The Significance and Effect of the Theory of Working Memory in SLA

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ABSTRACT. *Working memory plays a key role in many human central cognitive activities, including the second language acquisition. Numerous theories about working memory have shown up in the field of second language acquisition. Based on the specific results from some theories, they all can direct and offer a sparkling inspiration on the process of second language acquisition. Many people are not familiar with working memory, though it has a fundamental effect on whether people can cope with the information or the mentally demanding tasks they encounter in a more effective way. However, people always mix short-term memory, long-term memory and working memory together. A memory advantage, especially a working memory advantage on primary language learners, in other words, a larger working memory capacity promotes a better application of the second language for language learners. The better application of the second language can theoretically enhance the working memory in turn.*

KEYWORDS: *Working Memory, SLA, Working Memory Capacity, Significance*

1. The Reason for Choosing the Topic of Working Memory

We are often placed in a situation where we need to memorize a verification code to log on some website or where we need to remember a cellphone number for temporary use. After the use, we will generally forget those numbers. However, we will not forget some important and significant telephone numbers if we are willing to remember them. Similarly, when my son in the fifth grade asked me the formula for the area of a circle, I can automatically speak it out without hesitation. This somewhat belongs to the short-term memory and the long-term memory respectively. Besides, there are more situations where we are going to conduct specific and important ongoing tasks, which need us to filter out the useless information and pick out the related and activated information stored in the long-term memory. Thus, we can see some mutual interdependence between working memory, which has just attracted my interest to call to mind the role of working memory in various L2 processes.

2. The Theory or Concept to Be Discussed

The social and behavioral sciences are going hand in hand with theories. Theories play a crucial role in supporting the sciences. Some early theories in SLA, linguistic theory, skill acquisition theory, input processing in adult SLA, processability theory, sociocultural theory, complexity theory, and many other theories are not isolated or separated from each other, but overlapped with each other. They didn't come out in a vacuum, but went along the previous course. Among the numerous theories or concepts, one theory catches my eye. The theory says that working memory is limited in capacity. This means that people can pay attention to only so much information at a given time before working memory is overloaded. The theory also says that there are individual differences in working memory and how people use what they have (VanPatten and Williams, 2015, p. 5). The reason why the theory appeals to me at first sight is that I seem to have met or known it before. Thus, a feeling of familiarity popped out and the "aha" moments always flashed upon my mind. The more related materials and concepts extended from the theory I read, the more significant functions about working memory I realize. Regarding the theory above, it is naturally logical and testable.

3. The Logic and the Related Concepts

3.1 The Illustration and Comprehension of the Theory of Working Memory

As is mentioned above, the theory largely comprises two aspects. The first concept that working memory is limited in capacity can be related to a metaphor in my own perspective, which in part can account for this theory. Working memory can be described as a container, while capacity stands for the volume of the container. Let us assume for the sake of comprehension that some water is poured into the container. Water is equivalent to the upcoming information to be addressed. When water reaches the maximum of the volume or the capacity, water will naturally spill out, so the water spilling out cannot contribute to the content in the container. This point makes sense from the angle of life.

The second concept of this theory is naturally generated from the first concept. Take the metaphor mentioned above as an example again, different containers can hold different amounts of water. It is clear that the theory highlights the functions of individual differences in working memory. This perspective reminds me of another phenomenon in life. Different composers can make various tunes according to the limited musical notes. So we can see that the theory combines the two dimensions—storage capability and processing capability.

By contrast to long-term memory, which is about representation and is unlimited, working memory is about access and is limited (Ortega, L, 2013, p. 89). Speaking of the concept that working memory is limited in capacity, it is unavoidable to deal with some related tasks conducted by some researchers. As Majerus etd. (2006) notes in the task about sentence repetition, the process of chunking or grouping

demonstrates that the functions of working memory – storage and processing, are interactive, not isolated. They can not exist only in a totally separated way and the long-term memory and working memory exist in a similar way. Specifically, in terms of the function of processing in working memory, Harrington and Sawyer (1992) found that the dynamic feature of working memory processing is easy to see. Up to this point, the theory that working memory is limited in capacity and there are individual differences in working memory and how people use what they have remains testable in the presence of various tasks, but for the internal structure of the theory, the researchers further offer their in-depths, which are not contradictory but helpful perspectives and attitudes toward the theory that are presented in the next part.

3.2 The Related Concepts of the Theory

Cognitive psychologist Randall Engle (2002) argues that working memory capacity is not about how much information can be stored in an instant, but about the ability to control attention to keep it in an active, fast and retrievable state. He also proposed an attentional control model of working memory, holding that working memory was actually a combination of short-term memory and attentional control. Thus, individual performance of working memory capacity is a sign of individual's ability to control operation process. It is not directly about memory—it is about using attention to preserve or inhibit information. Working memory is capacity limited, possibly because attention is (Cowan, 2001). Because focal attention is limited, it is also thought to be selective. As for this point, I would like to insert an example in life, to be exact, an example existing at present. I am sitting at a table in a classroom prepared to write this paper, with the tick-tock of a clock ringing in the ear. The more I focus on it, the more tick-tock I can hear. However, as I shift my focus from the tick-tock to my paper, the tick-tock disappears, even without consciousness. This matter can also prove another characteristic that attention controls access to consciousness.

Although many studies agree that more noticing leads to more learning, on top of that, the function of working memory or the learning system is complex. Learning without attention exists according to some researchers, which literally means that sometimes some kind of learning will take place in a situation where it is not related with subjective experience and does not reach consciousness. The quality of attention varies from low-level, automatic attention to high-level, controlled attention. So the selective attention mentioned above is considered to be followed by subjective experience or consciousness in the course of processing, which is related to working memory processing. Apart from much of language use, the low-attentional processing cannot be ignored, because it really occurs to most people. For example, when we notice something not related to the content we are dealing with, we immediately turn to something else and forget about having noticed or seen that thing, but it can also leave its track in our mind, even sometimes leave its track in our dream at times. It is so complicated that we cannot entirely account for that

phenomenon, though Sigmund Freud analyzed the similar phenomenon in his book *The Interpretation of Dreams.*

The noticing function out of working memory is also related to the cornerstone of Monitor Theory. It is a common phenomenon that learners can fluently express themselves in whatever conditions exist in daily life using the first language, without a second thought, but when they express themselves in the second language, they always cannot help noticing whether their expression is correct or not. The process of noticing in this way is actually that of monitor. The theory was the first one to be developed specifically for SLA. It has been particularly influential among practitioners, and it has also laid the foundation for important ideas in contemporary theorizing within SLA. Monitor Theory can explain why what is taught is not always learned, why what is learned may not have been taught, and how individual differences among learners and learning contexts is related to the variable outcome of SLA. The acquisition- learning distinction is the central hypothesis in Monitor Theory. Another central construct, comprehensible input, has been claimed by Krashen that it is not just a necessary condition for SLA, it is the sufficient condition. In the presence of comprehensible input, SLA is an inevitable result. But as we know, there is no perfect theory. Some people have some doubt whether any comprehensible input can help the language learners for L2 acquisition. It turns out that input that is comprehensible but does not contain any new item does not help one acquire any new item. No matter how large the working memory capacity is, the comprehensible input which does not contain any new item cannot contribute to acquiring any new item.

In spite of the great significance from the Comprehensible Input Hypothesis, in later years, Swain (1995) found that a great deal of comprehensible input was of much benefit to the listening and reading comprehension ability and the communicative fluency, but it could not greatly improve the accuracy of spoken and writing expression, much of which contained many grammar mistakes. So Swain （1985）put forward the Comprehensible Output Hypothesis and thought that output can make not only a better fluency of expression, but also a better accuracy of expression. The theory also has a connection with attention, which cannot be separated from working memory that is mentioned at the beginning of the paper. One of the functions of comprehensible output demonstrates that output enables the learners to realize the difference between what they want to express and what can be expressed. Naturally, the learners turn attention to the parts needed to be improved, causing the acquisition of related language forms and they can be ignored in the process of comprehensible input. Noticing activated by output promotes the intake of target forms in the following input processing. Accordingly, output including relevant input is effective in improving interlanguage.

Attention and noticing are so closely connected that many people may blend them together, but they are different. Attention is the subjective efforts from learners, while noticing refers to the result of the subjective efforts when people find the presence of the stimulus in the subjective experience with their consciousness. Attention is the limited cognitive ability for people. Types of attention, degrees and hierarchies of consciousness as well as stability, width, distribution and transference

of attention vary from time to time, featured with being non-linear. If attention has a sequence, different learners' attention doesn't begin or develop in a fixed sequence because of individual differences. Different people in different situations have the different attention effects.

4. The Significance and Effect of the Theory about Working Memory in SLA

As a middle school English teacher, I am used to connecting the newly acquired knowledge with daily teaching and reflecting on its effect on the progress of the students. Some theories about working memory and some related ones I have been exposed to can bring me some immature thoughts which I can try applying to the process to my teaching. When I learned something useful or interesting that is helpful to the students directly or indirectly, I can always show it to the students when necessary sooner or later. In the course of my teaching, I always find some students who are excellent in their study during their elementary school. However, after they enter the middle school or higher ones, their academic grades appear lower than they get in the former stage. They prefer the repetition the teachers give them in the class when they are in the elementary school, which can provide the support to help them to learn. When they become older, the parents expect them to be more independent. The students with a poorer working memory tend to demonstrate more evident learning difficulty. With more complex content they face, a bad working memory fails to deal with the improvement of the challenge. This has nothing to do with their intelligence quotient but something with their working memory.

Working memory is connected with many fields and almost everyone. Working memory is a memory system where information is temporarily processed and capacity is limited. There are many scholars studying whether working memory capacity is positively correlated with some specific areas in SLA. Large working memory capacity and small working memory capacity in different people who have the same learning objective can contribute to different results. People with large working memory capacity almost outperformed in most aspects of SLA than those with small working memory capacity. So can people expand the working memory capacity by conducting some meaningful and relevant research since large working memory capacity does good to the SLA? On the contrary, working memory capacity does not necessarily promote some specific skills in SLA. Whether working memory capacity is useful to that skill or not, more research is needed. Only through sufficient evidence can people believe the correlation between working memory capacity and concrete areas studied by the researchers. Theories are useful in guiding research, which may not always have immediate practical purposes related to instruction.

In recent years, many studies center on the theory of working memory to explore some practical and helpful aspects in SLA. Let's look at a concrete example. Working memory plays an important role in distinguishing efficient and inefficient readers as indicated by Swanson and his colleagues. This study designs the three tests—pre-test, mid-test and post-test. After the subjects finish the pre-test, they will

take part in the training program lasting fourteen weeks. The aim of the design is to see whether the subjects can improve their reading comprehension performance after the working memory training. After the post-test, the data processed by SPSS 17.0 show the result that after the training, working memory capacity, working memory component capacity and reading comprehension performance are all improved to varying degrees. From the perspective of this study, working memory capacity, working memory component capacity and reading comprehension performance can be improved by working memory training and therefore in the real world, provides a theoretical basis for the classroom teaching of second language reading comprehension. In turn, learning a second language can also improve your working memory. If people want to improve their working memory, to learn a new language can help a lot. No matter what age level people belong to, people grasping two languages possess better cognitive skills, including working memory, than those who only know one language. Even better, speaking two languages can form a certain cognitive reserve, which can help to alleviate the symptoms of dementia. Adults who speak two languages still have cognitive function at the beginning of Alzheimer's disease for a longer time than those who speak only one language.

Although working memory is vital to the process of the acquirement of the second language, it is not necessary to make use of working memory all the time. On the contrary, as an English teacher, sometimes I was actually doing something that encouraged the students to ignore their working memory. To improve the ability to apply the second language in a more proficient way, the teachers always attach more importance to practice, because they all believe practice makes perfect. To put it another way, the teachers expect the students to apply the language in a natural way without considering working memory most of the time except facing some complex tasks. It is similar to running, which does not need working memory with intention during normal running. The right leg and the left leg are raised alternately without more attention except special circumstances.

The theories or concepts mentioned above about SLA and working memory are all right, but they are all wrong, because they are trying to overgeneralize their findings. They tend to describe the human language as the simple and flat system, but this is not correct. Language is a very complex system, which is not one dimension but multi-dimension.

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