

Ability Varies

The first of the simple truths is the simplest. All of us have known since our earliest memories of elementary school that abilities are real and that they vary. Whether it was a game of tag at recess or reading aloud from *Dick and Jane*, we observed that some of our classmates did better than others.

As soon as I move beyond that simplest two-word expression, *ability varies*, controversy begins. What abilities are we talking about? To what degree is ability determined by genes, to what degree by environment? Matters get even touchier as abilities of various kinds become entangled in issues of race, class, and gender.

For the moment, ignore the hot buttons. It is possible to talk about variation in ability in ways that almost everyone can accept. Laying out that common ground is the purpose of this chapter.

As a framework for talking about abilities, I will borrow from the best-known classification, Howard Gardner's multiple intelligences. In his original presentation in 1983, Gardner specified seven intelligences: bodily-kinesthetic, musical, interpersonal, intrapersonal, spatial, linguistic, and logical-mathematical. He has since expanded the list to eight (the additional one is naturalistic intelligence), with a

few more candidates still in the works. I will stay with the original seven, focusing on their educational and occupational relevance.

Bodily-kinesthetic intelligence encompasses physical skills—gross motor skills, fine motor skills, and more generally, the ability to exert subtle and precise physical control over one’s movements. Careers that call for good bodily-kinesthetic intelligence include athletics, the performing arts, and crafts.

Musical intelligence is what it sounds like, encompassing highly developed senses of pitch, rhythm, tones, and the ways in which they combine. People who need good musical intelligence to make their livings include musicians, singers, conductors, and composers.

Interpersonal intelligence involves interactions with others. People with high interpersonal intelligence are good at sensing others’ emotions and motivations. They are empathetic, able to work effectively as part of a group, good at communicating with others, and effective at manipulating the responses of others. High interpersonal intelligence is useful for almost any career, but is especially important in occupations such as management, sales, teaching, the ministry, and the caring professions. It is vital for politicians.

Intrapersonal intelligence involves knowing oneself and being able to use that knowledge effectively. People with high intrapersonal intelligence have a realistic grasp of their own emotions, motivations, strengths, and limits. They are able to exert self-discipline and defer gratification. They can remain analytical in times of stress. Courage and prudence are parts of intrapersonal intelligence. In excess, some of the qualities that go into intrapersonal intelligence can express themselves as neuroticism or extreme introversion, and can paralyze action through overanalysis. But when those qualities remain within bounds, high intrapersonal intelligence facilitates performance in any occupation.

Spatial intelligence refers in part to the ability to visualize and men-

tally manipulate objects, as when an engineer holistically grasps how the parts of a mechanism interact or a chess master plays a game without looking at the board. It is possible to have high spatial intelligence in this sense even if one is blind. This is also the aspect of spatial intelligence measured in IQ tests. Gardner adds other elements to his concept of spatial intelligence, however. For example, an accomplished artist perceives things visually that escape people with ordinary spatial intelligence. A good sailor calls on spatial intelligence when he determines his boat's position by dead reckoning. Good hand-eye coordination is also an aspect of spatial intelligence. Occupations in which spatial intelligence is especially important include architecture, engineering, mathematics, the sciences, the visual arts, and crafts.

Logical-mathematical intelligence involves numbers, logic, and abstractions. By definition, high logical-mathematical intelligence means the capacity for advanced mathematics, but it also expresses itself in the ability to mount and understand complex arguments and chains of reasoning, and the ability to make subtle distinctions. Logical-mathematical intelligence is especially important in the sciences and the law, but is useful for every occupation.

Linguistic intelligence embraces everything having to do with language and the information language conveys. High linguistic intelligence includes the abilities to absorb complex written text and to express oneself precisely, eloquently, or persuasively as the situation may require. The ability to learn foreign languages easily is associated with high linguistic intelligence. Memory—the ability to store and retrieve large amounts of information at will—is part of linguistic intelligence. Linguistic intelligence is especially important for any career that involves extensive writing or speaking, but is useful for every occupation.

Howard Gardner calls these abilities intelligences to give them

the status associated with the word *intelligence*. I will go in the other direction, and refrain from using *intelligence* at all, confining myself instead to *ability*. I do this partly to sidestep technical controversies about the theory of multiple intelligences that are not germane to our topic and partly because I agree with Gardner that *intelligence* has taken on a penumbra of unwarranted connotations. Intelligence traditionally understood is an ability—a very important one, but just an ability nonetheless.

Ability Not Only Varies, It Varies a Lot

The distance between low and high on all seven abilities is wide. For purposes of illustration, here are some extremes:

Bodily-kinesthetic: from someone who trips over his own feet to Fred Astaire

Musical: from tone-deaf to Mozart

Spatial: from someone who gets lost two blocks from home to Daniel Boone

Linguistic: from unable to form sentences to Shakespeare

Logical-mathematical: from unable to understand cause and effect to Aristotle

Interpersonal: from autism to Bill Clinton

Intrapersonal: from an undisciplined narcissist to Confucius

The differences that exist in a random cross-section of the population are not as wide as these examples, but they are still wide. They consist of two types: differences in degree, and differences in kind. Bodily-kinesthetic ability offers many examples. People with a wide

range of bodily-kinesthetic ability can play tennis. The difference between the way most people play tennis and the way that professionals play it is huge, but it is a difference of degree. In contrast, doing a somersault with a full twist off a pommel horse is impossible for most people, no matter how much they might practice. The difference in what they can do and what the proficient gymnast can do is one of kind.

This point needs emphasizing. Educational measures such as test scores and grades tend to make differences among schoolchildren look as though they are ones of degree when in reality some of them are differences in kind. For example, a timed math test limited to problems of addition and subtraction, administered to a random cross-section of fourth-graders, yields scores that place children along a continuum distributed in a shape resembling a bell curve. Those scores appropriately reflect differences in degree: Some fourth-graders can add and subtract faster and more accurately than others, but they are all doing the same thing and almost all children can be taught to add and subtract to some degree. The same is not true of calculus. If all children were put on a mathematics track that took them through calculus, and then were given a test of calculus problems, the resulting scores would not look like a bell curve. For a large proportion of children, the scores would not be merely low. They would be zero. Grasping calculus requires a certain level of logical-mathematical ability. Children below that level will never learn calculus, no matter how hard they study. It is a difference in kind. Not only that: The child without the logical-mathematical ability to learn calculus cannot do a wide variety of other things in mathematics that are open to the child with the requisite level of logical-mathematical ability.

The same distinction applies to linguistic ability. Reading is

something that almost everyone can be taught to some degree, and scores on tests of reading achievement will form a continuum with a distribution resembling a bell curve. But if we are talking about a classroom discussion of *Macbeth* among high-school seniors at the 20th percentile and 90th percentile in linguistic ability, the difference is more accurately seen as a difference in kind than as a difference in degree. Those at the 20th percentile will completely fail to understand the text in the same way that someone at the 20th percentile of bodily-kinesthetic ability will completely fail to do a somersault with a full twist.

Many of the things that high-ability students can do are different in kind from the things that low-ability students can do. That's a fact, and the design of every aspect of education needs to keep it in mind.

The Seven Abilities Are Not Equally Valuable in Adult Life

There may be seven distinct abilities, but two and a half of them have limited relevance to success as adults. Few adults make their living in occupations that demand exceptionally high bodily-kinesthetic, musical, or spatial abilities as the indispensable requirement for excellence.

Regarding bodily-kinesthetic ability: As of 2005, the Department of Labor estimated that 12,230 Americans made their living as athletes and 16,240 as dancers. That works out to one out of every 4,600 workers. There are many more people working as athletic coaches, but their own bodily-kinesthetic ability is not nearly as important as their teaching skills.

Regarding musical ability: In 2005, 50,410 people made their living as musicians and singers, and 8,610 as music directors and composers, together representing one out of 2,200 workers. As in the case of athletic coaches, music teachers need good musical ability, but teaching skills are crucial.

Regarding spatial ability: The importance of spatial ability in adult life depends on whether we are talking about mental visualization and manipulation of objects, which is important at the highest levels of achievement among engineers, architects, and many kinds of scientists, or the broader aspects of Gardner's concept of spatial ability that encompass such things as an artist's spatial perceptions and hand-eye coordination. Except for visual artists, the latter kind of spatial abilities need to be "good enough" for certain occupations—surgery and carpentry, for example—but not necessarily exceptional. Extraordinary hand-eye coordination is not what separates the best surgeons and carpenters from the ordinary.

Bodily-kinesthetic ability, musical ability, and spatial ability contribute to important parts of our lives, and education should do what it can to develop them. But as we focus on education's core function, to prepare people for adult life, the remaining four abilities—interpersonal, intrapersonal, linguistic, and logical-mathematical—are the invaluable all-purpose tools.

Links in the Expression of the Abilities

Now we move onto contentious ground. The story goes back to 1904, when the pioneering psychologist Charles Spearman observed that it makes no difference what mental skills are being measured in a

battery of tests. In every instance, the scores on all the tests in the battery are positively correlated. (A correlation is a statistic with a range of -1 to $+1$. The extremes represent perfect inverse and direct relationships, and 0 indicates no relationship at all.) Spearman hypothesized an explanation: All of the tests tap into a general mental factor, which he named *g*. Spearman then devised the statistical method called factor analysis to measure the degree to which test items and test batteries measure *g*—are “*g*-loaded,” in the jargon. Ever since, IQ tests have been assessed according to their power to measure *g* accurately.

Many things about *g* remain controversial. Gardner’s theory of multiple intelligences is involved in the controversy because Gardner argues that his seven intelligences are not only conceptually distinct, but also operationally distinct; that is, scores on the seven abilities would *not* be correlated if only our measures were good enough. Let me try to carve out a few narrow statements about *g* and the seven abilities that are not in empirical dispute, and then offer my interpretation of how they affect straight thinking about education. They all derive from the general observation that, using the measures that do exist, a high level of any cognitive ability has some positive statistical association with *g*.

SPATIAL ABILITY, LOGICAL-MATHEMATICAL ABILITY, AND LINGUISTIC ABILITY

Of Gardner’s seven abilities, these three are nearly coincident with the ones that IQ tests measure. For logical-mathematical ability and linguistic ability, there are no important operational differences between Gardner’s characterization of them and the ones that the designers of IQ tests bring to their task. I must again impose caveats

on spatial ability. I know of no data linking g with the qualities that enabled Daniel Boone to walk through trackless forest for months on end and still find his way home, or with the spatial apprehensions that sculptors call upon, or the spatial aspects of hand-eye coordination. But proficiency in the visualization of objects in three dimensions and the mental manipulation of them are exactly what certain subtests in the major IQ batteries calibrate.

I lump these three abilities together (two and a half, actually) because measures of them are so highly correlated with g , with the correlations usually falling in the $+0.7$ to $+0.9$ range, depending on the specific test battery and the population being tested. Correlations this high mean that scores on these separate abilities are interchangeable in large populations. The combination of the three constitute that thing which has been called *intelligence*, *mental ability*, *cognitive ability*, or *intellectual ability*. I will refer to the combination of the three as *academic ability*. I must emphasize that a label doesn't change the underlying nature of the construct. The three component abilities are valuable in every aspect of human life, not just education, and an IQ score by any other name is still just as g -loaded. But *academic ability* is a good label to use in a book about education. Dictionary definitions of *academic* focus on its relationship to higher education and to education that is liberal or classical rather than vocational. Linguistic, logical-mathematical, and certain spatial abilities are decisive in determining how well students can perform in courses that fit that description. So with just an occasional exception, *academic ability* it shall henceforth be.

The three components of academic ability are interchangeable in groups but not in individuals. You probably think of yourself as better in one of the components than in the other two, for example. But

don't confuse such differences with lack of correlation. Successful lawyers and English professors who consider themselves dolts in math usually had SAT-Math scores that were far above what would be the average if all seventeen-year-olds took the SAT; their math scores were pedestrian only in comparison with others headed for college.

The reason to combine the three components into a single measure of academic ability such as an IQ score is that treating them separately is pointless when working with large groups. Suppose, for example, that you have a sample of 10,000 people and want to analyze the relationships of spatial, linguistic, and logical-mathematical abilities to completed years of education among adults. The three analyses will produce almost identical results—that is guaranteed by the combination of large samples and the high intercorrelations of the three components of academic ability. You lose nothing by combining the components into a single measure, and actually gain something in the form of higher reliability in your results.

Here is the distinction you should keep in mind throughout the rest of the book: For understanding *an individual child* and what that child's educational needs might be, you want as much disaggregation of the child's abilities as possible. For understanding the overall relationship of the components of academic ability to educational performance and later outcomes in life *for large groups of people*, you are better off using a combined measure.

INTERPERSONAL AND INTRAPERSONAL ABILITY

Most aspects of interpersonal and intrapersonal ability have positive relationships to *g*, though often so small that they are inconsequential. In an ambitious meta-analysis of the relationship between

measures of personality and measures of intelligence, personality traits that were significantly and positively correlated with *g* included social potency, achievement orientation, social closeness, extroversion, and openness to experience. An analysis of a large nationally representative sample showed significant positive relationships between measures of cognitive ability and measures of calmness, self-confidence, and maturity. These individual relationships involved correlations with IQ scores in the +.1 to +.3 range. Other meta-analyses of leadership, conscientiousness, and extraversion have found correlations with IQ scores of +.27, +.28, and +.31, respectively. More global measures of interpersonal ability and intrapersonal ability would probably show larger correlations with *g*—that’s what happens when separate indicators with small relationships are aggregated into an index—but despite the publicity given to concepts such as emotional intelligence, measures of them have yet to gain wide scholarly acceptance.

When I first learned about them, I was surprised that *any* relationships existed between *g* and positive personality characteristics because my experience as an undergraduate at Harvard had led me to believe that people with extremely high IQs were, on average, pretty weird. My coauthor on *The Bell Curve*, the late Richard Herrnstein, pointed out my error. The high-IQ students who behaved oddly were conspicuous, so I noticed them. But if I had been given access to the students’ admissions folders, I would have found that the majority of students with stratospheric IQs also had above-average skills in the areas that Gardner labels interpersonal and intrapersonal. No one has ever documented the common belief (which I shared) that high IQ is systematically related to dysfunctional personality characteristics.

MUSICAL ABILITY

Several studies of musical ability and g have been done, and they find a correlation of about $+0.3$. The existence of a correlation makes sense. Raw musical talent can take a performer a long way, but Yo-Yo Ma's interpretation of a Bach suite for unaccompanied cello calls upon cognitive abilities as well, and the cognitive abilities Bach needed to write that suite are still more obvious. Memory also is important for a musical composer or performer, and memory is related to g . High achievement in music is also surely related to intrapersonal qualities such as self-discipline and perseverance, which in turn have a relationship with g .

BODILY-KINESTHETIC ABILITY

The association with g is probably smallest in the case of bodily-kinesthetic ability. I cannot be more precise than that because (to my knowledge) there is no good literature on the subject. The teams of the National Football League must think that g has some relationship to performance, because they have been administering the Wonderlic Intelligence Test to prospective draftees for years. Some teams have assigned minimum scores required for different positions, with quarterback having the highest floor. Other sports such as golf give an advantage to people who can think ahead and can accurately assess the probabilities associated with alternative choices ("Should I go for the green or lay up short of the water hazard?"). These qualities presumably create some association between sporting achievement and g , especially at the highest levels. As in the case of music, it is also surely true that high achievement in sports is related to intrapersonal qualities that are statistically related to g . Apart from the obvious roles of self-discipline and perseverance, the reason that a

handful of athletes can perform at their best under the most pressure—they don't choke as ordinary people do—involves intrapersonal qualities such as emotional self-control and ability to focus despite distractions. It seems safe to assume that the sign of the relationship of g to athletic achievement is often positive within a given sport, or within a given position within a given sport, but nothing more ambitious than that.

In summary: Ability varies and it varies a lot. Four of the seven abilities are especially important in adult life. A mathematical correlation is known to exist between g and the existing operational measures of six of the seven abilities. It probably exists to a limited extent for bodily-kinesthetic ability. For the components of academic ability, the statistical association is quite strong. What does it all mean for straight thinking about education?

To me, it means that educators who proceed on the assumption that they can find some ability in which every child is above average are kidding themselves. It is not Howard Gardner's fault, but the theory of multiple intelligences has become a justification for educational romanticism. The truth that people may possess many different abilities is unthinkingly transmuted into an untruth: that everyone is good at something, and that educators can use that something to make up for other deficits.

Empirically, it is not the case that we can expect a child who is below average in one ability to have a full and equal chance of being above average in the other abilities. Those chances are constrained by the observed relationship that links the abilities. In the case of bodily-kinesthetic and musical ability, those relationships are small enough that they don't matter much. In the case of interpersonal and

intrapersonal ability, the relationships are somewhat larger, and they have to be recognized. In the case of the three components of academic ability, the relationships are extremely close. It is a classic example of life not being fair. The child who knows all the answers in math class has a high probability of reading above grade level as well and, what's more, a higher than average chance of being industrious and determined. Conversely, children who are at the bottom of the math class usually have trouble with reading as well, and also have a higher than average chance of showing problems with thinking ahead and disciplining themselves.

Many exceptions exist, of course, and educational practice at any good school should ensure that exceptions are identified. But it is one thing to be on the lookout for exceptions, and another to talk breezily about multiple intelligences and how different children learn in different but equally valid ways, and pretend that if only we tap the special abilities that reside in every child, everything will work out. Ability varies. For any given ability, the population forms a continuum that goes from very low to very high. The core abilities that dominate academic success vary together. Schools that ignore those realities are doing a disservice to all their students.