Abstract Intelligence: An Introduction

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Abstract: Intelligence has been a key component of modern psychology, the science of human behavior. It is regarded as a complex of mutually independent skills. There are substantial differences in conceptions of intelligence across cultures. Abstract intelligence refers to one's ability to carry on abstract thinking. Abstract thinking is the ability to consider concepts beyond what we observe physically. This paper introduces the reader to abstract thinking and abstract intelligence.

Keywords: Abstract Thinking, Abstract Intelligence, Concrete Thinking, Concrete Intelligence

I. INTRODUCTION

Intelligence is an ability to acquire and use knowledge. It is a form of driving force that transfers information into actions in a human or a system. It plays a crucial role in cognitive informatics, computing, software science, brain science, and knowledge science [1].

Intelligence may also be regarded as the ability to learn from past experience and adapt to suit the environment. It is the combination of abilities required for survival and advancement in a particular culture or environment. It is being studied by psychologists, neuroscientists, cultural psychologists, and many others. It is affected by culture, environment, heredity, and education. Different cultures have different conceptions of intelligence and how it is manifested in day-to-day living. Some cultures emphasize the social aspect of intelligence than do Western cultures [2].
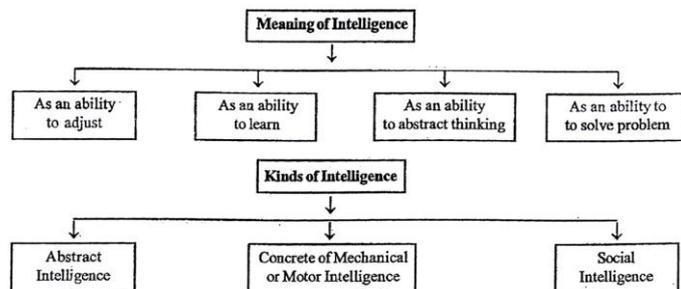

Figure 1: Characteristics of Intelligence [3].

Some characteristics of intelligence are shown in Figure 1 and explained as follows [3]:

- Intelligence is inborn. It cannot be acquired.
- Intelligence of every person is different.
- Intelligence does not differ due to sex differences.
- Environment training and education also affect it.
- Heredity affects intelligence.
- It helps in learning and in adjustment.
- Environment also affect it.
- It helps in solving complex problems.
- Is an ability to do intellectual works.
- It is a group of abilities.
- It is not knowledge but is related to knowledge.
- It is not a skill. Skill can be learnt but not intelligence.

There is no one overall conception of intelligence. Howard Gardener, an American developmental psychologist, described nine types of intelligence in 1983 [4]:

- Naturalist (nature smart)
- Musical (sound smart)
- Logical-mathematical (number/reasoning smart)
- Existential (life smart)
- Interpersonal (people smart)
- Bodily-kinesthetic (body smart)
- Linguistic (word smart)
- Intra-personal (self smart)
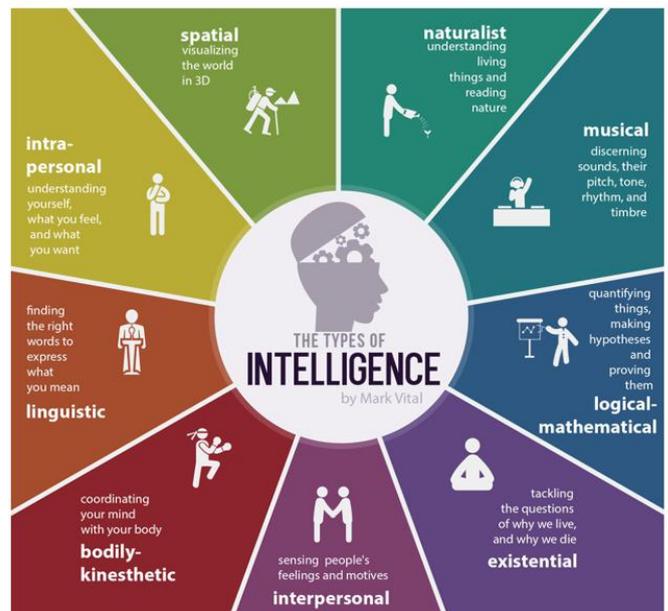- Spatial (picture smart)
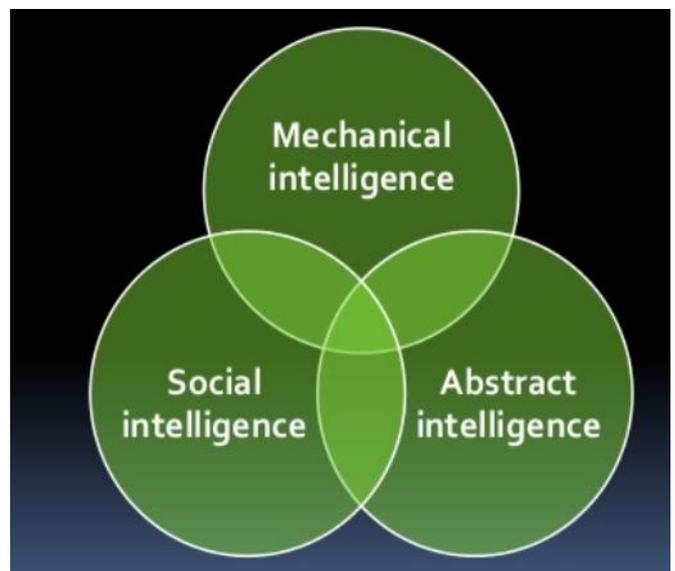

Figure 2: Nine types of intelligence [4].

Figure 3: Three types of intelligence [6].

These are illustrated in Figure 2 [4]. Other types of intelligence not in the above list include abstract intelligence, concrete intelligence, military intelligence, emotional intelligence, spiritual intelligence, swarm intelligence, machine intelligence, artificial intelligence, computational intelligence, digital intelligence, and augmented intelligence. Some forms of intelligence can be measured by standardized tests. It has been suggested that various paradigms of intelligence, such as natural, artificial, and computational intelligence, can be combined at the logical and functional levels to form abstract intelligence, which is the ability to engage in abstract thinking [5]. As shown in Figure 3, an American psychologist Edward Lee Thorndike divided intelligence into three forms: abstract intelligence, social intelligence, and mechanical intelligence [6].

II. CONCEPT OF ABSTRACT INTELLIGENCE

Abstract intelligence is the ability to respond to words, numbers, letters, etc. It is the ability to carry on abstract thinking. It is a measure of one's ability to reason and understand complex concepts and assimilate new information beyond previous experience. It is independent of educational and cultural background.

Abstract thinking is the ability to understand concepts that are real but not tied to concrete physical objects and experiences. Abstract thinkers can reason quite well and use analogies and metaphors to understand the world around them. They are good in seeing conceptually what is not there. For example, comedians are good at abstract thinking as they make jokes out of the unexpected connections. Math skills are often abstract as they depend on the ability to conceptualize things without laying hands on physical objects. The study of science, language, history, social studies, philosophy, and politics all require the ability to think generally and express abstract ideas [7].

The opposite of abstract thinking is concrete thinking, which is tied to objects and experiences that are observable. The terms "concrete" and "abstract" are used to suggest how practical or impractical an idea may sound. Abstract ideas are usually invisible, complex, and subjective, while concrete ideas are often visible and objective. Examples of abstract concepts include love, intelligence, bravery, happiness, loyalty, and convenience. Examples of concrete ideas include bank manager, college student, dog, computer, and pencil. A concrete thinker focuses on what is physically around him. Pure mathematics deals with abstract concepts, while applied mathematics deals with concrete concepts. For example, a concrete thinker may take everything too literally. The ability to think abstractly develops as we grow. Children begin to think like concrete thinkers. They observe and use their five senses and motor skills. As they child grow, their way of thinking changes and they gradually become abstract thinker. They become abstract thinkers at the last stage of their mental development [8].

Abstract reasoning questions can serve as a good measure of general intelligence. An abstract reasoning test is becoming popular as part of any job assessment or intelligence testing setup because they are independent of cultural background, education, and language. It measures one's non-verbal ability to reason logically and identify and interpret patterns. It is designed to assess the candidate's ability to work out new concepts and abstract ideas. It has been found to have a high correlation with general intelligence and the ability to reason logically [9].

Besides abstract and concrete thinking, there are other forms of thinking including linear thinking, nonlinear thinking, analytical thinking, creative thinking, critical thinker, divergent thinking, and convergent thinking. Abstract intelligence triggers the recent breakthroughs in cognitive systems such as cognitive computing and cognitive learning. Cognitive computing attempts to enable the computer to do what can only be understood and computed by human intelligence [10].

III. BENEFITS AND CHALLENGES

Someone who thinks more abstractly can do better on intelligence tests. Without abstract thinking, most of our inventions today would not exist. Abstract reasoning can benefit students in the classroom and in the real world alike. Some people, mathematicians, artists, comedians, writers, and engineers utilize this abstract thinking a regular basis. Children can develop their abstract reasoning skills using blocks, tinker toys, geometric toys or other items. Books expand the imagination of children and greatly help in the development of their abstract intelligence. Reading books aloud to children also contributes to the development of their abstract intelligence.

There is no general definition of intelligence. Although people talk about intelligence, they find it difficult to state just what it is and how it is to be measured.

CONCLUSION

The brain is a complex organ and no one has the same way of thinking. Intelligence is a global concept that involves a person's ability to act purposefully, think rationally, and deal effectively with the environment. It is the capacity to acquire and apply knowledge. More information on abstract intelligence can be found in the books in [11,12].

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