowadays, the children's museum simply has a better fit with the minds of children than does the average school.

It could be that multiple intelligences decline in importance as well as in visibility. But I believe that quite the opposite is true. As individuals become older, our intelligences simply become internalized. We continue to think differently from one another—indeed, differences in modes of mental representation are likely to increase throughout active life. These differences are simply less manifest to outside observers.

Consider, for example, what happens in the average high school or college classroom. The teacher lectures, the students remain in the seats, either taking notes or looking vaguely bored. One might easily infer that actually no processing is going on, or that all the process is linguistic in nature.

However, once it comes to representing disciplinary skills or contents, the individual is free to make use of whatever representational capacities she has at her disposal. A lecture on

physics might be represented in language, in logical propositions, in graphic form, through some kind of kinetic imagery (that is how Einstein thought about physics) or even in some kind of musical format (the Greeks stressed the parallels between musical and mathematical forces). Individuals may also take all kinds of notes and use disparate aids to study and recall.

The recesses of our mind remain private. No one can tell the mind exactly what to do. As I see it, the challenge to the mind is somehow to make sense of experience, be it experience on the street or in the classroom. The mind makes maximal uses of the resources at its disposal—and those resources consist in our several intelligences.

Educational Issues:

Q. I've heard it said that there is no proof that MI schools work. What's the evidence on that?

A. In terms of claims, "soft" data and "hard" data, there is much evidence that schools influenced by multiple intelligences theory are effective schools. The testimonials from satisfied administrators, parents, students, and teachers are legion. And many of the classes and schools claim that students are more likely to come to school, to like school, to complete school, and to do well in various assessments.

But there are problems with this evidence. It is almost entirely based on self-reports. We would not expect individuals who did not like MI theory to spend much time reporting their failures. We would expect individuals who like MI theory to chronicle its positive effects.

Even if these claims could be independently substantiated, however, we would not know for sure just which effects are due to MI theory. Schools are incredibly complex institutions, located in incredibly complex environments. When numbers or performances go up or down, it is easy to attribute these "highs" or "lows" to one's favorite hero or villain. But absent the kind of controlled studies that are almost impossible to mount outside of medical settings, it is simply not possible to *prove* that it was MI that did the trick.

For these reasons, I have been reluctant to claim that MI is a proved changer of schools. I had thought that I might be admired for this reticence; but instead my silence has been perceived in many quarters as a sign that MI does not work, or that I disapprove of what is being done in MI schools.

Recently, however, we have an important new resource. Mindy Kornhaber and her colleagues undertook the SUMIT project (Schools Using Multiple Intelligences Theory). The research team studied a set of forty-two schools that had been using MI theory for at least three years. The results from these schools were very encouraging. 78% of the schools reported positive standardized test outcomes, and 5/8 of these attributed the improvement to practices inspired by MI theory. 78% of the schools reported improved performances by students with learning difficulties. 80% of the schools reported improvement in parent participation, and 3/4 of these attributed the increase to MI theory. Finally, 81% of the schools reported improvement in student discipline, and 2/3 of these attributed the

improvement to MI theory. Even if these figures show a positive spin, they are based on hard data; and it is not possible for an impartial party to dismiss these results.

I strongly recommend the book *Multiple Intelligences*, by Kornhaber, Fierros, and Veenema, published in 2004.

Q. How might your multiple intelligences have a positive impact on public schools in the U.S. and elsewhere?

A. Briefly, my theory can reinforce the idea that individuals have many talents that can be of use to society; that a single measure (like a high stake test) is inappropriate for determining graduation, access to college, etc.; and that important materials can be taught in many ways, thereby activating a range of intelligences.

Q. Do you think we should be able to freely choose what courses we take? Or do you favor a uniform curriculum for all students? In other words, should I be able to decide to take four humanities courses and zero classes in the sciences, or should somebody tell me I *have to* take two science courses and two in the humanities?

A. In general at the secondary level, everyone should study some history, science, mathematics, and the arts. It is not important to me *which* science is taught—I am much more interested in students learning to think *scientifically.* Similarly, it does not matter that much which history students learn, though they certainly ought to be acquainted with their own country. What matters is that the student have some sense of how historical studies are carried out; what kinds of evidence are used; how history differs from literature on the one hand, and from science, on the other; why each generation rewrites history and there can never be a *definitive* history.

For more on disciplinary study, see my 1999 book *The Disciplined Mind.*

Q. You prefer depth over breadth. Do you think students might not learn enough with this approach, and graduate with major gaps in their knowledge? For example, if a history class were to focus deeply on World War I, and thus not have time to cover Vietnam?

A. Your point has some validity. However, to follow your example, it is more important that students learn how to think like a historian, and how historians handle data and draw conclusions. This can only come from in depth study of a manageable number of topics. If the teaching of history were well coordinated throughout K-12, we could certainly learn about all the topics that you mention. The problem now is that a student might study the American Revolution four times and never learn about the French or Russian revolutions at all.

Q. You have written that “cultural education is better left to after school or weekend options.” Do you have suggestions as to how to handle this aspect of education?

A. The best way to learn about diversity of cultures is to spend actual time with individuals from different backgrounds, and to see adults from different backgrounds work together with one another productively. Reading and lecturing have little meaning, apart from this face to face contact and interaction.

Q. You once said that most students do not want to continue with school after the age of 15 or 16 and that society would be better served if they did something productive in the real world. Do you suggest that we should just do away with high schools? Since this is probably too radical, do you think there should be less time spent in the classroom and more time spent in the "real world?" Should students spend time as apprentices or interns gaining experience instead of listening to a lecture?

A. I love school and at age 61 have never left. I am delighted at those who like to learn in an academic way. But that is not for everyone, and it is certainly not for every 16 year old. I am much more interested in youngsters being productive and learning *something* well than remaining in school when they want to be elsewhere. When they are ready to return to school and to learn what you learn best in school—whether they are 16 or 61—that is the time to return.

Q. Can you recommend techniques for teachers to identify their students' strengths?

A. If you want to get to know your students intelligences during the first weeks of school, I have two suggestions:

l. Take them to a children's museum a few times (or some other kind of rich experience like a playground with many kinds of games) and watch them carefully. This will complement what you observe in class.

2. Give a small questionnaire about their strengths to the students themselves *and* their parents *and*, if possible, last year's teacher. To the extent that all three report the same strengths and weaknesses, you are on pretty safe ground. I don't trust self reports unless they are corroborated.

Q. How can I teach multiple intelligence in a creative and innovative way to a group of new teachers?

A. See the writings of Tom Hoerr at the New City School in St Louis.

Q. Do you have scholarship or grant funding available for visitors or external projects?

A. Unfortunately, my office does not have access to any grant or scholarship funding for education or research projects, whether at Harvard or elsewhere.

Q. We were wondering what you might say to an adolescent who tends to get high grades and seems ambitious, but who is doubting himself/herself because of poor SAT and IQ test scores.

A. SATs measure a certain blend of linguistic and logical intelligence. Your SAT score has a tiny bit of predictive power about college success in the first year of college, but your class rank and school grades are a much better predictor. There are ways to 'prep' for the SAT and you should avail yourself of those opportunities. The far more important questions are: What do you want to do with your life? Are you learning the kinds of things that will allow you to be successful? While no one should ignore 'selection instruments' like the SAT, you should not permit them to obscure these far more important questions. If you are learning and making progress toward your life goals, then you should not worry too much about your scores on one instrument. If you are not learning and not making progress toward your life goal, neither a high SAT score nor a high IQ will do you much good.

Q. What role does MI theory play in promoting the implementation of the American curriculum standards?

A. At present, the American curriculum standards have no close link to MI theory. Of course, I regret this. But individuals who are charged with implementing the curriculum standards sometimes embrace the MI ideas. They then try to teach important disciplinary understandings and concepts by drawing on several of the intelligences (see Chapters 7-9 of my book *The Disciplined Mind* for examples of how to do this); they also try to build on students' individual strengths, using those strengths either as a privileged way to teach to the standards, or as ways of building up the students' confidence and sense of efficacy so they are more willing to take on difficult materials.

Q. Can MI approaches aid in the teaching of foreign languages?

A. Initially I was skeptical that MI approaches could be much help in learning of foreign languages. I saw mastery of languages as a function either of the opportunity to live in a setting where one is compelled to use the language; or of extensive drill and practice in a language laboratory.

But all over the world teachers of foreign languages (including English as a second language) tell me that foreign language instruction is enhanced by MI theory. To mention just a few ways: linguistic structures present in one language but not in another (e.g. cases in Romance languages) can be conveyed in several ways, drawing on several intelligences; vocabulary and appropriate syntax is most readily learned when students are engaged in activities (like dancing or drawing or debating) that draw on their favored intelligences; students learn best when they converse about topics about which they are knowledgeable, and those topics often are ones that use a characteristic blend of intelligences. Even drill-and-practice can be more effective if the various intelligences are drawn upon (e.g. in singing, dancing, creating different kinds of lists, etc.).

One place to read more about this is a special issue on multiple intelligences, issued by the *Teachers College Record* in January 2004. See the article by Marjorie Hall Haley and the references cited therein.

Q. How might technology be used to support the use of MI?

A. For discussion of technology and education, see related papers available for download on the 'papers' page of this website.

Q. Do you know of any research regarding MI Theory and adult education?

A. For information about the use of MI at the college level, see *Multiple Intelligences, Howard Gardner and New Methods in College Teaching: Papers From the fifth annual Urban Conference: Pedagogical Innovations in Higher Education*, C. Coreil, editor. For information about adult education, see *Multiple Intelligences and Adult Literary: A Sourcebook for Practitioners*, by Julie Viens and Silja Kallenbach.

For more information about Howard Gardner and Multiple Intelligences, try visiting our links page. Gardner's three principal books about Multiple Intelligences are *Frames of Mind* (editions 1983/1993/2004), *Multiple Intelligences: The Theory in Practice* (1993), and *Intelligence Reframed* (1999).

A list of all of Dr. Gardner's books is available here, as well as downloadable versions of selected research papers.

Biographical information is also available for download.

For information about the GoodWork Project, please visit www.goodworkproject.org.

For information about the Interdisciplinarity Project, see the papers available on the GoodWork Project website.

For information about Project Zero, please visit: www.pz.harvard.edu.

For information about the Harvard Graduate School of Education, please visit: www.gse.harvard.edu.

See the appearances page for information about requesting a speaking engagement, and for a list of upcoming public events featuring Dr. Gardner.