# To Be or To Do: *Is a Gifted Child Born or Developed?*

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*It is genuinely and rightly considered a virtue in a teacher to observe accurately the differences in ability among his pupils, and to discover the direction in which the nature of each particular pupil inclines him. There is an incredible amount of variability in talent, and the forms of minds are no less varied than the forms of bodies.*

–Quintilian, The Ideal Education, c. 90 A.D.

Imagine the scenario: as students file into my 7th grade or college classroom, I require that they hand over to me verification of their individual IQs. Reading these, I seat the students accordingly–the highest IQs in the front rows, where they will hear everything I say and be able to converse with others of equal intellect, and the lowest IQs relegated to that wasteland of educational promise, the back of the class. No need to squander my own intellectual prowess and instructional magnificence on students who won't be able to do much with them anyway. If the people in my classes don't have the genetic wherewithal to compete with real brains, I'll do the best I can with their limited potential, but they certainly won't be the focus of my energies.

Absurd? You bet. But, in a way, so is the premise of this Point/Counterpoint proposition— "Is a gifted child born or developed?"—for if human beings were complete packages when they were born, where the role of development meant nothing at all, we would need neither teachers nor parents, but merely caregivers who provided only the most rudimentary accoutrements to keep our bodies alive. The brain would manage on its own, to the extent of its innate capacity. In effect, no amount of enrichment, exposure, or environmental stimulation would turn that intellectual sow's ear into a cherished silk purse. Conversely, those endowed with fine minds at birth would need little tutelage, for as surely as a seed planted in the ground will blossom into its full, innate potential, nothing can stop the gifted intellect from becoming strong.

So, is this Point/Counterpoint little more than another review of the age-old nature/nurture controversy? I certainly hope not, for the boards of this controversial argument have been trod by those much more schooled than I in the scientific dissection of the human mind. Instead, I believe this column asks a different, though related, question: In our quest to serve the identified gifted students in our classrooms, have we diluted the concept of giftedness so much that the needs of truly gifted children remain unmet?

So, who are the truly gifted?

> [Howard Gardner]...never provides any empirical evidence for his esoteric and quite unrealistic notions. No wonder he gained high academic acclaim and a strong partisan following—you only have to attack the IQ to become famous and popular; however nonsensical the attack, and however weak the alleged evidence for your own systems! (Eysenck, 2000, p. 109)

The dumbing down of giftedness in our schools began when two major proponents of expanded concepts of intelligence, Joseph Renzulli and Howard Gardner, put forth ideas that were based more on political expediency than on scientific evidence. Believing that current efforts to identify giftedness in children were too limited by using IQ as a determining factor, each man went on to propose radical shifts in our thoughts about what intelligence is, what it looks like, and how it is measured. Renzulli (1978) conceptualized giftedness as a confluence of three traits (above average intelligence, creativity, and task commitment), all marks of high achievement in the adults whose lives he analyzed. What he has not done, though, is to show any correlation between these later life achievements and the childhood traits or experiences possessed by children of various IQs. Renzulli's work did allow more children to be identified for gifted services in schools, and this was assumed by many to be a good thing. Still, other than the "feel good" vibrations one gets when opening up the world of gifted child education to a broader band of students, there remains a gap in our knowledge base as to whether children whose IQs are above 130 are faring better now than they did when giftedness was seen as a statistical rarity, not a populist concept. Anecdotal evidence (the same type compiled by Renzulli in his "3 Ring" conception of giftedness) from researchers of high-IQ individuals (Gross, 1993; Morelock, 2000) shows glaringly just how apart many "truly" gifted students feel from their less-able counterparts.

Likewise, Gardner dismisses the importance of *g*, the underlying ability to reason logically and critically first coined by Charles Spearman in 1904, as anachronistic and spurious. In *g*'s stead, Gardner invents an ever-increasing collection of independent "multiple intelligences." Gardner's work has been widely accepted as dogma by many, but it has also been critiqued negatively by respected psychologists, both directly and obliquely, as follows.

Directly:

> Gardner wrote *Frames of Mind* in 1983, and *Multiple Intelligences* in 1993....Both rely entirely on assertions ("What I say three times is true"), and give no evidence for the alleged independence of his alleged "frames of mind." (Eysenck, 2000, p. 206)

Obliquely:

> We interpret the preponderance of evidence as overwhelmingly supporting the existence of some kind of general factor in human intelligence. Indeed, we are unable to find any convincing evidence at all that mitigates against this view. (Sternberg & Gardner, M. K., 1982, p. 250)

Renzulli's and Gardner's opinions—not theories— on intelligence and giftedness have bamboozled the field of gifted child education for the past generation. The result has been a watering down of options for students who had once been identified as gifted in the old-fashioned individually administered-IQ way. Instead, students are now selected as gifted on the basis of "validity chal-

lenged" group IQ measures and teacher recommendations of suspect quality. Ironically, an IQ of 130+ might no longer qualify a student as gifted, while a child with a 115 IQ and a lot of "task commitment" or "kinesthetic intelligence" might be selected instead. Indeed, in diluting the bathwater, we have also disposed of the baby!

Gifted programming, too, has changed in a negative direction, with fewer and fewer self-contained or "pull-out" classes being offered, while a proliferation of differentiation strategies for use by all students within a regular classroom has emerged as the preferred format for serving gifted students in schools.

There goes that baby again, for instead of adding to our repertoire of options for meeting the needs of gifted students in our schools, we have eliminated the very programs that have served them well (Rogers, 2002)! Metaphorically speaking, the net for finding gifted children in our schools has been cast wider, but now, into more shallow waters. In doing so, proponents of these inclusive plans are ignoring mountains of evidence related to the genuine distinctions between those children who are "truly" gifted and those (...dare I say it?) who are not gifted.

## Scientific Evidence on the Heritability of Intelligence

Although this Point/Counterpoint column is far too brief for a full discussion of both the historic and current evidence on the heritability of IQ, a few studies are worth mentioning. Francis Galton's work in the mid-1800's was among the first to examine the issue of nature versus nurture. By measuring the circumference of one's head, as well as investigating the family backgrounds of 1,000 eminent persons, Galton asserted that "there is no escape from the conclusion that nature prevails enormously over nurture." (Galton, 1883). Interestingly, more modern scientific research evidence supports Galton's findings. Today, instead of measuring head circumference, magnetic resonance imaging (MRI) is able to measure actual brain size. There is a moderately high correlation (0.45) between brain size and IQ, leaving much room for other determinants of high intellect, but adding credence to Galton's 100+-year-old observations. Too, scientists have explored the correlation between measures of speech perception (Event-related perceptions, or ERPs) in infants and their later performance in school. As reported, "Auditory ERPs recorded within 36 hours of birth can be used to successfully discriminate, at well above chance levels, the reading performance of children 8 years later." (Molfese & Molfese, 1997). In studies conducted by other scientists, it was assumed that the influence of genetics on measured intelligence would diminish with age and more exposure to environmental influences. In fact, the opposite is true. As reported by Gottfredson (2003), the heritability of intelligence increases with age, from 20% in infancy, to 60% by adolescence, to 80% by adulthood. As she concludes, "This is a truly astonishing finding" (p. 33). Lastly, in the ever-popular studies of adoptive children, a repeated finding is that "with age, [adopted siblings] become less like their environmental siblings and parents but more like the biological ones they have never met. By adolescence, adoptive siblings are no more alike than strangers" (p. 33).

The evidence regarding the genetic influence of high IQ answers the question "To be or to do" most conclusively: giftedness, as measured by high IQ ("the single most valid indicator of potential in educational, occupational, economic and social endeavors" [Tannenbaum, 2003, p 49]) is definitely a "to be" phenomenon. To decide otherwise goes against conclusive-and growing-scientific findings conducted by individuals who have no vested interest in selling a trendy, inclusive view of giftedness to school personnel who have grown uncomfortable with handling the political fallout from declaring giftedness as a providence of the few, not the many.

## Conclusion

Leta Hollingworth said it well:

> Schools cannot equalize children; schools can only equalize opportunity. It may well be thought to be highly undemocratic to provide full opportunity for the exercise of their capabilities to some, while to others the same offering means only partial exercise of their powers. It is hard for a psychologist to define democracy, but perhaps one acceptable definition might be that it is a condition of affairs in which every human being has opportunity to live and work in accordance with inborn capacity for achievement. (1922, p. 29)

"Inborn capacity": a term describing the genesis of giftedness from a decidedly politically incorrect viewpoint. Still, just because the truth is inconvenient, it is still a reality. No one argues that height, hair color, facial features or personality quirks have some basis in biology. Yet when it comes to documenting the source of intelligence, many people cower from the truth—that the genetic predisposition to be smart is strong and real.

As we look ahead as to how we can best serve our world's gifted students, let us first look for multiple ways to identify their intellectual abilities. Let us recognize that although IQ tests are not going to measure the innate potential of some of our students, they will do well what they have done for more than 100 years: reveal the incredible intellectual abilities of many of our students. And once we discover that there are children whose IQ test scores place them in the top 1-5% of all people their age who have ever taken these tests, let us not ignore the real challenges this finding presents to parents, educators and the children themselves.

I have studied, counseled, taught, raised, and admired gifted children for 27 years. To tell me that their intellectual needs aren't unique, or that almost "everyone is gifted in some way," is more than a denial of reality, it is a decision of disrespect.

First and foremost, gifted children are children—always have been, always will be—but should we choose to ignore their innate capabilities and the impact of this intellectual acumen on the lives they lead now and will lead as adults, we are being naïve, duplicitous and ignorant.

Giftedness is not simply what one does, it is who one is.

To be.

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# A Response to Howard Gardner: Falsifiability, Empirical Evidence, and Pedagogical Usefulness in Educational Psychologies

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I appreciate Professor Gardner's response to my article. I will reply to most of his comments sequentially.

## INTRODUCTION

In my critique, I argued that explanations based on multiple intelligences (MI) theory are tautologous (Klein, 1997, pp. 378–379). Gardner (1998, p. 96) countered that in doing so, I confused domains with intelligences. I did not; the distinction between these two concepts appeared throughout my paper (e.g., pp. 377, 381, 387). For example, on pages 386–387, I fairly describe Gardner's preferred level of analysis as a focus "on moderately *general* intelligences that address broad *domains* of knowledge" (italics added). So, Gardner and I agree that each "intelligence" is not equivalent to the domain or domains in which it explains performance; instead, each is equivalent to *ability* in its corresponding domains. The tautology derives from the fact that Gardner defined each intelligence as an ability in a corresponding set of domains, then explained the ability in each domain with reference to the intelligence. For example, "bodily-kinesthetic intelligence" is defined as "the ability to use one's body in highly differentiated and skilled ways, for expressive as well as goal-directed purposes . . . [and] to work skilfully with objects" (Gardner, 1993, p. 206), or for brevity here, "the ability to use one's body." But Gardner uses bodily-kinesthetic intelligence to explain ability in domains of physical activity that "use one's body." This reduces to: "the ability to use one's body" explains "the ability to use one's body." The same analysis applies to other intelligences: Why are some people good at composing or interpreting music? Because they have high musical intelligence. What is musical intelligence? It is the ability to compose and interpret music (Gardner, 1993, Chapter 6).

Gardner's second objection to the tautology critique is that the possession of an intelligence alone does not mean that one will succeed in a domain that relies on it; other conditions must be met, such as the need for practice. His comment is true, but not relevant, because it applies to both halves of the tautology equally. For example, just as someone with high "bodily-kinesthetic intelligence"

requires practice to actually become a good dancer, someone with the "ability to become a good dancer" requires practice to actually do so.

This example raises a third point that I should clarify: explanations of ability in specific domains, such as dance, in terms of a more general MI construct, such as "bodily-kinesthetic intelligence," are not, strictly speaking, tautologies.[1] This is because "bodily-kinesthetic intelligence" is used to explain performance in a variety of physical activities, rather than in any one specific activity, such as dance, alone. However, the MI explanation of dance remains uninformative, because it instantiates the tautologous, general claim that "bodily-kinesthetic intelligence" explains ability in physical activities.

Concerning "size of unit and scholarly goals," Gardner and I agree that one can accept psychological constructs at various levels of analysis (Gardner, 1998, pp. 97–98; Klein, 1997, pp. 386–387). So, I have no idea why he complains that I "cannot have it both ways" when I acknowledge the moderate influence of general intelligence on human activities, as well as the strong influence of specific knowledge. In any case, my critique of MI is based on the problems of this theory, not on its conflict with any other theory. Gardner claims several virtues for MI on page 98. I deal with most of these in the sections that follow.

## CONCEPTUAL ISSUES

Using Gardner's numbers, I take up point 2 first, then points 1 and 3 together.

In point 2, Gardner mistakenly takes me to question how the concept of mammal can be construed nonlinguistically. To clarify the problem that I actually raised, MI ascribes each concept to a substantive "intelligence" (e.g., "naturalist's intelligence"), and to a semantic "subintelligence" of "linguistic intelligence," which presumably also represents concepts. However, these intelligences are supposed to be distinct entities. Therefore, assigning the concept to both would be oddly redundant and disjointed. Other possible solutions to this MI problem also pose difficulties (cf. Klein, 1997, p. 380).

In point 3, Gardner claims that intelligences can be both independent and interactive. An instance of this claim is his point 1, that intelligences refer both to their own content and to operations that can be brought to bear on other content as well. The context of my objection is that most psychologists have treated abilities like those of MI as bodies of knowledge (e.g., Case, 1991; Ericsson & Charness, 1994), or as "components" of intelligence (e.g., Carroll, 1993). Gardner has signalled an extreme position by calling these abilities intelligences, implying that they are distinct entities in themselves. He has underscored this position by claiming that the intelligences are content-specific "modules" (e.g., Gardner, 1993, pp. 280–285). Modules are neurological structures that receive specific kinds of information from, and feed them to, other modules with which they are in line. In speech, for example, semantic and syntactic choices feed into phonological choices. However, by definition, a module carries out its own operations relatively autonomously; it does not share information with other modules to which it is parallel (e.g., Garfield, 1994). So, it is somewhat contradictory for Gardner to claim that the intelligences are modules, and that they interact and operate on one another's content. Gardner's counter-example of the quartet in which independent musicians interact is unconvincing, because the musicians do just what parallel modules do not do: they monitor and respond to one another's activity.



Consequently, because MI makes three paradoxical, and perhaps contradictory, claims, it is fundamentally ambiguous. The first and most essential claim of MI is that there are several relatively independent, coherent content-specific cognitive modules, called intelligences (e.g., Gardner, 1993, pp. 280–285). This claim, by itself, represents the strong version of MI theory. The second, more peripheral, claim is that these intelligences interact, operating on one another's contents (e.g., Gardner, 1998, p. 99). The third, equally peripheral claim, is that each intelligence consists of subintelligences that can operate independently (e.g., Gardner, 1998, p. 97). These three claims, taken together, comprise the weak version of MI theory (cf., Klein, 1997, pp. 380–381, 390). They generate ambiguity because given any particular issue, one does not know whether to expect that the intelligences will act independently or interactively, nor whether the subintelligences of any intelligence will act coherently or independently.

This ambiguity makes it difficult, perhaps impossible, to either prove or disprove MI theory; in Popperian terms, it is unfalsifiable. If evidence shows that, contrary to the essential claim of MI, the proposed intelligences are not relatively independent, an MI theorist can explain this away by claiming that they interact. Conversely, if evidence shows that, contrary to the essential claim of MI, a proposed intelligence does not operate as a relatively coherent entity, the MI theorist could explain this away by claiming that each intelligence has independent subintelligences. The point is that MI can be reconciled after the fact to almost any imaginable phenomenon. For example, Gardner (1998, p. 99) states that strength in one intelligence does not predict strength in others, and that correlations among the intelligences will disprove the theory (Gardner & Walters, 1993a, p. 38). But contrary to this, he also states that intelligences can correlate (Gardner & Walters, 1993a, p. 42), and believes that general intelligence is compatible with MI, although the former is predicated on correlations among the intelligences of the latter (Gardner, 1998, p. 97). For further examples of MI's unfalsifiability, see the Empirical Issues section below.

However, two points temper this criticism. First, Gardner makes some specific predictions, and identifies evidence that would disconfirm MI theory (e.g., Gardner, 1998, p. 99). If he maintains these predictions consistently, MI will become testable. Second, although Gardner's claim that each intelligence can operate on "other content" clearly violates the gist of his theory, he has offered the beginning of a partial solution to this contradiction. He explains that when a student, for example, uses a spatial representation to solve a mathematical

problem, she is not working on the mathematics per se, but on a spatial metaphor that represents part of the mathematical idea (Gardner & Walters, 1993b, pp. 32–33). This suggestion exemplifies a moderate version of MI theory, and invites further development.

## EMPIRICAL ISSUES

MI claims the existence of middle-level structures, between the level of general intelligence and the level of specific knowledge concerning each domain of activity. Gardner has reviewed copious evidence that general intelligence alone cannot explain human achievement (e.g., Gardner, 1993) but has offered little evidence that such achievements are best explained by the middle-level structures MI delineates. Specifically, as I argued in my critique, he has offered some evidence concerning the independence of intelligences, but almost none concerning their coherence. His reply continues this pattern.

1. Gardner originally claimed that exceptional individuals (geniuses) provide evidence for MI theory by exemplifying high levels of one intelligence or another (e.g., Gardner, 1993, pp. 9, 63–64). I argued that the abilities of such individuals do not correspond to the intelligences of MI theory (Klein, 1997, p. 381). To refute this argument, Gardner would need to explain how geniuses provide evidence for the independence and coherence of MI's structures. Instead, he presents a second explanation, in which he "insists" that exceptional individuals can have two or more high intelligences; then he adds a third explanation, according to which they can excel in one subintelligence more than others (1998, p. 99). His reply diversifies the claims of MI theory, but provides no evidence for them. Instead, it illustrates that MI is practically untestable: on an ad hoc basis, these three explanations can account for any set of exceptional abilities imaginable. Consequently, weak MI theory cannot be distinguished empirically from other explanations of exceptional achievement: the claim that geniuses excel in two or more intelligences is not testably different from the theory of general intelligence; the claim that they can excel in one subintelligence is not testably different from the theory that excellence is based on specific knowledge and skills.

Gardner's predictions concerning lawyers and writers *do* follow specifically from MI theory, so they should be investigated.

2. Gardner originally claimed that prodigies are evidence for MI theory because they exemplify a precociously developing, genetically prepared intelligence. I argued that the achievements of prodigies do not correspond to the intelligences of MI theory and the origins of their abilities are largely unknown (Klein, 1997, pp. 381–382). To respond effectively, Gardner would need to show evidence that the patterns of inheritance underpinning prodigy correspond to the seven (or eight) intelligences of MI theory. Gardner cites Winner (1996). Winner



in turn cites studies of the inheritance of several abilities, some of which can be compared to Gardner's intelligences. Most of these studies show that the heritabilities of specific abilities are modest, overlapping, and highly variable over the course of development. Interestingly, one of the few genetic studies of exceptional students, in mathematics, found that familial resemblance of abilities was *lower* for this group than for the population in general, and that this finding could not be attributed to a restriction of the range of the data (Benbow, Zonderman, & Stanley, 1983). So this research provides little support for the notion that prodigy can be attributed to "training imposed on a genetically well-prepared set of intelligences" (Gardner, 1998, p. 99).

Selecting one kind of prodigy as an example, I argued that chess skill depends on knowledge of strategic board arrangements, rather than on "spatial intelligence." Gardner's response, that chess players, with training, might excel more than clinical psychologists or poets in spatial pursuits such as sailing, suggests an enjoyable, if expensive, test of MI theory. But Gardner needs to counter existing evidence more directly (cf., Klein, 1997, p. 382).

3. Gardner and I agree that autism primarily affects children's understanding of mental states, and thereby affects their learning of other concepts and skills. But contrary to his comment, the preceding sentence shows that this point can be easily articulated without reference to MI theory.

4. Originally, Gardner claimed that savantry illustrates a single intelligence in relative isolation (e.g., Gardner, 1993, pp. 63–64). I observed that the skills of savants are too narrow to correspond to the intelligences of MI theory (Klein, 1997, pp. 382–383). Gardner (1998, p. 100) accepts this observation, and suggests that at least some savants show only a single subintelligence, without having developed associated subintelligences, in the way that unimpaired individuals do. However, this reply is problematic in several ways. First, I doubt whether any autistic savants show abilities broad enough to map onto an intelligence of MI theory. Second, their abilities appear to depend on specific knowledge and skills, rather than on subintelligences. For example, a common form of savantry is calendrical calculation, the ability to name the day of the week for a given calendar date. But calendrical calculators usually can answer only questions concerning a specific range of years, by relying on memory for particular dates and specialized calculations (Howe & Smith, 1988). Third, as I pointed out in my critique, non-autistic savants also appear to rely on specific knowledge and skills, so the issue is not "impairment." Fourth, because savants have histories of practising intensely in their preferred activities, they cannot provide unambiguous evidence for supposed pre-existing "biopsychological potentials."

Finally, Gardner's ad hoc application of a subintelligences interpretation of savantry illustrates again that MI theory is almost unfalsifiable.

5. Originally, Gardner interpreted learning disabilities as "confirmation by negation" of specific intelligences (e.g., Gardner, 1993, pp. 63–64). I pointed out that contrary to Gardner's claims, the deficits of dyslexia do not correspond to

MI's "linguistic intelligence." Gardner mistakenly takes me to mean that dyslexic students have difficulties only in reading (cf., Klein, 1997, p. 383), and wrongly cites Bryant (1993) to prove that they also have difficulties handling rhymes, naming colours, naming objects, and so forth. Most symptoms that Gardner and I have noted probably reflect dyslexic students' poor phonological processing. For example, Swan and Goswami (1997) found that gaps in naming time between good readers and dyslexic readers were greatest for objects with polysyllabic names; dyslexic readers often erred by substituting words similar in sound to the correct names of objects. In any case, the deficits of most dyslexic students are not general enough to comprise an impaired linguistic intelligence (e.g., Newman, Fields, & Wright, 1993).

I am surprised that Gardner did not respond to my claim that no learning disability corresponds (negatively) to an intelligence of MI theory.

6. Gardner's claim that Case's central conceptual networks map onto capacities like the intelligences of MI theory is somewhat overstated. Gardner's "logical-mathematical intelligence" and "spatial intelligence" correspond to two of Case's (1991) central conceptual networks, but these have not been shown to be independent of one another, a necessary feature for MI. The central conceptual network research also suggests that "intrapersonal" and "interpersonal" intelligences could be identical, and that the "linguistic" and "interpersonal" intelligences overlap (see point 7 below). Case's research does not include structures comparable to Gardner's "musical," "bodily-kinesthetic," or "naturalist's" intelligences.

7. Gardner and I agree that were knowledge to transfer more readily within intelligences than across them, this would comprise evidence for MI theory. Initially, this prediction may seem obviously true. But there are many ways to classify knowledge; considerable research will be needed to discover whether transfer follows the categories delineated by MI. One counter-example to Gardner's theory is Case and McKeough's (1990) research, in which instruction in narrative ("linguistic intelligence") transferred readily to tasks concerning emotions and intentions ("interpersonal intelligence").

8. Concerning his research with primary school children, Gardner acknowledges that efforts to investigate the intelligences empirically have been less productive than he hoped. Indeed, his assessments not only failed to produce evidence *for* MI theory, they produced evidence *against* it (Klein, 1997, p. 386). Furthermore, it is pedagogically important to emphasize that MI researchers have not found valid ways of assessing intelligences in the classroom (or elsewhere).

## PEDAGOGICAL ISSUES

Gardner and I agree that educational theory informs, but does not dictate, classroom practice. We also agree that there have been several ill-advised applications



of MI that do not follow necessarily from Gardner's theory. However, the instructional ideas I reviewed in my article are those that MI enthusiasts (sometimes Gardner himself) recommended and implemented. So Gardner need not remind me to "distinguish much more sharply between values or practices that follow directly from the theory (few, if any) and his [my] own favourite hobby horses or bugbears" (1998, p. 101). Moreover, I invite the reader to check Gardner's claim that he has dealt with my pedagogical criticisms elsewhere; I believe he has not.

My principal pedagogical critique was that like general intelligence theory, MI offers explanations of thinking and learning too static and general to inform educational practice usefully. Gardner (1998, pp. 101–102) attempts to respond to this criticism directly by stating two major educational implications of his theory. First, he recommends individualizing education. Although I agree that individualization is valuable, the question here is whether Gardner's theory can mediate this practice usefully. MI lacks empirical support and contradicts some available evidence, so it probably does not capture differences among students accurately. Moreover, efforts to assess multiple intelligences have failed, leaving it unclear how such individualization might begin. And Gardner has not indicated the nature of this intended individualization: Enrichment of strong intelligences? Remediation of weak intelligences? Presenting the same subjects to all students, but using different media to reach students "through" their strongest intelligences? Gardner's discussion of this issue is too general to permit further comment.

Gardner's second pedagogical recommendation is that important curricular ideas should be presented to individuals through representations that exploit the variety of intelligences. I agree that varied representations are valuable (e.g., Mousavi, Low, & Sweller, 1995). But whether this value derives from the multiplicity of intelligences is a different question. First, Gardner's recommendation contradicts a fundamental claim of MI theory: namely, that each intelligence operates on specific content. This content-specificity is, in fact, the reason Gardner is sceptical about transfer across intelligences (1998, p. 100). It is also the reason Gardner emphatically distances MI from "learning styles" theory, which assumes that students can use a cognitive strength to engage diverse kinds of content (e.g., Gardner, 1995, pp. 202–203; Gardner & Walters, 1993a, p. 44–45). This distancing is appropriate, in light of evidence that matching instruction to students' supposed learning styles is ineffective (e.g., Kavale & Forness, 1987; Snider, 1992). To keep MI consistent with itself and with existing evidence, this pedagogical implication should be toned down or reformulated as Gardner's more promising suggestion, mentioned above: content from one intelligence can sometimes be partially learned through a metaphorical representation that translates it for another intelligence (Gardner & Walters, 1993b, pp. 32–33).

The pedagogical value of Gardner's multiple representations recommendation is also limited because it is too general. Gardner's own examples are markedly

vague, for instance, that mathematical concepts can be given spatial representations (Gardner & Walters, 1993b, pp. 32–34). By contrast, the usefulness of a representation depends heavily on a careful fit between specific content and the form in which it is presented (Zhang & Norman, 1994). Various spatial symbols and devices differ widely in the efficiency with which they support arithmetic (Zhang & Norman, 1995). In another example of specificity, Mousavi, Low, and Sweller (1995) found that multimedia geometry lessons improved learning, but only if they were designed so that students could follow two modes of instruction (verbal and visual) without switching attention between them. And in an even more marked example of the particular effects of differing representations, Gentner and Gentner (1983) found that students who thought of electricity using a "flowing water" analogy were adept at solving problems concerning batteries, whereas those who used a "moving crowd" analogy were better at solving problems involving resistors. So although MI broadly hints that alternative representations will aid students, the real pedagogical work will lie in finding the right fit between concept and medium.

## CONCLUSION

MI claims the existence of middle-level structures between the level of general intelligence and the level of particular activities and basic modules. The strong version of MI theory is undercut by the absence of evidence for anything as coherent as a "module" or "intelligence" at this middle level. Conversely, the weak theory that "intelligences" interact readily and include independent "sub-intelligences" is ambiguous and nearly untestable. Gardner sometimes offers a moderate version of MI theory, in which the "intelligences" interact indirectly, and show a modest degree of coherence. Future research may confirm some of these structures, but they should probably be called something "softer," such as "networks of procedural and declarative knowledge."

Pedagogically, MI theory has contributed to educational psychology by introducing a wide readership to the cognitive nature of the arts, domain specificity in thinking and learning, and modularity. Gardner's suggestion for educators to use multiple representations of curricular ideas invites further theoretical and empirical exploration. However, the absence of any valid means for assessing students' "multiple intelligences" argues for a moratorium on assessment, except for research purposes. And for the present, as I argued in my previous article, limited educational resources might best be directed toward practices shown to yield rich educational benefits.

## NOTE

[1] I am indebted to John McPeek for pointing this out.



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# An Analysis of Gardner's Theory Of Multiple Intelligence

*Harry Morgan*

*Gardner suggests that the human organism has seven distinct units of intellectual functioning. He labels these units* ***intelligences****, each with its own observable and measurable abilities. The Gardner hypothesis of intelligence is examined within the context of* ***g****, and Gardner's MI Theory is compared to the work of* ***cognitive style*** *theorists. This report concludes that MI theory did not discover new "intelligences", but rather, put forth a reframing of what others have defined as* ***cognitive styles.***

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It is unlikely these days that anyone seriously studying intelligence can avoid reading something related to the Gardner hypothesis of multiple intelligences (MI). Gardner proposes the theory that the human organism possesses seven distinct units of mental functioning. He labels these units "Intelligences". He also asserts that these separate intelligences have their own specific sets of abilities that can be observed and measured (Gardner,1983).

There are possibly hundreds of articles, book chapters and similar citations associated with Gardner's concept of intelligence. The basic concept, however, is completely described in the Gardner text (1983), and more recently, the MI theory was

*Manuscript submitted October, 1994.*
*Revision accepted February, 1996.*

framed in the form of scientific research (Gardner and Hatch, 1989). For practical purposes, thereby this critique is limited to the two published works by Gardner and associates because they embody the major work on the MI concept.

The theory that multiple factors contribute to what is generally considered intelligence is not new. What is novel about Gardner's proposal is that each factor (as identified by his work), constitutes a separate construct that would qualify as an *intelligence*. There is sufficient evidence, however, to suggest that the seven areas of human performance described in the MI theory as *intelligence*, are more realistically *cognitive styles*.

The similarities between Gardner's categories of *intelligence*, and *cognitive style* studies that appeared in literature between the 1950s and 80s, are so striking that it is surprising how *cognitive style* theory could have gone unnoticed by Gardner and associates.

Gardner's seven "intelligences" are listed in Table I of this document. He describes the nature of these intelligences in various ways. Two of them, *Logical Mathematical Intelligence* and *Linguistic Intelligence*, are defined as "capacity" and "sensitivity". Two others, *Music Intelligence* and *Bodily-Kinesthetic Intelligence*, are defined as "abilities" and "skills." Another pair, *Spatial Intelligence*, and *Interpersonal Intelligence*, are described as "capabilities", and the *Intrapersonal Intelligence* is described as "access to one's own feelings". These descriptors can be useful to school personnel who recognize that children frequently demonstrate a variety of skills in various school settings that might not be demonstrated in a test taking environment.

Gardner's semantic approach can appeal to teachers who believe that all learners are gifted and talented in some unique way—and for those professionals who dislike the task of separating children from their classmates because *they* are deemed *gifted* and their friends are not—a great deal of support for their mission can be found in MI descriptors. The broad semantic diversity ("sensitivities","abilities", "capabilities", "capacity","skills" and "access to one's own feelings"), employed in this useful service to teachers who are troubled by certain elements of structuring programs for the gifted, however, does not entitle a *theory of intelligence* to emerge.

As Gardner and associates proceeded to operationalize MI theory they attempted to measure selected multiple intelligences. In their approach to work, they discovered that intelligence was not a fixed innate capacity that scholars of the early 1900s had surmised. They reported:

> *In our work, it rapidly became clear that meaningful assessment of an intelligence was not possible if students had little or no experience with a particular subject matter or type of material ( (Gardner & Hatch, 1989, p 6).*

Scarr (1986) has also provided an insightful view of the role of experience in human variability.

> *Human intelligence, as measured by traditional tests and by more contemporary information processing tasks, is about 50% heritable; the remaining variance is due largely to individual experience.....(Scarr, 1981 p. 119).*

These passages evoke the nature-nurture discussion which is not useful to pursue here except to make the point that, as teachers, it is important to know that *experience* is the essence of what we provide learners who are entrusted to our care. It is equally important for classroom teachers to know that the quality of their work can have important effects upon the child's intellectual performance. It also suggests that when learning experiences are modified for children who are labeled *disadvantaged* or *at risk*, we might be depriving them of essential elements of learning that *all* children need to maximize their intellectual potential.

## Gardner's Seven Intelligences

**Logical-mathematical**
Sensitivity to, and capacity to discern, logical or numerical patterns; ability to handle long chains of reasoning.
END STATES: Scientist, Mathematician

**Linguistic**
Sensitivity to the sounds, rhythms, and meanings of words; sensitivity to the different functions of language.
END STATES: Poet, Journalist

**Musical**
Abilities to produce and appreciate rhythm, pitch, and timbre; appreciation of the forms of musical expressiveness.
END STATES: Composer, Violinist

**Spatial**
Capacities to perceive the visual-spatial world accurately and to perform transformations on one's initial perceptions.
END STATES: Navigator, Sculptor

**Bodily-kinesthetic**
Abilities to control one's body movements and to handle objects skillfully.
END STATES: Dancer, Athlete

**Interpersonal**
Capacities to discern and respond appropriately to the moods, temperaments, motivations, and desires of other people.
END STATES: Therapist, Salesman

**Intrapersonal**
Access to one's own feelings and the ability to discriminate among them and draw upon them to guide behavior; knowledge of one's own strengths, weaknesses, desires, and intelligences.
END STATES: Person with detailed accurate self-knowledge
(Gardner & Hatch, 1989).

**Table 1**

## Theories of Intelligence

There has been no single element in the defining and measuring of intelligence that has survived over time with greater persistence than the theory that intelligence can be determined by a single factor—labeled the *g* factor (Spearman,1904;Terman and Merrill,1937;Burt,1940). L.L. Thurstone, however, was among the first to suggest that the human organism was far too complex for intellectual activity to be determined solely by a single human factor. Thurstone (1938) developed what he labeled Primary Mental Abilities and introduced to the intelligence testing community multivariate analyses as a method of measuring intellectual functioning. Thurstone's test batteries were developed for 3 age levels with approximately 6 tests designed to measure a separate ability. Thurstone's theory suggested that intelligence could not be determined by measuring a single ability. He identified multiple factors such as verbal ability, deductive reasoning, spatial ability and perceptual speed, as essential to a unified theory of intelligence. Despite Thurstone's new approach to the re-examination of a seasoned theory, it still remained the view of Spearman and his many followers, that Thurstone's "set of abilities" contained an underlying element common to all measures of ability that could be defined within the framework of *g*.

Despite these views, the practice of intelligence testing began to incorporate Thurstone's multifactor analyses. Following Thurstone's (1938) publication of a test battery of primary mental abilities, others started to develop multivariate tests to measure separate abilities. The work of Gardner has followed a similar pattern except for semantic applications.

The most widely used IQ test, the revised *Stanford-Binet*, first published in 1916, still provides a single score that purports

to reflect general intelligence (*g*) (Terman and Merrill, 1973). *The Wechsler Intelligence Scale for Children - Revised,* is the next most commonly used instrument (Wechsler,1974). Both are designed to be administered individually, with the Stanford-Binet emphasizing verbal responses more than the WISC-R.

The WISC-R is designed for children 6 to 16 and consists of 12 sub-tests (2 are optional). Half of the items are verbal and half nonverbal. The results are derived from two widely defined types of intelligence.

In the 1990s, the state of the art in measuring intelligence among school children for various purposes, like screening for the placement of children in classes for the gifted, has led to the selection of the *Wechsler Intelligence Scale for Children-III (WISC-III),* as well as to the *Wechsler Preschool and Primary Scale of Intelligence - Revised (WPPSI-R).* Both tests demonstrate an improvement in acknowledging the subtleties of race and gender. The preschool version has more than 40% new items, and the new items in the WISC-III total more than 30%. However, many experts in the field remain critical of instruments designed to measure intellectual functioning in children. In order to compensate for an inherent flaw in the most recent version of the WPPSI-R, the test developers added bonus points for speed. In response to this strategy, one reviewer suggested that:

> *Giving bonus points for speed to preschool children seems silly from a developmental and common sense perspective. Sure, brighter children will tend to solve problems more quickly than less intelligent children, and that relationship will hold even at the preschool level. But young children sometimes respond slowly for a variety of reasons that have more to do with maturation or personality. For example, a young child might respond deliberately because of immaturity of experience in test taking, underdeveloped motor coordination, insecurity, or a reflective cognitive style. (Kaufman, 1992. p.158)*

The widespread use of these traditional instruments occurs at a time when information processing theorists and others are suggesting alternative approaches, and in the process, are creating a receptive scientific environment for imaginative and inventive constructs (Elkind,1971; Ziegler & Tricket,1978; Messick,1973; McCelland, 1973; Sternberg,1985; Bracken,1987). At several intervals in the history of various approaches to assessing intelligence, single-factor theorists have had to defend against occasional assaults (Hunt, 1961;Cattell,1963; Gould,1981). The work of Gardner offers yet another commendable attempt that encourages practitioners to expand the number of ways that intellectual functioning can be examined and appreciated in the performance of learners.

## Cognitive Style and MI Theory

There is considerable evidence to suggest that MI theory is fundamentally a reframing of cognitive styles into 7 areas of "intelligences." *Cognitive style* has also been referred to as psychological differentiation (Witkin,1949;Dyk and Witkin,1965; Gundlach and Gesell,1979). Werner (1957) was among the first to introduce the concept of *psychological differentiation.* He theorized that human development followed a biological course from a global state to a state of differentiation, articulation and hierarchical integration. In other words, developmental changes in human growth are systematic and dependent upon earlier stages. In Werner's theory, the child's increase in foot size or arm length are *quantitative* changes and not particularly important developmental issues. Only *qualitative* changes, such as those associated with basic underlying biological structures are truly developmental. He theorized that the human organism develops in predetermined steps and stages that are influenced more by internal structures than environmental experiences. From a global (undifferentiated) relationship between the individual and the environment, the system progressively develops biological structures that become independent (differentiated). As the human system progresses, it becomes more efficient at maximizing cooperation between the underlying subsystems. In this advanced stage of maturity, one is able to differentiate external from internal stimuli, and process them appropriately. Finally, these underlying biological systems mature and become independently capable of setting goals and rejecting distractions. Werner's approach to this developmental system has been called *orthogenetic.* The *orthogenetic* approach to describing human development is also central to the work of Mahler (social adaptation), Freud (psychosexual), and Piaget (Psychosocial). With Werner's theory of psychological differentiation serving as a frame of reference, cognitive style is defined by Messick in the following manner.

> *Each individual has preferred ways of organizing all that he sees and remembers and thinks about. Consistent individual differences in these ways of organizing and processing information and experience have come to be called cognitive styles. These styles represent consistencies in the manner or form of cognition, as distinct from the content of cognition or the level of skill displayed In the cognitive performance. They are conceptualized as stable attitudes, preferences, or habitual strategies determining a person's typical modes of perceiving, remembering, thinking and problem solving. As such, their influences extend to almost all human activities that implicate cognition, including social and interpersonal functioning (Messick, 1976, pp 4-5).*

## Are They Multiple Intelligences, or Are They Cognitive Styles?

Gardner's intelligences in the hierarchical sequence of their listing in research literature (Table I), can be paired with counterparts in cognitive style literature. Using Gardner's categories as paragraph headings, a critical comparison of MI theory with cognitive styles reveals the following:

*Logical-mathematical Intelligence*

**Sensitivity to, and capacity to discern, logical or numerical patterns; ability to handle long chains of reasoning. END STATES: Scientist, Mathematician**

Studies have emerged from investigators in intellectually related fields that identify intellectual functioning (cognition), as central to theories of personality. It is also true, that cognitive style has been central to the conceptualization of personality from a cognitive development perspective. The growth of individual personality is viewed as a process that is shaped by the individual's assessment of their social context, with the application of problem solving and reasoning at its core (Kelly,1955; Mischel,1973; Bandura,1986).

Similar to Werner, Kelly interprets constructs of problem solving as hierarchical in their development, and he states that over time they become more complex and specific. As individuals acquire and apply their cognitive structures, variations in personalities emerge from each person's pragmatic repertoire. And in that process, more than likely, we are all different. The cognitive capacity to apply logic and reasoning to objects and/or events as proposed in social personality theory, fits well within Gardner's "Sensitivity to.....logical..... patterns .....ability to handle long chains of reasoning."

In the early 1900s, Katherine C. Briggs started a systemat-

ic observation of personality types in human interactions. Her primary focus was individual behavior related to experience and information processing. At the same time, she devoted a great deal of time to reading biographies. With her discovery of the work of Carl G. Jung, she began to realize that his descriptions of psychological types were highly compatible with her own interests in personality development. After a thorough study of Jung's personality theory, Briggs and her daughter—Isabel Briggs Myers—began observations of personality types and their cognitive styles.

In the early 1940s, Briggs and Meyers starting developing self-report questions that would lead to assessments of individual personality types and their cognitive styles. In their approach to work, Myers and Briggs expanded cognitive style theory to include typological constructs from their personality theory. In literature this concept has been referred to as the *Myers-Briggs Type Indicator (MBTI)* (Myers and McCauley, 1985).

Several years prior to Gardner's categorizing Logical-Mathematical Intelligence as the "capacity to discern logical or numerical patterns..... handle long chains of reasoning," the MBTI identified these characteristics as cognitive styles employed by various personality types. For example, individuals inclined toward sensing, thinking and introvert cognitive styles—as described in the Myers-Briggs Inventory—would process information in idiosyncratic modes that would maximize their capacity for logic and reasoning. Myers-Briggs' *Introvert Types* are preoccupied with work and concentration required in processing "long chains of reasoning." The MBTI *Thinking Types* utilize logic and analysis, with the likelihood that emotion will not be allowed to interfere. *Sensing Types* use standard procedures—with a concentration on *valuable information in problem solving.* These descriptions fit well within Gardner's framework for this category.

Of the various cognitive styles that have emerged from scientific studies, none have been given more attention than the *Field Independent/Field Dependent* construct. There is general agreement in the literature that *Field Independent* types approach object relations in an *analytical manner* with the ability to discern objects as discrete from their context. They also have a tendency toward impersonal preferences in social encounters. *Field Dependent* types, on the other hand, approach object relations in a global manner with less interest in analytical functions. They also demonstrate a preference for social interactions and often display superior social skills (Kogan,1976;Spotts & Mackler,1967). These field dependent characteristics will be discussed latter within Gardner's Social Intelligence domain. Individuals who process information in a *Field-Independent* cognitive style are also *analytical inperceiving, remembering and problem solving* (Vernon, 1972; Messick, 1972;1973; Foreman,1988). They also approach the tasks of math learning with less anxiety than their *Field Dependent* peers (Hadfield & Maddux,1988).

Gardner's Logical-Mathematical Intelligence employs practically the same descriptions as those cited above for *Field-Independent* cognitive style. It is also true, that general abilities and aptitudes have been linked to various cognitive styles (Federico & Landis,1984).

*Linguistic Intelligence*

**Sensitivity to the sounds, rhythms, meanings of words; sensitivity to the different functions of language.**
**End States: Poet or Journalist.**

Gardner's "sounds and rhythm" reference in this domain are also found in his "Musical Intelligence" definition. "Linguistic Intelligence", however, appears to have greater implications for *auditory* and *speech* modalities because Gardner includes "meanings of words and different functions of language" under this "intelligence." Cognitive style theorists have identified three basic sensory modes of interacting with the environment as kinesthetic (motoric thinking), visual and figural (spatial thinking), and auditory (verbal thinking). Some investigators have suggested that young children tend to prefer the visual sensory modality, and later progress to the auditory or verbal preference for processing information ( Birch & Lefford,1967). Other studies have suggested that this is the acquisition of the sensory capability to coordinate information perceived through one sensory modality with information from other modalities. This is compatible with Heinz Werner's theory of psychological differentiation. It is the *verbal thinking* component of these three sensory modalities, however, and its coordination with the other two (motoric thinking and spatial thinking), that bear a striking resemblance to Gardner's "sensitivity to meanings of words..... (and) sensitivity to different functions of language."

*Musical Intelligence*

**Abilities to produce and appreciate rhythm, pitch, and timbre; appreciation of the forms of musical expressiveness.**
**END STATES: Composer, Violinist**

The critical words to note in describing this intelligence are "produce" and "appreciation". There is a noticeable absence of the ability to produce and appreciate *paintings, sculptures and other visual arts,* from Gardner's MI theory. It is probably safe to say that if one can produce music at the level of Gardner's designated "End States" (composer, violinist) for musical intelligence, one can assume that there exists an appreciation - a priori (Copeland,1983). Cognitive style theorists have for some time investigated aspects of musical creativity and oral discrimination (Schmidt,1984; Schmidt & Sinor,1986).

As mentioned under Linguistic Intelligence, the perception of "rhythm, pitch, and timbre," are essential elements in cognitive style *sensory modalities* (auditory, motoric, verbal). Specifically, the *auditory* component from the three modalities appears to be an appropriate comparison with Gardner's "..... pitch, and timbre.....(and) forms of musical expressiveness." Developmentally, young children tend to progress from a preference for the kinesthetic (motoric), modality to the visual modality, and later in life to the auditory/verbal modality (Birch & Lefford,1963).

Gardner's "End States" expectation for a careerist with heightened intelligence in this category, for example, would be a violinist or composer. Cognitive style theorists have suggested that for adults, maturation and experience can influence a preference toward one sensory modality over others. This is balanced with the use of information from the preferred modality, that is supplemented by what is perceived from the other two. In this regard, the three sensory modalities are interrelated (Smith, 1964; Bissell, White & Zivin, 1971).

Research on the construct *creativity,* suggests that the end product needs to be deemed exemplary by creative peers on such dimensions as originality, flexibility, fluency and elaboration (Taylor, 1964). Upon examining the process, it has been shown that *Field-Dependent* persons are consistently more creative than their *Field-Independent* peers (Getzels and Jackson,1962; Spotts & Mackler,1967; Bloomberg,1967; Gundlach,R.H. & Gesell, G. P.,1979).

Gardner's "End States" identifies musical intelligence as the capacity to *perform* professionally as a violinist and/or composer. Monsaas and Engelhard (1990) concluded from a study in four talent fields that highly competitive home environments contribute significantly to the success of individuals at the top

of their fields. This seemed especially true for highly accomplished pianists and research mathematicians. This points up the risks involved in identifying *performance* as a determining index for capacity. The performance/capacity relationship has been a constant source of criticism of intelligence testing. An individual with rather modest intellectual capacity for learning to play the violin, for example, might be stimulated to maximize such ability, and become a competent performer because of a positive role-model, tenacity, an opportunity, temperament, curiosity, or a home environment of the type cited by Monsaas and Engelhard, just to name a few variables.

The possibilities are so broad in the areas of musical performance and composition, that it would be unwise to discourage students from pursuing music as a career if their interest and motivation is high, even though their "Musical Intelligence" might be modest. In the 1960s a constant source of frustration for school children with strong interests in the popular music of their generation, was that their interests could not be met in their school music experience. The music in which they were interested was not respected by the teaching faculty in their schools, and some schools would not allow certain youth-music to be played in the school building (Morgan,1969,1970).

*Spatial Intelligence*

**Capacities to perceive the visual-spatial world accurately and to perform transformation on one's initial perceptions. END STATES: Navigator, Sculptor**

Concerning the cognitive style *Breadth of Categorization*— sometimes referred to as *Conceptual Differentiation*, Kogan describes it as:

> *When a person is made aware of the central-tendency or is given a focal exemplar of a particular category, wide individual variation has been observed in the setting of boundary limitations for that category. Some individuals are relatively narrow in the sense of rejecting instances that, in their subjective opinion, stray too far from the central or focal value; others are able to accommodate a broader range of instances of subjectively setting category boundaries a considerable distance from the central-tendency or vocal exemplar (Kogan, 1976, p. 60).*

Spatial Intelligence as described by Gardner is highly compatible with the cognitive style construct of *Breadth of Categorization*. It refers to an individual's consistent cognitive preference for broad inclusiveness vs. narrow inclusiveness along a bipolar plain in establishing one's acceptance range of objects and ideas (Bruner and Tajfel,1961; Messick and Kogan,1965). Individuals with broad categorizing cognitive styles have a greater capacity to perceive the *visual-spatial world* and match Gardner's concept of Spatial Intelligence. Several investigators have referenced these attributes as *leveling* and *sharpening* (Holtzman & Klein,1954; Santostefano,1964; Israel,1969).

***Leveling*** is the tendency toward egalitarian structuring in memory assimilation by not differentiating between objects and events, but rather, by incorporating similar events into related experiences. ***Sharpening,*** on the other hand, is the capacity for memory detail that can isolate events without confusing similar events or objects with each other, and on occasion, such individuals will perceive of differences between events (even minor ones) of the past and present in an exaggerated form. In other words, the spatial/visual style of a "leveler" would be to merge and balance out objects and issues and use broad categories for sorting. The "sharpener", on the other hand, would differentiate between objects and issues and more often than not make fine distinctions (Holtzman & Klein,1954).

Sensory modalities mentioned earlier, distinguishes visual/figural (spatial thinking), as one of three basic cognitive preferences that require coordination to maximize the processing of information from the other two; motoric thinking and auditory/verbal thinking. The visual/figural is compatible to Gardner's "capacity to perceive the visual-spatial world...and to perform *transformations* on one's initial perceptions." Gardner's *transformations* is described by cognitive style theorists as the *capacity to coordinate* the three sensory modalities (motoric, visual, auditory) to assure that information from one domain can reinforce and clarify information from the other two.

*Bodily-Kinesthetic*

**Abilities to control one's body movements and handle objects skillfully. END STATES: Dancer, Athlete.**

What Gardner labels as bodily-kinesthetic intelligence is the most interesting of the seven intelligences identified through his work. There are striking similarities within the Gardner Bodily-Kinesthetic category with the work of cognitive style investigators related to sensory modalities and motor control. Kinesthetic (motoric thinking), is one of three cognitive style basic modalities found within the framework of Gardner's Linguistic Intelligence. Motoric thinking as described in cognitive style theory is essential to body movement and control.

What purpose, however, is served by delineating this category as a construct of intelligence? We now know, that intellectual requirements for performance in gymnastics and sports are not fundamentally different from cognitive endeavors that do not necessarily call forth competitive type physical interactions, responses, and performances.

Another essential element common to all intellectual functioning is problem solving through the processing of information. Performance associated with problem solving skills are useful indices of intellectual capacity. In classroom settings, problems are often presented in a well-structured format with the necessary information provided or close at hand. Problems to be solved by the athletic, however, are ill-structured and fuzzy with myriad variations of unfolding human encounters within the field of play. A careful observation of a brief episode in a basketball or football game, for example, would reveal a performer processing a tremendous amount of information. The successful athlete must have the cognitive capacity to differentiate between players, isolate spectator noise, execute memorized play action, and assess when the set play must be modified or abandoned—inserting a more suitable plan of action to achieve the "goal" while simultaneously calling upon the organism for extreme outputs of physical and mental responses. Occasionally a basketball player during an exciting episode, will mistake an official for a teammate, and pass the ball to the official. Or, a football player will attempt to "score" at the wrong goal. The stream of sensory activity during play can become too complex to execute—except for those athletes who tend to have superior cognitive processing abilities (kinesthetic/motoric thinking), in these environments.

What sets this apart from other cognitive styles is that the high levels of mental and physical abilities employed during the athletic performance, might not be available to the same individual in the static environment of the quiet classroom. It is in this context that previous work has attempted to identify a *sensori-active* cognitive style that tends to guide the information processing of certain individuals (Elias,1979; Einstein,1979; Fiske,1977).

A study conducted in Syracuse, New York public schools reported that black children from moderate to low income urban environments performed learning tasks with a more *sensori-active* cognitive style than their white peers (Morgan,1990). Similar patterns were found among children of Hispanic descent

(Ramirez & Price-Williams1974; Ramirez & Castaneda,1974).

In urban school settings that promote quietness and docility, it is often difficult for black children from moderate and low income families to comply with the demands made upon them by the system (Witherspoon, 1987). Their behavior can be termed disruptive when the planned environment lacks the elements which could accommodate their sensorimotor style (Einstein,1979; Elias,1979).

Gardner's approach has been to set this cognitive style of processing information apart from other intellectual functioning. He then proceeds to label high level motor performance as Intelligence (bodily-kinesthetic), when in reality these domains have been identified by others as cognitive styles.

*Interpersonal Intelligence*
**Capacities to discern and respond appropriately to the moods, temperaments, motivations, and desires of other people. END STATES: Therapist, Salesman**

*Intrapersonal Intelligence*
**Access to one's own feelings and the ability to discriminate among them and draw upon them to guide behavior; knowledge of one's own strengths, weaknesses, desires, and intelligences. END STATES: Person with detailed accurate self-knowledge**

For practical purposes and clarity, Gardner's *interpersonal* and *intrapersonal* categories will be treated as a single domain because of their obvious common characteristics along a single continuum from internal to external social skills.

The *Field Dependent* cognitive style, described earlier, implies that an individual demonstrates a global and social orientation during interactions with objects and individuals (Frank,1986;Kogan and Saarni,1989; Jacobs,1986). *Field dependent* individuals are also inclined to use social dimensions as their frame of reference in defining their own feelings and attitudes. Furthermore, they are particularly attentive to facial expressions, and likely to remember facial features significantly longer than their *Field Independent* peers (Messick and Damarin,1964; Wallace and Gregory, 1985).

Gardner's description of these attributes are under his Intrapersonal Intelligence as " access to one's own feelings and the ability to discriminate among them, and draw upon them to guide behavior." Studies have also reported that *Field Dependent* preschool children tend to play with others while their *Field Independent* counterparts show a tendency to sit alone with a table task (Coates, Lord and Jakabories, 1975). It also seems true, that *Field Dependent* children are more responsive to social cues provided by an examiner in an experimental problem solving setting (Jennings, 1986; Ruble and Nahamura, 1972).

Gardner has identified the absence or presence of external (interpersonal), and internal (intrapersonal) social skills as "intelligences." Cognitive style theorists have defined these characteristics within the domains of Field Independent and/or Field Dependent characteristics employed by individuals during social encounters.

Another positive comparison with Gardner's inter/intrapersonal intelligence can be found in the work of Bieri (1961) who identified the bimodal cognitive style labeled *Cognitive Complexity* vs. *Cognitive Simplicity*. These constructs are defined as the cognitive process utilized by individuals in defining their personal and social world. This compares with Gardner's "capacities to discern and respond appropriately to the moods, temperaments, and desires of other people." Work by others expanded the *Cognitive Complexity* psychological style to include the nature of individual choices and their associated values (Signell,1966; Kogan,1971).

Gardner's reference to "individual choices and their associated values (and) access to one's own feelings and the ability to discriminate among them," cited under intrapersonal intelligence,can be characterized within the framework of *Cognitive Simplicity* and *Cognitive Complexity* cognitive styles.

In the MBTI cognitive style/personality typologies, modalities similar to Gardner's category can be found in Myers-Briggs Inventory. For example, the *Extrovert Types* interact easily with people and prefer social variety (Interpersonal). *Feeling Types* base judgments on subjective values and demonstrate sensitivities toward the feelings of others. Gardner's Intrapersonal Intelligence description as having "access to one's own feelings..... strengths, weaknesses, desires....." are compatible with the aforementioned MBTI types.

Interpersonal and intrapersonal attributes of individuals have also been investigated for many years as *social intelligence*, and there is considerable agreement with Gardner's descriptions in this domain. Many studies of social intelligence over the past 30 years have conceptualized and measured this domain in various ways that match both Interpersonal and Intrapersonal constructs as defined by Gardner (Keating,1978;Greenspan,1980; Ford,1983; Ford & Tisak,1983; Frederiksen,1984; Barnes & Sternberg,1989).

Thorndike (1936) concluded that the social domain of intellectual activity was more than a factor in general intelligence, but was a separate entity that individuals demonstrated in response to the behavior of other persons. Guilford (1958) accepted the idea that there is an intellectual behavior that involves insights into the thoughts and actions of others, but did not acknowledge an entity framed as "social intelligence." The early work of Thorndike and Guilford appear in Gardner's inter/intrapersonal intelligences when he states that individuals who demonstrate this type of intelligence have the "capacity to discern and respond appropriately to the moods, temperaments, motivations, and desires of other people."

Other studies seeking social intelligence have defined it as a cognitive process that enables individuals to successfully negotiate problem provoking human situations through social interactions and adaptation. They stressed *external* values of competence (Charlesworth, 1976; Barnes & Sternberg, 1989) which is similar to the one employed by Gardner in defining Interpersonal Intelligence. Yet, other studies have conceptualized and measured social intelligence as self-awareness, temperament and individual social autonomy. These approaches emphasize *internal* affective variables (Greenspan, 1980), and match attributes described by Gardner as Intrapersonal Intelligence ..... "access to one's own feelings."

Scarr (1981) has sought social intelligence by selecting a combined *(external and internal)*, set of abilities that demonstrate both pro-social and affective self awareness values. Here, the skills of personal communication and social adaptation demonstrated by individuals during real life experiences are considered essential. This approach embraces the notion that *inter/intrapersonal* attributes can be perceived along a single continuum from one domain to the other. Despite the variety of scientific studies in this domain, none have reported unequivocal certainties about the existence of *social intelligence* (Keating,1978; Ford & Tisak,1983; Ford,1983; Frederikson,1984; Barnes & Sternberg,1989).

From cognitive style researchers and practitioners we have come to know that the human organism receives information from various sources—from other persons, from the environment, and from itself—and, processes this information in psychologically differentiated ways. Cognitive style researchers,

however, do not identify their work as "intelligence theory" because as in the case of MI theory, it does not qualify as such.

It is clear from current literature that consultants, school districts, publishers, practitioners and professional trainers, have made substantial personal and professional investments in MI as a new theory of intelligence, and, I do not take these commitments lightly. Gardner—along with others—has provided sound reasons to encourage us to dismiss the single factor constructs of intellectual functioning and expand the number of ways in which we can value nontraditional performances among learners. Unequivocally, MI theory constitutes a major contribution to an already large body of knowledge related to this point of view. The label "intelligence", however, need not be called forth in this case in order to validate yet another novel approach to rejecting *g*.

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