What is cognitive science?

By Julia Lee Ai Cheng

As a lecturer who works at the Faculty of Cognitive Sciences and Human Development, friends or acquaintances frequently ask me what cognitive science means.

History

Cognitive science is a very young discipline in the world and even more so in Malaysia. The history of cognitive science dates back to the time of the Greek philosophers such as Socrates and Plato when they began ruminating about the human intellect. They were possessed by the quest to answer questions such as: Where is the mind? What does it consist of? How is knowledge represented in the human mind?

However, the questions of the human intellect were put aside when scholars such as Ivan Pavlov, B F Skinner, and J B Watson, who subscribed only to the public methods of observing human mind and to the theory that Behaviour, topped the proponents who were interested in understanding the human mind. These three scholars, known as behaviourists, were more interested in explaining how the human being functions from observable behaviours.

After much debate in the 1940s, the “forfathers” of cognitive science began to realise that a better and more scientific study of the mind was on its way. They were convinced that human activities such as learning, speaking, and performing on a musical instrument can be accounted for with insights about the brain and computers.

In the mid-1950s, researchers from various areas such as linguistics, mathematics, neuropsychology, computer science, and artificial intelligence met at the Massachusetts Institute of Technology for a conference on cognitive science (Gardner, 1985). They wanted to understand the function of the mind and began to build theories of the mind using complex computational representations with the help of computer systems. This meeting led to the cognitive revolution and cognitive science was born.

The researchers’ quest to understand the mind led to the idea that there were similarities between the computer and the human mind. The computer was a useful analogy to understand the human mind. Computers have input facilities such as the keyboard, mouse, bar code reader, and joy stick, while human beings have five senses to receive and filter information.

Computers have hard disks which are very similar to the long-term memory in human beings. Computers also have software programmes to run a set of procedures while human beings have memories in the mind capable of remembering procedures and knowledge to function efficiently and effectively in the world.

Computers have output tools such as the computer monitor and printed hardcopies while human beings have the capability of producing knowledge representations of the world around them.

Based on this discovery, the early cognitive scientists began to rely heavily on computers to understand how the human mind functions. This knowledge of the similarities between the human mind and computer systems was thought to be able to guide research in both psychology and computer science. The computer serves as the most viable model of how the human mind works.

What is cognitive science?

Today, cognitive science refers to the scientific study of the mind; how we think, perceive, remember, and learn. The coalition of researchers from various fields such as philosophy, psychology, artificial intelligence, neuroscience, linguistics, education, and anthropology has resulted in the interdisciplinary study of the mind through the studies and exchange of ideas of researchers in these fields.

As the human mind is the focus of the field, what was previously studied in a compartmentalised manner has now amalgamated to form clearer understandings of the human mind. The MIT Encyclopaedia of the Cognitive Sciences classifies the cognitive sciences into six domains.

These are: computational intelligence, culture, cognition, and evolution, linguistics and language, neuroscience, philosophy, and psychology. Clearly, the interdisciplinary coalition between these multidisciplinary fields is the best way to uncover our search about the human mind.

Many other reputable sources converge where the definition of cognitive science is concerned. The Stanford Encyclopaedia of Philosophy states that cognitive science is the interdisciplinary study of mind and intelligence, including psychology, philosophy, artificial intelligence, anthropology, education, linguistics, and computer science.

Meanwhile, Howard Gardner who wrote The Mind’s New Science (1985) defines cognitive science as “a contemporary, empirically-based effort to answer long-standing epistemological questions particularly those concerned with the nature of knowledge, its components, its sources, its development, and its deployment”.

Today, Cognitive Scientists still ruminate about the nature of the human mind. How is knowledge stored? How might knowledge be lost?

In order to answer these questions, the multi-disciplines such as philosophy, psychology, artificial intelligence, linguistics, anthropology and neuroscience have been drawn together to answer these questions and to produce products that would model human thinking and human behaviour.

How can we investigate the mind?

Historically, research in the field of cognitive science conducted extensive research on animals due to the non-existence of non-invasive machines that could capture what the mind was doing while a person was engaging in a particular task such as singing, reading, crying, and sleeping.

Today, there are many non-invasive machines in the market that can scan the brains of both adults and children.

The popular types of brain scanners are Magnetic Resonance Imaging (MRI) and Functional Magnetic Resonance Imaging (fMRI). The use of these machines has illuminated complex problems such as dyslexia.

Researchers-cum-Professors of Paediatrics such as Sally Shaywitz and Bennett Shaywitz from Yale University have found through the use of the fMRI that they could directly evaluate the effects of specific reading interventions on the neural systems for reading (Yale Bulletin, 2004).

With the use of these high-tech tools they were able to discover that early intervention and effective reading instructions are important to take advantage of the plasticity of our human brain. This finding is very important because it points us to the path where education and health sciences experts can come together, exchange ideas, and discover a holistic solution to address dyslexia in society.

The field of cognitive science is, therefore, extremely important for the advancement of society, whether we are solving social problems or specific problems such as the learning disorder just mentioned.

Applications

The applications of cognitive science research are vast. Today basic cognitive science research has also moved into the classroom. A science of learning is possible because of the many research projects undertaken on cognitive development to understand how children learn. Going deep enough using what we know about cognitive science such as how the human mind works is helping us improve teaching and learning.

Zawawi Ismail (1998) mentioned in his keynote address on the Business of the Mind at the National Conference on Cognitive Science in 1998 that the understanding of cognitive science will also be able to address issues of human resource development and the management of organisations.

Recently, I learned from a professor at Nanyang Technological University of Singapore that we can apply the “Language of Leadership” to frame the minds of our subordinates. She suggested that “Language is the most powerful tool of influence. As leaders we must not only be able to understand but we must also be able to use language for the benefit of the organization’s leaders.”

The vision for the establishment of the Faculty of Cognitive Sciences and Human Development is found in the Unimas Tree Book (1993). The pioneer leader of the university at that time mentioned that “as our society becomes more knowledge-based, ever increasingly, all the subject areas are required. New approaches will be needed to be sought out to solve issues of growing complexity, and one central aspect of such change is the mind itself.”

It was visualised that the Faculty of Cognitive Sciences and Human Development would “be geared towards the issues of creativity, technology utilisation, and value reinforcement.”

To conclude, I share one last question people have asked me about cognitive science. Can people trained in cognitive science or psychology read other people’s minds? This was a question posed to me once during a dinner party.

My answer is very simply “No”. People trained in the field of cognitive science cannot read other people’s minds. We can, however, use our training in scientific observation, empirical methods or our intuitive skills to understand the phenomenon or a person’s.

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