Frames of Mind

What’s in it for me? Get acquainted with the psychological theory that reshaped Western education.

Intelligence: it’s a single, general trait that all people possess in greater or lesser quantities. Or so people in Western societies tend to believe, anyway. And the idea is reinforced by tests that purport to measure a person’s intelligence. But while it’s true that these tests can predict academic success, they ignore all the other forms of success available to a person. Also, IQ tests primarily address logical and linguistic abilities. Aren’t there many other competencies a person can have? Enter the theory of multiple intelligences, which argues that within the human brain there’s not one, but several different intelligences that operate somewhat independently from one another. The blinks that follow will explore both these and some potential implications of the theory. In these blinks, you’ll learn

why the ability to recognize faces isn’t a type of intelligence; how Dalton capitalized on spatial thinking in the field of chemistry; and how music could help teach computer programming.

The modern conception of intellect is severely limited.

Picture three individuals. The first is a 12-year-old Puluwat boy from the Caroline Islands. His elders have selected him to become a master sailor, which he’ll do by combining extensive knowledge of sailing, stars, and geography. The second individual is a 15-year-old Iranian boy who’s memorized the entire Koran, mastered Arabic, and is now going to a holy city to learn to become a religious leader. The third and final individual is a 14-year-old Parisian girl who’s just learned how to use a computer program to compose musical pieces. Three competent individuals, each taking on a challenging task and attaining a high degree of achievement – you could reasonably say that they all exhibit intelligent behavior. Yet current methods of assessing intelligence have no way of measuring their potential or achievements. The key message here is: The modern conception of intellect is severely limited. The word intelligence has been used so often that it naturally conjures up images of itself as a tangible, measurable quality. But it’s better used as a convenient shorthand that describes a person’s potential to attain a high degree of competence in a particular area. Which areas, exactly? Well, the author’s list consists of seven intelligences: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, intrapersonal, and interpersonal. To come up with that list, he used several criteria. One is that, for a competence to be considered a distinct type of intelligence, it must be possible for brain damage to isolate it. That is, if a particular area of a person's brain is damaged, their skill in that specific area must be markedly diminished with little or no impact on their other abilities. However, the competence being considered must also enable individuals to find and solve problems. For instance, the ability to recognize faces can be isolated by brain damage, so it meets the first criterion. But the ability to recognize faces doesn’t lend itself to problem-solving or the acquisition of new knowledge, so it’s not an intelligence. Importantly, the author acknowledges that his list of criteria is by no means definitive.

That’s because he’s considering intelligence broadly, taking into account multiple levels of analysis. It’d only be possible to come up with a complete list if you stuck to one level, like neurophysiology. But that would mean ignoring other possible levels of analysis, like the correlations between competences and outcomes and how well they predict a person’s academic success. Of course, this limitation raises a question: Why try to define intelligences at all?

Multiple intelligence theory could be used to capitalize on people’s inherent potential.

Scientists have come up with wildly different estimates about whether or not intelligence has a genetic component. Some claim that up to 80 percent of the variability in intelligence scores in the general population can be chalked up to genetics. Meanwhile, other scientists estimate a heritability of just 20 percent, and some even believe that intelligence can’t be inherited at all. Given this variability, should all language referring to intelligence as an inherited trait be set aside? It might be better to instead consider certain individuals as genetically “at promise” for a particular talent. Having this “diagnosis” doesn’t mean they’ll develop the talent, of course. A person can be born with the ability to become a great chess player, but if she’s never given a chessboard, she’s not going to get very far. The key message here is: Multiple intelligence theory could be used to capitalize on people’s inherent potential. From a genetic perspective, a stimulating environment can help an individual reach a high level of competence in a particular area. But the study of genetic inheritance is incredibly complicated, and it’s not easy – or is sometimes impossible – to separate a person’s inherent genetic abilities from her environmentally acquired traits. Two key principles from the field of neurobiology are a little more useful in understanding human cognitive abilities: canalization and plasticity. Canalization is the tendency of an organic system to follow a particular developmental path. For instance, the growth of the human nervous system is remarkably predictable. Cells start out in the neural tube – part of the embryo – and eventually migrate to the areas where they’ll become parts of the brain and spinal cord. Plasticity, on the other hand, describes the potential for a wide range of environments to impact development. The brain is particularly plastic when it comes to language; if the entire, say, left hemisphere of a child’s brain is removed during the first year of her life, she’ll still be able to speak quite well later on. But there’s a caveat: this plasticity starts to disappear later on in life. An adult whose left hemisphere is removed will almost certainly experience extreme linguistic difficulties. The theory of multiple intelligences is significant because it could help societies capitalize on the plasticity of young children’s brains. Educators could draw on early knowledge of students’ proclivities to enhance their educational opportunities. Finally, policymakers could use multiple intelligence theory to consider new ways of training and heightening intellect on a broad, societal scale.

Linguistic intelligence implies a high awareness of language and its properties.

When working on a poem, the writer Robert Graves was struggling over a particular line. It originally read, “and fix my mind in a close pattern of doubt.” But he was bothered by the word pattern; he felt that there must be some better substitute. “Frame of doubt” sounded too formal. “Net of doubt” was too negative. Finally, Graves hit upon the word “caul.” The word had many different senses: it simultaneously referred to a type of woman’s cap, a spider web, and a membrane that sometimes covers the head of a child when it’s born. All of those fit within the poem – and even better, “close caul” alliterated nicely. In the end, the line read, “and fix my mind in a close caul of doubt.” This kind of agonizing over the meanings and sounds of words is representative of highly developed linguistic intelligence. The key message here is: Linguistic intelligence implies a high awareness of language and its properties. Poets are good examples of people with high linguistic intelligence. They’re sensitive to all the shades of meaning a word suggests. They also consider not just how that meaning may intersect with the meanings of words in other lines, but also whether the words sound good together. Of course, poetry is far from the only task to which linguistic intelligence can be applied. For example, it’s crucial in rhetoric – the use of language to convince other people of a course of action, as politicians do. Linguistic intelligence can also be used for explanation, especially when teaching and learning concepts and metaphors. Neurobiologically, linguistic intelligence is the most thoroughly studied of all the intelligences. Scientists have detailed knowledge of how linguistic skills develop, from a child’s babbling during his opening moments of life to the strings of words he utters at age three and the adultlike syntax he can employ by age four or five. And this development carries across cultures – everywhere in the world, people use some form of language to communicate. In most individuals, linguistic ability is localized in the left hemisphere of the brain. Correspondingly, damage to particular areas in this hemisphere causes damage to specific linguistic abilities. For instance, impairments in Broca’s area, which is part of the frontal lobe, cause a person to rely heavily on simple sentences with little inflection or modification – almost like an extreme version of Ernest Hemingway’s writing style.

Musical intelligence involves sensitivity to the properties of sound.

Three preschool-aged children have just performed at a musical audition. The first child accurately and emotively played a Bach suite for solo violin. The second sang a complete aria from a Mozart opera after hearing it sung just once before. The third played a simple minuet for piano that she composed herself. Each of these children is a hypothetical example of a musical prodigy, and they’ve all arrived at their talents via different routes. The first child participated in the Suzuki Talent Education Program, which teaches very young Japanese children to play string instruments. The second has severe autism, which in his case manifests as an inability to verbally communicate with others coupled with a talent for flawlessly singing back any piece of music he hears. And the third child was raised in a musical family; that experience enabled her to pick out and create tunes on her own, like a young Mozart. What the children all have in common is musical intelligence. The key message here is: Musical intelligence involves sensitivity to the properties of sound. Musical intelligence is tied to a person’s auditory-oral capabilities. Skill in this sphere allows individuals to understand the meaning of rhythmically arranged sets of pitches – and produce those pitches themselves. Just as poetry can be thought of as the culmination of linguistic intelligence, musical composition can be thought of as the culmination of musical intelligence. While very few people will ever become composers, research has shown that almost everyone can at least appreciate the basic structure of music. They can group a piece with a certain rhythm together with other pieces in a similar rhythm. Or, given a piece in a certain key, they can judge which sort of ending is more or less appropriate. Like language, music relies heavily on a person's auditory tract. Yet musical intelligence is distinct from linguistic intelligence because the ways the brain processes and stores pitch are different from the ways it stores other sounds such as language. Here's the proof. In a study done by psychologist Diana Deutsch, a series of tones were played for participants, who were asked to remember them. Then, different sounds were played. If those sounds consisted of other tones, subjects had trouble remembering the original tones and made errors 40 percent of the time. But if the interfering material was verbal – words or numbers – participants did much better: their error rate dropped to just 2 percent.

Logical-mathematical intelligence centers around abstract reasoning.

A child is sitting on the floor in front of a set of objects. She decides to count them and determines that there are ten. Then she points to the objects in a different order. Ten objects again! She tries over and over. Eventually, she begins to understand that the number ten represents all the elements in the set, no matter which order she counts them in. This child has naturally arrived at an insight about the concept of number. In doing so, she's exercised her logical-mathematical intelligence. This type of intelligence begins through interaction with the world of objects. As it develops, it becomes more and more abstract until it enters the realms of logic and science. The key message here is: Logical-mathematical intelligence centers around abstract reasoning. At some point, an aspiring mathematician is likely to find herself presented with a long chain of propositions – that is, mathematical statements. The ability to remember the links in the chain may help her understand them. But a good memory isn't a mathematician's true strong suit. Instead, it's her ability to follow long chains of reasoning – to understand the logical links between mathematical statements and grasp their overall meaning. Like painters or poets, mathematicians are concerned with patterns. They're not concerned with language or pitch, though; it's ideas they're interested in. It's impossible to overstate how abstract mathematics is. The discipline asks a person not just to find analogies, but to find analogies between different kinds of analogies. It deals with imaginary numbers, irrational numbers, paradoxes, possible and impossible worlds, and so on. So where is mathematical ability located in the brain? At the moment, there's only a fragile consensus about that, but it seems to be centered in the brain's left hemisphere. Typically, logical-mathematical abilities decay after generalized diseases like dementia. And there are also conditions like Gerstmann syndrome, where children experience isolated impairment in learning arithmetic and have difficulty recognizing and identifying their fingers and distinguishing left from right. In modern Western society, logical-mathematical intelligence is the most privileged intelligence of all. And it's often said that this intelligence guides the course of human history. There's only one logic, and only those with logical-mathematical intelligence can exercise it – or so the theory goes. The author disagrees. Though this intelligence has been deeply important in the West and is highly equipped to handle certain problems and tasks, it can't solve everything.

Spatial intelligence is used for visualization and orientation in space.

If you can, visualize a tall animal – say, a horse – in your head. From just that image, can you determine which point is higher – the top of its tail or the base of its head? Now try this one. Visualize folding a piece of paper in half three times. How many rectangles are created by the folds after you’re finished? It’s probably clear right away whether or not these tasks are difficult for you. Though different, both are related to spatial intelligence. They ask you to visualize images in your head and utilize your understanding of space. Ultimately, this intelligence is all about the capacity to accurately perceive the visual world, transform and modify that perception, and recreate it even when the visual stimulus is no longer in front of you. Oh, and in case you’re still thinking about those rectangles in that piece of paper: the answer is 8. The key message here is: Spatial intelligence is used for visualization and orientation in space. Despite the focus on perceiving the visual world, spatial intelligence can actually operate independently of the ability to see. This means that individuals with blindness can still have highly developed spatial intelligence. Of course, people who’ve been blind since birth can’t perceive certain aspects of it, like color. But they can recognize sizes and shapes by using their other senses. Spatial abilities allow people to find their way around, whether they’re in a room or in an ocean. They also give people sensitivity to the details and qualities in visual or spatial displays, such as paintings or sculptures. But the “space” doesn’t even have to be as literal as that. Spatial capacities can be used in a much more abstract way, such as drawing connections between different domains. Take John Dalton, who combined the imagery of both chemistry and astronomy to imagine atoms as tiny solar systems. No matter what purpose spatial ability is applied to, this intelligence can be observed across all cultures – though some make more use of it than others. For instance, the ability to discern slight differences in the angle and shape of snow drifts is essential for navigation in the tundra, and that requires a high degree of spatial skill. In fact, one study found that over 60 percent of children who lived in such an environment, whom it identified as Eskimo, scored as high on tests of spatial ability as the top 10 percent of white children. Unlike logical-mathematical intelligence, spatial intelligence is very much concerned with the world of objects. There’s another intelligence that’s similarly concerned with the concrete over the abstract. It’s called bodily-kinesthetic intelligence – and it’s the subject of our next blink.

Skilled use of the body reflects bodily-kinesthetic intelligence.

Of all the ways people can use their bodies, the one most widely developed is probably dance. Because there are so many forms, uses, and meanings associated with dance, even defining the term can be difficult. But, in general, a dance is a culturally patterned sequence of purposeful, intentionally rhythmic body movements. Dance goes back many thousands of years. In Paleolithic times, masked and dancing sorcerers and hunters were depicted in cave paintings. Over the years, dance has been used to reflect and enforce social organization, express both secular and religious ideas, and serve as recreation, to name just a few. On a bodily level, dance is all about combining the qualities of speed, direction, distance, intensity, and so on – qualities that require a highly developed sense of bodily-kinesthetic intelligence. The key message here is: Skilled use of the body reflects bodily-kinesthetic intelligence. In Western culture, the activities of the body aren't typically thought of as having anything to do with intelligence. But that's a historical artifact that comes from associating intelligence with things like reason and logic. If you look more closely, you'll notice that lots of cognitive pursuits also include a distinct physical element. Think of a surgeon conducting an operation, for instance. Precise movements are absolutely essential to her task. Even in noncognitive pursuits, it's hard to consider bodily skill nonintelligent. When he was in front of the net, famous hockey player Wayne Gretzky would hold the puck for an extra instant; that disrupted the game's rhythm and threw off the goalie. Some would call that instinct. But Gretzky rightly stated that no one would claim a doctor had learned his profession by instinct – so why should they say the same about his understanding of hockey? It's also just factually incorrect to claim that the brain doesn't play a role in bodily movement, because it does – though it's more a means to an end. The brain helps refine, redirect, and adapt motor behavior so that it better serves a person's goals. In other words, the body and the brain are constantly communicating with each other to execute a given motor task. Additionally, impairments in the brain – especially in the left hemisphere – can reduce a person's motor abilities. Take, for instance, the various types of apraxia. An individual with this condition can cognitively understand a request and is physically able and willing to perform it – yet is unable to actually do it. We've covered all the externally oriented intelligences. Next, it's time to move on to the internally oriented, personal intelligences.

The personal intelligences deal with knowledge of yourself and others.

In 1909, the famous psychologist Sigmund Freud was giving lectures throughout the US, outlining his theories about the human psyche. After one of Freud's lectures, the dean of American psychologists and philosophers, William James, came up to him and said, "the future of psychology belongs to your work." That meeting was symbolic in an important way. Freud and James each represented very different philosophies and conceptions of psychology. Freud's focus was on the development of the individual psyche – a person's inner life. James, on the other hand, was much more oriented toward people's relationships with others. Their diverging visions are a good way of understanding the difference between the two forms of personal intelligence: intrapersonal and interpersonal. The key message here is: The personal intelligences deal with knowledge of yourself and others. To flesh out the distinction between intrapersonal and interpersonal intelligences, it's worth pointing to some distinct features of each. Intrapersonal intelligence is all about knowing yourself – being able to get in touch with your own thoughts, feelings, and emotions. The novelist Marcel Proust, who wrote introspectively about feelings, is a great example. By contrast, interpersonal intelligence is all about knowing others – specifically, their moods, temperaments, motivations, and intentions. The political and religious leader Mahatma Gandhi, who was renowned for his ability to understand and influence other people, might be the best example of this. Both inter- and intrapersonal intelligence are located in the same area of the brain: the frontal lobes. This is where sensory information and limbic system information are integrated. In less technical language, it's where your perceptions – including your perception of other people – combines with information about your emotional states. Though the neurological basis for the personal intelligences is shared among all people, the ways they manifest in culture vary greatly

– perhaps more so than for any of the other intelligences. Balinese culture, for instance, emphasizes the “masks” that individuals wear. People are identified by the many roles they play, in a kind of constant performance. This frame emphasizes interpersonal intelligence over intrapersonal. This is much different from Moroccan culture, where the interpersonal and intrapersonal selves are both cultivated but in clearly demarcated, separate contexts. The selves that Moroccan people display in public are deliberately much different from their private selves.

Educational systems should be modified to reflect the theory of multiple intelligences.

If you were going to teach someone to program a computer, which intelligences could you utilize? The first and most obvious choice is logical-mathematical, and linguistic intelligence would be a close second. But you could also take advantage of musical intelligence by first introducing a student to a composing program. For a student with strong spatial abilities, you might display a flow chart or other spatial diagram. Students with interpersonal skills might be aided by working with a team. Some intelligences are clearly more suited to a certain task than others. But the theory of multiple intelligences could help instructors cater to the strengths of their students. The key message here is: Educational systems should be modified to reflect the theory of multiple intelligences. The first step in applying the theory of multiple intelligences to education is developing a more accurate intelligence test – or rather, set of tests. The intelligences should be assessed at different ages and in developmentally appropriate ways. Testing children’s intelligence early on will enable them to progress rapidly in the areas where they’re particularly skilled – and receive support where they’re weak. The next step is for educational programs to review their goals. If a new program states that their goal is to “educate individuals to help them achieve their potential,” that’s not very helpful. By contrast, “achieving sufficient literacy to read a newspaper or discuss a current political program” is much more specific. And the more specific the goal, the easier it is to analyze the intellectual skills necessary for teaching and learning it. Then, educators should determine ways of employing the intelligences as both a means and an end. In other words, they should explore how an intelligence could be used to both teach a skill and itself be part of a skill. For instance, a child who has difficulty learning how to read using traditional methods might try using bodily-kinesthetic exploration to understand the shapes of the letters. Most of all, educators and policymakers should make an effort to understand how the intelligences intersect with a given cultural context. In the mid-twentieth century, policymakers attempted to Westernize the education system of Iran; they implemented systems that relied heavily on logical-mathematical reasoning. This was a dramatic shift in a culture that hadn’t previously prioritized that form of intelligence. As such, students and the systems themselves became tremendously stressed. Carefully combining cultural awareness with the knowledge of multiple intelligences could revolutionize education. What, then, would lie ahead in the story of human potential?

Final summary

The key message in these blinks is that: In modern Western society, there’s a reigning belief that intelligence is a general trait that can be measured and represented by a single numerical value. However, there’s convincing evidence that suggests there are several different intelligences operating in relative neurobiological isolation. These intelligences are, according to the author’s criteria: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, intrapersonal, and interpersonal. By further studying and exploring these intelligences, it may be possible to develop new tests that indicate a child’s intellectual strengths and weaknesses – which will in turn help educators better foster their potential.