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MASTER

Psycholinguistics Issues In English Language Teaching

The Importance of Working Memory Skills in Academic Achievement

**The case of first year English language students at the university of
Abdelhamid Ibn Badis, Mostaganem**

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Dedication

I dedicate this research work to all members of my beloved family, my precious mother, my brother, my supportive and lovely sister. Thank you for believing in me, to my fiancé thank you for being all the time with me.

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Abstract

Despite the late focus put on improving the four language skills; listening, reading, speaking and writing in second and foreign-language learning. A little attention is given to the system that drives the students' comprehension, attention and concentration. Working memory plays a critical role in promoting the language learning. If the information is hold and rehearsed repeatedly, it will be fossilized in the students' long-term memory. First year English language students at the University of Abdelhamid Ibn Badis possess good working memory. However they cannot give their feed-back perfectly on the auditory aids. Their working memory performs better when they collaborate together in reading span tests. These students are better individual achievers in following the instructions and listening spans. Results of the present study are obtained from the collected data where students of the University of Abdelhamid Ibn Badis in Mostaganem are taken as samples for this investigation about the importance of working memory skills in academic achievement. Twenty students from first year English language are tested thrice each session via three different span tests (Reading Span Test, Listening Span Test and Following the Instructions Span Test) in a total number of three sessions. The training contains important experiments conducted by a number of educators and psychologists to measure working memory's capacity. In addition, a questionnaire is distributed among these students at the last training session, inside their class. The questionnaire was designed by an Israeli psychologist to detect students with working memory deficit. The questions are easy to understand and fit the students' level of English.

Abbreviations

WM: Working memory

LST: Listening span test

RST: Reading span test

AWMA: Automated Working Memory Assessment

Appendices

1-Following the instructions (session 01)

2-Following the instructions (session 02)

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GENERAL INTRODUCTION

Memory is how information is encoded, processed and stored for later on storage. Memory has always been an area of interest for many psycholinguists, cognitivists and authors. It can be considered as the source of intelligence, creativity and knowledge. Thanks to memory people can remember names, phone numbers and special occasions. Philosophers have always related the term memory with that of intelligence. They believed in the intimacy between the two of them. With no memory, people lose their identity, their past, their present and even their future. Memory is a part of people's life. Thanks to old memories, and painful ones our personality constructs itself. International competitions are organized once a year to tribute to the value of memory and to encourage those who possess a good memory. Memory can be sensory i.e. derived from the individual senses "a picture that you have just glanced or a voice you have just heard".

Long term memory is another type which is characterised by the long duration of the information stored. Childhood souvenirs are to be stored there. Working memory on the other hand is the short storage of the information. Information is manipulated, processed and held over there.

Alan Baddley, who is considered as the father of the "working memory", produced different books as an attempt to figure out the nature of the working memory and how it actually works. He started the journey with amnesiac people who have had different types of car accidents and lost a part of their memories they forgot about persons, names and even an entire period of their lives. Their working memory became lower than the norm. Some of these patients tended to preserve their "short-term memory" and impair "long-term memory" while others showed a reversed pattern.

From psychology to education, a leap was made. People started having interest in that gloomy but effective factor in the student's learning process "working memory". Teachers have largely related this term with the "school achievement", and they kept questioning to what extent low working memory can affect the pupils' educational grades.

Since psycholinguistics is my field of study and scope of my interest, I want to shed light on the significant role played by working memory in the academic tasks, such as, understanding difficult cognitive tasks and solving complex equations, etc.

Most learners are still struggling to cope with some school subjects that provoke their working memory skills. They often show a lack of concentration or total disinterest of the school subject; however teachers are almost unaware of the poor working memory behaviour signs that may emerge inside their classroom, especially when it affects the learners' academic scores. I have experienced teaching twice and it was nothing but a marvellous journey. I enjoyed giving, receiving and sharing ideas. One of the reasons that I think are more than enough to motivate me for choosing that field of research and not others is that during my teaching experience, as a middle school English instructor. I noticed that pupils are often reluctant and hesitant, when it comes to a working memory tasks. They seem frustrated, stressful and disturbed, and they refuse to participate or even be a part of the lesson. Another reason is that our schools (primary, middle and secondary) lack psychologists. School teachers need to be psychologists and teachers at the same time, in order to diagnose their poor working memory learners and afford help when needed. Philosophy was my favourite school subject and it can be considered as the other third reason that motivates and drives me to embark on working memory. Memory was defined as an entire entity and it was characterized by its complexity and independency. I was eager to learn more about memory. That is why I grabbed this occasion to investigate more and make my own assumptions.

Research questions:

- 1-How do first year English language students perform in working memory tasks?
- 2-Do first year English language students possess good visual and auditory working memory so they can easily follow instructions?
- 3-Do the working memory skills lose their credibility once the students are inattentive?

Hypotheses:

- If First year English language students are attentive enough, they may perform well in the working memory tasks.
- Students cannot perform well in all the working-memory tasks maybe because this is due to their learning styles.
- If first year English language students are inattentive, their working memory tasks cannot be accomplished properly.

The following concepts are browsed from Wikipedia

Memory: is how information .is encoded, stored and retrieved

Working memory: a core executive function is a cognitive system with limited capacity that is responsible for the transient holding, procession and manipulation of information.

Low-working memory: people who are low in following in the instructions and applying them correcting them correctly.

School achievement: is the outcome of education_ the extent to which student, teacher or institution had achieved their educational goals.

The structure of this study will be divided into three main chapters listed as follows:

The first chapter covers the literature review of the investigation. It is devoted to the human memory and its types; stressing on the working memory importance. It will deal with the crucial role of the working memory in the individual's daily cognitive tasks. As far as its importance in the classroom learning is concerned.

The second chapter presents the research methodology concerning procedure, participants, tools and materials in terms of the training and questionnaire. It is consecrated to data collection and analysis of the investigation. A close view on first year English language students inside their class. How they interact with working memory tasks, how they perform in the reading span test, the listening span and how they follow the instructions

The third and final chapter is dedicated to the result of the training and the questionnaire. It deals with possible recommendations, tips and some strategies to enhance working memory performance. In addition to a set of some suggested activities and games that can promote the working memory skills.

As far as the data collection is concerned, I have chosen first year English language students, of the University of Abdelhamid Ibn Badis Mostaganem. The reason behind choosing these level and not another is that students are at a sensitive and critical period of time. That is moving from one school system to another. From high school to university.

I have selected first year English language students to be under investigation, in order to collect as much data as possible. 20 students are to be tested three times via three different span tests (the reading span test, the listening span test and following the instructions).

Another tool of research that will be used is the Raviv Questionnaire, which detects students

with working memory deficit inside and outside the educational setting.

The study has been conducted to realize a set of aims, and the main objectives are as follows:

- 1) To shed some light on the crucial role played by working memory in conceptualizing school subjects and retrieving important information.
- 2) Also, to make school tutors widely aware of the problems and obstacles due to working memory deficit, that may hinder their students' academic performance.
- 3) In addition, to help teachers pay more attention to students with poor working memory profiles.

In 1974, Baddley and Hitch proposed a model of the working memory, as an alternative to the short term store. The original model of both previous psychologists was composed of three main components: the central executive, phonological loop and the visuo-spatial sketchpad. In 2000, Baddley added another component that is "the episodic buffer".

This theory believes that the working memory differs from the short-term memory by its ability to manipulate and process information. According to Baddeley working memory is composed of four components: the executive system which controls the whole system. It is responsible for directing attention, the visuo-spatial sketch pad stores the visual input "images and pictures", and the phonological loop stores the auditory information like music, sounds...etc and finally the episodic buffer the new component which is responsible for storing all sort of information. All of the three last components: (the visuo-spatial sketch pad, the phonological loop and the episodic buffer) are slave systems of the central executive.

Chapter I

The Human Memory

Introduction:

The first chapter mainly revolves around some of the basic concepts related to the human memory. In order to grant the readers a clear idea about that complicated cognitive system that involves in a number of crucial activities. An overview is being presented to highlight its importance in the individual's life. For more clarity and demonstration, different experiments are displayed within this chapter about the various types of the human memory. After that the multi store model theory is being briefly explained.

Then the working memory topic has been discussed in detail. Some definitions are put forth to introduce the working memory, its use and its relevance to the academic context. Furthermore, some psychologists and educators highlight the issue of low working memory and its interference in the daily and academic life of the human being. The chapter is finally concluded with some examples of children with a limited working memory.

I.1.MEMORY:

Memory plays an essential role in the individual's life. Thanks to memory, people remember names, places and special occasions. Human can't dissociate memory from their lives. It is a part of the person's routine. Going to the store and remember which items to buy is typically related to memory. It helps people to store information for a later on usage.

Knowing what road to take, when did the Algerians people get its independence, who is your uncle or aunt? Are all facts saved in the person's memory. Memory was the major interest for a number of philosophers, cognitivists and psycholinguists like Bertrand Russell, Malcolm Deutscher and Descartes. Books are dedicated to memory hence its undeniable role in the learning process. Memory is a purely cognitive system. It encompasses a number of mental abilities. It is that essential g, reasoning and thinking logically.

Richard Mohs "the chief Science Officer at Global Alzheimer's platform Foundation" wrote an article about the human memory and said:

"In the past many experts were fond of describing memory as a sort of tiny filing cabinet full of individual memory a folder in which information is stored away. Others linked memory to a neural supercomputer wedged under the human scalp. But today, experts believe that memory is far more complex and elusive than that – and that it is located not in one particular place in the brain but instead a brain-wide process"

How the human mind works by Richards C. Mohs.

In short Richard C Mohs considers memory as a very pivotal component in the individual's life. Thus it is not something that he can owe like body organs. Memory is not a concrete object. It refers to the process of remembering information, encoding, and storing them as well. In the past, experts were enthralled in defining what memory is, they referred to "memory" as a small cabinet, full of different folders, each folder holds a given information. While other linked the term "memory" to that of supercomputer. That is memory has an indefinite amount of storage capacity as much as the supercomputer one. Nowadays, experts define memory as a complicated and a hard-defining term. Memory is a brain-wide process. There is no particular area in the brain sacrificed for memory. Each of its distinct operations "from encoding to saving" occurs in a different area in the brain although each single

operation relies on the other one. They are complementary. For example, when the word “pen” pops to the person’s mind, the brain recouped information related to that word “ colour, shape, function” from different brain-regions , yet the individual is never aware of the various mental experiences manifesting in the brain while calling-back any given word stored in “memory”.

The word memory had never been comprehensible nor hasty, psychologists, cognitivists and writers had that eagerness to figure out how the human memory functions. Or simply which path the information takes before it gets stuck in the human mind.

Systematic studies had been conducted 2000years ago by different philosophers and psychologists. Aristotle in his treatise “on the soul” stated that the human mind can be seen as “a blank slate”. He theorized that humans are born benighted. He also compared memory to making impressions on wax, and referred to memory as “*a storehouse*”. It was assumed at that time that there were two types of memory. The natural memory; that is the memory carried by each individual from day one .And the artificial one, that is, the memory trained through learning, and practise of a variety of techniques. In the 18th century, the English philosopher “David Hartley” was the first to hypothesize that memories are encoded through hidden notions in the nervous system. William James in America and Wilhelm Windt in Germany “who are considered as the founding fathers of modern psychology” carried out some basic research, questioning the human memory functions. In the mid 1880, the young German philosopher, Herman Ebbinghaus developed the first scientific approach to studying memory. He did experiments using list of non-sense syllables, and then associating them with meaningful words. His work, led to the discovery that the amount remembered depends on the time spending on learning, information that is not automatically processed is quickly forgotten and that the person’s capacity for storing long-term memories is essentially unlimited.

Ebbinghaus discovered what is called” the learning curve and the forgetting curve”.

With the emergence of “neuropsychology” and the upgrading of technology, Karl Lashley the world’s foremost brain researcher, sacrificed 25 years of his life to make researches on rats. He tried to locate the area of the brain, where engrams or memory traces were stored. He removed a part of the rats’ brain after teaching them how to run mazes. Some of the rats were exposed to simple mazes, while others were confronted to complex ones. The task was to learn how from get to the starting point to the box where food was located. Lashley counted how many attempts were performed by tests before rats could run the maze without deviating to any other blind path. Before making this experiment, Lashley removed a part of the rats’ cerebral cortex. It turned out that if the task was simple, even with the large amount of the

cortex removed –up to 50%_ rats could find their way to the boxed-food path, however, the other rats which were exposed to harder tasks, could not do as good as the previous ones. Lashley concluded that memories had to spread all over the brain, through a tissue present in the brain, in his attempt to locate where information is stored; he figured out that “Memory is widely distributed”. “Karl Lashley: Brain Mechanisms chapter 5 p48”.

Jonathan K Foster in his book “a Very Short Introduction to Memory” said:

“Our memories are personal and internal; yet without memory we would not be able to undertake external acts-such as holding a conversation, recognizing our friends’ faces, remembering appointments, acting on new ideas, succeeding at work, or even learning to walk”

(page2/ 2009 Jonathan K Foster.

Memory might be considered as a simple storehouse, present in each individual’s brain. It is there when needed. It is true that each individual possesses a memory. It is a God-given mechanism thus it is not that simple and banal. It is the ground that should be stepped on whenever the person learns a new concept or act on novel ideas. The old memories shape the new ones; individuals are very dependent on their memory.

A good question must be raised here. How is the information stored in the brain? And how the memory systems operate? The human brain is known as a hard disk of a pc. So the same criteria are applied while saving information. First, the information is encoded, stored and retrieved. If any of these operations do not function properly, the information will not be saved as it is supposed to. According to Foster *using the filling cabinet analogy, first you file in a document in a particular location. The document is then held in that location, and when need it you go to retrieve it from the cabinet, but unless you have a good search system, you are not going to be able to find the document easily. So memory involves not just taking in and storing information but the ability to retrieve it too. And all the three components have work well together if our memory is to work efficiently. Page 25*

Richard C Mohs mentioned in his article the different procedures that emerge in the human brain while encoding information. Taking the example of the memory of the first loved-person. When meeting that person, the one’s visual system likely registered physical features, such as the colour of their eyes and hair, the auditory system may have picked up the sound of their laugh. The smell of their perfume or cologne, the touch of their hands. Each of these sensations travelled to the part of the brain called “hippocampus” which integrated these experiences as they were occurring into one single experience. The experience of that person.

Experts believe that the hippocampi together with the frontal cortex are responsible of analyzing these sensory inputs and deciding if they are worth remembering. If they are, they may become a part of the long-term memory. As cited by Foster, “Problems in encoding are often related to poor attention” if the person is not attentive, the information is simply filtered out.

Saving means maintaining information in the memory for a period of time. Information can be saved into three main storage areas: sensory memory, short term memory and long-term memory, while retrieving means accessing or calling back stored information, it allows the person to use information stored in memory to answer question, perform tasks and interact with people. A clear distinction should be made between *availability* and *accessibility*. And here a very important point should be raised, that is the tip of the tongue phenomenon. Sometimes the person knows his friend’s name, and it is there in the tip of his tongue, but he cannot say it. The information is available, but it is not accessible for the moment.

I.2.-Types of Memory:

Memory allows people to retain information for a long period of time. It takes many different forms. It is scientifically proved that information is encoded, stored and retrieved. But which type of memory the encoded-information goes to?

Memory can be sensory, short-term, long-term, procedural, declarative and episodic.

I.2.1. Sensory memory:

It refers to the initial process of storing information, through the human senses. “*Memory that is based on a particular sensory modality*” Baddley “*the Human Memory: Theory and Practice, p09, 1999*”

Sensory memory can be “iconic” or “auditory”

I.2.1.1. The iconic memory:

It is a memory derived from the visual perception. It involves the memory of “visual stimuli” For example if a person looks at an object in the rooms he is staying in. Then he closes his eyes shortly after this glance. He will visualize the same object with closed eyes. That picture in his mind is the iconic memory of that “visual stimuli”. It is characterised by its very short duration. It lasts only about 250 to 300milliseconds. The idea of the “iconic memory” came about because of George Sperling’s experiment, where he used “a

tachistoscope” in 1960. He asked the participants to look at a blank screen when he flashed very briefly (1/20 of a second) three rows of four letters each:

G Z O F

D H V J

X R T P

And he asked the participants to recall as many letters as possible. Most participants recalled 4/5 letters. He interpreted his finding that each participant had stored an image of the entire letters. By the time, they had started reading the second row of their mental image. It had disappeared. The iconic memory exists and stores a detailed visual copy of the original perception for less than a second

“This effect was used to measure the duration of the visual memory trace as long ago as 1740 by Swedish investigator [Johann Andreas] Segner, who attached a glowing ember to a rotating wheel. When the wheel was rotated rapidly, a complete circle could be seen, since the trace left at the beginning of the circle was still glowing brightly by the time the ember returned to its starting point if the wheel was moved slowly only a partial circle would be seen since the trace of the first part had faded by the time the ember returned to its starting point” (according to Baddley 1999 p11)

I.2.1.2The echoic memory:

On the other hand is an auditory store derived from a voice heard. It lasts longer than the iconic one. For example: asking a person to remember series of numbers someone was reciting immediately after the sequence was stopped. If the person responds immediately, the possibility of remembering all the numbers is high. However, if he waits for few seconds, the memory of numbers will fade away because echoic memory only lasts for seconds.

An experiment was carried out by Guttman and Julesz in 1963; they used a computer to generate repeating segments of white noise. White noise is composed of all frequencies randomly mixed together. It sounds like “shhhhh” and cannot be described or memorized. The computer made it possible to put together a repeating system pattern of white noise with no gap between the repetitions. The subjects had no clue that a sound was being repeated. Guttman and Julesz instructed subjects to put on headphone listen to the noise and repeat what they heard. If the repeated segment of white noise lasted more than few seconds, the subjects never realized it was repeating. They heard a continuous whooshing sound with no pattern. If the segment of the white noise was less than two seconds long. The subjects suddenly realized they heard a repeated- sound. They still could not describe the sound (other

than saying shhhhh) but they knew it was repeated. To detect a repeating pattern of random frequencies, subjects must use a memory system capable of preserving an exact copy of the noise. This is what echoic memory does. It preserves the exact pattern for one or two seconds. According to Jeffrey Ricker the sensory memory can be described in terms of five characteristics: **the level of awareness, duration, capacity, the encoding and forgetting.**

I.2.2.Long-term memory:

It is a system for permanently storing, managing, and retrieving information for a later use. Anything that the person remembers that has already taken place a couple of minutes ago are stored in long-term memory. Once the information is stored in the long-term memory. It can last anywhere from few minutes to the rest of the life. The amount of information that can be held in long-term memory is infinite. According to the article written by Kendra Cherry (August 8th, 2016)

“Long term memory refers to the storage of information over an extended period. If you can remember something that happened more than just a few minutes ago whether it occurred just hours ago or decades earlier, then it is a long-term memory”

An experiment was conducted by Bahrick in 1975, where he tested 392 American participants aged between (17/75) in a real life environment. The aim of his study was to analyze the duration of a very-long term memory (VTM) using photographs from high-school yearbooks. He wanted to show that memory could last over several decades or even a lifetime. There were various tests including: A free recall test, where participants tried to remember names of people in a graduate class. A photo recognition test, consisting of 50 pictures. A name recognition test for ex-school friends.

Bahrick found that 90% of the participants were able to correctly match the names and faces, 14 years after graduating and 60% of the participants were able to correctly match the names and faces 47 years after graduation. Bahrick concluded that people could remember certain types of information, such as names and faces for almost a lifetime. These results support the multi-store model and the idea that the long-term memory has lifetime duration (at least 47 years) and is semantically encoded.

He concluded that

- Overall VTM works better with visual of photograph than names and texts.

- Memory works up to 57 years after the graduation.

-in real life, our memories contain a large amount of information. Long-term memory has different types:

I.2.2.1. Declarative memory (explicit):

“Knowing what” is a memory of facts and events and refers to those memories that can be consciously recalled or declared. It is also known as “conscious memory”. *“It is the conscious storage and recollection of data”*

(Graf and schacter, 1985) in other words, the individual must actively “think” about retrieving the information from memory. This type of information can be explicitly stored and retrieved-hence its name. Explicit memory can be subdivided into semantic, episodic and procedural. The psychologist Endel Tulving proposed a distinction between episodic, semantic and procedural memory

I.2.2.1.1.Episodic memory:

It is a part of the long term memory. It is responsible for storing information about events that had been experienced by the individual in his life. As stated by Saul McLeod in his article published in 2010. In Tulving’s book Memory. He defined Episodic memory as follow: *“episodic memory receives and stores information about temporally dated episodes or events”* (p05 semantic and episodic memory) Munsat in 1966 said that: “the term episodic memory is a somewhat loose synonym of “occurrence”, and one of its dictionary definitions is that of “an event that is distinctive and separate although part of a larger series” episodic memory is about occurrence of such events”. An example of the episodic memory is recalling the one’s family trip to the beach. Autobiographical memory, on the other hand, is a memory for a particular events in one’s own life) is generally viewed as either equivalent to or, a subset, of episodic memory. One specific type of the autobiographical memory is the flashbulb memory, which is highly detailed, exceptionally vivid “snapshot” of the circumstances and moments in which a piece of surprising and consequential news was heard. For example: many people do remember exactly where they were and what they were doing when they heard of the terrorists attack on September 11th, 2001. This is flashbulb memory.

I.2.2.1.2. Semantic memory:

It involves abstract factual knowledge, such as “Albany is the capital of New York”. It is the type of information that is learned from books and school. Example: the concept of a book, the meaning of the word memory, understanding the multiplication, the knowledge of the civil war. Semantic memory is used while taking a test. Another type of semantic memory is called **script**. **Scripts** are like blueprints of what tends to happen in a given situation. For example: what usually happens if a person visits a restaurant, he gets the menu, he orders a meal, he eats it, and then he pays the bill. Through practice he learns these scripts and encodes them in semantic memory.

I.2.2.1.3 Procedural memory:

“Implicit memory” called also “unconscious procedural. It involves procedures for complementing actions. These actions develop with practice through time. Everyday examples include remembering how to tie shoes, drive a car or ride a bicycle. Athletic skills are one example of “implicit memory”. The athletic first learns the necessary moves of a sport, practises them over and over, then they flow naturally during the game. All these memories are accessed without conscious awareness. They are automatically translated into actions without realizing so

Cohen and Squire in 1980 drew a distinction between the declarative memory and the procedural one. Procedural knowledge involves “knowing how” to do things. It includes skills such as: playing the piano and driving a car. These actions are automatic and unconscious. For example: when the person brushes his teeth, he does it with little or no awareness of the skills involved. Whereas declarative knowledge involves “knowing what”. For example: London is the capital of England. Zebras are animals. Recalling information from the declarative memory involves some degree of conscious effort.

I.2.3. Short term memory:

It is also known as “primary” or “active”, is the information humans are currently aware of thinking about. The information found in short term memory comes from paying attention to sensory memory. It acts as a kind of “scratch-pad” for temporary recall of the

information which is being processed at any point in time. It can be thought of as the ability to remember, and process information at the same time. “I will refer to the simple temporary storage of information” Alan Baddley p04 working memory: Theories, Models and Controversies Department of psychology, University of New York YO10 5DD, United Kingdom.

Short term memory has a three key aspect:

I.2.3.1.limited capacity:

The amount of the information that can be held in the short-term memory differs from that of the long-term one. Its capacity is more limited. In order, to figure out the number of the information stored in the short-term memory. A famous experiment was conducted by the American psychologist George A. Miller in his well-known paper “The magical number seven, plus or Minus Two: Some Limits On Our Capacity for Processing Information (1956)”. According to him, the human short-term memory cannot process effectively more than seven unites or chunks, of information. The magic number seven is the number of the seven chunks that can be hold in the person’s short-term memory. These chunks could be letters, numbers or words. Old psychologists, -before the encoding revolution- used to think that fewer words could be held in the memory, simply because words contain many letters. However, Miller’s discovery assumed that an organized chunk functions as one item in the primary memory. He proposed that if the items are grouped and treated as chunks in memory, then the capacity of the memory will increase as well. He gave the example of a series of seven numbers, if the person tries to remember them by processing each item independently, he may not recall the whole numbers correctly. But if, he tries to group these chunks and organize them in a form of date. These chunks will be held easier in memory. According to him, if the short-term memory is limited to about 7chunks, the only way to improve its capacity is to organize larger chunks. Memory is improved by organizing little pieces, into larger wholes.

I.2.3.2. Limited duration:

Most of the information kept in short-term memory will be stored for approximately 20 to 30 seconds. Information needs to be rehearsed; otherwise, it will fade away. Some

information can last in short term memory for up to a minute, but most information spontaneously decays quite quickly. For example: if a person tries to remember a phone number, the other person has just rattled off, the person makes quick mental note. Moments later, he realizes that he had forgotten the phone number, he was supposed to save. Without rehearsing or continuing to repeat the number until it is committed to memory, the information is quickly lost from short-term memory.

I.3.3 Encoding:

It is a crucial step in creating a new memory. It is a biological phenomenon that starts with perception through the senses. There are three types of “encoding”, yet it is believed that, in general the short-term storage relies primarily on “the acoustic encoding”

I.2.3.3.1 The acoustic encoding:

It is the processing of sounds, words and other auditory input. It is the process of remembering and comprehending auditory information”. For example: learning the table of multiplication can be an acoustic encoding. Some people can learn the table by heart rhythmically through reciting “six times six is thirty-six” because of the absolute attention that was given to the numbers when spoken. If a person is reading aloud, while doing his homework, he is using an acoustic encoding.

I.2.4. WORKING MEMORY:

“Is a limited capacity part of the human system that combines the temporary storage and manipulation of information in the service of cognition. Short term memory refers to information storage without manipulation and there is therefore a component of working memory”.

(Prof Alan Baddley, university of York, UK/ Prof. Graham J. Hitch, Department of Psychology, University of York, York YO10 5DD, UK)

Working memory is considered as a system for temporarily storing and managing the information required to carry out complex cognitive tasks such as learning, reasoning, and comprehension. As cited by Alan Baddley: “I will use STM and to refer to the simple temporary storage of information, in contrast to WM, which implies a combination of storage and manipulation” p04. The term “Working Memory” was first used by the two scholars Baddley and Hitch, who replaced “the short-term memory” concept, by “the

working memory” one. Yet, this term is used interchangeably by the “short- memory”. According to Gathercole and Alloway, an arithmetic activity will be a good example to illustrate the working memory phenomenon. If a student is seeking to solve an arithmetic multiplication. For example: Attempting to multiply 43 and 27 together, having another person talking to him, without being able to use neither a pen nor a calculator. First, he needs to hold the two numbers in his working memory. Next, he uses the learned multiplication rules to calculate the products of successive pairs of numbers, adding to working memory the new products as he proceeds. Finally, he would need to add together the products held in working memory, resulting in the correct solution. Priti Shah and Akira Miyake in their articles “Models of Working Memory” defined “working memory” as a core cognitive system that plays a crucial role in complex cognitive tasks. Daily cognitive activities from reading the newspaper article, calculating the appropriate tip in a restaurant, to comparing and contrasting various apartments to decide which to buy. These tasks involve a multiplicity of steps with intermediate results that need to be stored in mind briefly to carry out the task and hand successfully. In the cognitive psychology discipline, the term working memory had been nicknamed as “the box”, “the place metaphor, “the workspace” or “the blackboard” metaphor. The origin of the word “working memory” can be traced back to the 1690, where the philosopher John Locke, differentiated between *contemplation*-bringing ideas to mind- and *memory*.

I.3.The Multi-Store Model:

In an attempt to figure out the nature of the human memory, many scholars had created various models of the possible operations taking place in the human brain, while acquiring and storing a given new information. How it works? How the information is encoded, stored and retrieved? Atkinson and Shiffrin created the “multi-store model” in 1968. Their model was extremely successful. They believed that once information enters the brain, it must be either stored or maintained, and that the information which is stored goes into three distinct memory systems: the sensory register, short-term memory and the long-term memory.

I.3.1. The sensory memory:

It is the first memory system that the information goes through. The sensory register perceives and retains information that is received via the five senses for a short amount of time. Most information that humans are not attentive to, will be forgotten. Attention allows humans to move information from the sensory register to the short-term memory. (Short term memory can be considered as where humans store information that they can actively work with and use. Information can be kept in short term memory between 18 to 20 seconds. However there are techniques to increase this. For example: making people repeating the phone number, over and over again in their heads, until they can write them or dial them. By repeating, the person is rehearsing which extends the length of time. The more humans repeat or use information, the more likely it is to move into the long-term memory. This model was successful in terms of the information, it generated. However there were a number of problems with their ideas about short term memory.

I.4. Working Memory And Education:

Psychologists have been trying to understand the factors that underpin students' success and failure, in different educational domains for many years. They end up by revealing the important role played by "the working memory". Susan J Pickering sacrificed a whole book to the working memory and education. An experiment was conducted by the two scholars Gathercole and Pickering in 2000. They tested eighty-three children aged between 6 and 7, attending local education authority schools. The two scholars wanted to investigate whether working memory abilities are also associated with attainment levels in the national curriculum assessment at 7 years of age. Participants were assessed by a test battery designed to tap individual components of Baddley and Hitch's (1974) working memory model. Children were assigned to normal and low achievement groups. On the basis of their performance on national curriculum tasks and tests in areas of English and Mathematics. The results were as follow: children with low level of curriculum attainment showed marked impairments on measure of central executive function and of visuo-spatial memory in particular. A single cut-off score

derived from the test battery successfully, identified the majority of the children failing to reach nationally expected levels of attainment. They conclude that complex working memory skills are closely linked with children's academic progress within the early years of school. The assessment of working memory skills may offer a valuable method for screening children likely to be a risk of poor scholastic progress. *"More generally, many studies have shown that weak Working memory functions is a characteristic of children with learning disabilities in literacy and numeracy or in both areas (Bull and Scerif, 2001; de Jong , 1998; Mayringer and Wimmer, 2000; Siegel and Rayan , 1989; Swanson, 1994; Swanson Ashbaker, and Sachse-Lee, 1996)". Working memory and Education Gathercole p221.* Gathercole gave two types of explanation to the association between WM and Learning. One possibility is that working memory limitations result from difficulties in a particular processing domain. Children with poor processing spoken language may obtain low listening span because of the difficulties while listening to the language spoken and they would be incapable of making semantic decision, which leads to task failure. They would be expected to be struggling when learning how to read as a result of their weak language processing skills. In this case, neither the low listening span scores, nor poor levels of academic achievement are a result of poor working memory capacity. Instead, they are both consequences of a primary language processing problem. The other alternative view, is that working memory capacity directly constrains the ability to learn complex skills and to acquire knowledge. The detailed processes by which WM contributes to the acquisition of skills and knowledge during the school years are not, however, well-understood. Statistical association between WM assessments and outcome measures of learning (reading, mathematics) do not cast light on these processes because these measures tap the endpoints of scholastic attainment and thus provide no information regarding the nature of failed individual learning episodes that led to poor attainment levels.

Working memory is a crucial factor that must be added and implemented in the learning setting. As Baddley mentioned in his book: *"working memory is required whenever anything must be learned because learning requires manipulation of information"* Engle said that: *"Clearly, working memory plays a crucial role in learning; it is where knowledge is constructed and modified and where information is processed for semantic encoding."* p92 *Alan Baddley book.*

According to Alan Baddley working memory is considered as the birthplace of reading decoding, reading comprehension, mathematics and written expression. There is an intimate relationship between working memory tasks and school achievement. In a research conducted by the scholars Engle (1996) and Engle, Tuholski, et al. Working memory capacity has documented significant relationships with:

-Reading, Reading comprehension, Language comprehension, Spelling, Following directions, Vocabulary development, Note taking, Written expression, Reasoning, Complex learning.

The good classroom learning surroundings must rely on a variety of working memory tasks. Classroom activities should innovate students and place heavy demands on the working memory tasks. For example: listening to a speaker while trying to take notes, following complex instructions, decoding unfamiliar words, writing sentences from memory and mental arithmetic as cited by Baddley p 94. working memory and academic learning assessment and intervention by Melton j Dehn

I.4.1.WORKING MEMORY AND READING:

“Working memory is thought to play an important role in reading” (Baddley 1983, Daneman and carpenter 1980)”

“when decoding new words, the central executive must retrieve and perform operations on grapheme-phoneme correspondences while the phonological loop retains the phonemes and the syllables so that words may be recognized, Similarly, the central executive must retrieve and process syntactic, semantic and text-specified information while the phonological loop retains the words, phrases and sentences as they are being processed so that larger units of text may be comprehended.”(Working memory, inhibition and reading skills chapter 2.

Learners or pupils with learning disabilities may encounter difficulties in terms of word recognition, spelling and reading comprehension. In the experiment conducted by the scholars Wagner et, al .where they made a longitudinal study, and tested 216 children. The children were randomly selected from kindergarten in six elementary schools in Florida (53% girls) and (26% African American). All the children could speak English fluently and could successfully pass the screening measure to detect articulation difficulties that could harm their performance.

For the **phonological Awareness task**. These children were asked to say a word, and after saying the word, they had to delete a specified phoneme. For example: they were asked

to say the word “cup”, and they were asked what word would be left if deleting the “k”. All the deleted phonemes were consonants. The remaining-phonemes formed a word. Each grade had a set of different test items consisted of a set of phonemes for example: for the second grade, there were 15 items consist of three to six phonemes).

For the sound categorization test, they adapted the version of Bradley and Bryant’s 1985 sound categorization task. Children were asked to listen to a set of words, one word is the odd one out. They were instructed to identify the word that sounded different. For example: pin is the odd word out of the following: fun, pin, bun and gun. The location of the key phoneme varied, it took different position at the beginning, the middle and the end, and the same procedures were followed with test as well. Different tests consisting a set of phonemes. **Phoneme segmentation test:** children listened to words, instructed to say back each sound they hear in the word, in the order they hear it.

Phonological Awareness-synthesis Task- children were asked to blend phonemes into words; they listened to words, presented phoneme by phoneme at a rate of two per seconds and were asked to pronounce the words that resulted when the phonemes were blended together. **Phonological memory Tasks:** memory for words. Children listened to recorded sentences that lengthen from 4 to 21 words and they were asked to repeat the words.

Digit span children listened to recorded series of digits. **Serial naming task:** six rows of five single digits per row were arrayed on a card, and children were instructed to name the digits, as fast as they could. Starting with the top of the row, and continuing to the bottom.

Word level Reading Measures: children were required to name individually presented words.

Verbal Aptitude Measure: children were asked the meaning of words from the vocabulary subtest of the stand ford Binet intelligence scale. Letter-name knowledge: participants were asked to name all the 26 uppercase letters that were presented individually in random order on individual cards (470/471). The results had provided evidence on the relations between individual differences in phonological processing abilities and how these relations change as the child grows up. This work suggested that although verbal short-term memory is significantly associated with reading achievements over the early years of reading instruction, its role is a part of a general phonological processing construct related to reading

development. Review how does working memory work in the classroom Tracy Packiam Alloway 6July, 2006.

I.4.2.WORKING MEMORY AND SPELLING:

According to Frith, spelling is not a simple task. People would define it as the knowledge of how to transcribe speech sounds into letters, According to a set of acquired phonological rules. And that what makes a good speller. In fact, especially in the English language. A good speller needs to know much more than sound-letter correspondence rules. A good speller must master a high degree of linguistic competence. A research was conducted by Gindri G, Kesk-Soares M and Mota HB in the Projects Office of the Health Science Center of Federal University of Santa Maria. The aim of this study was to verify the relationship between working memory, phonological awareness and spelling hypothesis in pre-school children at first grades. The participants of the study were 90 students, belonging to the same school, with a typical linguistic development. Forty students were pre-schoolers with the average age of six. While the other fifty were first graders, with the average age of seven. Participants were tested in a number of different tasks - for the sake of evaluating “working memory” based on the model of Baddley (2000), involving phonological loop, Phonological awareness abilities and the phonological awareness- using syllabic and phonemic awareness tasks. The results showed that the preschooler participants could repeat sequences of 4.80 digits and 4.30 syllables. Regarding phonological awareness, the performance in the syllabic level was of 19.68. The phonemic level was of 8.58. Most of the preschoolers proved to have the pre-syllabic writing hypothesis. First graders repeated, in average sequences of 5.06 digits and 4.56 syllables. They presented a phonological awareness of 31.12 the syllabic level and of 16.18 in the phonemic level. They demonstrated to have an alphabetic writing hypothesis. It was assumed that the performance of the working memory, phonological awareness and spelling are interrelated; they are related to the chronological age, the development and scholarship as well. “Research article Pro-Fono R. Atual. Cient vol.19 no.3 Barueri July/Sept 2007”.

I.4.3.WORKING MEMORY AND VOCABULARY:

Working memory is heavily involved in acquiring a language. “Phonological short-term memory capacity is an important predictor of vocabulary acquisition patterns in children and adolescents” (eg Gathercole & Adams 1993,1994, Service Hitch, Adams and Martin 1997).

The relationship between vocabulary and short term memory measures monolingual and bilingual speakers Margarita Kashanskaya and Henrik K Blumfeld and Viorica Marian. According to Paivio (1986), being knowledgeable in vocabulary is an integral component of success in the second language acquisition". An experiment was conducted by Atkinson and Raugh in 1975, and the method they produced is used nowadays in learning the foreign languages vocabulary. the experiment was applied on native English speaking participants, they made them learn both Spanish and Russian vocabulary using "the keyword method". The subjects heard Spanish and Russian words and had to write their English meaning. The keyword group remembered the meanings of many words. The kind of vocabulary they learned is called "receptive knowledge". They also made an experiment. Where participants were given English words and asked to give their equivalent in the Spanish language (native language to foreign language). They ended up by producing a promising instructional method for the acquisition of foreign language vocabulary. The method, they produced was and still very influential to nowadays foreign languages teaching and learning. And it is sometimes called "mnemonic keyword method".

I.4.4. NOTE TAKING:

According to Bosh (1999), Van Metter, Yokoi, Pressley, (1994) note taking is considered as an important factor in the learning process. It is used to record information and to aid reflection. It is an essential tool in the information-transmission situations. At the university level, note-taking helps students to gather information from lectures, books or any other situation that needs to be memorised and used for a good school achievement. As stated by Kiewra, 1987: "In general, students take notes in order to record information that they will need to learn at a later date. However, the result of note-taking notes is much more than the production of a passive "external" information store, as the note taking action itself is part of memorization process and results in the creation of a form "internal" storage". The WAC Journal vol, 16: September 2005 Françoise Boch: Stendhal University and Annie Piolat, University of Provence.

I.4.5. LANGUAGE COMPREHENSION:

The temporary storage of information would be very important for learning complex cognitive tasks such as listening, reading and comprehension, as stated by Randall W. Engle and Andrew R.A. Coway. Page 66 thinking and memory chapter 5 According to them, it is

possible that working memory would not be needed when talking about adults, competent in comprehending the language, who comprehends the language without any difficulties. And if all the written and spoken languages were simple and contain only affirmative sentences or a few amount of words.

To explain the intimate relationship shared between comprehension and working memory, the context of the following three main elements need to be discussed:

I.4.5.1.The visuo-spatial Sketch-Pad and Comprehension:

According to Baddley and Hitch model (1975), this representation is thought as coding the visual and the spatial features of an event. Taking the following example for better explanation: if a student is asked “which of the following is longer than the other, the pen or the cigarette?? He might first form a visual image of both objects, and then answer the question based on the mental image. Levin in 1973 had 10 to 11 years old who were believed to be poor readers. These children read 12-sentence story. They were asked about the detail of the already read passage. The first group of children were trained to form a mental image of the events in each of the sentence read from the passage while the other children were asked to remember what they were reading because they will be asked some questions about it. The group which was taught how to think about the passage using the visuo-spatial code performed much better than the other ones. The findings were illustrated as follow the poor readers can be helped if they are trained to use mental images as stated by Pressley 1976. Example the newspapers that are more comprehensible and understandable are rated as most likely to be lead to a mental image. Working memory is that important at the mental level of understanding. As cited by Engle and Conway, the type of coding human beings call the visuo-spatial sketch-pad is very useful in both language reading and comprehending, that is certainly necessary for making comparisons about the objects described by the language. However, if comprehension is defined as whether the language makes sense, then the sketch-pad is probably not necessary for comprehension. Page 70 WM & Thinking.

I.4.5.2.The role of the phonological loop:

The phonological loop is defined as the “slave system” of the working memory; it is responsible for the storage of verbal information. *“In Baddley’s model it refers to a system that includes a phonological store coupled with an articulatory loop”* (Vallar & Baddley

1984, 1987). It stores short-lived information derived from speech-based coding, and appears to be important in the retrieval of the information. Its role is to quickly refresh the stored information and preserve it from the possible decay. According to Caplan and Waters 1990, the phonological loop is not required for automatic, first-pass language comprehension, including syntactic parsing. It is required, when the first-pass processing is not enough for comprehension, and second-pass processing is necessary for successful comprehension, and when the number of content words necessary for comprehension of a structure is large. The working memory is very important in effort-demanding tasks such as comprehension. The phonological loop processes are harder to use and attention demanding. For example if the student is listening to a sentence that contains many different rhyming words, that would make the phonological loop more attention-demanding.

I.4.5.3. The role of the central executive:

As stated by Engle and Conway there is considerable overlap among the ideas referred to as “central executive”, controlled-effortful attention (Kahneman, 1973; Posner, Synder, 1975), supervisory-attentional system (Shallice & Burgess, 1993), working-memory capacity (Daneman & Carpenter, 1980; Conway & Engle, 1994; Engle, Cantor & Carullo, 1992) and possibly even fluid intelligence (Kyllonen & Christal, 1990; Engle et al, 1997). It is not an easy task to confirm that all these concepts refer to the same mechanism or are simply related. But there is a recent research that believes that the central executive system is related to attention.

Daneman and Carpenter (1980/1983) were the first to demonstrate the importance of the individual differences in central-executive capacity to comprehension. They reasoned that individuals with large working memory capacity are able to maintain information in an active state at any given time and this is relevant to comprehension when sentences are quite long or rely definitely on the previously-read words. They proposed the following example:

“Fred and Bill went to the store to buy groceries, Fred brought a half gallon of ice cream and Bill bought some bread and a bottle of juice. On the way home, they were involved in an accident but no one was hurt. After lengthy questioning by the authorities and exchanging insurance information with the driver of the other car, the two went home. When they arrived, he quickly put the ice cream in the freezer” p81 WM and thinking

When the reader encounters the word “he” in the last sentence. Successful comprehension depends on whether the reader can quickly retrieve information about *who* bought the ice-cream. According to the scholars, Daneman and Carpenter, the individuals

with larger working memory capacity, should have the information still available while reading the word “he”. They developed a reading-span task, in this task, students are required to read a number of sentences (from 2 to 7) loudly and they try to recall the last word from each sentence with the correct order. The one who could recall all the last words correctly with the right order was called “the reading-digit span”. Those who scored higher in the reading-digit span were referred to as “high working memory” while the other lower-scored readers were referred to “low working memory”. The central executive is not necessary only for maintaining relevant information but also important for suppressing irrelevant information that is not needed for comprehension (Grensbacher, 1990) WM and Thinking p 85. If the central executive system is defined as the ability to bring controlled-attention to accomplish a task and the individual differ in their abilities, so the high-working memory subjects can store information and filter the unneeded ones, however, if the low-working memory subjects are confronted with a comprehension attention-demanding task, they would be less able to maintain or suppress the information.

I.4.6.WORKING MEMORY AND COMPLEX LEARNING:

“fluid intelligence is defined as the ability to understand complex relationships and solve problems” Martinez 2000 from the article page 9 Working memory, fluid intelligence, and science learning Kun Yuan *, Jeffrey Steedle, Richard Shavelson, Alicia Alonzo 1, Marily Opezzo August, 2006.

According to Jeffrey Steedle, Richard Alonzo and Marily Opezzo, working memory and fluid intelligence share a close relationship. Fry and Hale’s research in 1996, research on processing speed, working memory and fluid intelligence. They used Raven’s Standard Progressive Matrices (Court and Raven,1982) to measure fluid intelligence and simple temporary span tasks to measure working memory. These tasks required participants to recall digits or positions and the colour of these stimuli in the same reverse order. They found out that the impact of working memory on fluid intelligence was statistically significantly, even after the influences.

Studies conducted on working memory and learning sciences, revealed that they are positively correlated. Visuo-spatial memory is also related to mathematics skills. Mathematical deficits could result from poor working memory abilities (Wilson and Swanson, 2011).

I.4.7.WORKING MEMORY AND WRITTEN EXPRESSION:

Written expression is defined by Milton J Dehn, as a complex cognitive activity that requires the integration of several cognitive processes and memory components. According to Sawson and Berninger, 1996, the mastery of the elementary writing processes, such as punctuation, spelling and transcribing, allows greater working memory capacity for the higher level writing processing of generating, organizing and revising. Even gifted and skilled writers will always place extensive demands on their working memory, because constructing ideas can never become fully automated. Findings from the existing investigations hypothesized the following: if individuals with longer verbal spans write more complex sentences, than those with shorter spans. The relation between verbal working memory span and written language increases as written language skills increase. As stated by Swanson and Siegel,2001 working memory and academic learning 2008.

I.4.8.WORKING MEMORY AND REASONING:

Working memory is also related to reasoning, strong relationship between working-memory capacity and reasoning had been found in a number of studies such as Engle, Tuholski, Laughlin, Conway 1999, Fry& Hale, 199; Kyllonen,1994 and other different scholars. According to Robert H Logie and Kenneth J Gilhooly, in Baddley and Hitch's model of working memory, they emphasize on the role of the working memory in which the subject is presented with sentences that are either true or false. The audience had to answer quickly; the sentences were varied from positive or negative to active or passive. This task was considered as a reasoning task. The data suggested an involvement of the phonological loop in the reasoning task, yet there was no strong role of the visuo-spatial scratch-pad. P8/9 working memory and thinking.

I.4.9.WORKING MEMORY AND FOLLOWING INSTRUCTIONS:

Working memory supports the ability to follow instructions. Following instructions require holding information in mind and perform the action at the same time.

I.5. THE USE OF THE WORKING MEMORY:

According to the working memory classroom guide designed by Gathercole and Alloway. Working memory is not used only in comprehending and solving mental arithmetic operations. It is a frequent process that occurs in the human life whenever he is trying to:

-Remember a new phone number, a pin number, web address or a vehicle registration number. While he is trying to find a pen and a paper.

-Following spoken directions such as “Go Straight over at the roundabout”, “take the second left and the building is on the right opposite church”.

-Calculating the sum of the bill.

-Remember the unfamiliar foreign name of a person who has just left, after being introduced to.

-Measuring and combining the correct amount of the ingredients (e.g. rub 50g of butter and 100g of flour, then add 75g of sugar) when the person has just read the recipe, but he is no longer looking at the page. (Working memory Classroom guide).

I.6.THE LOW WORKING MEMORY:

The article entitled “working memory and learning difficulties” by Dr Joni Holmes (from the Cognition and the Brain Sciences Unit in Cambridge University) shed light on the poor working memory profile and how it looks inside the classroom. According to her, working memory is integrated in daily classroom activities. It stores and manipulates information during complex and demanding activities. For example when the student tries to read a given text and comprehend a passage. The process of reading sentences. Holding these sentences in mind and try to understand the real meaning that rely under each word. Following a set of complex instructions. A number of classroom observations combined with teacher reports have highlighted the major signs of the working memory difficulties. They include:

-Poor academic progress.

-Difficulties following multi-step instructions.

-Failing to complete common classroom activities that requires large amount of information to be held in mind.

-Problems keeping their place in demanding and complex activities.

I.7.POOR WORKING MEMORY BEHAVIOUR:

“you can think of working memory like a “Bonsai Tree”. It will grow bigger than the seed it came from, but it will not grow bigger than a normal pine tree that is not pruned back. In the same way, students with poor Working Memory will always find it difficult to keep up with their peers at any age” JM Booklet Alloway’s Guide to Working memory Booklet 3

As stated by the scholars to Susan Gathercole and Alloway, children with poor working memory :

-Are well-adjusted socially.

-Are reserved in group activities in the classroom, rarely volunteering answers and sometimes not answering direct question.

-behave as though they haven’t paid attention, for example forgetting part or all of instructions, or messages, or not seeing task through to completion.

-Frequently lose their place in complicated tasks that they may eventually abandon.

-Forget the content of messages or instructions.

-Make poor academic progress during the school years, particularly in the areas of reading and mathematics.

-Are considered by their teachers to have short attention spans and also to be easily distracted.

According to Alloway, these students may not be noisy or hyperactive, so that the teacher’s radar may detect the problem. He may not notice until they start declining because they have not understood the key concepts of the lesson or they just cannot understand what to do and how to do it. here are some samples of students with a working memory deficit (poor working memory):

“The lost-in-space” Student Diana:

Diana is the school girl who keeps struggling to cope with the learning process, trying to accomplish the school tasks, she is confronting with. Here is how Mrs Roberts describes

her: *“whenever I give the class something to do, Diana never listens to me. I do check to make sure that she is paying attention but she will end up by doing only what some of what i asked her to do. I find that I always have to check on her because she usually ends up doing her own thing”*. She may seem as if she is lost in space, she is eight years old but her working memory’s size is that of five years old. Which lead to difficulties inside the classroom. The space of her working memory can only keep two instructions in mind. Diana is always the last students to accomplish the instructions. For example: Mrs Roberts asked the students to put their colouring pencils in the packet, pick up their math worksheet from the green folder, get their pencils and rulers, and come and sit on the carpet. Diana could only remember to put her colouring pencil away and sit on the carpet. She had forgotten to pick up her math worksheet and get her pencil and ruler. Working memory is related to age. The average eight year old can remember about three instructions. But for Diana’s case, her working memory space can only keep two instructions in mind. Her post-it-note can not carry various information that need to be accomplished in the learning process. IE she struggles to keep up with her teacher’s instructions and she finds it hard to keep in mind all the words she is reading. Even the simplest activities like doing her chores, will be a hard task for her. Diana was asked if she ever forgets her teacher’s instructions. She said: *“yes, she talks a lot, and i cannot remember it all.”* she started listening to her mom and teacher, but working memory space gets overloaded consequently she cannot take in any more information.

The “never-finisher” student: Rob

When asking about Rob’s behaviour inside the classroom. His teacher Mrs. Lewis says that he is a calm student but he could do much better. He just lacks motivation. *“Rob is a sweet boy. I know he tries hard, but he often hands in incomplete work. He needs to finish his assignments.”* Rob is ten years old, he is not troublemaker. He is not noisy. He doesn’t even disturb his peers. On the contrary, he is polite. He just draws pictures or staring at the window. But the problem is that he doesn’t do the assignment. According to Rob, Mrs Lewis talks fast. And when he tries to start solving the activity, it is time for the next activity, and he gets stuck with the first task he was trying to process. At home, when his mom gives him an extra instruction, he forgets everything else. Rob says he has problem with listening to Mrs Lewis and writing the task at the same time. If he is just finishing the task and his teacher is telling the class what they need to do next. He gets confused and often throws his book down. He says: *“I just can’t keep up!”* and this is a common reaction from students with “poor working memory” . when they are given too many tasks to do in a short space of time. They

just can't process the information as fast as they should. And they just got panicked and incapable of doing it.

The "I can't" Student: David

Mr Moore teaches David in high school. David likes group activity best, but Mr Moore says that Rob seems very forgetful when he works independently. "Even simple things, like following all the requirements for an activity seem hard for David. I often notice him asking his classmates, what he needs to do? I tell him to write it down in his notebook, but I don't think he does" said Mr Moore. David is 15 years and he knows he has trouble remembering stuff; however he just feels embarrassed to ask his teacher for help. He knows he is supposed to write it down. But he says: "why should I bother trying if I am going to get it wrong anyway." Cases like David find it hard to switch between different things. If David is confronting a task that needs juggling multiple pieces of information. He is likely to abandon the task because his working memory can't cope. There is one activity that David find it difficult is writing. He has a problem organizing his work and structuring his sentences in order to convey the meaning. He writes words with some missing letters, spelling mistakes and unconnected sentences. When he was asked what is the things that you find it difficult. He responded: "I can't write and listen at the same time. Teachers talk when we are supposed to write and I can't do it." David has working memory problem. He can't listen to instructions and performing a task at the same time. He thinks it is very effortful. When writing, the tasks of organizing his thoughts, putting together the right words, and then checking his spelling, while listening to the teacher as often distract him and he gives up the activity.

I.8. Working Memory and classroom learning:

According to Susan Gathercole, each classroom activity, children are engaged in from reading to solving complex equations, or even other areas of the curriculum necessitate working memory's touch. Activities often require the child to hold information in mind (for example a sentence to be written down). While doing something that is considered to be challenging for them (spelling the individual words in the sentence). These are the cases when children or pupils with low working memory will struggle with. They often fail in completing the tasks properly. Because they have lost from their working memory the crucial information needed to guide their actions. As a result, children may not benefit nor learn from the task

which may affect their learning outcomes. Children with poor working memory have a deficit in following lengthy instructions, because they just forget them. As a consequence; the child will engage poorly in the classroom activity. Often it appears that children are not paying attention. But this is not the truth. They do pay attention but they just forget the instructions. Working memory is also essential to help learners remember where they have got to in a complicated mental activity. For example: a child with poor working memory attempting to follow the teacher's instruction, to write down a sentence. He will not need only to keep in mind the sentence in working memory, long enough to guide his/her attempts, to write the individual words. but needs also to remember how far they got in their attempt. And to find the next word in the working memory. this may seem as an easy task for writers. Yet children with poor working memory find it extremely difficult. While others skip or repeat letters and words as they lose their place in the demanding mental activity.

I.9.The causes of low working memory:

According to the scholars Susan Gathercole and Packiam, the causes behind low working memory are still gloomy and not well understood. What can be said about working memory is that, it cannot be related to the child's educational background such as ineffectiveness at pre-school experiences, or with the quality of the social or intellectual stimulation at home. Yet, genes factor is believed to play an essential role in the frontal areas of the brain that support working memory. The COGMED website explained its possible causes as well. According to it, low-working memory reasons differ from one person to another. For some people, it is a genetic endowment, for others it can be acquired through an illness or natural aging. Low-working memory can be associated with ADHD. Dr. Theresa Cerulli a prominent psychiatrist from Andover, Mass, who has been treating children with ADHD for many years. Said: "We used to view working memory as co-existing deficit in ADHD, but now we see that it is the core deficit." **Acquired deficit**, some people working memory deficit after an accident after traumas, strokes, cancer survivors and war soldiers, traumatic brain injury. However working memory deficit develops gradually during aging. **Environmental deficit** working memory is not related only to people whose capacities fall under the lower percentage of population. Even intelligent people may experience some working memory deficits. Robert Rydell at the University of California, Santa Barbara and Allen McConnell at Miami University showed that a group of college women, who perform

well in Math struggled significantly on a test. When they were told they were competing against men. After the test, these women declared that they were nervous, anxious and distracted when they knew they were being compared to men.

Conclusion:

As a conclusion, all the elements being discussed earlier, one way or another, stress on the importance of working memory in the humans daily life. There is no doubt that working memory is crucial for learning, following instructions and performing a variety of tasks. However, a least consideration is given to it. Working memory is being marginalized or totally ignored by teachers and educators. For instance: inattentive students are considered as whether lazy or careless while the majority of them possess a limited working memory.

School teachers have to be aware of the importance of working memory in executing academic tasks, and the different signs that may manifest with students with low working memory. Working memory skills should be enhanced via a number of tasks and activities both at home and at the school setting.

Chapter II

Data Collection and Analysis

Introduction

The objective of this study is to shed light on the significant role played by the working memory in the learner's educational process. Generally, students do remember the content of the lecture being introduced to, the rule, the title and even the conclusion, however when it comes to recalling back the words of the sentences written on the board. They usually fail.

The second objective of this study is to reveal the relationship between working memory and language comprehension, reading comprehension and following the instructions. To test students' working memory capacity, how much attentive they were how many words they could easily remember, how many words they could understand and how many instructions they could follow.

For these reasons, the following research tools are chosen to collect the suitable data, to validate or invalidate the study's hypotheses, hence, they are training and questionnaire addressed to first year university English Language students.

II.1.The theory of working memory:

Alan Baddley believed that short term memory and working memory are two distinct phenomena, when the short term memory is defined as the brief storage of information “*generally seven items according to the scholar George A. Miller*”, in his theory the magical number seven. Working memory is described as a pool of limited resources that carry out processing and storage functions. Alan Baddley was eager to explore and reveal the complexity of that important phenomenon. Together with Hitch, they created their own theory, replacing the term short term memory by the working memory one.

II.2.The multi-component theory: “The Working Memory Model”

In the theory of Alan Baddley, working memory is a limited capacity system with a temporary storage of information. It is essential for achieving a number of cognitive activities. According to Baddley, the working memory is composed of three main components; One master system (central executive) and two slave systems (the phonological loop and the visuo-sketch pad). Another system was added later on called the episodic buffer.

II.2.1The central executive:

It is a crucial part of the working memory. Baddley and Hitch avoided tackling it because it was complicated. The central executive is the most important component of the whole model. It drives the whole system “it was assumed to be capable of attentional focus, storage and decision making”. Working memory p13. The central executive decides what working memory pays attention to. A good example of the central executive’s function is the following; if someone is driving and talking on the phone at the same time, rather than hitting a cyclist it is preferable to stop talking and concentrate on driving. The central executive directs attention and gives priority to particular activities.

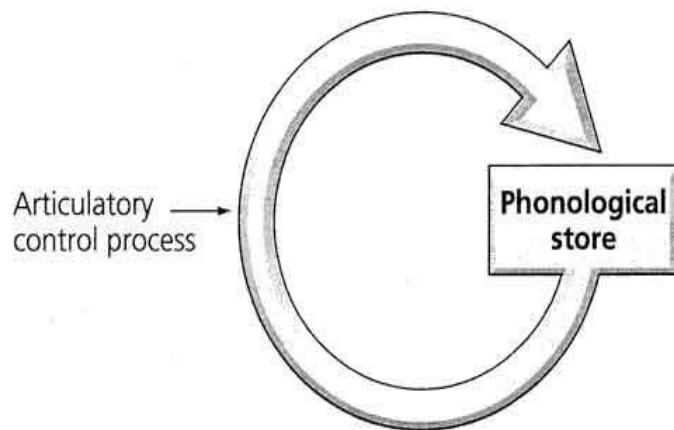
Baddley (1960) uses the metaphor of company boss to describe the way the central executive operates. The company boss makes decisions about which issues deserve attention and which should be ignored.

According to Shallice (1982), the supervisory attentional system is a limited capacity system and is used for a variety of purposes, including:

- Tasks involving planning or decision making.
- Novel situations.
- Dangerous or technically dangerous situations.
- Situations where strong habitual responses or temptations re involved.

II.2.2.The phonological loop:

It deals with the spoken and written materials. It acts as an inner ear and holds the information in “spoken-based” form for 1 to 2 seconds. The spoken words enter the store directly while the written words must be first converted to an articulatory code before they



can enter the phonological loop.

Figure II.01: The phonological loop from Working Memory/ Simply Psychology article

The articulatory control process acts as an inner voice rehearsing information from the phonological loop. This is how people remember a phone number, they have just rehearsed. As long as they keep repeating it. Information can be retained in the working memory.

II.2.3.The Visuo-Spatial Sketch Pad:

It is the inner eye. It deals with visual and spatial material. “it is likely that the visuo-spatial sketch pad plays an important role in helping us keep track of where we are in relation to other objects as we move through our environment” Baddeley, 1997. The sketch pad also and manipulates information held in the long term memory. For example, the spatial layout of someone’s house is held in the long term memory. If he is asked how many windows are there in front of his house? He will probably find himself picturing the front of his house and

counting the windows. An image has been retrieved from the long-term memory and pictured on the sketch pad.

II.2.4 The episodic buffer:

“it acts as a buffer store, not only between the components of WM, but also linking WM to perception and LTM. It is able to do so because it can hold multidimensional representations, but like most buffer stores it has a limited capacity” 15 working memory. It holds visual and verbal information and hold them. It combines things together into chunks or episodes and it is linked to central executive.

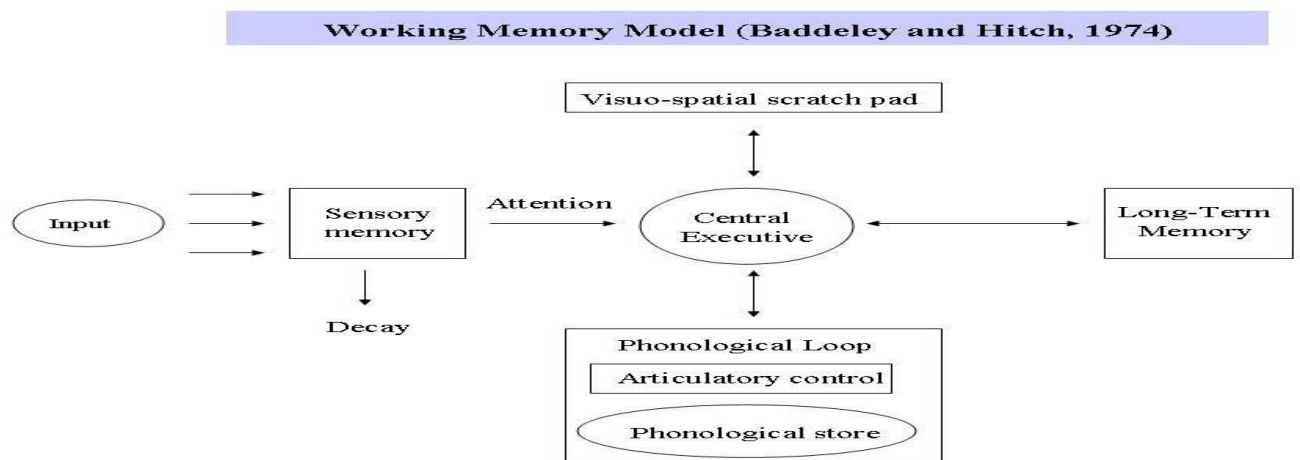


Figure II.02: The working memory model

Susan J Pickering, Susan Gathercole Alan Baddley and many other scholars and educators were interested in studying and investigating that core cognitive system. Since Working Memory is highly needed in daily activities, it must be that important in the school context simply because students need their memory to hold, retrieve, manipulate, calculate and understand the huge amount of information they get exposed to.

Working memory is related to academic achievement. Students need it to learn lessons by heart, to make sense of the information and following the instructions. Working memory is related to Vocabulary, Reading Comprehension, spelling and other academic skills. This thesis aim at exploring the real relationship between working memory and reading, listening and Following the instructions via different span test adopted from the internet.

II.3.Procedure:

For the sake of this study's continuity, two research tools are selected for experimental and observational research in order to get predictable and reliable data. Firstly, the training takes place to test the first year English Language students' working memory performance. Secondly, the questionnaire was used to reveal the students' working memory profile.

First year English Language students from Abdelhamid Ibn Badis University are the corpus of this study, aged between 17 years old and 22 years old .The training takes place on the Written Expression's session.

II.4.The training

II.4.1.The first session:

The first session the students were tested in pairs. The session took place on Thursday, February 16th, 2017. The students were tested thrice during the written expression session. The experiments started at 13.30 and last to 14.30. For the reading span test (RST), the researcher used that of Daneman and Carpenter 1980. Where the following eight simple unrelated sentences were written on the board:

1-it seems that the cats won't eat usually eat the food we put on the porch.

2-The wall will surely crash after few years in the harsh climate.

3-John used a knife to chop the large carrots, for dinner.

4-The dog ran over the tractor.

5-The man in the suit walked to work.

6-Monkeys enjoy eating banana.

7-She sang a beautiful song.

8-You should stop because I am getting mad.

It was a pair work. The students were asked to read the sentences loudly. After a couple of minutes, the researcher cleaned the board and asked them to remember the last word of each sentence. The participants couldn't remember any of the last words written above.

The sentences were written on the board again. The participants were asked to be more attentive to the last word of each sentence.

For the listening span test, Dr. Tracy Packiam Alloway's software "the automated working memory assessment AWMA" was used to test the students' listening span and their language comprehension. This software was published in 2007. It provides a practical and convenient way for teachers and psychologists to screen significant working memory problems from childhood to early adulthood. It is designed to fit learners from 4 to 22 years of old.

The participants listened to a set of 22 simple sentences, two times, and were asked to say whether the following sentences are meaningful or not:

1-Dogs have four legs.

2-Apples play football.

3-Sheeps have hair.

4-Magazines have pages.

5-people have 2 eyes.

6-Warners are straight.

7-Lass is sharp.

8-Balls are round.

9-Tables have four legs.

10-Cats make webs.

11-Bananas live in water.

12-Flowers smell nice.

13-Chicken make eggs.

14-Sharks have sharp teeth.

15-Shoes are warm on hands.

16-Glass grows on trees.

17-Roses have thorns.

18-Mice play music.

19-Toes are on your feet.

20-Horses have wings.

21-Piggs work in schools

22- Sheep has fluffy hair.

The last experiment conducted was to test the students' following instructions' span. A picture from the teacher handbook of Packiam Alloway was presented to the participants. They were given a list of seven instructions to accomplish. The following instructions were read twice: (see appendix n°= 01)

1-Find the man on the terrace.

-Put a circle on it.

2-Find the thief.

-Put a cross on his face.

3-Find the old man and his wife.

-Put a line above their heads.

4-Find the 21st

-Put a slash on it.

5-Find the door n°=02

-Colour it with your pen.

6-Find the bag with the money.

-Draw a triangle on the dollar sign.

7-Find the sofa

-Put it between brackets.

The participants were asked to apply the instructions on their sheets and number them.

II.4.2.The second session:

The second session took place on Thursday, February 23, 2017 from 13.30 to 14.30. The participants were tested individually; the aim of this session was to make a comparison between their pair-work performance and the individual one.

For the reading span test, a different experiment was conducted by the researcher which required the participants to sort out from a 12 words-length sentences the keywords and the last words of the sentences. The participants were exposed to these eight sentences and had to remember the last words and the keywords after the board got cleaned:

1-The products of this factory can be sold in all over the world.

2-This jar of jam will be expired soon.

3-The doctor treated a number of desperate cases.

4-Here is the paper that you were looking for yesterday.

5-I am afraid he cannot swim today. The water is too cold.

6-Will you take care of the garden while i am in hospital.

7-Marry is going to celebrate her birthday, tomorrow.

8-When we were young; we used to jump all the time.

In the listening span test, the same experiment was conducted with different sentences. The students listened to these 22 sentences and answered by true or false:

1-The heart is triangle.

2-Human beings have five senses.

- 3-William Shakespeare was a female writer.
- 4-Donald Trump is the new president of the United States.
- 5-Trees are white.
- 6-Dolphins are mammals.
- 7-We use our tongue to taste.
- 8-Waves are in the sea.
- 9-Hair dryer is used to cook meals.
- 10-Fingers are on your hand.
- 11-Cigarettes are good for health.
- 12-Necklace is a piece of jewellery worn around the neck.
- 13-Elbows are on your arms.
- 14-Crocodile is a reptile.
- 15-People can live on the moon.
- 16-Bees make honey.
- 17-Telephones are used for communication.
- 18-Egypt is located in Europe.
- 19-Men wear dresses.
- 20-Titanic was one of the buildings that sank in the water.
- 21-Milk is black.
- 22-Italy is famous for pizza.

In the following instructions span test, the students were shown a picture of a living room with different articles. They were asked to: (see appendix n°=2)

- 1-Find the small pig in the picture.

-Colour it with your pen.

2-Find the cross in the farm.

-Write cross above it

3-Find the milk in the picture

-Put a slash on it.

4-Find the cat

-Put it inside a square.

5-Find the grass in the farm.

-Put it in a triangle.

6-Find the hat in the picture

-Put it in a circle.

7-Find the right leg of the cow.

-Write L on it.

II.4.3.The third and last session:

This session took place on Thursday, March 09, 2017 from 14:00 to 15:00. Twenty Participants were tested individually. The experiment of Hacker, Handrick and Veres 2004 was conducted. The students had to remember the last words of the eight sentences with their keywords. This time the researcher chose sentences with rhyming words.

1-She was blind for a long period of time. She can finally see.

2-He is not the man, he used to be.

3-We went to the garden this morning, we planted a tree.

4-He made a mistake but he was begging on his knee.

5-Jane produced a new awkward movie called “Free”.

6-I am not against what you said. I totally agree.

7-Cory Monteith was the main actor of the series “Glee”.

8-You can have a glass of juice or a cup of tea.

In the listening span test, the participant listened to a record of 22 sentences two times,

They had to say whether the following statements are true or false:

1-Irish men wear skirts.

2-Tooths is the plural form of the word tooth.

3-Elevator helps people to move from one country to another.

4-Newton made the law of temptation.

5-Dum people are wise.

6-The flute is a kitchen utensil.

7-Calcium strengthens your bones.

8-Giraff is the tallest animal ever.

9-Massachussets is an American state.

10-Sociology is the study of social behaviours or society.

11-Autumn is a hot season.

12-Jim Carrey is a comedian actor.

13-Consonant cluster in a word is a group of vowels, with no consonants between them.

14-Visa Card is a ticket that can be used to travel by plane.

15-Russia is a snowy country.

16-Icing sugar is pink.

17-The skin covers the bones.

18-Cambridge University is located in England.

19-Marijuana is a drug that can be used as a treatment.

20-Motel is smaller hotel.

21-Bold men are hairless.

22-Exams are used to test students.

In the following instructions span test, students were shown an angle of a small room. They were asked to: (see appendix n°=3)

1-Find the umbrella.

-Draw a heart above it.

2-Find the picture of the rabbit.

-Put a cross on it.

3-Find the keys.

-Write K under them.

4-Find the bag.

-Put it in a circle.

5-Find the light.

-Write light on it.

6-Find the coat next to the bag.

-Colour it with your pen

-Find the clock

-Put it inside a square

The students had to follow the instructions, apply them and number them in the same order as they heard them in the first place

II.5. Analysis of the training:

For additional credibility of this investigation, this training is carried out. In addition to the questionnaire's analysis, first year English Language students are chosen to be tested thrice. Twenty students are given three different exercises to be answered. Those exercises put focus on memorization of the last words of eight sentences, listening to twenty two sentences and figure out whether they are true or false and follow a list of instructions and apply them on their sheets. First year English Language students were selected for the reason that they are new at the university atmosphere and still coping with this environment. This work investigates the capacity of working memory within students at the university level. How much items can be stored there? Do attentive students remember more information than the others?

The aim of this training was to assess the students' working memory hence its capacity, to draw attention to their failure in accomplishing the three tasks due to their lack of attention, to find out how many items can be stored and processed in their working memory and to test the relationship between working memory and language comprehension via the listening span test.

II.5.1. First year English language training's analysis:

First year English language students have three different exercises, the first one deals with memorizing and recalling back the last words of eight sentences, the second one requires them to listen to twenty two simple sentences and write down "true" for meaningful correct sentences and "false" for unmeaningful incorrect sentences, and the third one demands them to listen to a list of instructions, follow them and apply them with the same order on their sheets.

II.5.1.1. First Exercise: Reading span test:

In this activity, the researcher writes eight sentences on the board, asks the students to read them loudly, cleans the board and asks the students to remember the last words of each of the eight sentences. Then she rewrites the eight sentences again with insisting on memorizing and storing the last words only. The students must remember the eight last words and write them down on their sheets. The sentences fit their level of understanding. They are

not difficult nor too easy and the students are already familiar with all the words of the reading span test.

II.5.1.2.Second Exercise: Listening span test

In this activity, the participants listen to a record with twenty two sentences. The sentences are chosen from different books, websites, literature, general knowledge...etc (which is the basic assumption of this test). They have to listen to the sentences two times in order to verify or falsify them. The researcher doesn't repeat the sentences after the record ends. They are supposed to listen carefully and write down the correct answer by their own.

II.5.1.3.Third exercises: Following instructions span test

The last activity focuses on listening to a list of seven instructions two times, find the items. Memorize them and apply them -in the same order on as they were read by the researcher- on the distributed sheets.

II.6.Comparison between the students' pair-work performance and the individual one:

II.6.1.Reading Span Task:

The human's working memory is able to hold up to eight items for a brief period of time. In order to validate or invalidate this hypothesis Daneman and Carpenter's experiment was conducted in the first session. This experiment requires the students to read eight unrelated sentences and hold in their working memory the last words of these sentences. In the first session, students were tested in pairs; they were then tested individually in the two other sessions to make a comparison between their first performance, the second and the third one. In the two last sessions, the experiment of Hacker, Handrick and Veres was conducted. It requires the students to read eight sentences loudly and remember the last words and the keywords of these sentences.

In the first session, twenty students were gathered in groups. They worked in pairs. After reading the eight sentences, they were given 5 minutes to remember and write on their sheets the last words only of the sentences. Almost all students could recall the last words of the

eight sentences. 89% of the students succeed in recalling these eight words, only eight students couldn't really remember the whole words. Their score varied between five to seven last words.

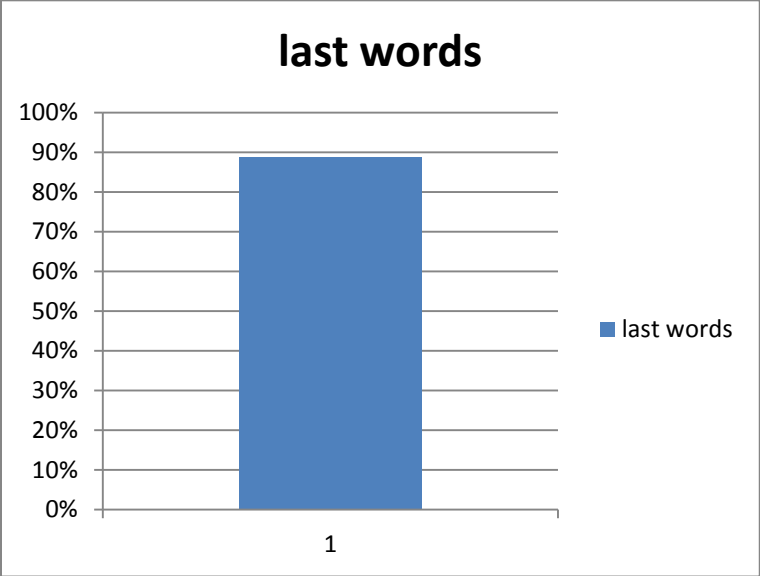


Table II.1: First session Reading span results.

In the second and the third session, twenty students were tested individually. In addition to the last words of the sentences, they were asked to remember the keywords of the eight sentences as well. In the second session, the students' score diminish to 52, 50%. Their performance was not as good as the first time; some of the participants didn't succeed in recalling any of the eight words while others could remember two to three words. Only one student could remember eight words yet when it comes to the keywords, the majority of the students didn't remember any keyword their score varied between zero to two words. Only one student could remember four keywords.

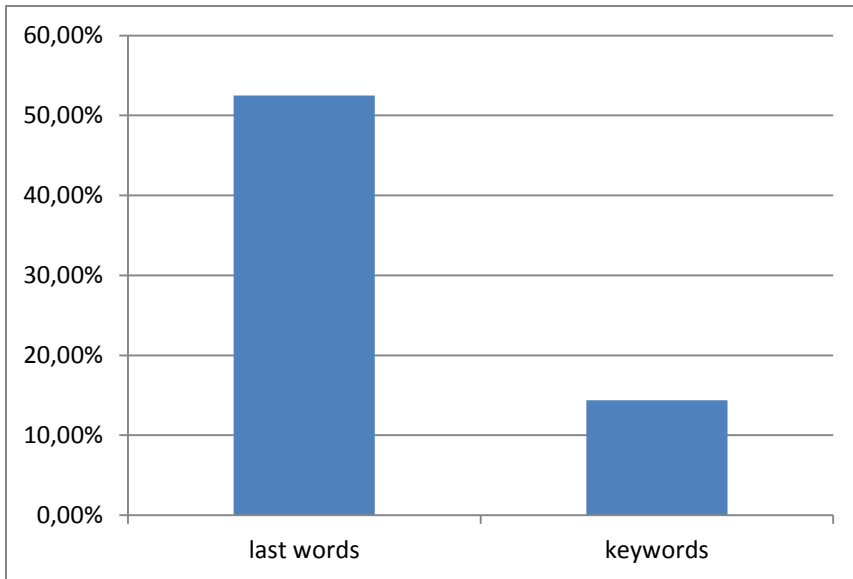


Table II.2: Second session Reading Span results

In the third session, the students were tested individually again. They were supposed to remember the last eight words of the sentences and their keywords. This time the participants scored better. Almost 50% of the students could remember eight last words. The general success in this session is 84, 37% which is better than their first individual performance. Even the students, who scored the best in recalling back the eight last words, couldn't remember any of the keywords. 3,13% is the general success in remembering the keywords

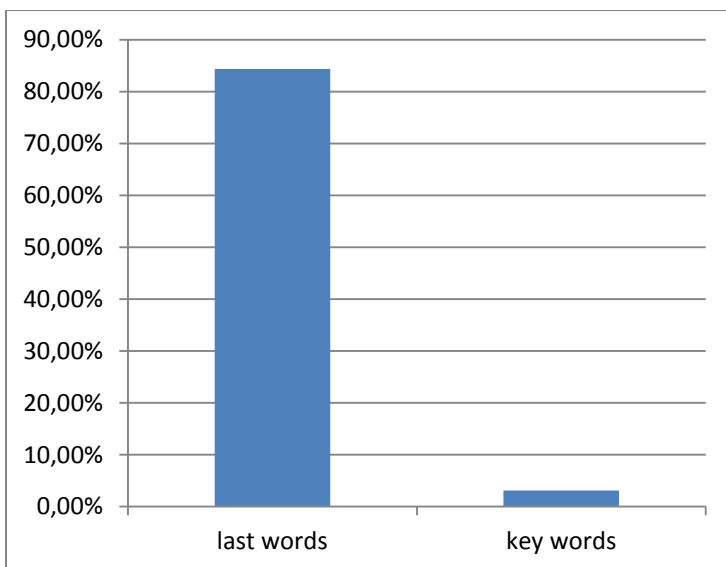


Table II.3: Third session Reading Span results.

II.6.2.LISTENING SPAN TEST:

In the first session, Tracy Packiam Alloway's automated working memory assessment version was used. It is used to help teachers to identify students' working memory problems. AWMA can be used to assess children and adults from 4 to 22 years old. The participants listened to twenty two simple sentences (two times). They have to verify or falsify them. The sentences are easy to grasp and fit their level of English. They worked in pairs.

In this session, the students couldn't accomplish the task as they were supposed to. The majority of the students couldn't answer more than nine sentences though the sentences were very simple. The sentences were not long and didn't contain any complex words. Out of twenty two sentences only one pair could answer thirteen sentences. The success rate of this test is 40%.

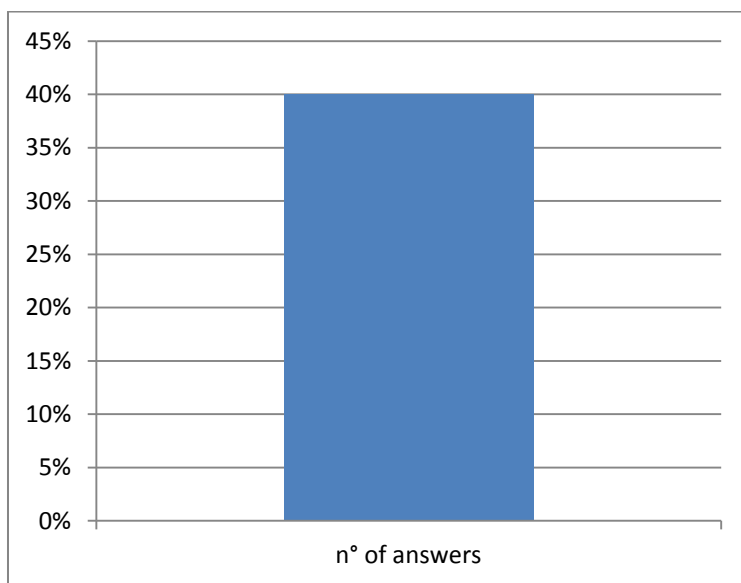


Table II.4: First session Listening Span results

In the second session, twenty students were tested individually. The researcher followed the same concept of Alloway's experiment. This time the researcher brought a record of twenty two simple sentences; the students listened to the record twice and started answering while listening to it. In this session, the participants scored very well. Some of them accomplish the task properly and gave his feedback about the whole twenty two sentences. The weaker performance this time is one student with eight answers only. The success rate in this listening span is 77, 27%

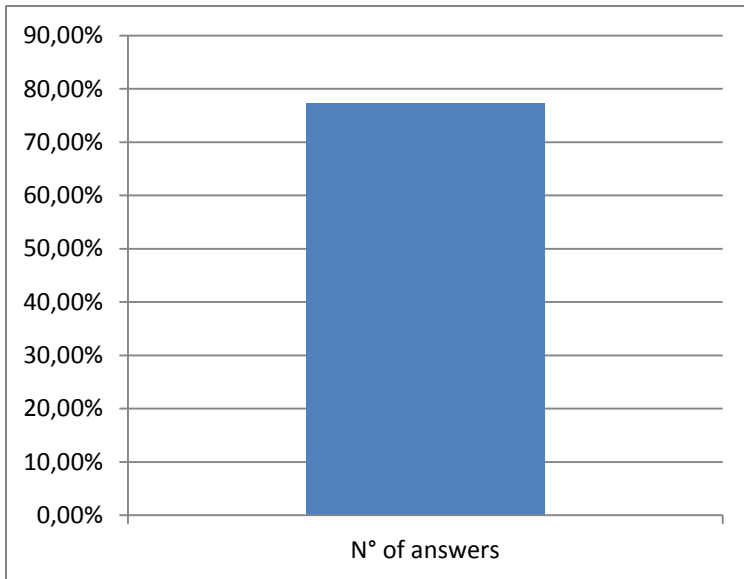


Table II.5: Second session Listening Span results

In the third session, the participants were tested individually again. The same procedure was followed. The participants listened to twenty two simple sentences chosen from different books and articles, two times. In this session, students were allowed to write “I couldn’t hear” or “I couldn’t understand” next to the sentences that they couldn’t understand or hear. The students were less attentive in the first time they were listening to the record however the general success at this session decreased to 56, 82%. Fifteen students could answer more than ten sentences however the other five participants couldn’t answer more than nine sentences.

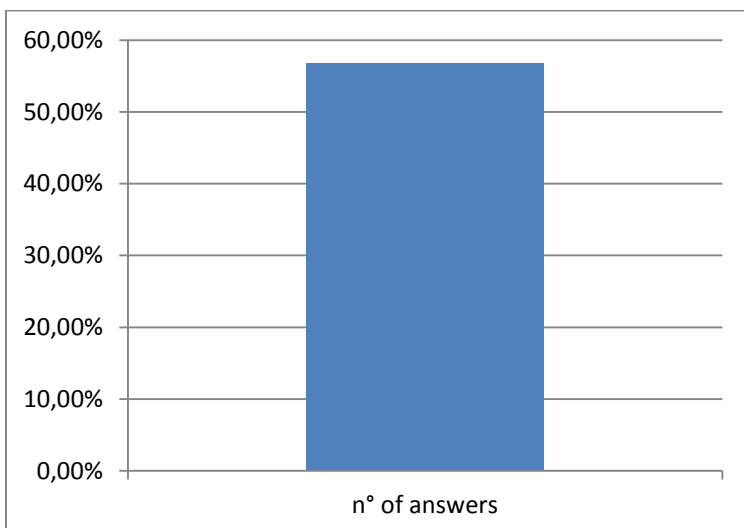


Table II.6: Third session Listening Span test results

II.6.3.Following the instructions:

In the first session, ten groups were assessed. The students were given a list of seven instructions to apply on The Plimpton Hold Hp picture. The instructions were read by the researcher twice, and then the picture was distributed among the participants. They had to follow the instructions, number them in the same order as they had been instructed to. The picture is derived from critical thinking activities booklet “**Substitute Teacher Handbook/8th edition**”. The success rate at this session is 77, 14%. The majority of the students could follow the instructions and number them correctly nonetheless two groups couldn’t follow more than two instructions.

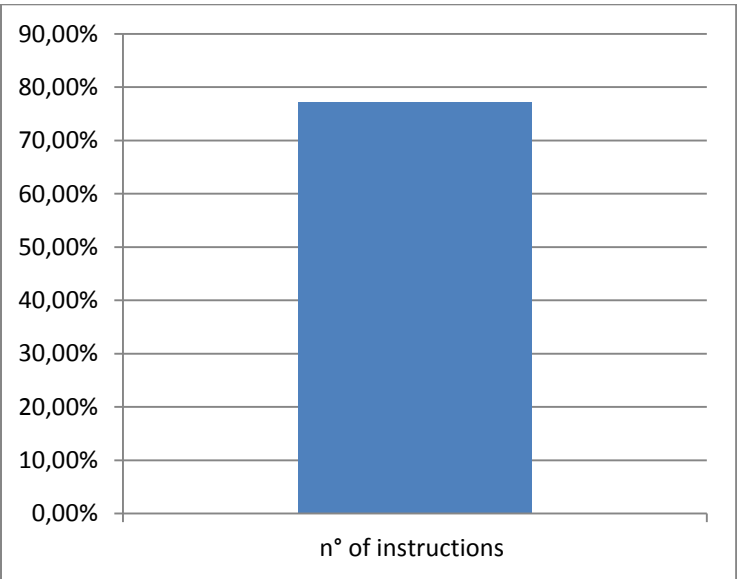


Table II.7: First session following the instructions’ results

In the second session, twenty students were tested individually. The same principle is followed this time again. The participants had to listen to a list of instructions two times and apply them on the distributed sheets. A picture of a farm was selected from the internet. Almost all the participants numbered the instructions and followed them. The success rate increases at this session to 87, 14%. 50% of the students followed the instructions and number them correctly.

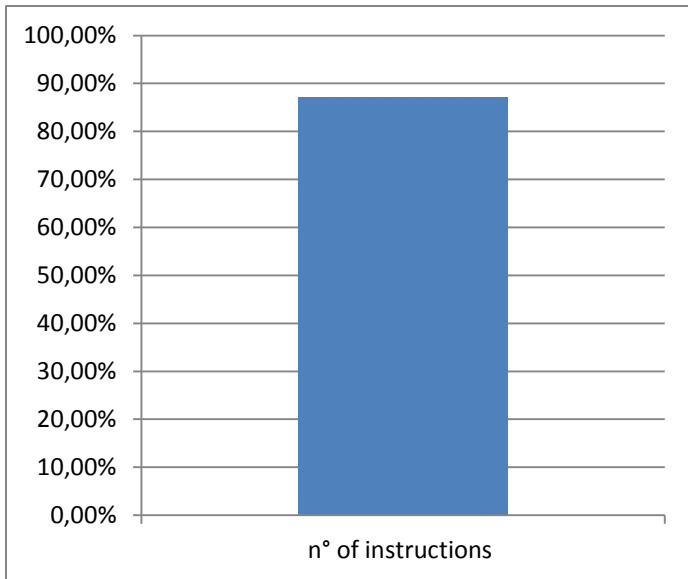


Table II.8: Second session following the instructions' results

In the third session, twenty individuals were assessed. A picture of corner room was distributed among the participants with seven instructions to apply. The participants were given five minutes to accomplish the task. Almost all the students have numbered the instructions. 50% of the participants applied more than six instructions however the other 50% could implement four to five instructions. The success rate at this session is 81,43%.

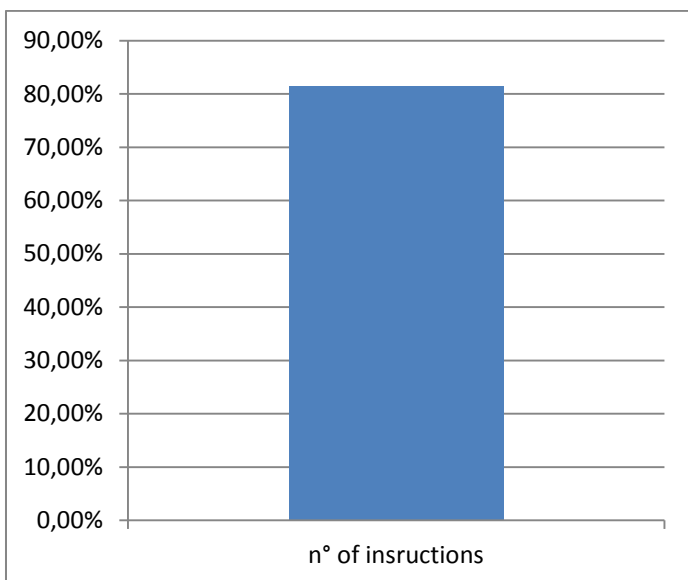


Table II.9: Third session following the instructions' results

II.7.THE QUESTIONNAIRE:

Working Memory Questionnaire by Raviv is carefully selected to assess the level of first year English Language students working memory's capacity. The questions are simple, precise and practical. At the end of the third last session, the questionnaire was quietly distributed among first year English Language students of the University of Abdelhamid Ibn Badis inside their classroom. The students were supposed to answer the questions by never, frequently, sometimes or never.

II.7.1.THE QUESTIONNAIRE'S ANALYSIS:

After the participants finish the third exercise of the last session, the distribution process of the questionnaire takes place at the same session. The questionnaire contains thirteen close-ended questions with the intention to test their working memory capacity. The students' questionnaire is designed and adjusted to fit their level. The questionnaire is written English with simple and easy words to understand

Q01: Are you easily distracted when working memory on or doing something that is not highly interesting?

This question aims at detecting students' attitude about doing insignificant tasks that require working memory skills

Suggestions	N	%
Never	3	15 %
Sometimes	12	60%
Frequently	4	20%
Unsure	1	5%
Total	20	

TableII.10: Suggestion of the students' attitudes towards doing insignificant working memory demanding tasks.

The table's statistics clearly shows that the majority of the students 60% do not focus on tasks that are not highly interesting to them and may lose attention while attending them. While 15% of the students claim that they stay focused even if the working memory demanding task is not that highly motivating.

Q02: Do you have trouble waiting your turn, for example in a conversation or when waiting in line to get help?

This question intends to explore first year English Language students' working memory problems. One among the signs of limited working memory is the inability to wait within a line or during a conversation

Suggestions	N	%
Never	7	35%
Sometimes	10	50%
Frequently	2	10%
Unsure	1	5%
Total	20	

TableII.11: Suggestion of the students' difficulties while waiting for their turn.

The table's results show that 50% of the students do face problems while waiting for their turn to speak or getting help however less than 40% claim that they do not have this kind of problems. Only a minority of the participants are not sure about that.

Q03: Do you struggle with reading comprehension and have to read through texts repeatedly to understand?

Since a big part of this work is sacrificed to the relationship between working memory and reading comprehension, this question can be considered as the suitable mean to detect students with low working memory deficit.

Suggestions	N	%
Never	6	
Sometimes	8	40%

Frequently	2	10%
Unsure	4	20%
Total	20	

TableII.12: Suggestions of first year students’ problems with reading comprehension.

The table demonstrates the prevailing part of “sometimes” answers. 40% of the students struggle in reading comprehension and may not understand the texts well after the first reading. 30% of the students claimed that they do not struggle with reading comprehension and do not read the text more than once for a good understanding.

Q04: Do you struggle with problem solving that requires holding information in mind for example mental math and calculation?

One of the functions working memory performs is holding information for a brief period of time, process them and manipulate them. Mathematics deals with holding numbers in the working memory and manipulates them as well. This question seeks to reveal students with working memory deficit within mathematic subjects.

Suggestions	N	%
Never	4	20%
Sometimes	11	55%
Frequently	0	0%
Unsure	5	25%
Total		

TableII.13: Suggestions of the students’ possible problems during solving an arithmetic equation

The table illustrates the dominating “sometimes” answers by the students. Only a minority “4 students” do not skirmish with mental calculations and equations.

Q05: Are you inconsistent in remembering math facts?

This question has similar objectives as the previous one. It intends to know whether First Year English Language students have changeable behaviour towards remembering mathematical facts.

Suggestion	N	%
Never	6	30%
Sometimes	8	40%
Frequently	1	5%
Unsure	4	20%
Total number	20	

TableII.14: Suggestions of the students' inconsistency in remembering math facts

The statistics clearly shows that the majority of the participants are inconsistent in remembering fact. They may struggle in solving mathematical calculations.

Q06: Do you struggle with completing tasks, especially multiple step tasks?

This question intends to know if first year English language students have problems in finishing the exercises or the work given to them. Exercises that can be lengthy or done through different steps.

Suggestions	N	%
Never	5	25%
Sometimes	9	45%
Frequently	1	5%
Unsure	5	25%
Total number	20	

TableII.15: Suggestions of the students' problems in completing multiple step tasks.

The table demonstrates the prevailing part of “sometimes” answers. Nine students may sometimes struggle in finishing tasks that are multiple step demanding. 25% of the students do never struggle at all with finalizing their tasks while the other 25% are unsure about it.

Q07: Do you have difficulty in remembering long instruction given in several steps, for example following recipes, directions or school/work assignments?

The seventh question was intentionally put forth to find out if first year English language students do encounter some difficulties in remembering lengthy instructions. Not only in academic context but even outside the school environment.

Suggestions	N	%
Never	5	25%
Sometimes	12	60%
Frequently	1	5%
Unsure	2	10%
Total number	20	

TableII.16: Suggestions of the students’ difficulties in remembering long instructions.

The seventh table shows that the big majority of the students may not be always able to remember long instructions. Five students do not have any difficulties in remembering long instructions and the other 3 students’ answers varied from frequently to unsure.

Q08: Do you struggle to understand the context in a story or a conversation??

This question aims at finding out whether first year English language students are able to understand the context in stories and conversations or not.

Suggestions	N	%
Never	10	50%
Sometimes	7	35%
Frequently	1	5%
Unsure	2	10%
Total number	20	

TableII.17: Suggestion of the students’ ability to understand the stories.

The table clearly demonstrates that half of the respondents (50%) do not face difficulties in understanding the context in a story or in a conversation. While 35% of the participants stated that they don't struggle a lot in conceptualizing the context in a story.

Q09 Do you have difficulties when planning and organizing something that needs to be done in separate steps?

The ninth question aims at finding out if the students have difficulties in planning and arranging things that should be done in various steps.

Suggestions	N	%
Never	7	35%
Sometimes	11	55%
Frequently	0	0%
Unsure	2	10%
Total number	20	

Table II.18: Suggestion of the students' ability to plan and organize things in multiple steps

These statistics demonstrate that the majority of the participants (55%) may encounter some issues in planning and arranging things in various steps. Less than half of the students (35%) stated that they don't face any kind of problems while planning and organizing things while the other 10% of the students are sceptic and unsure.

Q10: Do you have difficulty staying focused during cognitive demanding tasks but attends well when cognitive demands are minimal?

This question aims at finding out the students' memory capacity. Some of the students are attentive and hard-working when cognitive tasks are minimal. Once the cognitive demanding tasks are larger, they become confused and unfocused

Suggestions	N	%
Never	3	15%
Sometimes	9	45%

Frequently	0	
Unsure	8	40%
Total number	20	

TableII.19: suggestions of the students' difficulties during cognitive demanding tasks.

As already shown on the table, nine students out of twenty (45%) answer “sometimes”. They may face some obstacles while dealing with a large number of cognitive demanding tasks. Three students (15%) do not have any problem while confronting highly cognitive demanding tasks. The other 40% of the participants are hesitant and indecisive.

Q11:Do you have difficulties integrating new information with prior knowledge?

This question targets the issue of complication students' may meet while accommodating the already-acquired knowledge with the new one.

Suggestions	N	%
Never	2	10%
Sometimes	12	60%
Frequently	3	15%
Unsure	3	15%
Total number	20	

TableII.20: Suggestions of the students' issue during the accommodation.

The table statistics demonstrates a high percentage (60%) of the students who assert that they meet some predicaments while meshing prior information with the new one. only two students (10%) declared that they have never faced these problems. The other 50% is divided between those who claimed that they often encounter these troubles (15%) and those who are uncertain and ambivalent.

Q12: When called on, do you forget what you were planning to say?

The twelfth question aims at finding out the students' ability to remember the next action they are going to perform when are called by someone.

Suggestions	N	%
Never	6	30%
Sometimes	12	60%

Frequently	1	5%
Unsure	1	5%
Total number	20	

Table21: Suggestions of the students’ ability to remember the following step when they are called on.

The table demonstrates a large percentage (60%) of those who state they occasionally fail to remember what they were intending to say when called on. 30% of the participants claimed that they don’t forget what they were doing when they get distracted. 10% of the respondents’ answers vary between “frequently” and “unsure”.

Q13: Do you have difficulties taking notes and listening at the same time?

This question is tightly linked to the listening span task. Generally students who have difficulties in listening and taking notes at the same possess a limited working memory.

Suggestions	N	%
Never	4	20%
Sometimes	10	50%
Frequently	0	0%
Unsure	6	30%
Total number	20	

TableII.22: Suggestions of the students’ listening and taking notes difficulties.

The statistics indicate that half of first year English language students may face some difficulties while listening and taking notes at the same time. These students may not be able to concentrate on the two tasks at the same time. Four students (20%) do not struggle in taking notes and listening. The other 30% of the students are unsure and sceptical.

Conclusion

First year English language students seem to have a good working memory that can absorb a number of information. However, the lack of attention prevented them from holding and retrieving all the information stored in their working memory.

In addition to the training sessions, the questionnaire's analysis demonstrate that half of these students carry a poor working memory and may struggle with cognitive demanding tasks, forget what they were planning to say if interrupted, and are unable to take notes. All these skills are highly needed inside their educational setting so working memory skills should be highlighted and trained inside and outside the school context.

Chapter III

Useful Activities and Recommended Classroom Strategies

Introduction

This chapter discusses the results of the training and the questionnaire addressed to first year English language students. It includes some suggestions, recommendations, strategies and different methods and techniques that can boost the students' working memory.

Teachers should not prioritize teaching some skills over others. Using a new up-dated methods and strategies that can improve the students' cognitive performance must be adapted inside the classroom context. Working memory can be trained, strengthened and enhanced. It is up to the teacher to make the difference.

III.1.RESULTS:

This chapter represents the results of the current study. Three different experiments were conducted by the researcher for the sake of verifying of falsifying the previous hypotheses. In addition to the three experiments, a questionnaire of the working memory designed by the scholar Raviv was used. The objective of this study was to make a comparison between the first year English language students' pair-work performance in working memory tasks and their individual one.

III.3.1.THE READING SPAN TEST RESULTS:

The data obtained through the training of the three sessions showed that students' working memory's capacity is limited to eight items maximum. In the reading span test, students' pair-work performance was better than their first individual one. Almost all the students could remember the eight last words in the first session. 89% is the success rate of the students who could remember the whole eight last words in the first session. Students' working memory works better when they collaborate together. In the two first sessions, some students misspell the words and didn't rank them in the correct order. They showed a deficit in recalling the words written on the board or what is called "short-term visual memory issues". "This deficit may emerge when the individual has a difficulty recalling what he has just seen. Because of that he may struggle with reading and spelling. He may also have troubles remembering what he has just read" as stated by Beth Arky in her article "understanding Visual Procession Issues". In the two last sessions, a different reading span test was conducted yet Students didn't perform as good as the first time. Only one student could remember eight words out of eight, his working memory couldn't hold more than two keywords. A conclusion to be drawn here is that students don't shift attention between two items at the same time. They can focus only on one word in each sentence. In the last session, statistics verified the hypothesis that human memory cannot hold more than eight chunks and that recalling eight rhyming words is much easier than recalling eight unrelated words.

The following segment demonstrates the students' ability to remember the eight words from eight sentences. The results show that the students were able to recall almost all the eight

words in the first and the last session. Students were able to perform well in the reading span test when they worked in pair and when they were confronted with sentences that include rhyming words. not to mention that some of them wrote the words in different sounds such as “porsh” and “croch” instead of “porch” , “cleamer” or “climant” instead of “climate” and “kessis” instead of “cases”. Furthermore, no correct ranking was indicated. As a matter of fact, the results of this training show that students’ working memory can grasp up to eight different words and that these students are characterised by “selective attention” rather than “divisible one”.

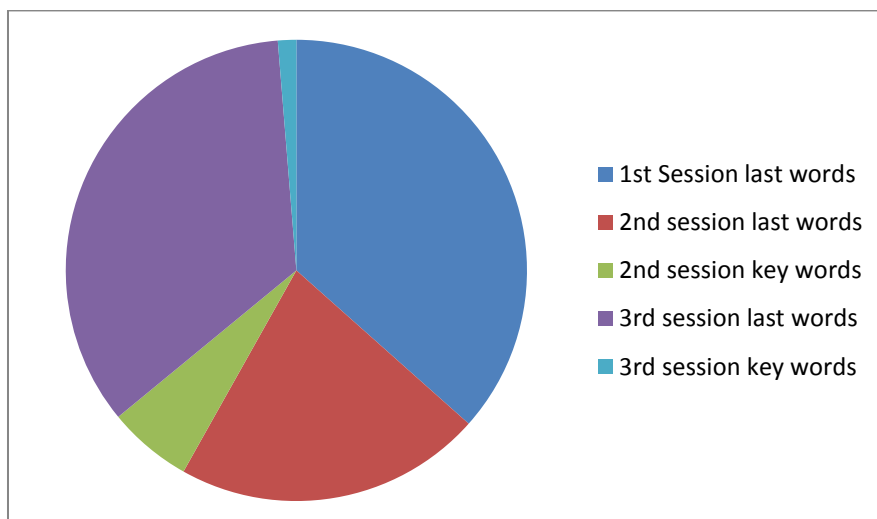
The blue colour represents the success rate in the first session 89%

The red colour represents the success rate in the second session 52, 50%

The green colour represents the success rate in recalling back the key words in the second session 14, 38%

The purple colour represents the success rate in recalling back the last words in the last session 84, 34%

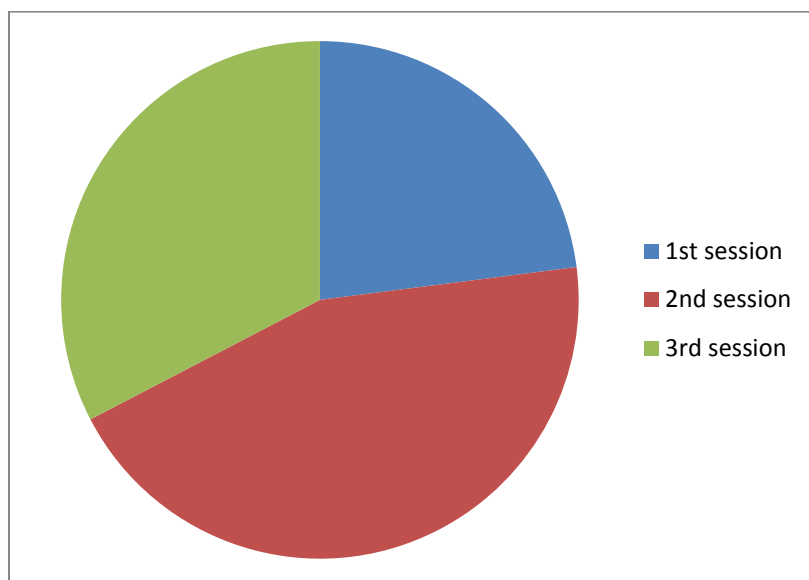
The light blue represents the success rate of recalling back the keywords in the last session 3, 13%



Segment III.01 presents the students’ ability to remember the last words in the three sessions.

III.3.2.THE LISTENING SPAN TEST RESULT:

When the data regarding students' pair-work performance was compared with individual performance, the following results presented in the second segment were found out.



Segment III.02 presents the students' ability to listen, verify or falsify 22 sentences.

The blue colour represents the success rate of students' ability to listen to 22 sentences 40%.The red colour represents the success rate of students' ability to listen to 22 sentences. 77, 27%.The green colour represents the success rate of students' ability to listen to 22 sentences 56, 82%.

As can be seen in the previous segment, students' pair-work performance was not so satisfactory as their individual one. In fact, in the first session of the listening span test, the percentage success is estimated at only 40% as far as the students' pair-work performance is concerned. In the three sessions, students were confronted to 22 mundane sentences. In the first session, no group could answer more than 13 sentences however the participants could perform better in the two other sessions. This listening span test aims at testing the students' language comprehension as well as their listening span. Despite the fact that all the sentences given in the listening span are attainable, they failed to authenticate or misstate them.

Unlike the reading span test, the listening span test has clearly demonstrated that students' working memory processes pretty good when they work individually. Students were

more attentive in the two last sessions yet more than 60% of the students couldn't verify or falsify the 22 sentences when they worked in pair. Students' shortcoming to understand some words such as "Warner", "lass", "thorns", "fluffy hair", "elbows", "elevator", "temptation" and "dumb" hinder their ability to answer. This test has proved that the individual's working memory cannot process 22 sentences in a short period of time. Even if the students listened to the sentences more than once, they couldn't respond to the whole task sentences. The results show also that the respondents possess a visuo- spatial working memory rather than auditory one simply because they scored better in the reading span test rather than the listening one.

III.3.3.THE FOLLOWING INSTRUCTIONS' RESULTS:

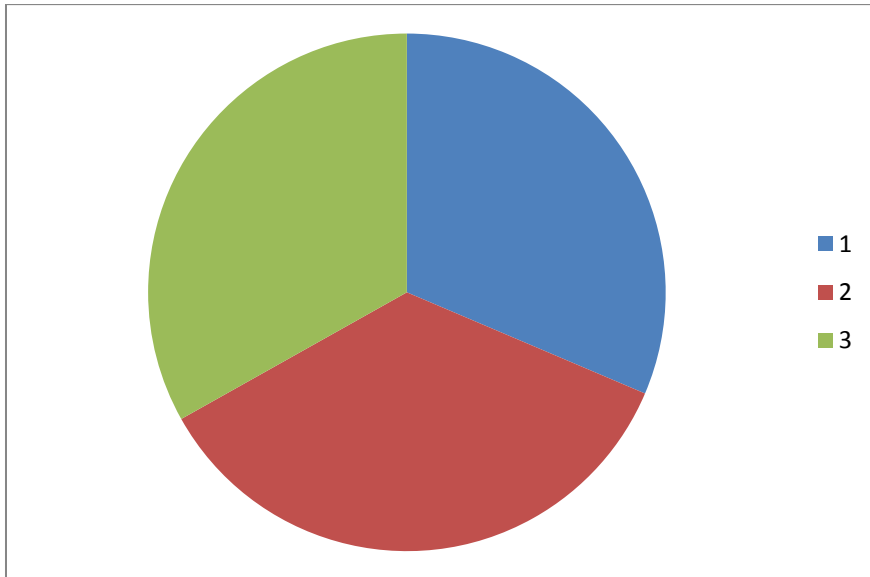
The data obtained through the three sessions' training show that more than 50% of the students are able to memorize, follow the instructions and apply them. Unlike the reading span test, students working memory operate better when they perform the task alone. Students' success rate is higher in the two last sessions than the first one.

The majority of the respondents show a good working memory performance in following the instructions' test yet they were unable to number them. Students have verified Miller's theory 'the magical number seven' which believes that the human working memory may hold up to seven chunks for a brief period of time. Only 10% of the students show a limited-working memory, they couldn't apply more than 3 instructions. The results show also that students follow and apply better the instructions on smaller pictures than bigger ones. The following segment indicates that the majority of first year English language students' could follow the instructions and apply them perfectly. Simply because they were more attentive than the other few minorities who could not accomplish the whole task and did almost similar mistakes. For example; they coloured the clock instead of putting it inside a square or putt a line above the child's head instead of writing cross.

The blue colour presents the students' success percentage of following the instructions in the first session 77, 14%.

The red colour presents the students' success percentage of following the instructions in the second session 87, 14%.

The green colour presents the students' success percentage of following the instructions in the third session 81, 43%.



Segment III.03 presents the students' ability to follow the instructions in the third session.

III.4.THE QUESTIONNAIRE'S RESULTS:

The questionnaire is designed to detect students with working memory deficit. 13 different questions aim at revealing the students' strengths and weaknesses in dealing with cognitive tasks. First of all, the results of the 50% of the respondents show that these students may struggle with working memory tasks and that they can be quickly disturbed while doing something repulsive. These participants tend to have difficulties waiting for their turn in a conversation or in conceptualizing a given text quickly. They may face some issues in holding information and long instructions in their mind. The results demonstrate that first year English language students do struggle occasionally to accommodate information with prior knowledge. They also show that half of the participants have troubles taking notes and listening at the same time. These students tend to have working memory difficulties in learning. Most of them struggle in dealing with working memory activities such as; planning, completing multiple-step tasks and understanding the context in stories and conversations.

Next 30% of the students' results show that they possess a good working memory and they don't struggle in cognitive-demanding tasks. They do not struggle in comprehending the context in stories either or following instructions that need to be done in several steps. Information can be saved in their working memory and retrieved whenever it is needed without any difficulties. These students tend to be good at solving mathematic equations and mental calculations. This type of students does not face difficulties in listening and taking notes at the same time. They do not get easily disturbed while doing something unattractive or not very compelling to them.

Finally the 20 % of the results reveal that one half of this category (10%) has a limited working memory. According to these respondents' feedback, they frequently face trouble staying focused during cognitive demanding tasks or while performing multiple-step exercises. They often encounter issues waiting for their turn in a line or in conversation, forgetting what they were planning to say if somebody called them. The results show also that these respondents cannot unite novel information with previous one. Saving and retrieving information from their working memory may be considered as an elusive task to them. Their answers show that their working memory doesn't process information quickly. They need time to save information and long instructions in their mind.

The other half (10%) is devoted to the respondents who could not answer the questions and kept putting a tick on the "unsure" box". These participants might face trouble in understating the questions and couldn't encode the meaning of the words. They might have needed a hand to comprehend the task in order to be able to answer the questions.

III.5.RECOMMENDATIONS:

Working memory is essential in the individual's life. It is that important for all people of all ages. Basically, every individual uses and depends on his working memory to memorize and retrieve information in daily activities. Working memory is a core cognitive system which is responsible for storing, processing and manipulating information for a brief period of time.

Working memory is tightly related to academic achievement. Thanks to working memory, learners accommodate, memorize and solve mental calculations which necessitate holding digits or words in mind temporary. It is closely linked to different academic skills such as: vocabulary, listening, reading comprehension, spelling, mathematic calculation and

following the instructions yet a very little importance is dedicated to it. In addition to listening, speaking, writing and reading, working memory should be taught as another fifth skill. Teachers may not be aware of its importance; some of them may possibly ignore what working memory is.

Working memory skills and activities should be implemented as an independent trainee subject for the future teachers. Teachers are not expected to teach something they are not aware of it at the first place. A whole session should be devoted to working memory what does it mean? How does it look like? What is its real function? What are the signs of students with limited-working memory? Their behaviour and how it can affect the academic achievement. These teachers can design their own peculiar lesson plans to meet their students needs.

A diagnostic assessment must be used at the beginning of the year, in order to detect students with working memory learning difficulties. Raviv questionnaire is considered to be the best mean to assess and categorize students with working memory deficit or limitation. The questionnaire can be translated into other languages like Arabic or French. So that students will be able to answer it easily and without any troubles. According to Can LEARN society teachers should:

- Review and activate prior knowledge.
- Be overt and explicit.
- Model and think loud.
- Have skilled students model step.
- Encourage use and practice.
- Evaluate and recognize effort and success.
- Encourage self-monitoring.
- Promote transfer to other situations, times, activities and groups.

Extra beneficial school activities can be added to the school curriculum to enhance academic performance. The evidence-based computerized program designed by leading

neuroscientists to improve attention by effectively increasing working-memory capacity must be used in the Algerian schools.

III.6.RAVIV PRACTICE LONDON:

It is a practice consisted of three different therapies for individuals who are experiencing learning difficulties. The objective of this practice is to diagnose the learning problems and address them with activities and exercises that fit their needs. It is “multifaceted approach” which helps individuals with learning difficulties such:

Asperger’s syndrome, Attention Deficit Hyperactivity Syndrome (ADHD), Autism Spectrum Disorders, Auditory Processing Disorder, Dyslexia, Dyspraxia, Dyscalculia, Dysgraphia, Language Speech impairment, Motor Co-ordination Problems, Memory and Concentration Difficulties. The practice includes three therapies: “the Raviv Method”, “The FastForWord” and “Cogmed training”.

III.6.1.RAVIV METHOD:

It is a method developed from a recent study of how the brain functions and how does it needs to work to amass learning skills. This method aims at training and improving new “neural pathways” via special exercises which work on parallel on the visual and auditory centres and hemispheres. The result of this practice will be a remarkable free-difficulties learning. The Raviv program consists of five implemented processes:

Creating the specific neurological structure required for the learning process, focused strategies for controlling the brain activity necessary for attention and concentration, training the brain to control two-dimensional perception, reading, training the brain in phonological skills and maths and finally learning and memory strategies.

Raviv sessions’ take place once a week with duration of 50 minutes to one hour. This program may last up to 20 sessions. In these sessions, the student will learn how to do the 20 minutes “figure-of-eight-walk”. This technique is based around a series of exercises that consist of doing the “figure-of-eight-walk” for around six months, with visual and auditory stimulus. During the walk, the trainer will develop the ability to stay focused on visual and auditory stimulus. When the participant is doing that figure, he is making connection between the two sides of the brain “the left and the right” says practitioner Karen Wexelstein. “When you have learning difficulties, you have neurons that are firing but not making a full

connection. By doing these exercises every day, you are nurturing the growing process of the brain cells and, within about six months, the connections will be established and the older neurons will wither away.” The practitioner uses the time of the walk to give the subject different age appropriate mental sequencing, rhyming, and numerical games and exercises designed to develop sequencing and memory skills. The clock-face exercise is another exercise among Raviv method. This exercise helps the practitioner’s vision and eye strength and has a positive effect on his visual learning. The practitioners will learn breathing-techniques and other exercises including stand-alone exercise, spelling correction, developing a photographic memory and other different exercises.

III.6.2.FAST FORWARD:

This program comes as a second step after finishing the Raviv Method Training. It believes that practitioners will need to ameliorate their learning skills such as: reading, writing and spelling after getting over their learning difficulties through Raviv Method. Even intelligent children are among practitioners who could not process information correctly and are now ready to join their peers. This program provides the practitioners with the opportunity to catch up quickly with the rest of their class. Fast ForWord program is computer-based educational software that is aligned with the school curriculum. The program is scientifically designed for individuals with learning difficulties. It consists of 2 levels: primary education and secondary one.

The Fast ForWord primary education aims at developing language skills. It improves memory, attention and processing rates. It consists of different level from Reading Level 1 to Reading Level 5. Within each level, students are provided with reading comprehension exercises to improve their learning potential and skills. For example: in the reading level 1, practitioners have to chose between various exercises like Bear-Bags, Buzz Fly, Flying Fish, Bedtime Beasties, Quail Mail and Magic Rabbit. In the Magic Rabbit, a picture of different letters are joined together to form a word, HIDE this program shows the student how to change a single letter to form another word different in meaning than the first one. for example Side, Ride and Wide. The aim of this “phonemic awareness” exercise is to train the practitioners to train their working memory to hold spoken words and to improve their attention as well. In the Buzz Fly exercise, practitioners listen to a short passage that contains homophones, homonyms, a definition or a short saying and try to remember the words after the voice finished talking. For instance the voice says: “a hog and a frog took a jog in the fog,

“I can’t see a thing said the hog to the fog” then the practitioners are asked where the animal went for a jog? They answer the question and move to the question that follows. This exercise helps the practitioners to develop their listening comprehension and their working memory. In the Fast ForWord Secondary education, students are confronted with various exercises. For instance in Stellar Stories 4 pictures of the same person performing different actions is displayed. And the practitioner is asked a question about one particular action and he must recognize it.

III.6.3.THE COGMED THERAPY:

The third suggested- therapy by the scholar Raviv is this computer-based program which is believed to be as an efficient solution to poor working memory problems related to attention deficit. Cogmed Working Memory Training Coach Eva Ullberg plans the training for her students carefully: “I start by going to out to our school’s teacher teams and finding out which students they think would benefit from working-memory training. It is important that they not only refer students who have difficulty in concentration, but also those struggling with reading, writing and mathematics and students who have trouble getting started on assignments” she said. The principle of that program is that student must be introduced to it through an introductory session with the entire class then the teacher allows them to decide whether they would like to participate –but rarely does anyone decline-. Parents are invited to the meeting to know more about what working memory is, how it functions and how the training work and what results it can provide.

A series of activities can be implemented in this program with different degrees of difficulty. Activities like “Twist, Hidden, Pop Up, Letters, Assembly, 3D Grid, Cube, Grid, Rotating, Correct, Sort, Numbers and Chaos” 3D Grid is one of these exercises that will help the students train all aspects of working memory. In this exercise students are shown a picture of a desk, they need to remember the order and repeat, this activity improves spatial visual working memory by challenging the students to recall the order in which the squares up at the picture. In the Hidden exercise, students listen to a voice say a series of numbers, when the panel appears students must enter the numbers in reversed sequence. This exercise challenges the auditory working memory. In the rotating exercise, some of the lamps in the circle light up; the students must remember the order and repeat it. Each time the student completes the sequence, the program adjust to his performance. If the students answer correctly the difficulties increase if they answer incorrectly the subsequent exercise becomes easier. This

ensures that students are continually pushing the limits of their working memory. As stated by Ullberg most students report that they are to concentrate, focus on their school work and that they find test-taking easier. Plus, they are more organized and better able to start and finish a task or project on schedule. She said: “what I see as the great common denominator among my students who complete the Cogmed training is that they are more able to focus and spend time on their school work, and they are seeing positive results from the time they are investing. These results contribute to all of their academic success.” High School Students Improve Concentration, Quality of Time-on Task With Cogmed Working Memory Training.

According to Alison Winter in her article Cogmed: Copy and evidence, school-aged children and adolescents have also shown improvements in working-memory post Cogmed training. Klingberg et al. (2002) observed a significant effect on the span-board, a non-trained assessment of visuo-spatial working memory in children with ADHD, ages 7 to 15 years. In 2005 Klingberg et al. replicated these findings in a group of children, 7 to 12 years of age, with improvement in both verbal working memory (digit span) and visuo-spatial working memory (span board). Recently Green et al.(2012) demonstrated that children 7 to 14 years old with ADHD who did standard (adaptive training) significantly improved compared to the placebo group (non-adaptive training) on the widely used working memory index. Of the Wechsler Intelligence Scale for children. Fourth edition.

III.7.CLASSROOM STRATEGIES TO IMPROVE WORKING MEMORY:

Linda Houston Educational Consultant and Nathalie Paquet-Bélanger specialist in Learning Disabilities proposed some strategies to work effectively with students who have learning disabilities and working memory difficulties:

1-COMPENSATORY STRATEGIES:

These strategies must be taught using pedagogical approaches that stress on clear instruction. They are techniques or modifications to the pupils’ behaviour or environment that are used to compensate for a deficit, weakness, injury or perceived inadequacy in a specific area or skill. Two examples of these strategies for a student who understands mathematical concepts, such as addition, would be playing cards or calculating the total cost of a grocery shopping list.

2-RECALL STRATEGIES:

These are verbal strategies used to help students retrieve previously learned materials. To boost the steps in a task, the educator can model the steps aloud. This will help the student remember the sequence.

3-EXTERNAL AIDS:

These aids sum up key information on a given subject. The student can refer to the memory aid as needed. The memory aid can be a schedule for the day, a list of criteria task such as long-term project, a flow chart for completing a writing assignment, a clock face showing time that students have to complete task or even a simple a straightforward poster that is displayed in the classroom.

Other strategies are proposed by Glenda Thorne in her article “10 Strategies to Enhance Students’ Memory”. According to her, these strategies are may help students with a deficit or a difficulty in their working memory to develop a more efficient and effective memory:

Give directions in multiple formats: directions can be given in both verbal and visual formats. Their conceptualization and memorization of the directions could be checked by encouraging them to repeat the instructions given and explain the meaning of these directions. Examples of what needs to be done are also helpful for improving memory of directions.

Teach students to over learn materials: this strategy stresses on the necessity of teaching students “over-learning” new information. Often they practise this strategy until they become able to perform one “error-free” repetition. Several error-free repetitions are required to solidify the information.

Teach students to use visual images and other memory strategies: substitute word system is used for memorizing information that is hard to visualize. The words “occipital and parietal” are words that are hard to memorize. They can be transformed to other familiar sound that can be visualized. The word occipital (which is actually a region of the brain that is responsible for vision) can be converted to exhibit hall because it sounds as the exhibit hall. As stated by Glenda Thorne, The students can make a visual image of walking into an art museum and seeing a big painting of a brain with big bulging eyes. Via this program, the word this student is trying to remember becomes the cue for the visual image.

Give teacher-prepared handouts prior to class lectures: the hand-outs for class lectures could be a brief outline or partially complete graphic organizers that student need to finish during the lecture. Gaining this information permit the students to identify the most important information given during the lecture, to correct and organize the information in their notes. Both of these activities help to improve the memory of information.

Teach students to be active readers: this strategy highlights the importance of reading. While reading students highlight, underline and write the keywords on the margin. They can go back to read the underlined keywords in a later time. This strategy is used to enhance working memory registration when reading. It enhances school performance as well.

Write down steps in Math problems: students with limited or poor working memory should not depend on mental calculation when solving mathematic problems. For instance: if the student is trying to solve a long mathematic division, he/she should every single step including carrying numbers. This strategy helps the students remember what they are doing and to not lose their place.

Provide retrieval practice for students: research has shown that long-term memory can be improved when students engage in retrieval practice. Taking a test or an exam is a retrieval practice because students are recalling back information from their long-term memory. The practice retrieval test can be very helpful for students. Through this test parents and teachers will have a concrete feed-back of whether these students are concentrating in the most important information or just focusing on less significant details.

Help students develop cues when storing information: according to the memory research, information can be easily retrieved when it is stored using a cue. That cue should be present while retrieving the information. For example the acronym HOMES can be used to represent the names of the great lakes: “Huron, Ontario, Michigan, Erie and Superior. The acronym is used when learning the information. Recalling the cue while taking a test will help the students recall the information.

Prime the memory prior to teaching/ learning: cues that prepare students for the task to be presented are helpful. This is called priming memory. For instance when students read a text, they will have an idea of what is expected through discussing the vocabulary and the topic earlier. This will help the students to focus on the most important information. Cliff Notes for literature pieces can be used with elder students; they are helpful for priming memory.

Review material before going to sleep: it is helpful to review materials right before going to sleep at night. Research has shown that information studied that way will be better remembered.

III.8.CLASSROOM-BASED WORKING MEMORY APPROACH:

according to the Education Psychology Service in its article working memory in the classroom: “classroom-based working memory approach is designed to avoid working memory overload in structured learning activities.

Principles

Further information

Recognize working memory failures

Warning signs include: incomplete recall, failure to follow the instructions, place-keeping errors and task abandonment.

Monitor the child

Look out for warning signs and ask the child about difficulties.

Evaluate working memory loads

Remain vigilant to heavy loads caused by:

-lengthy sequences of instructions.

-unfamiliar content.

-demanding mental processing activities.

Reduce working memory loads

Reduce the amount of material to be remembered, increase the familiarity and meaningfulness of material, simplify mental processing and structure complex tasks.

Repeat important information

Repetition can be supplied by teachers or follow pupils nominated as memory guides.

Encourage use of memory aids

Can include wall charts/posters, useful spellings, cubes, counters, numbers, lines, calculators, memory cards, personalised

dictionaries, audio recorders and computer software.

Develop the child's own strategies

These include asking for help, rehearsal, note-taking, use of long-term memory, place-keeping and organizational strategies.

III.9.THE ASSESSMENT OF WORKING MEMORY:

Several battery tests can be used to assess working memory, the German scholar Ebbinghaus was the first who was interested in assessing working memory capacity 100 years ago. In 1885, He created simple artificial materials, nonsense-syllables, he investigated how much materials are learned and forgotten by a single adult participant. He created "The Ebbinghaus Forgetting Curve" to explain how memories remain the human memory. According to him, people retain information in mind depends on: The strength of their memory and the amount of time that has passed since learning.

As reported by Professor Susan Gathercole and Doctor Tracy Packiam Alloway in their classroom, different methods can be used to assess working memory such as: complex span tasks, reading span task, operation span task, the rotation span task, updating tasks such as: the verbal updating task, in the numerical updating task, the spatial-figural updating task, binding tasks such as; the letter-colour binding task, the word-number task, secondary-memory tasks such as: the word-word SM task, the letter-position SM task, reasoning tasks such as the fluid intelligence section of the Berlin Test of Fluid and Crystallized intelligence, tasks measuring response inhibition such as the Erikson Flanker Task and the Simon task.

III.10.THE LIMITS OF WORKING MEMORY:

According to Gathercole and Alloway, working memory is limited in a number of ways; it may not be able to recall the necessary items when needed. The individual must be attentive to the items being hold in the working memory. They suggested some situations where information can be lost and filtered out from the working memory. Situations as:

III.10.1.DISTRACTION

An unrelated thought or interruption such as the phone ringing or someone speaking can be sufficient to divert attention the contents of working memory so that its contents are rapidly lost.

III.10.2.TRYING TO HOLD IN MIND TOO MUCH INFORMATION:

It is known that there are limits to the information that be saved in the working memory. For example: the majority of people may not be able to multiply the numbers 739 and 891 in their heads, simply because of the amount of information that has to be stored of the course of this calculation exceed the capacity of most people's working memory.

III.10.3.ENGAGING IN A DEMANDING TASK:

There are activities that require difficult mental processing, such as applying the rules of multiplication during mental arithmetic, lower the amount of space in working memory to hold information. This may result the loss of other already-stored information.

If the information is filtered out from working memory, it is gone for good. The only suitable solution here is to restart the process of entering information into working memory. For example: the sum would have to be re-calculated from the beginning.

III.11.HOW WORKING MEMORY WORKS?

Cogmed program provides a guide about Working Memory. How it works? What are the different observable signs that prove Working Memory needs exercise. According to Glenda Thorne "All students need to understand how their working memory works and identify their particular profiles of memory strengths and weaknesses (metamemory)".

In the pre-school level, toddlers are learning the alphabet, Focusing on short instructions such as "Come brush your teeth" and remaining seated to complete independent activities such as puzzles. The warning signs that prove that Working Memory needs exercise are: toddlers look unable to learn the alphabet and numbers, they can't focus on long instructions or shift their attention from one thing to another.

In the elementary school, working memory is crucial for reading and understanding, Mental arithmetic and interacting and responding to school activities such as playing on the

school ground. The signs that show that working memory needs practice are: they read but do not understand or remember what they read, troubles holding math facts in their working memory, difficulties waiting for their turn in a conversation or in school activities.

In the Middle School level, working memory is important for doing homework independently, planning for an activity, solving multi-step math activities, participating in team sports yet the clues that indicate their working memory needs training are: the inability to proceed their homework without help, forgetting essential things related to activities, the inability to analyze the read-materials into understood materials, difficulties understanding the rules of games “team-player”.

In high school, working memory is necessary for getting a driving license, understanding social norms and writing essays. The major signs that attest that working memory needs enhancing are: difficulties with spatial awareness, reading, talks too much. They do not listen to others. Their essays are short and disorganized.

During adulthood, working memory is crucial for being at work on time, deciding which step to start with in multiple-step tasks and dealing with family problems however signs that may manifest are the following: belittle time required for a task, arrive frequently late to work, has problems proceeding a long project and being moody with children and spouses.

Seniors’ working memory is responsible for being active members in group discussions, being able to accomplish an already-planned project, arranging materials and activities and managing financial transactions. The indicators that working memory needs exercise are: forgetfulness, distractibility, misplacing things like glasses, mobile...etc.

Les difficultés d’apprentissage as being called by Linda Houston and Nathalie Paquet-Bélanger in their article “working memory: classroom strategies”, can be cured and fixed. Together, they proposed some solutions and tips for educators and individuals to deal with working memory issues. According to them, in order to avoid working memory issues. Educators and individuals need to:

- Repeat important information so that it can be memorized and remembered.
- Use visual and auditory aids to enhance working memory performance and allow encoding.
- Reduce the number of exercises to the main important ones.

- Allow time for retrieving the stored information.
- Divide lengthy projects or the work into smaller units.
- Keep new information concise and brief.
- Review the important information frequently.
- Provide new information in a variety of ways (visual, auditory, verbal).
- Develop specific routines and procedure for daily activities.
- Use paraphrasing to recode the information that is hard to grasp.
- Use note taking in order to remember what need to be done.
- Integrate the prior knowledge with the new information acquired.

III.12.WORKING MEMORY AND SCHOOL ACHIEVEMENT:

Marilee Sprenger believes that if a student has an excellent memory and can keep information in mind. He must then thank his teacher for it. Nowadays technology minimizes the function of working memory and can perform its function.

- The working memory helps students to memorize information.
- It plays an important role in concentration and following the instructions.
- it is vital for comprehending new information.
- It is important for paying attention and concentration.
- it is important for dealing with mental calculation.
- It is important for spelling words and learning new vocabularies.

Scholars Gathercole and Alloway consider working memory as a mental workspace provider in which humans and students can hold information. Working memory helps the students to deal with different mental tasks at the same time. For instance: holding in mind the sentence dictated by the teacher and spelling the words while writing. Or following lengthy instructions and performing them at the same time.

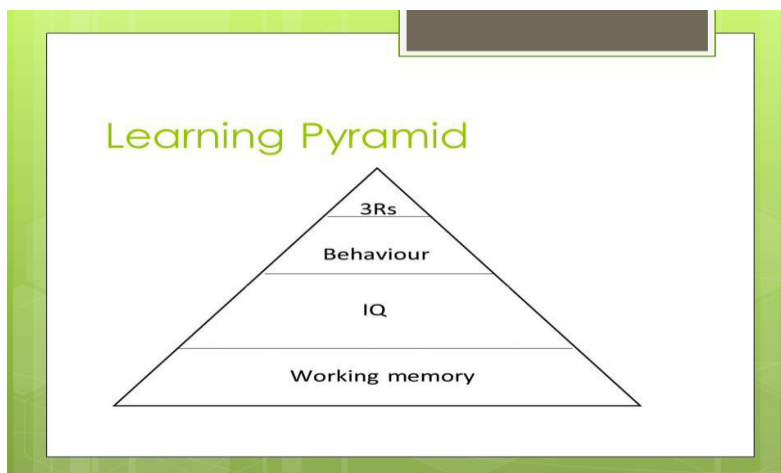
III.13.WORKING MEMORY “THE NEW INTELLIGENCE”:

Alloway and Gathercole mentioned in their book “Understanding Working Memory” that intelligence is tightly related to working memory. According to them, intelligent people are those who possess a good working memory which enables them to hold information, solve arithmetic equations and perform different tasks at the same time. They designed the “Learning Pyramid” in an attempt to explain the relationship between working memory and intelligence. The pyramid shows that working memory is highly important in the academic context. If the learner has difficulties in understanding or remembering letters sounds and put them together he will surely have issues at the educational level “poor language”. The key to intelligence and a good learning outcome is being able to execute, construct the information make use of prior knowledge and to grasp the new information. Students with low working memory may face issues in understanding the information and succeeding at school. As a result, they will struggle with the main important academic skills the 3Rs: Reading, Writing and Arithmetic. Consequently, they will show no improvement in the learning outcomes.

Poor Working Memory= Poor Language

Good Working Memory= Good Learning Outcomes

Good learning Outcomes= Intelligence.



Learning Pyramid derived from National Training Laboratories, Bethel Maine website

BRAIN GAMES TO IMPROVE WORKING MEMORY FOR CHILDREN:

Amanda Morin says that children can be helped to improve their central executive by building some working memory boosters in their daily lives. She suggested that parents should ask their children to teach them what they have learned in the school. Like how to dribble a basketball. This will guarantee that information has been stored and the child starts working with it right away. Playing cards can be efficient and fruitful in improving the working memory. The child has to memorize the rule games, and be attentive to which cards have been already-played by other players.

At school, educators can use the Hide and Wait game. At the beginning of the class each day, teachers hide an item and let the students see where they put it. then at the end of the class, they ask one of the students where did they hide it?

III.14.CHILDREN GAMES:

III.14.1.THE THREE CUPS GAME:

The teacher lines up three paper cups, he then hides a small object under one of the three cups. While the child is watching he switches the cups position and asks the child where the object is?

III.14.2.WHAT IS MISSING?

In this game, the teacher put 10 items from his/her schoolbag on the table. Have the pupils look at them and memorize them for 10 seconds. The children close their eyes for little time and the teacher removes 1 to 3 items. Once they open their eyes they try to remember what is missing.

III.14.3.DOMINOES:

It is another game that can be practised with pupils, it helps them to recognize numbers and objects quickly. They also learn how to make a match between different pieces. This game sharpens their critical thinking strategies.

III.14.4.ANIMAL MASTERMIND TOWER:

each child is given four animals in this game. He put the four animals in a given order; one above the other. They hide the animals and ask each other: Is that animal above that one? This game boosts the memory of the child as well as his deductive skills.

III.14.5.SCRABBLES:

In this game, children are provided with 100 letters and each player forms seven words. This game helps the children with reading, vocabulary and spelling since he is creating new words. It boosts his attention span and long-term memory.

III.15.ADULT GAMES:

Free brain games enhance the human memory and boost the human attention. Games are not only for fun; they can improve the human memory, promote their learning potential and their attentional span. Memory improvement tips provide a number of useful games that can be used to strengthen the working memory and active the human mind.

These games are considered as a self-training brain program. According to the Memory Improvement Tip website, to keep the human mind in top shape, these games should be played often. In a period of 15 minutes once or twice a day. The following games can train various mental abilities.

III.15.1.SCOOBY DOO VELMA VISION

It is a game that trains the mental processing speed and the visual attention. The player witnesses a scene of crime, he gets only few seconds to get a look at this criminal's face, and then he describes the face for the police sketch artist for points.



Scooby Doo Velma Vision game

III.15.2.THE LIGHTNING LIBRARIAN:

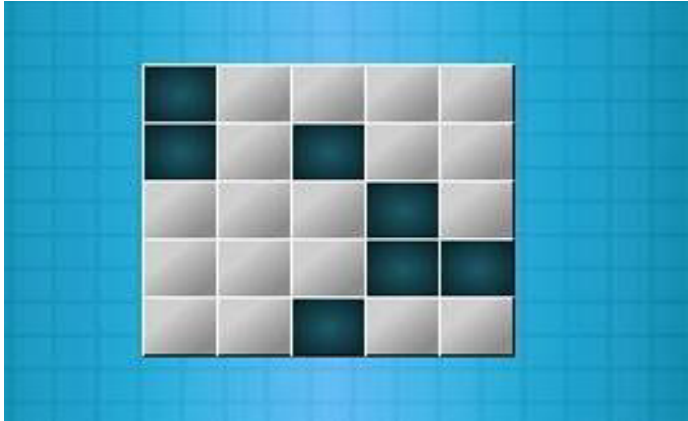
It is another game that exercises the working memory and helps the learners to enhance their spatial memory. This game is about a group of little children who came to the librarian asking for books. If the player doesn't bring the book quickly they will be furious and leave the library. If 5 students leave without having their books, the game will be over and the pity is the books are not organized.



The lightning Librarian game

III.15.3.PATTERN MEMORY:

It is a game that trains the spatial recalling memory. It can help people remember where they parked or where they have left their keys. In this game, a visual pattern is quickly displayed then hidden; the player tries to memorize the pattern of the blocks. Using his memory he clicks the blank squares to reveal the hidden pattern. The complexity and the size of the pattern to be remember increase slowly. The more the player remembers the pattern, the more his memory strengthens.



Pattern Memory game

III.15.4.BRAIN SEQUENCER:

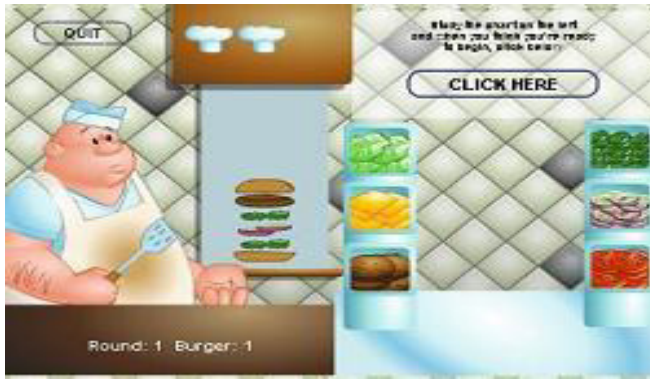
It is a game that strengthens the working memory. After clicking on the “start” button. The game flashes a series of numbers or coloured lights on the screen. The player’s role is to remember that sequence of numbers or lights then press the suitable key.



Brain Sequencer

III.15.5.BURGER BUILDER:

It is another fun game that boosts the individual working memory. The player is a cook, he should arrange the meals in the same order as they ordered by the customer. After getting the order, the player presses the “CLICK HERE” button and starts preparing the order. He recalls out information from his working memory shortly after the list order disappears.



Burger Builder

The memory improvement games are unlimited. In addition to these games, different approaches, methods, techniques and trainings are used to boost the human working memory and improve its performance. It is true that the human working memory is limited to a small amount of information however if the information is rehearsed again and again, this short-termed information can be fossilized in the long-term memory.

Conclusion

First year English Language students tend to have fresh and flexible minds that can retain a huge amount of information, however they lack training and rehearsing. Students cannot concentrate on various tasks in the same session. They possess a good visual-processing working memory as compared to the auditory one. It is better to train these students to use their working memory frequently. Reading, spelling, vocabulary, note taking and following the instructions are span tasks that should be implemented in their curricula.

Classroom-based working memory approach is a good and efficient approach that should be implemented in the Algerian schools yet Algerian teachers may not be aware of its existence. This approach principle fits students with low working memory behaviour. Together with Cogmed training exercises, the students' working memory can be enhanced and improved.

Each teacher is free to exercise different tasks and games inside his/her class as long as his/her students' skills are improving and developing.

GENERAL CONCLUSION

In this research work, the main concern, certainly, is to find out how many items can be stored in the first year English language students' working memory, how many words can be processed in a short period of time and how many instructions they can be followed. For this reason, four hypotheses are conceived to be confirmed or disconfirmed by the results of the qualitative and quantitative data analyses. Teachers ignore the importance of the working memory inside their classes; they believe that the majority of the students pay less attention to their lessons and that is what affects their academic achievement.

Through this research work, we take a small glimpse at the different works and experiments conducted by a number of psychologists and educators, some cases of children with working memory deficit and the major signs of poor working memory behaviour inside and outside the educational setting. As far as data collection is concerned, first year English language students from the University of Abdelhamid Ibn Badis are taken as sample for the present investigation. The reason behind choosing these students but not others is because these students are new at the university backdrop. They are experiencing a leap at their educational career, a leap that may affect their mood and even their feedback.

In this regard, the University of Abdelhamid Ibn Badis is selected to be under investigation, because it is the only establishment that allow this investigation to take place. In order to collect as much data as possible, Raviv Questionnaire is distributed among first year English language students. A questionnaire that suits their level of familiarity of English. Moreover, a training at the same institution takes place to assess students' working memory via three different span tests.

The questionnaire aims at assessing students' working memory and exploring those with low-working memory. Each of the 13 questions intended to uncover their strengths and weakness in working memory tasks. After analyzing the students' answers of Raviv Questionnaire, it is concluded that half of the respondents do not possess a good working memory. They struggle with working memory tasks, they do not manage to deal with cognitive demanding activities such as calculation, following instructions and understanding the context in stories and reading comprehension texts. This category cannot solve problems that require holding information in mind. They simply cannot integrate new information with prior knowledge. Whereas, 30% of the students' show that they do have a good working

memory. They do not face trouble preceding a multiple step tasks. Working memory tasks can be easily performed by them. They can simply deal with any mental activity that requires working memory interference. 10 % of these students can rarely manage to deal with working memory tasks. This category's answers reveal their inability to comprehend the context in stories or conversations. Long instructions cannot be easily stored in their working memory. They frequently encounter issues in holding and retrieving information from their working memory. they have also troubles organizing things that need to be done via a number of steps. It is also concluded that the rest of the students (10%) have difficulties understanding the questions of the questionnaire though the questions were not that arduous. The only feedback given from them was the "unsure" answer.

In addition to the questionnaire, 3 sessions training take place. Twenty students' working memory is tested through three different span tests. In each session, students have to recall back words from their working memory (RST), listen to 22 sentences then confirm or disconfirm them (LST) and listen to seven instructions and apply them on their sheets (following the instructions test). In accordance with the data gathered earlier and after making a comparison between students' pair-work performance and their individual performance in the reading span test, it seems that the majority of first year English language students' working memory is able to retain 8 words for a brief period of time when they collaborate together, or while holding in their working memory words that rhyme. These students could easily recall back the words from their working memory yet, a few minority of the students struggle in retrieving back these words. The students with this deficit "short-term visual issues" cannot recall the visual aid they have just glanced. In the listening span test, students' performance differs from the previous one. Students' auditory working memory works better when they work alone. This test is tightly linked to language comprehension and listening comprehension. The sentences were not difficult yet students' auditory memory couldn't process the whole 22 sentences in a period of 2 minutes. Some students face some difficulties in understanding the words in order to falsify or verify the sentences. By contrast, the data obtained through following the instructions tests, reveal that first year English language students can hold in their working memory the 7 instructions and apply them. The majority of the students show a good working memory performance. However, 10% of the students show a weak performance while they couldn't apply more than 3 instructions.

Therefore, the results of this investigation moderately confirm the hypotheses proposed earlier. Students perform well in working memory tasks when more attention and focused are

placed on cognitive demanding tasks. However, students' learning styles play an important role in acquiring and processing information, these learning styles differ from one student to another. Visual students can perform in tasks which require holding visual aids. However auditory students can process, store and retrieve auditory information easily. They can perform well in both the listening test and following the instructions.

BIBLIOGRAPHY

1-BOOKS

Akira Miyake and Priti Shah 1999, Models of Working Memory “Mechanisms of Active Maintenance and Executive Control

Alan Baddeley 2011, Working Memory: Theories, Models and controversies

David Klahr, Kenneth 1989 Kotovsky Garengie-Mellon University “Complex Information Processing The impact of Herbert A. Simon”

Jonathan K Foster 1995, Memory: A Very Short Introduction

Milton J Dehn 2008, Working Memory and Academic Learning “Assessment and intervention”

Professor Susan Gathercole, Dr Tracy Packiam Alloway 2007, “A Classroom Guide” Understanding Working Memory

Robert H Logie, Kenneth J Gilhooly 1998, Working Memory and Thinking

Susan J Pickering Working Memory and Education “A Volume in the Educational Psychology Series”

Tracy Packiam Alloway, Alloway’s Guide To Working Memory, “Jungle Memory, Train Your Child’s Brain. Booklet 3

2-ARTICLES

Acoustic encoding 1998/2016, AlleyDog.com

Amanda Morin “8 Working Memory Boosters”

<http://www.understood.org/en/school-learning/learning-at-home/homework-study-skills/8-working-memory-boosters>

Critical Thinking Activities Web “Substitute Teacher Handbook/ 8th edition.

Glenda Thorne 2006, “10 Strategies to enhance student’ memory

<http://www.idatschood.ca/executive-function/working-memory-difficulties/>

Glenda Thorne, what strategies can be used to increase memory?

www.cdl.org/articles/what-strategies-can-be-used-to-increase-memory/

Dr. J Educ Psychol.2012

<http://www.ncbi.nlm.nih.gov/pubmed/10900777>

Joni Holmes “Low working memory”

www.mrc.cbu.cam.ac.uk/wpcontent/uploads/2013/03/working-memory-and-learning-difficulties.pdf

Richard C Mohs “how human memory works”.

Science .howstuffworks.com/life-the-mind-/human-brain/human-memory.htm

Supporting students with working memory difficulties

<http://canlearnsociety.ca>

Dr. Tracy Packiam Alloway “Working Memory: The New Intelligence”

www.alf.dk/images/pdf/Alloway-3HrHandouts_Comptability_Mode.pdf

Working memory in the classroom “educational psychology service, November 2011

<http://prezi.com>

3-WEBLIOGRAPHY

www.human-memory.net/intro-study.html

www.intropsych.com/ch06-memory/Lashleys-research.html

<http://sccpsy101.com/home/chapter-5/section-7/>

www.intropsych.com/ch06-memory/echoic-memory.html/

www.tutor2u.net/psychology/refrence/duration-long-term-memory

<http://prezi.com/p-qkoznswzvq/bahrick-et-al-study/>

www.boundless.com/psychology/textbook-long-term-memory-210-12745/

<http://www.boundless.com/psychology/textbooks/boundless-psychology-textbook/memory-8/types-of-memory-52/long-term-210-12745/>

www.cogmed.com/falling-short-deficits-in-working-memory

<http://www.understood.org/en/learning-attention-issues/child-learning-disabilities/visual-processing-issues/understanding-visual-processing-issues>

<http://penta.ufrgs.br/edu/telelab/3/central-html>

<http://www.simplypsychology.org/working20%memory.html>

<http://sidsavara.com/the-ebbinghaus-curve-of-forgetting/>

<http://trainyourbrainpodcoast.com/ep-052-clock-face-eye-stretches/>

<http://cogsci.stackexchange/questions/1670/how-to-reliably-measure-working-memory-capacity>

www.ravivpracticelondon-co.uk/fast2.html

www.ravivpracticelondon-co.uk/fast1/html

www.cogmed.com/about-working-memory

www.cdl.org

<http://www.memory-improvement-tips.com/brain-games.html>

<http://www.memory-improvement-tips.com/velma-vision.html>

<http://www.memory-improvement-tips.com/lightning-librarian.html>

<http://www.memory-improvement-tips.com/pattern-memory.html>

<http://www.memory-improvement-tips.com/brain-sequencer.html>

<http://www.memory-improvement-tips.com/burger-builder.html>

<http://www.google.dz/search?q+056638871a75ed143f8594330>

<http://www.google.dz/search?q=fiving+animal+drink+on+farm+animal>

<http://www.google.dz/search?q=phonological+loop>

THESIS

Douglas J.Lynch University of Amherst “Reading Comprehension performance as a function of individual differences in working memory for texts of varying reading.

Appendices



Appendix II 01: The Plimpton Hold Up picture from Critical thinking activities Web

“Substitute Teacher Handbook/ 8th edition”.



Appendix II.02: Giving the animal drink on farm animal



Appendix II.03: Charlotte Mann Drawing from 9 dessins murs Charlotte Mann

Working Memory Questionnaire by Raviv

Are you easily distracted when working on or doing something that is not highly interesting.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you have trouble waiting your turn, for example in a conversation or when waiting in line to get help.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you struggle with reading comprehension and have to read through texts repeatedly to understand.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you struggle with problem solving that require holding information in mind, for example mental math calculations.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Are you inconsistent in remembering math facts.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you struggle with completing tasks, especially multiple step tasks.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you have difficulties remembering long instruction given in several steps, for example following recipes, directions or school/work assignments.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you struggle to understand the context in a story or a conversation.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you have difficulties when planning and organizing something that needs to be done in separate steps.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you have difficulties staying focused during cognitive demanding tasks but attends well when cognitively demands are minimal.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you have difficulties integrating new information without prior knowledge.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
When called on, do you forget what you were planning to say	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure
Do you have difficulties taking notes and listening at the same time.	<input type="radio"/> Never	<input type="radio"/> Sometimes	<input type="radio"/> Frequently	<input type="radio"/> Unsure