



# Teaching Strategies of Chinese Language History Class Based on Brain Science

Zhubing Cao<sup>1\*</sup>, Kangcheng Li<sup>2</sup>

## ABSTRACT

Brain science and education are both new emerging research fields which received much international attention. At present, there have set up research organizations and institutions of bigger children, in their studies there are several characteristics as follows: choosing different research entry points, exploring the research mode connecting brain science and education, paying attention to application research questions, and adopting advanced research tools and techniques. In this study, we attempt to analyze and sort out the advanced teaching research materials from abroad, start from the perspective of brain science, and probe into scientific and effective classroom teaching strategies. According to the physiological characteristics of the brain and the latest relevant research, this study explores and presents teaching strategies that are suitable for the Chinese language history classes.

**Key Words:** Brain Science, Emotions and Learning Cognition, Teaching Strategies, Chinese Language History, The Hippocampus

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## Introduction

Education is an activity that aims at cultivating people and is closely related to the brain. One of the purposes of education is to develop the potential of the brain and improve the efficiency of learning and working (Hinton *et al.*, 2008). After the "ten years of the brain" proposed by the United States and the European Community in the 1990s, humankind has ushered in the "era of brain science." By the joining effort and research of countries in Americas, Europe, and Asia, the results of research in this decade on the brain have surpassed the sum of past history as a whole and some groundbreaking research results were generated: the development of brain imaging technology makes it possible to observe the dynamic process of learning activities of the human brain. These research results have raised the international community's desire to explore the law of student learning from the perspective

of combining brain science and education (Wang *et al.*, 2006).

The location of the hippocampus in the brain as shown in figure 1.



**Figure 1.** The location of the hippocampus in the brain

**Corresponding author:** Zhubing Cao

**Address:** <sup>1</sup>Department of Chinese, Fuyang Normal University, Fuyang 236041, China; <sup>2</sup>Hunan University of Science and Technology, Xiangtan 411201, China

**e-mail** ✉ zhubing19782003@sohu.com

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**Table 1.** Related Search Results (1994-2017)

Key words	Journal Network	Bo Shuo theory library
Effective teaching	1317	30
Classroom teaching strategy	2568	18
Brain Science + Teaching	15	2
Ten effective brain science + teaching	0	0
Brain science + classroom teaching	10	1
Ten strategies of brain science + classroom teaching	0	0

As brain science can provide a new way of thinking and theoretical basis for the development of education. The research progress obtained by the brain science on the brain mechanism and learning principles have provided theoretical support for re-thinking and re-positioning the role of teaching. Especially in recent years, brain science research has provided scientific explanations for many educational issues (Fischer *et al.*, 2009; Chuntonov *et al.*, 2012; Du *et al.*, 2017). At the same time, it also offers possibilities of education and teaching based on the law of brain cognitive activity. To establish “education of the brain, for the brain and promote the brain” is to establish teaching methods, teaching organization strategies and educational evaluation methods that are suitable for the characteristics of students’ cognitive ability development at the premise of fully understanding of the brain’s cognitive function, emotional function, self-awareness and other advanced features. Truly laid scientific foundation for education, achieve scientific teaching and learning, strive to improve the quality and efficiency of teaching and learning, all these have become focuses of educational science research and reform for all developed countries in the world. Therefore, to understand the brain of students and to carry out teaching according to its characteristics has become a serious task facing educators today. However, the research results of domestic brain science are rarely used in education. Related Search Results from 1994 to 2017 as shown in table 1.

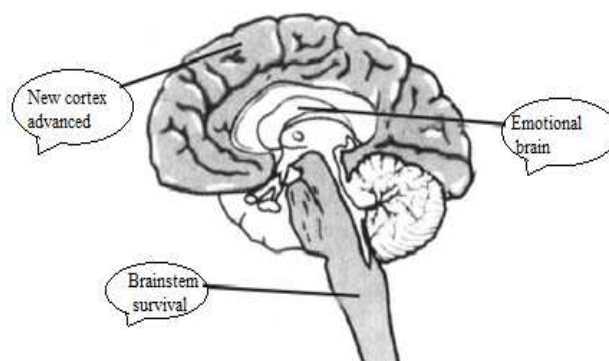
### The Concept of Brain Science

#### Memory-related brain basic structure

##### (1) The hippocampus

The word hippocampus comes from the Greek language, the hippocampus is closely related to memory. Studies have shown that hippocampus plays an important role in the transition from short-term memory to long-term memory. It can not only temporarily store information accepted from outside world as the short-term memory but also send it to the cerebral cortex-related brain

area for permanent storage, and change it into long-term memory. Seriously damaged hippocampus not only lose long-term memory, but also cannot recall things that has just happened (Li *et al.*, 2015; Du *et al.*, 2018). The Brain wave pattern and new cortex of hippocampus are distinctly different, when the brain is awake, it shows high amplitude mantle wave; when the brain is in coma, the fast wave appears; when the brain in deep sleep, the peak wave often occurs, noninvasive brain imaging confirmed the role of hippocampus in the learning and memory. Trinity brain model as shown in figure 2.



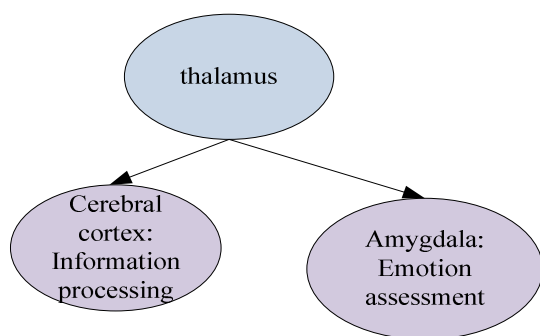
**Figure 2.** Trinity brain model

##### (2) Amygdala

The amygdala is attached to the end of the hippocampus and plays an important role in emotional behavior, particularly in relation to the reaction of fear. Electrical stimulation of the amygdala can cause anger or have a sense of fear or happiness. After amygdala remove surgery, the character of furious mental patient would become gentler. As the amygdala approaches the memory-bearing hippocampus, researchers believe that the amygdala can generate emotions and encode information into long-term memory. At the same time, amygdala also manage some of the behaviors that maintain the survival of body, such as to fight or to flee, food searching because of hunger, foraging for hunger, mating for future generations, etc., all these behaviors were selected by amygdala (Pan, 2011; Beine *et al.*, 2011). If the amygdala considers that there are potential



dangers in the environment, it will stimulate the hypothalamus to send signal to the body to flee immediately. Therefore, the amygdala is called the guard of the brain. In teaching practice, the commonly used teaching strategies of role play, cooperation and interaction, and entertainment games have achieved good teaching effect and achieved the purpose of long-term memory because of the involvement of amygdala, this is because amygdala has the functional feature of transforming the accepted information into long-term memory through its controlled emotions. Emotions of the amygdala as shown in figure 3.



**Figure 3.** Emotions of the amygdala

**The definition of brain science**

Brain science is a discipline with dual nature and characteristics. It is not only a single and highly specialized natural biology discipline, but also a comprehensive discipline with rich connotation and nature. In a narrow sense, brain science is a neuroscience we can usually recognize, it is a scientific study conducted by brain scientist in order to understand the changing process inside the nervous system on the molecule level, cell level and between-cell level, as well as the integration role of this process in the central nervous system (Tao *et al.*, 2013). Broadly speaking, brain science is a comprehensive discipline that studies the structure and function of human brain, with the purpose of revealing the mysteries of the advanced consciousness of human brain, it is closely related and cross-infiltrated with some interdisciplinary disciplines such as pedagogy, psychology, artificial intelligence, cognitive science and creative science

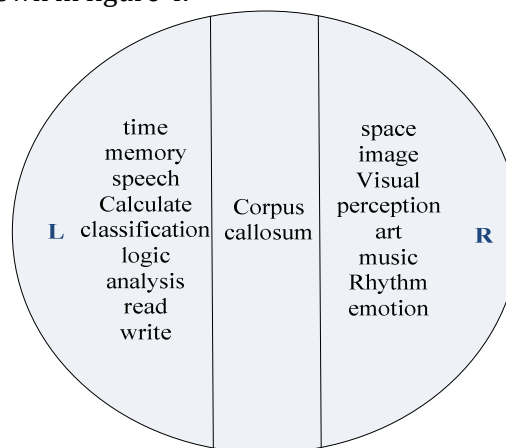
The selection and development of teaching strategies of Chinese language history is an important part of modern teaching design of information technology education in primary and secondary schools. Appropriate introduction of new teaching strategies and methods to innovate classroom teaching of information technology can

better optimize the teaching effect of information technology and improve teaching quality. As an important discipline theoretical basis of Chinese language education, the brain science has far-reaching influence and guidance significance on the choice and development of Chinese teaching strategies. Later, combining the latest research results of brain science, the writer will analyze and explore its close relationship with the teaching of Chinese language history of primary and secondary schools, and then put forward teaching strategies and path based on brain science information technology.

**Teaching Strategy of Chinese History Based on Brain Science**

*Implementing whole-brain teaching to develop students' creative potential*

The concept of "whole brain" was first proposed by American brain expert Ned Herman in his book *"The Whole Brain Business Book"* in the late 1970s. Base on Sperry's brain function division theory and McLean's triune brain theory, Herman had constructed his "whole-brain model", according to coordination function and function of left and right hemispheres of the brain, he designed the "whole-brain teaching and learning model" and "whole-brain creation and innovation model". The whole-brain type teaching (whole-brain teaching) model is an efficient teaching method based on the whole brain and exerting all the advantages of the brain. The teaching methods, teaching process, teaching activities and the like must be designed by the teachers based on the whole brain in order to adapt the students' different ways of thinking and learning styles to ensure that their whole brain is trained and improved. About the different functions of the brain as shown in figure 4.



**Figure 4.** About the different functions of the brain



The introduction of whole-brain teaching into the current teaching practice of Chinese language history in primary and secondary schools in our country is an important issue and requirement for teaching reform and curriculum reform in Chinese language history of schools. Whole-brain teaching can not only mobilize the students' right brain to participate in the learning of Chinese language history skills, but also give full play to the advantages of left and right brain hemispheres and make the logical and visual thinking more coordinate with each other, so as to improve the development of the right brain and the whole brain, which is helpful for stimulating students' creative thinking and enhance their ability to innovate. In specific process of Chinese language history teaching, schools should vigorously advocate double-brain teaching and whole-brain teaching based on brain science and change the concept and phenomenon of over-emphasis on students' left brain intelligent development in the traditional education and teaching, and turn to the development of creative potential of students' right brain, giving full play to the overall role of the students' left and right brain so as to enable the students to use both their half brains, both the hands and the brain, and their multiple senses to carry out their thinking activities simultaneously, in order to cultivate and enhance their innovative thinking more rapidly. Ebbinghaus forgetting curve as shown in figure 5.

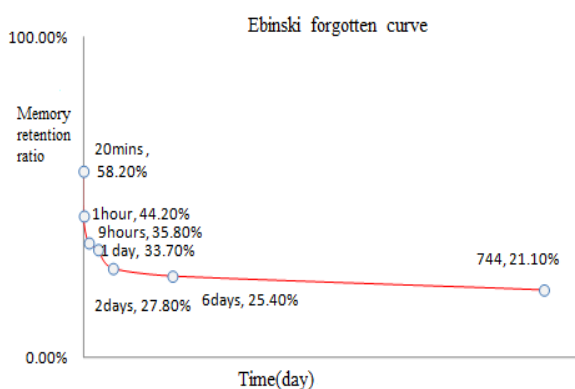


Figure 5. Ebbinghaus forgetting curve

**Carry out emotional teaching to give full play to the promotion role of emotional brain to the intelligent brain**

Brain learning is not only a rational cognitive process of the intelligent brain, but also involves the irrational factors of the emotional brain, because there is a very close relationship between feeling and emotions and learning cognition.

Learning is actually a process of cognitive activities involving multiple factors such as intelligence, creativity, emotion and physiology. Therefore, our current teaching should not only be based on the simple intellectual training of the traditional educational concept, but also need to pay attention to the changes of the students' feelings and emotions. At present, the teaching of Chinese language history in primary and secondary schools in our country only focuses on training students to master the knowledge and skills of Chinese language history, while ignoring the improvement of inner cultural qualities of students in Chinese language history. Cultivating and enhancing students' literacy in Chinese language history is the internalization process of cultural experience, which requires strengthening attention of the students' inner feelings and real emotions, encourage students to take the initiative to contact the knowledge of Chinese language history, and start from their interest to form their own learning method. Working memory capacity changes with age as shown in table 2.

Table 2. Working memory capacity changes with age

Generation	Working memory capacity changes with age
Age ≤ 5 years old	1~3
5 years old < age ≤ 14 years old	3~7

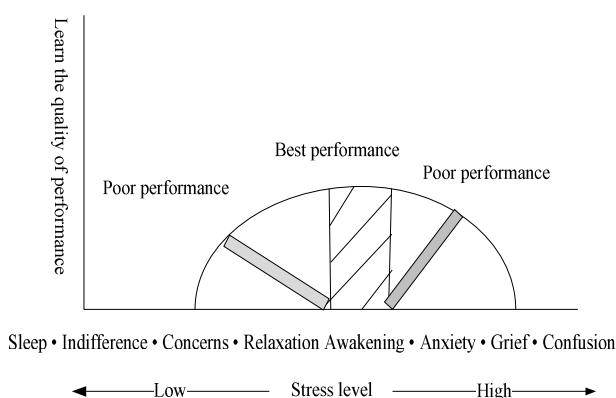
In specific process of emotional teaching, teachers of Chinese language history should strengthen students' emotional brain, give full play to the potential of emotional brain, and optimize the cooperation between intelligent brain and emotional brain of the students based on keeping the effective original teaching methods.

(A) Negative impact

When facing strong external stimuli, the amygdala transmits information through the hypothalamus, the information reaches the entire body and prepares it for the situation, this physical reaction is called stress reaction. Many brain chemicals are involved in this reaction, with epinephrine, norepinephrine and cortisol playing major roles. Under their influence: the individual's heart beats faster, blood pressure raises, awareness becomes more alert, muscles in tension, hand sweating, blood coagulation components increase, all the exercise centers are mobilized. If the pressure is too much, or lasts too long, it can lead to excessive stress reaction resulting in potentially negative results. Long-term high concentrations of cortisol and high



levels of peptide levels will lead to brain cell death and atrophy in the hippocampal gyrus area, inhibit short-term memory of the brain and the ability to form long-term memory. Prolonged stress can impair students' ability to rank important events or to organize their thinking. Stress can also affect neuronal growth. Figure 6 depicts the difference between normal neurons and neurons under stress. Neurons under stress have fewer and shorter dendrites. This defect will damage the exchange with other dendrites. In addition, under prolonged stress conditions, the immune system can be harmed, increasing the chance of illness and even causing growth retardation.



**Figure 6.** The effect of stress level on the quality of learning

### (B) Positive role

Stress reaction is not only important to survival, but also plays an important role in memory. The cerebral cortical memory system extracts any information related to the emergency at any time and impresses the new information vividly in the memory. Neuroscientists explain this: Epinephrine and norepinephrine have activated the body's automated reactions. The effect of these hormones enhances the brain's memory of events that activate stress reactions. Apparently, stress is not necessarily harmful to learning. The stress of feeling threatened is harmful, while the stress which makes the individual have a sense of urgency is helpful. Therefore, for most learning scenarios, a lower or moderate level of stress is most appropriate.

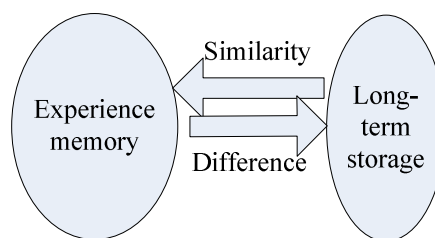
### *Introducing migration strategy to create context suitable for the learning of the brain*

The essence of learning and the results of brain science research show that the learning of the brain is greatly influenced by external

environment stimuli, good and appropriate environmental stimuli can help the brain to establish an effective neural circuit, which is helpful for the orderly conducting of learning cognition.

### (1) Similarity

One of the characteristics of information processing is that they are stored according to similarity and extracted according to their differences, that is, working memory encodes new information and stores it in a long-term memory network containing similar features or relationships. When extracting a certain information, long-term memory needs to distinguish it from all the other items in the network. Therefore, whether there is detail similarities between old and new information and how similar are they, all these will have an impact on learning. The way of the brain stores information by similarity as shown in figure 7.



**Figure 7.** The brain stores information by similarity

### (2) Relevance

The relevance can recall several pieces of information together, extending the brain's ability to retain information. When multiple items are learned together, they are relevant. When you recall one piece of information, the brain automatically recalls information associated with it. Besides establishing relations from the content meanings, emotions are also good connection bonds. When storing information, the amygdala encodes emotional information, making emotions closely linked with the content. Therefore, the relationship is particularly strong when emotions are associated with learning.

### (3) Key Attributes

A key attribute is a unique feature of a concept that differs from other concepts and is a clue used by the brain in storing information. The brain stores information by similarity and extracts information by difference. Therefore, key attributes help students classify similar concepts

and store them in a logical network with the appropriate clues. At the same time, to distinguish the key attribute of concepts is to identify the difference of concepts, which is good for the searching of long-term memory, and increase the possibility of accurately identifying and searching for the abstracted concepts.

#### (4) Initial learning

The quality of relocation that occurs in new learning depends very much on the quality of prior learning. As past experience is extracted from long-term memory back into working memory, the new and old information interact with each other to generate meaning of new information. Therefore, the meaning of the information depends on the students' mastery of the existing information. If the old and new information are relevant in content and well-studied before, then its impact on new learning will be more constructive and can help the students to achieve greater success.

### Conclusions

There are no two identical brains in the world, every student is a unique individual. It is based on this fact that individualized teaching strategies are formed. Teaching should start with the uniqueness of each student, but in reality, it is hard to fully achieve that. A unified mode, a unified approach, a unified rule is the biggest characteristic of traditional teaching, which prevents many students from adapting and exerting their own potential. Therefore, to actively change this shortcoming of traditional teaching is a pressing matter of the moment. Although we cannot really achieve the one-on-one teaching completely, we can at least meet their different needs according to the characteristics of the students. As the study of the mechanism of brain learning is getting deeper, our understanding of the teaching process is constantly changing. The contribution of brain

science to educational practices will continue and its impact will continue to increase. The dynamic process of teaching is influenced by numerous factors, many of which go beyond what teachers can influence and control. What teachers can control is their own behavior. Therefore, constantly update their basic knowledge, guide the teaching by scientific theory and improve their own abilities, those are what teachers can do and should actively pursue. I hope this book can provide teachers with some new information, strategies and insights to help teachers make more students successful.

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