

4. INTELLEGENCE

4.1 CONCEPTS AND DEFINITIONS: Intelligence has been defined in many different ways such as in terms of one's capacity for logic, abstract thought, understanding, self-awareness, communication, learning, emotional knowledge, memory, planning, creativity and problem solving.

Intelligence is most widely studied in humans, but has also been observed in animals and in plants. Artificial intelligence is the simulation of intelligence in machines.

Within the discipline of psychology, various approaches to human intelligence have been adopted. The psychometric approach is especially familiar to the general public, as well as being the most researched and by far the most widely used in practical settings.

Intelligence derives from the Latin verb *intelligere*, to comprehend or perceive. A form of this verb, *intellectus*, became the medieval technical term for understanding, and a translation for the Greek philosophical term *nous*. This term was however strongly linked to the metaphysical and cosmological theories of teleological scholasticism, including theories of the immortality of the soul, and the concept of the Active Intellect (also known as the Active Intelligence).

This entire approach to the study of nature was strongly rejected by the early modern philosophers such as Francis Bacon, Thomas Hobbes, John Locke, and David Hume, all of whom preferred the word "understanding" in their English philosophical works. Hobbes for example, in his Latin *De Corpore*, used "*intellectus intelligit*" (translated in the English version as "the understanding understandeth") as a typical example of a logical absurdity. The term "intelligence" has therefore become less common in English language philosophy, but it has later been taken up (with the scholastic theories which it now implies) in more contemporary psychology.

Definitions

The definition of intelligence is controversial. Some groups of psychologists have suggested the following definitions:

From "Mainstream Science on Intelligence" (1994), an editorial statement by fifty-two researchers:

A very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—"catching on," "making sense" of things, or "figuring out" what to do.

From "Intelligence: Knowns and Unknowns" (1995), a report published by the Board of Scientific Affairs of the American Psychological Association: Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought.

Although these individual differences can be substantial, they are never entirely consistent: a given person's intellectual performance will vary on different occasions, in different domains, as judged by different criteria. Concepts of "intelligence" are attempts to clarify and organize this complex set of phenomena. Although considerable clarity has been achieved in some areas, no such conceptualization has yet answered all the important questions, and none commands universal assent. Indeed, when two dozen prominent theorists were recently asked to define intelligence, they gave two dozen, somewhat different, definitions.

Besides those definitions, psychology and learning researchers also have suggested definitions of intelligence such as:

Alfred Binet Judgment, otherwise called "good sense," "practical sense," "initiative," the faculty of adapting one's self to circumstances ... auto-critique.

David Wechsler: The aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment.

Lloyd Humphreys "...the resultant of the process of acquiring, storing in memory, retrieving, combining, comparing, and using in new contexts information and conceptual skills."

Howard Gardner To my mind, a human intellectual competence must entail a set of skills of problem solving — enabling the individual to resolve genuine problems or difficulties that he or she encounters and, when appropriate, to create an effective product — and must also entail the potential for finding or creating problems — and thereby laying the groundwork for the acquisition of new knowledge.

Linda Gottfredson The ability to deal with cognitive complexity.

Sternberg & Salter Goal-directed adaptive behavior.

Reuven Feuerstein The theory of Structural Cognitive Modifiability describes intelligence as "the unique propensity of human beings to change or modify the structure of their cognitive functioning to adapt to the changing demands of a life situation."

What is considered intelligent varies with culture. For example, when asked to sort, the Kpelle people take a functional approach. A Kpelle participant stated "the knife goes with the orange because it cuts it." When asked how a fool would sort, they sorted linguistically, putting the knife with other implements and the orange with other foods, which is the style considered intelligent in other cultures.

Human intelligence

Human intelligence is the intellectual capacity of humans, which is characterized by perception, consciousness, self-awareness, and volition. Through their intelligence humans possess the cognitive abilities to learn, form concepts, understand, and reason, including the capacities to recognize patterns, comprehend ideas, plan, problem solve, and use language to communicate. Intelligence enables humans to experience and think.

Animal and plant intelligence

The common chimpanzee can use tools. This chimpanzee is using a stick to get food. Although humans have been the primary focus of intelligence researchers, scientists have also attempted to investigate animal intelligence, or more broadly, animal cognition. These researchers are interested in studying both mental ability in a particular species, and comparing abilities between species.

They study various measures of problem solving, as well as mathematical and language abilities. Some challenges in this area are defining intelligence so that it means the same thing across species (e.g. comparing intelligence between literate humans and illiterate animals), and then operationalizing a measure that accurately compares mental ability across different species and contexts.

Wolfgang Köhler's pioneering research on the intelligence of apes is a classic example of research in this area. Stanley Coren's book, *The Intelligence of Dogs*[unreliable source?] is a notable popular book on the topic. (See also: *Dog intelligence*.) Nonhuman animals particularly noted and studied for their intelligence include chimpanzees, bonobos (notably the language-using Kanzi) and other great apes, dolphins, elephants and to some extent parrots, rats and ravens.

Cephalopod intelligence also provides important comparative study. Cephalopods appear to exhibit characteristics of significant intelligence, yet their nervous systems differ radically from those of backboned animals. Vertebrates such as mammals, birds, reptiles and fish have shown a fairly high degree of intellect that varies according to each species. The same is true with arthropods.

It has been argued that plants should also be classified as being in some sense intelligent based on their ability to sense the environment and adjust their morphology, physiology and phenotype accordingly.[18][19]

4.2 The triarchic theory of intelligence was formulated by Robert J. Sternberg, a prominent figure in the research of human intelligence. The theory by itself was groundbreaking in that it was among the first to go against the psychometric approach to intelligence and take a more cognitive approach.

Sternberg's definition of human intelligence is "(a) mental activity directed toward purposive adaptation to, selection and shaping of, real-world environments relevant to one's life" (Sternberg, 1985, p. 45), which means that intelligence is how well an individual deals with environmental changes throughout their lifespan. Sternberg's theory comprises three parts: componential, experiential, and practical.

Schematic illustrating one trial of each stimulus pool in the Sternberg task: letter, word, object, spatial, grating. Sternberg associated the workings of the mind with a series of components. These components he labeled the metacomponents, performance components, and knowledge-acquisition components (Sternberg, 1985).

The meta-components are executive processes used in problem solving and decision making that involve the majority of managing our mind. They tell the mind how to act. Metacomponents are also sometimes referred to as a homunculus. A homunculus is a fictitious or metaphorical "person" inside our head that controls our actions, and which is often seen to invite an infinite regress of homunculi controlling each other (Sternberg, 1985).

Sternberg's next set of components, performance components, are the processes that actually carry out the actions the metacomponents dictate. These are the basic processes that allow us to do tasks, such as perceiving problems in our long-term memory, perceiving relations between objects, and applying relations to another set of terms (Sternberg, 1997).

The last set of components, knowledge-acquisition components, are used in obtaining new information. These components complete tasks that involve selectively choosing information from irrelevant information. These components can also be used to selectively combine the various pieces of information they have gathered. Gifted individuals are proficient in using these components because they are able to learn new information at a greater rate (Sternberg, 1997).

Whereas Sternberg explains that the basic information processing components underlying the three parts of his triarchic theory are the same, different contexts and different tasks require different kind of intelligence (Sternberg, 2001).

Componential / Analytical Subtheory

Sternberg associated the componential subtheory with analytical giftedness. This is one of three types of giftedness that Sternberg recognizes. Analytical giftedness is influential in being able to take apart problems and being able to see solutions not often seen. Unfortunately, individuals with only this type are not as adept at creating unique ideas of their own. This form of giftedness is the type that is tested most often (Sternberg, 1997).

Experiential / Creative Subtheory

Sternberg's 2nd stage of his theory is his experiential subtheory. This stage deals mainly with how well a task is performed with regard to how familiar it is. Sternberg splits the role of experience into two parts: novelty and automation.

A novel situation is one that you have never experienced before. People that are adept at managing a novel situation can take the task and find new ways of solving it that the majority of people would not notice (Sternberg, 1997).

A process that has been automated has been performed multiple times and can now be done with little or no extra thought. Once a process is automatized, it can be run in parallel with the same or other processes. The problem with novelty and automation is that being skilled in one component does not ensure that you are skilled in the other (Sternberg, 1997).

The experiential sub theory also correlates with another one of Sternberg's proposed types of giftedness. Synthetic giftedness is seen in creativity, intuition, and a study of the arts. People with synthetic giftedness are not often seen with the highest IQ's because there are not currently any tests that can sufficiently measure these attributes, but synthetic giftedness is especially useful in creating new ideas to create and solve new problems. Sternberg also associated another one of his students, "Barbara", to the synthetic giftedness. Barbara did not perform as well as Alice on the tests taken to get into school, but was recommended to Yale University based on her exceptional creative and intuitive skills. Barbara was later very valuable in creating new ideas for research (Sternberg, 1997).

Practical / Contextual Subtheory

Sternberg's third subtheory of intelligence, called practical or contextual, "deals with the mental activity involved in attaining fit to context" (Sternberg, 1985, p. 45). Through the three processes of adaptation, shaping, and selection, individuals create an ideal fit between themselves and their environment. This type of intelligence is often referred to as "street smarts."

Adaptation occurs when one makes a change within oneself in order to better adjust to one's surroundings (Sternberg, 1985). For example, when the weather changes and temperatures drop, people adapt by wearing extra layers of clothing to remain warm.

Shaping occurs when one changes their environment to better suit one's needs (Sternberg, 1985). A teacher may invoke the new rule of raising hands to speak to ensure that the lesson is taught with least possible disruption.

The process of selection is undertaken when a completely new alternate environment is found to replace the previous, unsatisfying environment to meet the individual's goals (Sternberg, 1985). For instance, immigrants leave their lives in their homeland countries where they endure economical and social hardships and go to other countries in search of a better and less strained life.

The effectiveness with which an individual fits to his or her environment and contends with daily situations reflects degree of intelligence. Sternberg's third type of giftedness, called practical giftedness, involves the ability to apply synthetic and analytic skills to everyday situations. Practically gifted people are superb in their ability to succeed in any setting (Sternberg, 1997). An example of this type of giftedness is "Celia". Celia did not have outstanding analytical or synthetic abilities, but she "was highly successful in figuring out what she needed to do in order to succeed in an academic environment. She knew what kind of research was valued, how to get articles into journals, how to impress people at job interviews, and the like" (Sternberg, 1997, p. 44). Celia's contextual intelligence allowed her to use these skills to her best advantage.

Sternberg also acknowledges that an individual is not restricted to having excellence in only one of these three intelligences. Many people may possess an integration of all three and have high levels of all three intelligences.