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**Faculty of Letters and Languages**  
**Department of English Language and Literature**

*The Role of Working Memory, Anticipation of Meaning and  
Automatic Information Processing in Enhancing Young Adults'  
Reading Comprehension*

*The Case of 3<sup>rd</sup> Year English Language Students at Frères Mentouri University,  
Constantine, Algeria*

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candidacy for the Degree of Doctorat Es-Sciences in Applied Linguistics and  
Foreign Language Teaching**

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## ***Dedication***

*This research work is dedicated to:  
my parents for their love and support;  
my sisters and my brother-in-law for their constant encouragement;  
my cherished grandparents for their prayers;  
and all my friends who have always been there for me.*

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## **Abstract**

The current study seeks to investigate the importance of working memory, anticipation abilities and processing speed/ automaticity in university students' reading comprehension. Therefore, the aim of this study is threefold. First, it sets out to investigate whether there is a strong correlation between the students' working memory and their reading comprehension abilities by conducting a correlational study. Second, it measures the contribution of anticipation abilities in the growth of the students' text processing abilities by carrying out an experimental study. Third, it examines the nature of the relationship between the participants' processing speed/automaticity and written comprehension using both- a correlational and an experimental study. Thus, it is hypothesised that "high memory spans are better comprehenders of a text written in English as a foreign language than low spans." The second hypothesis that is tested in this study suggests that "if the students anticipate what comes next in the text, their reading comprehension of a text written in English as a foreign language will be improved. The third hypothesis that directs this study states that "the more automatic the students' information processing is, the better their reading comprehension of a print will be." The participants are 100 third year English language students at the university of Frères Mentouri, Constantine, Algeria. The targeted cognitive capacities of these students are measured using different tasks. The participants' reading comprehension is measured using multiple-choice-question exercises. Moreover, 2 working memory span tasks have been used to measure their reading comprehension. Besides, the participants' word-automaticity is assessed using word-list viewing exercises. In addition to these measures, many texts and strategies are used in the treatment phases with the experimental group. The statistical analyses, using correlation coefficient 'r' and the t-test, reveal that working memory capacity correlates significantly with reading comprehension capacities. Furthermore, anticipation abilities have shown to contribute to the students' understanding of the print. Moreover, processing speed is revealed as an important regulator of the readers' processing of the written discourse.

## **List of Abbreviations**

- 3CI:** Constrained Construction Integration
- AWL:** Academic Word List
- CASL:** Center for Advanced Study of Language
- CI:** Construction-Integration
- CC:** Capacity Constrained
- CBM:** Curriculum-based Measurement
- DF:** Degrees of Freedom
- EFL:** English as a Foreign Language
- IQ:** Intelligence Quotient
- IRI:** Informal Reading Inventory
- LOP:** Levels of Processing
- LTM:** Long-term Memory
- MCQ:** Multiple Choice Questions
- NDRT:** Nelson-Denny Reading Test
- NICHD:** National Institute of Child Health and Human Development
- NRP:** National Reading Panel
- OST:** Operation Span Task
- PALS:** Peer-Assisted Learning Strategies
- PPMC:** Pearson Product-Moment Correlation
- RR:** Repeated Reading
- RST:** Reading Span Task
- SAT:** Scholastic Aptitude/Assessment Test
- SAS:** Supervisory Attentional System
- TAWRA:** Timed Automatic Word-recognition Assessment

**TOEFL:** Test of English as a Foreign Language

**VE:** Verbal Efficiency

**WCPM:** Words Correct Per Minute

**WM:** Working Memory

**WMC:** Working Memory Capacity

**ZPD:** Zone of Proximal Development

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## **General Introduction**

1. Background of the study
2. Statement of the problem
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5. Research tools and materials
6. Population of interest and sample
7. Research methodology
8. Organisation of the thesis

## **1. Background of the study**

Reading research began late in the nineteenth century. For many decades, investigators have been primarily interested in eye movements and other mechanical features of the reading process. Comprehension, then, was assumed to result from the mastery of these aspects. Nevertheless, the researchers' interest has started to shift from reading as a *mechanical* process to reading as a *thought-getting* process. Therefore, an individual cannot be said to be reading unless he grasps what he reads. To put it differently, a person is really reading when he is able to form an internal consistent mental representation of the text (Snow, 2002).

It is important to understand the workings of the human mind in order to understand what individuals do when they read. Reading has often been considered as a proxy of intelligence since it requires the ability to attend, process and use information successfully (Naglieri and Reardon, 1993; and Shaywitz, 2003). That is why this research project targets the components of intelligence that relate to reading including working memory (retrieval skills and memory capacities that facilitate verbal comprehension), anticipation of meaning (using reasoning processes to combine information from text with the reader's prior knowledge in order to set predictions) and automatic information processing (rapid processing and automatic reasoning with no intentional thinking).

## **2. Statement of the problem**

Constructing meaning from a text is a difficult task. Hence, increasing knowledge in reading by finding the reading factors which lead to a successful text processing is of utmost importance if we are to improve reading comprehension capacities and assessments (Felton, 2001). The specific problem that is examined in this research paper is the relationship between reading comprehension and intelligence components of English language third year university students. Actually, previous research projects have investigated the relationship between some intelligence

components and reading comprehension. This study is particularly interested in understanding the relationship between working memory, anticipation of meaning and automatic information processing; these specific components of intelligence are particularly related to the human memory.

The above-mentioned components, particularly based on the human memory, have been revealed, in the past research, to be significantly related to reading comprehension. First, working memory capacity has shown to play a key role in complex cognitive tasks such as language comprehension (Just and Carpenter, 1992) and reading (Tomitch, 1996). More explicitly, having the power to simultaneously sustain information, process a text (complex cognitive task), and produce a result is extremely important to understand a written discourse (Wechsler, 2003). Second, reading comprehension problems have been related, in many research works, to a lack of inference skills. In some contexts, the readers show a weakness in the fluid perceptual reasoning that hinders the integration of their existing knowledge with the new information. In such cases, not being able to anticipate what comes next in the text does not result in a successful comprehension (Shaywitz, 2003; and Snow, 2002). Finally, another serious problem that is encountered by developing readers is reading automaticity. Here, readers who possess a slow reading processing are unable to recognise words rapidly. Therefore, they are forced to decode items (words) every time they encounter them and, thus, waste valuable cognitive efforts on word identification that would better be devoted to reading comprehension (Kail, 2000). This difficulty is considered as a primary symptom of individuals with reading comprehension problems (Shaywitz, 2003).

### **3. Study aims and questions**

A need to analyse the impact of working memory capacities, anticipation skills and automatic information processing on university students' reading comprehension exists. The current research sets out to investigate whether or not these constructs account for students' differences in reading comprehension. To put it differently, the aim of this study is threefold. To begin with, it investigates to what extent the students' ability to simultaneously store information and process a text correlates with their reading comprehension abilities. Moreover, this study seeks to increase the understanding of how the activation of the students' background knowledge helps them anticipate what comes next in the text for a better understanding of the written print. Finally, it considers how the students' speed of word recognition helps them economise on their cognitive resources for comprehension to better understand the print. By doing so, a better understanding of the importance of such cognitive regulators in reading comprehension would empower educators assess students' reading comprehension and help learners go beyond a merely passive reading.

Although the importance of comprehension in reading has been recognised, there are still many unanswered questions regarding the working memory, anticipation of meaning and reading automaticity abilities that underlie the reading process. To better understand the relationship between reading comprehension and these cognitive abilities, this research addresses and seeks to answer to the following questions.

#### ***Primary questions***

1. What role does the students' working memory play in their reading comprehension?
2. How does the anticipation of meaning help the students understand the print better?
3. How does the students' automatic information processing influence their text processing?



### ***Secondary questions***

1. How does the working memory system facilitate complex span tasks that are related to language processing?
2. What is the limitation in working memory that leads to individual differences in reading comprehension?
3. Is the students' prior knowledge about the text's topic necessary for their understanding of the written discourse?
4. Do pre-reading strategies help the students make active links between their existing knowledge and text information?
5. Does the instruction of anticipation guides and text previewing pre-reading strategies enhance the students' reading comprehension by activating their background knowledge?
6. Does speed reading mean speed comprehension?
7. How can teachers help the students to spend no effort on word recognition for a more successful comprehension?
8. How can teachers help the students become faster comprehenders, not faster readers using highlighted texts?
9. Does the structured repeated reading method improve the students' reading automaticity?

### **4. Research assumptions and hypotheses**

Since the focus of the study is on the relationship between reading comprehension (the dependent variable) and working memory, anticipation of meaning and automatic information processing (the independent variables), the ideas assumed to be true for the study include the following: (a) reading comprehension is the essence of reading; (b) students' active memory use is important for their understanding of texts written in English as a foreign language; (c) having

the ability to anticipate meaning using pre-reading strategies is crucial for reading comprehension; and (d) the students' automatic information processing influences their reading comprehension. On the basis of these assumptions, our study is directed by many hypotheses related to these cognitive capacities as the predictors of academic reading comprehension achievement. Hence, it is hypothesised that:

1. High memory spans are better comprehenders of a text written in English as a foreign language than low memory spans.
2. If the students anticipate what is to come next in the text using anticipation guides and previewing strategies, their reading comprehension of a text written in English as a foreign language will be improved.
3. The more automatic the students' information processing is, the better their reading comprehension of a print will be.

## **5. Research tools and materials**

To test the study's hypotheses and achieve the aims of this research, many tests and materials are used. The reading comprehension measures (correlation tests, pre-tests and post-tests) that are used in the current study target the different abilities a reader needs to approach a text successfully. These tools assess the students' ability to (a) determine the author's general purpose of writing the text, (b) extract the main idea of the passage, (c) draw a logical conclusion/end to what is presented in the text, (d) guess the meaning of words from their context, (e) understand a decontextualised sentence, (f) understand the supporting details, (g) find out the relationship between sentences in the text, (h) understand implied information/hidden messages, and (i) understand the chronological order of events. All the reading comprehension measures

consist of a number of multiple choice questions (MCQ); however, not all the measures require a written justification of the students' answers.

To assess the participants' working memory capacities, two span tasks are used: the reading span task (RST) and the operation span task (OST). These tasks measure the students' storage, rehearsal and retrieval capacities simultaneously with additional input processing. To this end, these measures present the participants with to-be-remembered input (a word) and a to-be-processed task (sentence comprehension and equation verification).

To assess the students' automatic information processing, a timed word-recognition exercise is used. This tool puts to test the students' ability to automatically recognise words. To this end, it presents the participants with 8 lists of frequent academic words, and the participants are required to recognise a list of 25 words in no more than 30 seconds.

As far as the study's materials are concerned, many texts have been used. Some unformatted passages are used to teach students how to think more critically during reading through the use of pre-reading strategies. Some highlighted texts are used to help readers process a text conceptually by dividing it into smaller pieces of thought.

It is noteworthy that the study tools are piloted before being used in the full-scale study. This is very helpful for the researcher to test the validity of these measures. Therefore, more practical instruments are created to target the abilities in question and more reliable results are obtained.

## **6. Population of interest and sample**

The selection of participants is formulated so as to attenuate differences among variables and minimize the chances of unsystematic variations while administering the research tools. The population the researcher is interested in understanding is 465 third year English language students

at the university of Frères Mentouri, Constantine, Algeria. These are healthy young adults, from both sexes, who are enrolled in normal education classes. They are believed to share the same native language, background (educational and cultural) and age. In the current study, random sample of 100 students is designed to be the study's sample. In the correlational parts of the research, the students are not divided into smaller groups. Nevertheless, in the experimental parts of the research, the participants are divided into two groups- an experimental group, which receives the experiment treatment, and the control group, which follows more traditional text approaching methods.

Targeting this specific population is not the product of a random choice; many reasons justify such a selection. First of all, third year students have been studying English as a foreign language for seven years or even more. That is, the students are less likely to encounter language problems when they take the tests, approach the texts and listen to the teachers' instruction. In addition to their expected linguistic proficiency, these participants are expected to have a decent background knowledge to be activated prior to reading texts and little or no knowledge about the different pre-reading strategies. Therefore, this helps the researcher relate any reading comprehension growth to the instruction of these strategies. Furthermore, many research works have highlighted the importance of working memory capacity in children's reading comprehension and much less research has been devoted to investigating how young adults (or even older adults) make use of their storage and recall capacities to understand what they read. This has clearly discriminated struggling readers at higher educational levels. Additionally, this study extends the importance of reading automaticity research beyond elementary grades and it seeks to add effective interventions to help older learners who struggle with comprehension.

## **7. Research methodology**

To explain the relationship between the students' working memory, anticipation of meaning and automatic information processing and their reading comprehension, analysing the importance of the study's independent variables in the dependent variable is required. To this end, the study is divided into three parts. The first section of the study consists of a correlational study that investigates the relationship between the students' reading comprehension and working memory as measured using reading comprehension exercises and working memory span tasks.

The second part of the research is an experimental study. It analyses the importance of anticipating text content (using pre-reading strategies) in reading comprehension. Thereupon, the participants' reading comprehension abilities are pre-tested prior to a treatment that focuses on the use of pre-reading strategies that help the readers activate their background knowledge and anticipate what is to come next. Then, their reading comprehension abilities are post-tested to measure the growth of their reading comprehension.

Finally, the third section of the research investigates the relationship between automatic information processing and reading comprehension. It includes a correlational study, which tests the students ability to recognise words rapidly and their reading comprehension, and an experimental design, which pretests and posttests the students reading comprehension abilities prior to and after receiving a treatment that targets the students' reading automaticity.

## **8. Organisation of the thesis**

This thesis comprises eight chapters- four theoretical chapters that represent the study's literature review and explain a range of conceptual areas that are relevant to the study and four practical ones that report the research's field work and its findings. Chapter one aims at reporting research and theories that are required to understand what reading comprehension, in this thesis,

stands for. It also seeks to help the teachers understand the problems they face in their reading classes and become better teachers and assessors of this complex capacity.

Chapter two presents many points that facilitate the understanding of the working memory concept. It discusses the general and the specific issues about memory. Actually, it traces the different models that explain the nature and the function of working memory. Furthermore, it relates to this concept in reading achievements (comprehension). Moreover, it reports what research has revealed about working memory assessment.

Chapter three is concerned with the understanding of strategic reading. Therefore, it tackles reading from a constructivist point of view. That is to say, it seeks to encourage the readers to be creators rather than collectors of meaning while reading. To this end, it discusses the importance of anticipating what comes next in the text in understanding the processed print. Here, the teachers are presented with anticipation guides and text previewing as pre-reading strategies that help them activate the students' existing knowledge to set their minds for the reading activity.

Chapter four focuses on the importance of word automaticity in reading. It seeks to help the learners recognise words (lower-order skill) effortlessly to save some cognitive resources for reading comprehension (higher-order skill). Therefore, it reviews literature that provides a better understanding of the automatic information processing. Fundamental reading automaticity theories have been discussed because of their significant relevance to reading. Moreover, this chapter sets out to describe what research has revealed as successful tools to assess word automaticity.

Chapter five reports the correlational study that investigates the relationship between working memory and reading comprehension. It describes the study method and the tools of research. It also reports the data collected and its descriptive analysis. As far as the statistical

analysis is concerned, the Pearson Product-Moment Correlation coefficient 'r' is calculated and the results are discussed to examine how working memory and reading comprehension correlate.

Chapter six describes the experimental design that seeks to examine the contribution of anticipation use in the growth of the students' reading comprehension. It reports the different steps of the experiment- pretest, treatment and posttest. Then, it provides a descriptive analysis of the data obtained and a statistical analysis of the results obtained. To this end, a t-test is used to compare the students' performances on the reading comprehension measures (pretest and posttest) and measure to what extent anticipation strategy contributes to the students' reading comprehension.

Chapter seven provides a description of the study that investigates the relationship between automatic information processing and reading comprehension. This investigation is divided into two parts- a correlational study and an experimental design. This chapter describes the research tools (correlation tests, a pretest and a posttest) and reports and analyses the data gathered from both parts of the study. Then, it provides two statistical analyses- a correlation and a t-test analysis. Finally, the results that are obtained from both analyses help the researcher confirm or disconfirm the study's hypothesis.

Chapter eight reports the pedagogical implications, limitations of the study and recommendations for future research. First, it provides pedagogical implications that help reading teachers take into account the students' working memory, anticipation skills and automatic information processing in developing and assessing their students' reading abilities. Further to this, it presents reading researchers with the study's limitations they may need to know about to conduct successful research works by minimising the chances of unpredicted errors. Besides, it offers some

suggestions that may draw novice researchers' attention to some fruitful research projects they may feel interested in carrying out.



## **Chapter One**

### **Reading Comprehension**

*“Every man who knows how to read has it in his power to magnify himself, to multiply the ways in which he exists, to make his life full, significant and interesting.”* Aldous Huxley

#### Introduction

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## **Introduction**

The value of reading is not often questioned; it is most of the time extolled. This fundamental human activity plays an increasingly bigger role in raising people's social and educational understanding and awareness as our culture becomes more complicated. For many decades, the teaching of the reading skill has been focusing on comprehension. In fact, we must make sense of what we read to be able to make sense of the world we live in. Therefore, the aim of this chapter is twofold: it reports data, research and theories that are essential to one's understanding of reading comprehension and it suggests support to help teachers face the problems they encounter with the struggling readers in their everyday classes since they complain, continuously, about the students' reading difficulties during their course of reading in class. This chapter gives educators an insight into the comprehension assessment methods that are adopted in the current study.

### **1.1 Definitions of reading and reading comprehension**

Defining reading may seem to be an easy matter since everyone has already had some experiences with this skill. Nevertheless, reading may mean different things to different people. In this chapter, the definitions of reading and reading comprehension are restricted to the study's issue.

#### **1.1.1 Definition of reading**

Looking for a simple definition of reading is pointless; as many other words, reading has a 'multiplicity of meanings.' The different significances of this word depend on the context in which it is put (Smith, 2006, p.1). The dictionary defines reading as "[...] interpreting- making sense of something, predicting or anticipating. Reading print is only a small part of this. In its broadest sense, reading is striving to understand everything in the world around us in which we are

particularly interested and involved” (Smith, 2006, p.1). Reading may imply understanding in some contexts but not in some others. Discussing this would not result in a single definition of what reading is; it leads to endless arguments and dispute about language, not the nature of reading. Instead, one has to consider what is involved in reading through illustration, description and analysis (Smith, 2006, p.2).

In the context of this study, the term reading is not considered from its initial stage as a low level of learning; it is more than extracting ideas from a text. Reading is an active process that involves the arrangement of knowledge in the reader’s mind that would be refined by the text’s input (Grabe, 1988, p.56).

### **1.1.2 Definition of reading comprehension**

Understanding is the essence of reading. Interchangeably used with comprehension, it is described by Huey (as cited in Hart, 1983, p.05) as one of the “most intricate workings of the human mind.” The definitions of reading comprehension have changed over time. Similarly to defining reading, defining reading comprehension is highly debatable (Paris and Hamilton, 2009).

The researchers that are following, on the one hand, the bottom-up models of reading see that comprehension starts with a mere conception of a text and ends with the construction of meaning (Gaugh, 1972). Their view of reading comprehension fails in explaining many phenomena that happen during the course of reading such as the anticipation of a message before the completion of the bottom-up process (Goodman, 1967). On the other hand, supporters of the top-down models believe that the reader does not solely rely on the linguistic features of a text to understand it; the input should be guided by his prior knowledge (Stanovich, 1980).

More realistic, interactive models of reading comprehension view reading as a more dynamic process in which the reader constructs meaning based on information s/he gathers from

the text. These views of reading comprehension conceive understanding as a cognitive, developmental, and socially-constructed task which is behind the understanding of the printed words (Rummelhart, 1977). Similarly, Wray (2004, p. 14) suggests that "Understanding in reading is exactly like this. It is not simply a question of getting meaning from what is on the page. When you read, you supply a good deal of the meaning to the page. The process is an interactive one, with resultant learning being a combination of your previous ideas with new ones encountered in this text." This leads to get things clearly while reading without any puzzlement or misunderstanding.

The cognitive models may differ in their components, but they agree that comprehension requires decoding, vocabulary knowledge, fluency, knowledge of text organization, inference and most importantly knowledge representation (Cromley and Azevedo, 2007). Thus, this research considers reading comprehension as a dynamic whole construction process that takes place between the reader, the text and the activity and that requires all the elements of reading to be put together to help the reader build a meaningful representation of the text.

## **1.2 History of reading comprehension**

Tracing the history of reading comprehension, it is asserted that it has had few technical improvements over time. Throughout history, the goal of reading has always been to grasp what is being read (Allen, 2005). Regardless of what students' might be asked to read (novels, plays or handouts), their teachers' concern has always been to get what they read. This has resulted in the evolution of their strategies for teaching reading comprehension (Chall, 1983). Here, it is noteworthy that in the past, for some teachers, teaching and testing comprehension stood for the same thing. In fact, teaching reading comprehension used to be that activity in which a teacher makes students read a passage then answer some comprehension questions about it. The very same

activity was used to assess their reading comprehension. What is the difference between the two notions then? It is thanks to the increasing interest of educators in receiving teaching training that their conceptions about teaching and testing reading comprehension have been reshaped.

### **1.3 Reading comprehension components**

Reading comprehension is a complex process that involves many reading skills and cognitive processes (Cain, Oakhill, and Bryant, 2004). Researchers must focus on all of them to have a better insight into how readers process a print. These skills can be summarised as follows.

#### **1.3.1 Vocabulary**

Vocabulary is an important text variable that impacts reading comprehension greatly. This positive correlation is rarely considered in research although it is undeniable (Zang, 2008). Facing new words is one obstacle to a flawless reading process. This is because readers will concentrate and waste their time and energy on finding a definition to the encountered unfamiliar word among the several definitions a dictionary might give; this results in a successful choice or a greater puzzlement.

Keehn, Harmon, and Shoho (2008, p.338) point out that “proficient readers bring a wealth of word knowledge that enables them to construct meaning across a variety of texts.” Comparatively, Coady and Huckin (1975) emphasise on the role of vocabulary in facilitating text understanding. For a text to be comprehended, its lexis should be controlled. This might be the case of students who use reading to do their homeworks; in these activities, a full command of the text requires a higher percentage of understanding with a lower percentage of unfamiliar words.

Conversely, some reading situations require less vocabulary knowledge. These are cases where the reader needs to get the gist of the text; thus, checking upon words one by one is not necessary for understanding; the reader needs to make guesses using the context in which these

unfamiliar words occur to be able to read flawlessly. This applies mainly when one reads for pleasure or to understand what a text is generally about. That is to say, vocabulary knowledge is crucial in reading, but its amount depends mainly on the reading purpose.

### **1.3.2 Cognitive processing speed/automaticity**

Processing speed is a reading fluency subskill that is of a paramount importance in reading comprehension. It is the reader's ability to recognise words rapidly. According to Carver (1997), the Rauding Theory states that understanding a text does not rely on its difficulty or the purpose for its reading; it is all about how fast a reader is while processing the text cognitively. Similarly, Hawkins (1991, p.171) states: 'As automaticity in decoding develops, the learner would also improve in terms of comprehension, since there would be more "freed-up" processing capacity for comprehension as decoding skills become automatic.' That is to say, when the reader is good at identifying written words, he spends his time and energy on building coherent mental interpretations to the text of decoding words.

It is worth mentioning that not all researchers take this stand; many of them focus on teaching some reading strategies that are more likely to improve the cognitively weak readers' text comprehension. Therefore, spending that much time and effort on improving the capacities of impaired readers is a support to the Rauding theory (Carver, 1997).

### **1.3.3 Word identification**

The ability to identify words is an important comprehension skill. It is the readers' capacity to recognise words with given speed and accuracy. Gough and Tunmer (1986, p.7) explain that "the skilled decoder is exactly the reader who can read isolated words quickly, accurately, and silently." In fact, skilled readers can identify 5 words per second (Rayner and Polatsek, 1987). This identification requires the activation of some information or codes that contribute to a coherent

mental representation of the text; those codes are the different meanings a word might have (Swinney, 1979), information related to its sound (Gough, 1972), and information about the structure of the sentence in which this word occurs (McClelland and Kawamoto, 1986). McCollin, O'Shea and McQuiston (2010) put that

Many struggling secondary readers . . . continue to struggle with word identification (e.g., syllabication, identification of affixes to help break words into parts). Research has found that students who expend great energy on decoding typically do not read extensively and, consequently, they do not acquire the background knowledge essential for comprehending secondary-level content-area subject material. (p.133)

In cases where readers are slow in recognizing words, memory and attention capacities that are required for comprehension are wasted on word identification. At earlier levels, readers identify very few words instantly. Through time, being exposed to the same words enriches reader's instant identification vocabulary (Cunningham, Stanovich, Wilson and Carr, 1990).

#### **1.3.4 Text structure/features identification**

Knowledge about text features is one important factor that influences reading comprehension. Text types differ depending their topic and purpose. Davies (1995) explains that texts differ in their rhetorical functions. These differences impose a diversity of development methods, structures and flow of ideas. Being knowledgeable about these is of a paramount importance for the reader to follow logically and easily the stream of ideas.

Being aware about how to follow and respect text features such as punctuation, paragraphing, explanations, illustrations, additions, capital letters and so on is one important element of reading prosody (Chafe, 1987). In fact, many readers do not realize the importance of such features for their understanding. Chafe points out that



Some readers may object that the signaling of prosody is only one of the functions of punctuation, and perhaps not the primary one. Although that is a common belief, and although there are certainly instances of punctuation that do not serve prosodic ends, I will defend the position here that those instances are departures from its main function, which is to tell us something about a writer's intentions with regard to the prosody of that inner voice. (p. 5)

The different texts readers may encounter during reading might be mainly expository or narrative. What readers need to understand about the expository ones is that they are informative texts that tackle history or science issues. Therefore, language/vocabulary in such written products is domain specific, so it is of a given level of difficulty for readers. Thus being aware about this makes the task of reading less difficult. Conversely, narrative texts are said to be less difficult and less demanding than the expository ones. They can be short stories or any other types of texts that are about tales. What readers need to understand is that such texts, according to Rumelhart (1980:313), have plots, characters, settings, climax and denouement; this is what he calls 'story grammars'. When the reader knows about such story elements, he will know previously what elements the story will be made of and, thus, he will be ready to read.

### **1.3.5 Background knowledge**

It is generally used interchangeably with prior knowledge. It is what we already know about a topic (Stevens, 1982). Dochy *et al.* (1995) define prior knowledge as the entire person's knowledge, including explicit, implicit, conceptual and metacognitive information. Prior knowledge includes two principal components: "our assimilated direct experiences of life and its manifold activities, and our assimilated verbal experiences and encounters" (Swales, 1990, p.9). Prior knowledge plays an important role in reading comprehension. When readers are

knowledgeable about a topic, it is less difficult for them to recall and understand it. This importance is the concern of a majority of reading theories (Anderson and Pearson, 1984).

In fact, background knowledge is not one type of information; it includes all persons experiences including those of reading; knowledge about text features, text types, words and their definitions are all parts of this knowledge (Davies, 1995). Therefore, prior knowledge is too much information connected together with no separate chunks. Davies (1995) puts that when a reader processes a text, it is not certain that he uses one type of information or that he starts by one specific type. He suggests that reading requires the different types of information that make up prior knowledge to be interacting with each other and are used randomly. What the reader uses here is one body of the whole knowledge.

### **1.3.6 Inference skills**

Reading researchers support the idea that making inferences is necessary to reading comprehension. In reading, it is not sufficient to have background knowledge because the reader must be able to relate it appropriately to the text Pearson, Hansen, and Gordon (1979). Inference is the ability to understand a text without having all the information given. The reader uses context clues such as story grammars (plot, characters, setting etc...), in the case of narrative texts, to draw conclusions relating these clues to their past experiences (Goetz, 1977).

As far as the demands that are put on the readers are concerned, Collins, Brown, and Larkin (1980) state that to build a mental representation of the text, the readers need to go through a constructive thinking process using their reasoning skills; they put hypotheses and evaluate them to gradually refine their text understanding. Similarly, it is important to focus on the right elements of the text and to impose some organization forms on text events to disambiguate them and better their understanding. On the other side, inference in reading relates to the text. It is based mainly

on text's explicitness, organization, ideas relevance, the possibility of text ideas integration with those in the readers' head (Nicholson and Imlach, 1981). These skills characterise the complex processes that are in constant interaction during reading.

#### **1.4 Reading comprehension processes**

To be able to extract meaning from print, readers have, in addition to reading and understanding words, to be accurate and fluent, to activate their prior knowledge about the topic of the text beforehand, to make inferences, to store information in memory and to manipulate it using self-monitoring strategies. Additionally to these processes, some other text factors (vocabulary, text type, coherence and cohesion, automaticity and syntax) and reader factors (reading purpose, interest, language proficiency and culture) may influence the process of understanding (Vukovic and Siegel, 2006).

Similarly, Westby (2004) explains that when readers are able to decode proficiently, higher-order skills better explain readers' differences in reading. Comprehension, thus, implies that readers have to integrate microstructure elements (knowledge about language) with macrostructure elements (text organisation); this results in generating text mental models.

As has been noted, microstructure knowledge comprises morphological awareness. Thanks to their morphological knowledge, readers are able to extract the meaning of new words through transforming them into familiar meaningful units. Equally influential, syntactic awareness helps readers use their grammatical information to read fluently what might be grammatically erroneous. To read proficiently, hence, readers have to understand the smallest syntactic units of the text (Westby, 2004).

By the same token, Vukovic and Siegel (2006) add that to be critically and dynamically reading, one has to read, additionally to words, between and across the lines and beyond the

implicit information. To put it differently, the reader needs to think, abstractly, about what may happen, explain why and how it happened, put hypotheses, examine results and make judgments that go beyond the text. To this end, the reader has to build a mental representation of the text (Oakhill and Yuill, 1991). According to Wetsby (2004), under the text-based model, readers have to understand texts at the level of words and syntax that form individual sentence information (microstructure) and at the level of text propositions that represent the general idea extracted from microstructure (macrostructure); that enables readers to understand the relationship between elements in the same sentence and the relation between different sentences.

Later, Sanford and Garrod (1998) put that a situation-mapping model is formed in relation to the degree of text comprehensibility. They assume that if a text is direct, its full meaning is mapped onto a situation model. Conversely, if it is not, the reader must have recourse to long-term memory to relate to and support the text ideas; accessing the readers' background knowledge completes the situation model. Text propositions are provided by the text base, while mental images are derived from long-term memory. Therefore, a situation model formula takes the following form:

Situation model= text propositions + long-term memory propositions

Wetsby (2004) adds that the situation model's inferential nature provides the reader with the ability to link input with previous text information and/or background knowledge. That is to say, these models depend on reader's knowledge, values and experiences.

Human, Bouwer and Ribbens (2001) state that under the situation model, emotions and thoughts are transferred between the writer and the reader. They add that readers become more flexible while reading in the sense that they adapt to different texts and read differently according to the purpose of reading while activating their background knowledge. Correspondingly, Manzo

and Manzo (1995) note that to be changed by what they read, ‘authentic’ readers are able to read and understand the writer’s intended message (reconstructive reading) and they are able to add to the author’s message, express their point of view and evaluate what is being read (constructive reading). This constructive comprehension is critically influenced by memory. The latter is, both in its short- and long-term components, greatly considered to be influential since the reader, during text processing, has to store and manipulate input in working memory. Simultaneously, he must refer to his background knowledge to construct a coherent mental representation of the text (Van Den Broek, 1994).

In line with the psycholinguistic model of reading, the process of reading comprehension can be viewed from the point of categorization; it represents an effort to “make sense” of written language (Gerhard, 1981). At a lower level, the process required the readers’ capacities to find out about the similarities and differences between text ideas and events, actions. At a higher level, the process involved the abilities to perceive the relationships between text items and to structure text information. Research on applying categorisation strategy in reading shows that this strategy enables readers to locate the topic sentences and understand the gist of the text (Gerhard, 1975).

### **1.5 Models of reading comprehension**

Theoretical Models of Reading comprehension are drawn from education and cognitive psychology fields, which explains why they assume cognitive processing efficiencies. They highlight the importance of different aspects of reading and the cognitive processes involved in understanding a print. Thus, they guide researchers and educators to understand the readers’ difficulties while processing a text and, therefore, to help them with their problems. Reading comprehension models are based on some key concepts that contribute highly to reading comprehension to different extents depending on theorists’ belief about their importance in text

processing. Because it is impossible to cover all the reading comprehension models in this paper, the ones selected are mainly focusing on the key concepts the study is considering like rapid word identification, background Knowledge, inference making and working memory.

### **1.5.1 Kintsch's construction-integration (CI) model**

This model describes the whole reading process starting from word identification to constructing a coherent representation of text meaning. It is based on essential predictors of comprehension capacities: background knowledge, inference, strategies, vocabulary, and word reading (Kintsch, 1998). This connectionist model divides text comprehension into two stages: construction phases and integration phase.

In the construction phase, reading a given word activates it automatically along with all its meanings in long-term memory and its semantic associates in background knowledge (Graesser, Millis, and Zwaan, 1997). Using these components (decoding, vocabulary, and background knowledge), the reader builds a literal text version in his mind (Kintsch, 1998). To illustrate this, the following sentence is taken into consideration: "Two masked gunmen made their getaway with \$100,000 from the First National Bank" (Kintsch, 1998, p. 227). When the reader goes through the word 'Bank', all its meanings are automatically activated from his long-term memory (place, fund, river edge, clouds). Here, if the reader has no vocabulary knowledge, the nodes will not be activated; yet, his poor prior knowledge might help him activate very few nodes. Actually, activating the meanings of the word 'bank', relevant and irrelevant ones, means that the idea is not understood correctly (Kintsch, 1998).

In the integration phase, contrarily to the construction phase in which the activation is immediate and effortless, the process becomes slow and sometimes effortful. This coherent mental representation is said to be stable and it is called 'a situation model;' that is where comprehension

resides (Kintsch, 1994). In this phase, background knowledge serves to support nodes from long term-memory and it builds on readers' inference skills and text interpretations using the appropriate knowledge (Kintsch, 1994; Kintsch, 1998).

Van Dijk and Kintsch (1983, p.19) define the previously mentioned situation model as the “[...] the cognitive representation of the events, actions, persons, and in general the situation, a text is about.” In other words, the situation model is the content of the background knowledge that relates to the text. They add that “To understand a text, we have to represent what it is about. If we are unable to imagine a situation in which certain individuals have the properties or relations indicated by the text, we fail to understand the text itself” (van Dijk and Kintsch, 1983, p.21). In the case of narrative texts, the situation model refers to persons, experiences and events from the LTM/background knowledge. This situation model is the result of the interaction between the reader's mental micro world and the text being processed (van Dijk and Kintsch, 1983; Kintsch and Kintsch, 2005).

In the integration phase, Kintsch (1998, p.167) notes that “All text structures require domain-specific strategies and knowledge.” In fact, readers use some problem-solving strategies to achieve a coherent mental representation of the processed text. Skilled readers might have recourse to imagery for some types of texts. They can also use prediction or activate text schema that, for example, assists them in understanding poetry (Kintsch, 1998). Less skilled readers can undergo group/peer reciprocal teaching or can be taught strategies like summarizing, organizing, questioning to become active readers (Kintsch, 1998). Ericsson and Kintsch (1995) have used the same ‘Bank’ example to explain the integration phase processing. Here, some relevant semantically relevant items like ‘money’, ‘robbery’ are strongly connected that they lead to a stable

activation for ‘financial situation’ that is referred to by the term ‘bank’ in the processed sentence; all other irrelevant concepts are weakly active or completely inactive.

The phases the readers go through in processing one sentence are the same they go through in processing all the sentences to come next in the text. The readers’ long-term working memory keeps the mental representation of each previous sentence active to combine it with that of the coming sentence and, thus, ensure a better interpretation and understanding of the text (Ericsson and Kintsch, 1995).

### **1.5.2 Perfetti’s verbal efficiency (VE) model**

This reading comprehension theory is an interactive information processing model. It highlights the importance lexical access components (the ability to have rapid access to the different representations of the word: be it phonological, orthographic or semantic) and their quality in freeing up mental resources for higher-order comprehension components; these may include skills like inferencing, problem-solving and elaborating that, all, rely on prior knowledge (Perfetti, 1985; and Perfetti and Hart, 2001).

Perfetti (1992) believes in the importance of lexical access in explaining individual differences in reading acquisition and reading proficiency. He puts that prior knowledge “is a potent source of differences in reading ability [...] Schemata are critical to comprehension[...] It does not follow, however, that failures of schemata are a major explanatory mechanism for a general theory of reading ability”(1985, p. 118). That is to say, Perfetti considers lexical quality as an essential support of text comprehension, and inferencing skills, metacognitive strategies and prior knowledge problems are inconsiderable sources of reading comprehension problems.

Similarly to Kintsch’s Construction-integration Model, Perfetti’s Verbal Efficiency Model divides text processing into two stages. First, in the assembly phase, the reader is required to

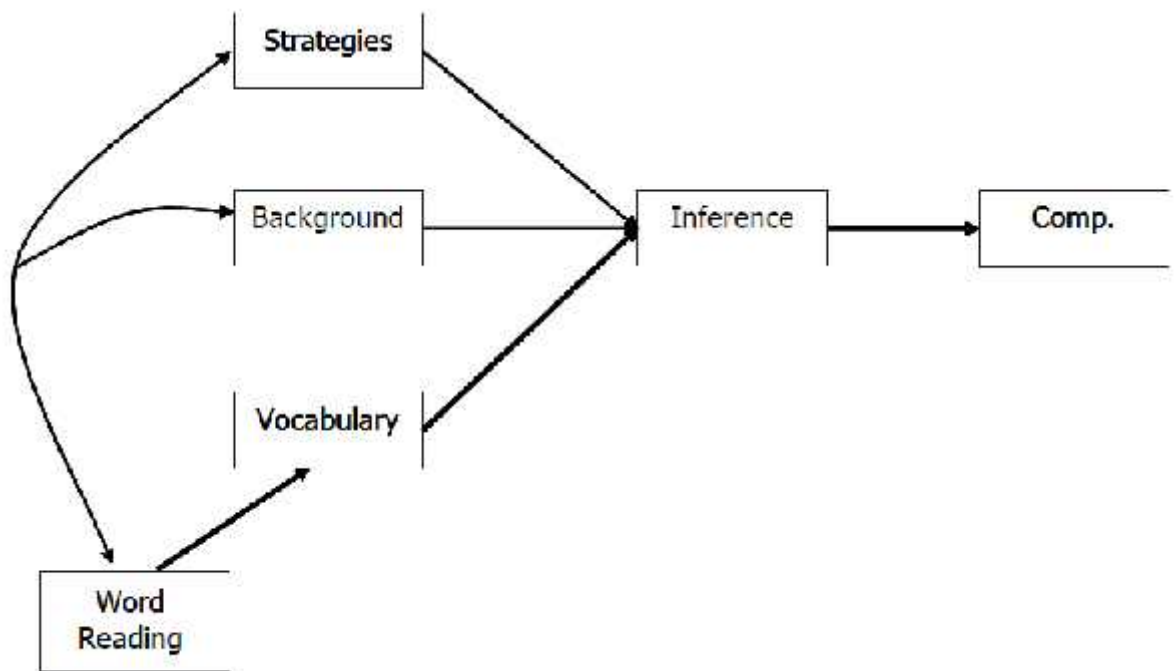


identify words and to connect them to their mental lexicon; this is what is known as 'lexical access.' The reader's vocabulary knowledge then helps in grouping words to make propositions. Therefore, lexical access is about word recognition and access to different word mental representations (Perfetti and Hart, 2001). To illustrate this phase better, Perfetti uses a story that starts with the following sentence: "Joe and his infant daughter were waiting for the doctor to get back from lunch" (Perfetti, 1985, p. 46). Similarly to what Kintsch (1998) suggests in his construction phase, Perfetti (1994) sees that the reader needs to identify text words, access their definitions, and assemble them into propositions. In that phase of reading, Perfetti assumes that background knowledge is not involved in lexical access and he names this phase, contrarily to comprehension, as 'general reading ability' (1989). It is no surprise, then, that skilled readers create their propositional representations faster since they have better lexical representations of words that are more appropriate phonologically, orthographically, and semantically than less skilled readers (Perfetti, 1992).

Second, in the integration phase, the reader uses his inference skills to transform the previously assembled propositions into a meaningful text model, which is similar to what Kintsch refers to as a situation model (Kintsch, 1988). To be able to make inferences, schema needs to be activated (Perfetti, 1988). To keep the same example stated earlier in this model review, Perfetti explains that three schemata need to be activated: father-daughter, doctor-visit, and doctor-lunch schemata. The readers draw inferences that go that the visit is for medical reasons, not social ones; and a coherent text representation is built including the two characters (father and daughter) and story complication item (doctor's absence). When the reader moves on in his story reading, he encounters a sentence like "The room was warm and stuffy, so they opened the window." Here, the reader encounters a second node and the text model, then, comprises two characters (father and

daughter), one old complication (doctor's absence) and a new one (the stuffy room) (Perfetti, 1988, p. 123).

The following figure represents the different processing phase in the Perfetti's model.



**Figure 1.1: Processing Components in Perfetti's reading comprehension model. Adapted from *Verbal efficiency in reading ability* (P.132), by C.A. Perfetti, 1988, New York: Academic Press**

Some processes are required while or after text model construction; they are “interpretive, inferential, and critical comprehension” (Perfetti, 1988, p. 122). These processes are more cognitive than linguistic. They take the form of inference skills, past experience, monitoring skills, reasoning or problem solving skills (Perfetti, 1994, p. 332). Additionally, Perfetti believes that

cognitive comprehension strategies are included in readers' knowledge and, thus, impact inference skills (Perfetti, 1985, p. 78-79).

Similarly to Kintsch's Model (1988), this theory holds that the reader keeps text models of previous sentences active while he processes the next ones. Also, these two models go that comprehension processes occur with regards to limited-capacity working memory and that the latter is not a component of text comprehension on its own (Perfetti, 1985).

### **1.5.3 Just and Carpenter's capacity-constrained (CC) reader model**

By presenting this model, Just and Carpenter focus on the importance of eye movement and cognitive processing in working memory. The latter is considered to be central to the understanding of individual differences in text understanding. According this model, the reader is supposed to combine his automatic information processing (low order) and interactive working memory processes (high order) that enable activation during reading (Just and Carpenter, 1987). Working memory is seen as a support to the different processes of information manipulation and maintenance. It is, then, defined as the greatest amount of activation that processes and maintains information. For Just and Carpenter, the processes that take place while processing a text are simultaneous, not serial. Additionally, eye movement processes slow down by the end of sentences to integrate the existing active information in working memory (1987).

Later, Carpenter and Just (1992) have come up with CC READER Stimulation Model; a revised version of the former one. This model focuses on the importance of production system network in working on nodes by creating, maintaining and removing them in working memory and long-term memory. The upper limit of memory capacity is seen in the degree of information activation that is available for input maintaining and processing. The constraints this model is based on are those of working memory that are strongly imposed on text processing. This shows

that individual differences in working memory are of a paramount importance in reading comprehension. Just and Carpenter (1987, 1992) back this model up using the following factors that have a great impact on readers' cognitive capacities. Thus, they are demands on memory that influence strongly reading comprehension.

- Increased syntactic complexity
- linguistic ambiguity
- Variation in selectivity and suppression mechanisms
- Demands on the maintenance of textual information across distances
- External demands on memory load
- Demands imposed by time constraints

Relating to the previously stated factors, this model is based on activation as it is believed to be traced by memory. According to this model, every text item (from a word to a longer structure) has its own activation level. Here, two cases are distinguished. First, when the activation propagation is inferior to activation maximum (in the reader's capacities), then it is within the reader's working memory capacities and it paves the way to other cognitive processes to take place. Also, when some items activation is propagated, the other elements are serially activated. When a reader processes a sentence that contains a subject, for example, he will keep this element activated in his memory above the activation threshold because he needs to link it to other elements in the same sentence or in the coming ones to understand what is being read. That is, when the reader processes a text, he keeps the activation of one element above the threshold and prepares for the activation of another element in the text. This is what information maintenance and manipulation stand for (Just and Carpenter, 1992). In the second reading situation, the element activation is inferior to its propagation. In this case, maintenance and processing will not be

processing to similar extents. Therefore, there will be much effort put into making an element reach the threshold; this, then, results in slowing down processing and, thus, forgetting some elements (Just and Carpenter, 1992).

All things considered, comprehension can be said to be dependent on processing information at a lower level (automatic word processing) and higher level (working memory capacity processes). That is, working memory capacity constrains reading processes efficiency and the quality of the reader's text mental representation.

#### **1.5.4 Goldman and Varma's capacity constrained construction-integration (3CI) model**

This model, developed by Goldman and Varma (1995), as its name indicates it, is a combination of Kintsch's (1998) and Just and Carpenter's (1978, 1992) models of reading comprehension. To put it differently, it extends the CI model by considering a dynamic capacity-constrained working memory instead of the fixed working memory capacity. Additionally, it extends the CC model from analysing the processing of separate sentences in capacity-constrained memory network into the analysis of connected sentences (Goldman and Varma, 2009, p.339).

Goldman and Varma (2009) suggest this combination for several reasons. The first one is the way of maintaining propositions for further use. The new model is more flexible in terms of explaining the processed propositions; the process is more dynamic than that in the CI. According to this model, working memory processes propositions and decides which and how many of them should remain active for the coming processing; the active ones might be many or very few (Goldman and Varma, 2009, p.339). The second reason that provokes such a combination of models is the search for working memory flexibility in accessing and using prior knowledge activation to process new information. In the same fashion, dynamic activation applies also to information stored in long-term memory to emphasise information in the text over that in LTM

(Goldman and Varma, 2009, p.339). Goldman and Varma, in creating this model, aim at making readers process text strategically; this, naturally, requires a specific architecture. Putting this into practice, they build what they call the REREADER, which is a model that “rereads based on a relatively simple coherence evaluation criterion” (Goldman and Varma, 2009, p.339).

In a nutshell, this model can be said to be the one that “can incorporate strategic processing and flexible allocation of working memory resources in the service of discourse comprehension and knowledge acquisition” (Goldman and Varma, 2009, p.355). In this study, it is recognized that the conceptualisation of the processes of reading comprehension has always been under active debates and is investigated in different inquiries. It is noteworthy that the models discussed in this paper are those that are of a particular link to the core of this study.

### **1.6 The difference between good and poor comprehenders**

Research on reading comprehension has always considered individual differences in reading processes and components so as to differentiate between good/skilled readers and poor/less skilled readers. These differences are potential sources of failure for poor readers. Some readers, for instance, with an average IQ (Intelligence quotient) are poor comprehenders because they are, unexpectedly, impaired in comprehending what they read (Oakhill, Cain, and Bryant, 2003).

To compare between good and poor readers, researchers must measure some reading comprehension aspects, be it global or specific. For instance, some studies have focused on the readers’ abilities to make inferences. These studies have revealed that poor comprehenders are readers who cannot execute the process that by which new information is integrated with earlier one, be it I the same text or prior knowledge stored in long-term memory (Cain and Oakhill, 1999; and Nation and Snowling, 1998). Similarly, readers, in some cases, might be unable to allocate their attention to processing the text; this might be due to their attentional capacity or to problems

at the level of executive control; it could be possible for a reader to access the relevant comprehension processes but not to use them appropriately (Gersten, Fuchs, Williams and Baker, 2001). For instance, the reader might look for less useful or useless information in his storage and select what is not appropriate to build a coherent text representation. Unexpectedly, even good comprehenders may make wrong decisions in terms of invoking the appropriate comprehension processes; they may look for previous knowledge to integrate it with the new information in their long-term storage when they just have to get it from the text or vice versa.

Lorch, Lorch and Morgan (1987) have had participants, in their studies, who are not able to link serial topics; other readers in the study of Palincsar and Brown (1984) cannot link the newly encountered information with the stored one to understand the general idea of a text. Comparatively, Cain, Oakhill, Barnes, and Bryant (2001) have found out that the difference between good and poor readers lies in the lack/absence of the readers' abilities to link text ideas, understand event structure and control their understanding. In the same fashion, skilled comprehenders are found to be more conscious about text semantic contradictions and less permissive with the intrusion of irrelevant ideas than less skilled readers (Garner, 1986; and Gernsbacher and Faust, 1991). Equally important, good comprehenders differ, metacognitively speaking, from poor ones in their awareness about the importance of both decoding and comprehension, unlike less skilled ones who focus on the former at the expense of the latter (Baker and Brown, 1984). Additionally, poor comprehenders, according to Garner and Reis (1981), differ from more skilled ones in another point; sometimes, it is not possible for them to realise that they do not grasp what they read.

Some poor readers scarcely use reading strategies; and when they do, they might not be able to adjust them to the reading activity (Brown, Armbruster and Baker, 1986; and Palincsar and

Brown, 1984). Additionally, Wingenbach's study (1983) of gifted readers has focused mainly on three categories of specific reading strategies that are important for text comprehension. They are summarised as follows: word-related strategies, which are about use of context, synonym substitution, and stated failure to understand a word; context-related strategies which require the use of rereading, the use of inference, the stated failure to understand a clause and use of information about the story; and meaning-related strategies which require personal information, addition of information, anticipation/hypothesis, and imagery.

These different situations show that process-related reasons are at the origin of reading comprehension struggles. Given these points, good and poor readers can be compared over essential points that facilitate the processing of a text; they are mainly readers' awareness about the text structure, its level of difficulty and its anomalies. The difference between skilled and less skilled readers is also about their manipulation of their own understanding and their belief about their own comprehension capacities.

### **1.7 Reading comprehension difficulties and interventions**

Numerous researches have been conducted to find out about the different reading comprehension problems and to suggest the appropriate solutions to help struggling readers with their reading difficulties. These interventions are mainly based on the analysis of the processes and crucial components of reading comprehension. Studying how readers fail to construct meaningful mental representations of the text enables the researchers in the field of reading develop specific intervention strategies. The following suggestions are based on the model of Van den Broek and Kremer (1999) that emphasizes on the reader, the text and the reading goals as crucial elements that influence the reading comprehension process.



### **1.7.1 Reader-based interventions**

Many remedial studies have focused on essential reading skills that include word identification, vocabulary knowledge and fluency (LaBerge and Samuels, 1974; Stanovich, 1986; and White, 2005). Focusing on such basic skills, these studies aim at facilitating earlier processes of comprehension to save time and energy for higher-order processes (Rayner, Foorman, Perfetti, Pesetsky, and Seidenberg, 2001). Therefore, these interventions are basically made of word training to improve word identification, repeated reading to improve speed of reading, and vocabulary instruction to enrich struggling readers' knowledge about words (LaBerge and Samuels, 1974; and Tan and Nicholson, 1997;). Nevertheless, these interventions do not help all readers with their reading problems; their higher-order processing problems do not allow such remedies to take place (Taylor and Williams, 1983).

Some researchers have focused, in their interventions, on higher-order processing skills, similarly to what has been stated earlier in this paper. Background knowledge appropriate activation, be it automatically or strategically, is one potential element that has been spotted (Guérard and O'Brien, 2005). This is reflected in many interventions that aim at facilitating the retrieval of appropriate knowledge for a given text comprehension. In addition to that, researchers target specific problems of readers who exaggerate in relying on their prior knowledge while it is irrelevant or insufficient; this makes understanding the text out of the readers reach (Trabasso and Suh, 1993). Tasks that are used to decrease such reading problems include text previews, pre-reading vocabulary activities and questioning activities (Sachs, 1983; and Darch and Gersten, 1986).

Inference issues have been targeted by some researchers for their crucial impact on comprehension processing. They emphasise on the importance of teaching reading through

training students on answering different types of comprehension questions (Cain and Oakhill, 1999; and Graesser, Singer, and Trabasso, 1994). Some other suggested activities, such as matching different related items, teach readers how to categorise information as referred to in the text (Simmonds, 1992). By the same fashion, think-aloud exercises also ameliorate readers' inference skills (Trabasso and Magliano, 1996).

Some researches address failures at the level of attention allocation skills. In such interventions, readers are taught how to use metacognitive strategies like explaining, self-questioning, self-monitoring and summarising (McNamara, 2004). Nevertheless, chances are that some of the participants in such remedial studies may not use the strategies taught during the course of these studies with next texts (Gersten *et al.*, 2001).

### **1.7.2 Text-based interventions**

As discussed previously, text features are of a paramount importance in comprehension processing. When the readers are not knowledgeable about the characteristics of different types of texts, their reading is not appropriately guided for a better comprehension (Williams, 2006). That is, reading remedial programs are supposed to teach readers the different strategies they can use to read different types of texts successfully (Gersten *et al.*, 2001). Some studies have focused on the use of some illustration forms like tables and graphs to guide the readers' reading and, thus, to facilitate their understanding (Winn, 1987). In studies like that of Smith and Friend (1986), readers are taught how to identify the different text developmental methods; and for some others the focus is principally on making readers use semantic mapping and story grammars (Williams, 1993). Similarly, other studies main concern is to teach students, using story grammars, how to recognize the main story theme (Taylor and Williams, 1983) or to use instruction on text structure using different text types (Williams *et al.*, 2007).

It is true that such interventions have shown to be highly remedial for struggling readers. Nevertheless, it is noteworthy that it cannot apply to all reading situations. These interventional studies use explicit and appropriate instruction and well-studied texts. Nevertheless, this is not true about all reading situations; there may be some issues about text structures or teachers' instruction (Williams, 2006). Therefore, one has to consider the influence of such features on reading comprehension and their appropriate remedial conditions in trying to guide and facilitate the readers' comprehension processing.

### **1.7.3 Instruction-based interventions**

To increase the readers' gains from a specific text, it is crucial to follow the teachers' instruction. The latter has been the concern of many researchers that believe in the importance of instruction in helping struggling readers with their difficulties. Some studies' core is to find out the appropriate and explicit ways of delivering appropriate comprehension instruction; these instructions are most of the time described as explicit ones. In fact, appropriate comprehension instruction requires appropriate structure, repetition of unclear points, logical sequencing of activities and direct constructive feedback (Polloway, Epstein, Polloway, Patton, and Ball, 1986). Some studies focused on designing content-based instructional system that requires the students to use specific strategies. Following this system, teachers act as models to teach students how to apply strategies like anticipating, asking questions and summarizing to make the students use metacognitive discussions while reading in groups (Palincsar and Brown, 1984).

Similarly, other remedial programs focus on finding appropriate solutions to struggling readers' comprehension problems. POSSE program is a reading intervention that Englert and Mariage (1991) have developed in their study. This program tries to model the habits of skilled readers to make less skilled readers adopt them in reading. This procedure includes important

reading practices that train the students on how to make predictions by activating their prior knowledge and how to organize them into semantic maps. Also, they teach them how to look for main ideas, to summarise text information, and to evaluate the story by asking questions, and comparing their previous predictions with the information under processing while reading. Englert and Mariage (1991) put that such a program is more successful in the presence of effective communication between students in groups.

Other peer-mediated approaches are available in the field of reading research. Peer-Assisted Learning Strategies (PALS) is a group peer tutoring program that is developed by Fluchs and Doug. It involves making higher- and lower-performing students work together (with no extreme abilities difference). These structured reading activities allow peers with different abilities to perform the roles of coach and reader. They help each other in summarising paragraphs and predicting what is to come next (Fuchs, Fuchs, Mathes, and Simmons, 1997).

The previously stated remedial programs consider readers capacities, text features and instruction issues that assist greatly readers with basic or higher-order comprehension processing difficulties. They have been applied in many researches and have proven to be effective. Yet, more interventional studies, following those programs, should barely struggling readers (Gersten *et al.*, 2001).

## **1.8 Assessing reading comprehension**

The instruments that are designed to evaluate reading comprehension have to include tasks that mirror the reading comprehension cognitive processes. Perspectives of reading comprehension evaluation have to consider what reading comprehension stands for and what its cognitive processes are to build appropriate assessment tasks. Thus, the essential standard to consider reading comprehension assessment tools is the construct validity. That is, researchers

need to check whether the instrument reflects what research has revealed about the different cognitive processes and demands required in understanding a text (Schreiner, 1977).

Some educators do not make the difference between reading tasks and assessment tools; this point needs to be polished up. In fact, reading tasks are the activities that students are assigned by their teachers to help them learn to read. They may take the form of workbook exercises, discussion questions... etc. These tasks are referred to as the 'reading content'. These tasks, however, do not reflect the processes of reading comprehension on their own; they just reflect instructional tasks that are not presented as part of reading processes (Schreiner, 1977, p. 2).

Either reading comprehension tests are meant to provide reading proficiency assessment, assessment of classroom learning, assessment for learning, assessment of curricular effectiveness, or assessment for research purposes, they all mirror the reading comprehension capacities but in different ways. Such tests target crucial components of reading comprehension. The following reading constructs can be translated into reading comprehension tests: (1) Fluency and reading speed, (2) Automaticity and rapid word recognition, (3) Search processes, (4) Vocabulary knowledge, (5) Morphological knowledge, (6) Syntactic knowledge, (7) Text-structure awareness and discourse organisation, (8) Main-ideas comprehension, (9) Recall of relevant details, (10) Inferences about text information, (11) Strategic-processing abilities, (12) Summarization abilities, (13) Synthesis skills, (14) Evaluation and critical reading (Alderson, 2000).

Taking into consideration the previously stated reading constructs, standardised reading tests might take different forms. Hughes (2003) suggests the following list: (1) Cloze, (2) Cloze elide (remove extra word), (3) Text segment ordering, (4) Gap-filling formats (rational cloze formats), (5) Text gap, (6) Choosing from a "heading bank" for identified paragraphs, (7) Multiple-choice, (8) Sentence completion, (9) Matching (and multiple matching) techniques, (10) C-tests

(retain initial letters of words removed), (12) Editing, (12) Classification into groups, (13) Dichotomous items (T / F / not stated, Y / N), (14) Free recall, (15) Information transfer (graphs, tables, flow charts, outlines, maps), (16) Short answer, (17) Skimming, (18) Scanning, (19) Summary (1 sentence, 2 sentences, 5–6 sentences), (20) Project performance.

Covering all these standardised test formats is not the objective of this section; it mainly discusses multiple choice question tests (MCQ) since they are the tool of interest in this study. In this type of questions, the reader deals with comprehension questions that are followed by some options, each of which represents a possible answer, but only one option is correct. In fact, questions in such standardized tests, readers engage in a variety of comprehension processes, depending on the item in question; this can be better revealed when MC question structure and content are examined (Rupp, Ferne and Choi, 2006). Taking some standardized tests as an example, the MC questions in SAT and TOEFL assessments target general and specific comprehension processes and this results in drawing on “component and integrative processes to different degrees” (Rupp, Ferne and Choi, 2006, p. 452-453). Questions in the TOEFL standardized tests (reading comprehension section) require readers to extract the gist of a passage, to look for specific information, to guess the meaning of words in their context and to solve pronoun references (Sheehan, Ginther and Schedl, 1999). Furthermore, MC questions require readers to ‘reduce’ or ‘augment’ the ideas explicitly presented in the print (Sheehan and Ginther (2001); this is the process of reducing or augmenting the text base in Kintsch’s CI model (1988, 1994, 1998). Similarly, different reading comprehension facets can be evaluated using different question types.

In spite of the fact that MC questions are considered less reliable or not reliable by some researchers because the readers’ answers might result from a random choice of options, it is still

considered by some others that responding to such questions helps researchers understand some reading abilities and cognitive processing difficulties that are highlighted in such types of items.

## **Conclusion**

Discussing reading comprehension is a complex task. To be able to predict success in text understanding, one has to understand the reader, the text and the task being undertaken. This might seem to be easy, but with the diversity of terminology and the variety of comprehension models, some of which are presented in this chapter, establishing exact boundaries around text understanding is hard. Nevertheless, discussing some major constructs of reading comprehension, that have been recognised in different models and researches, such as vocabulary, Cognitive processing speed, background knowledge, word identification, text structure recognition and inference making gives better insights into how cognitively complex this process is. This best explains why more research attention has to be oriented to reading comprehension. This will make educators at elementary levels focus, in their reading instruction, on tasks that are more likely to build learners vocabulary and enrich their background knowledge. Higher level teachers, however, would direct their instruction toward developing students' higher-order cognitive processing abilities. This chapter has devoted space to memory-based components, in general, and working memory capacities, in specific, as influential concepts that are at the origin of many definitions and models of reading comprehension in reading research. This capacity, among others, is better discussed and documented in the next chapters of this study.

## Chapter Two

### Working Memory and Reading Comprehension

*“Memory is the ability to use the past in the service of the present.”* Jeffrey D. Karpicke and Melissa Lehman.

#### Introduction

#### 2.1 Definitions of memory and working memory

##### 2.1.1 Definition of memory

##### 2.2.2 Definition of working memory

#### 2.2 History of human memory research

#### 2.3 Development of the human memory concept

#### 2.4 Models of memory

##### 2.4.1 Atkinson and Shrifin’s multi-store model

###### 2.4.1.1 Sensory store

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##### 2.4.2 Information-processing models

#### 2.5 Models of working memory

##### 2.5.1 Baddeley and Hitch’s model

###### 2.5.1.1 The central executive

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2.7 The difference between WM and STM

2.8 Working memory and reading comprehension

Conclusion

## **Introduction**

The previous chapter tackles the different processes and models of reading comprehension in which the concept of working memory has been focused on to different extents. In some models, working memory capacity is considered as a major determinant of activation quantity, while in some others it is considered as one part of the long-term memory (LTM). The discussion of the tremendous role of memory in reading, specifically, and school achievement, in general, explains why several researches have been conducted to investigate the role of this capacity in reading. To understand its important contribution to reading comprehension, many points need to be covered about the concept of working memory. To this end, this chapter reviews the most relevant issues about human memory, in general, and working memory, in specific. It explains what working memory as a concept stands for through defining it, discussing the different models that describe its nature and function, comparing it to different memory subsystems and explaining its importance in academic achievement, mainly reading comprehension. Finally, it relates to what research has revealed as the most reliable methods of assessing working memory.

### **2.1 Definitions of memory and working memory**

This section provides a general definition of human memory and a more operational definition of what the term represents in this thesis.

#### **2.1.1 Definition of memory**

Memory can be defined by non-specialists as that property of the human mind that is mainly responsible for retaining acquired knowledge. This definition is correct, yet not specific enough to understand what the term really stands for. According to Smith (2004, p.96), for example, the term memory can be used in several ways; it is used “sometimes to refer to how well we can put something away for future use, sometimes to how long we can retain it, and sometimes

to how well we can get to it.” This definition sounds to be comprehensive, yet not thoroughly describing the term. A more explicit definition of memory is put by Loftus and Loftus (1976) who describe it as a kind of repository for information (personal experiences, emotions, facts, procedures, skills and habits) where it can be retained for a given period of time. Simply, it is a group of systems that that store and recall information.

### **2.2.2 Definition of working memory**

The concept of working memory is defined, in simple terms, by Sternberg as a specialized part of long-term memory that transfers what is recently activated in LTM into and out of STM (1996). In more complicated terms, working memory is defined as a limited-capacity system that retains information; it is a multi-component, controlling system that contributes to higher-order cognitive processes (Baddeley, 1990).

Although these definitions might seem to be explicitly defining what working memory capacity (WMC) is, its conceptual definition, nevertheless, is much more complicated than it seems; researchers view it differently, at the level of structure and function, depending on the model they follow. Some researchers consider working memory as a system that is made up of many components, and thus their focus is mainly on its structure (Baddeley and Hitch, 1974). Conversely, some other theorists do not view working memory as a distinct system; it is an active LTM part (Engle, 2002), and it is defined in terms of its content not structure (de Ribaupierre, 1995). This second definition is operationally adopted in this study because it takes into account individual differences in relation to their different cognitive processing capacities. It is more relevant to take it as an active LTM portion that maintains and manipulates information attentionally. Thus, the focus is on this system as content rather than structure.

A more operational definition of working memory describes it in terms of the number of items one can recall while performing hard/complex tasks. Such tasks need information to be kept activated for successive recall and to be manipulated for the current processing (Feldman Barrett, Tugage, and Engle, 2004).

## **2.2 History of human memory research**

For thousands of years, researchers have been trying to conceive the idea for human memory. Comparing it to the telephone, many psychologists have considered memory, structurally, as a store of information. This conception has been, later, replaced with other views of memory that take into account the processes rather than the structure of this construct. None of these two views has explained this capacity comprehensively. Conversely, that has been achieved with the coming of a new, more comprehensive, approach that considers working memory functions (Neath and Suprenant, 2003).

The starting point of memory research has been provoked by Hermann Ebbinghaus through observing memory characteristics. This, nevertheless, has been disapproved by many researchers for the reason that most complex characteristics and issues of memory cannot be merely understood through observation. Later in the sixties, many psychologists have started to speculate about the concept of memory from a more cognitive, flexible angle. This has led to less limited approaches of human memory (Baddeley, 1990).

These progresses in the field of memory research have influenced our understanding of this concept and have led memory to be investigated in terms of its contribution to many achievements, general and specific ones.

### **2.3 Development of the human memory concept**

Some researchers (Sternberg, 1996) consider working memory as an intermediate capacity that transfers the activated part of LTM in and out of STM. Others consider it as a concept that has emerged from short-term memory theories and consider it as a unitary system (Logie, 1995). The emerging information processing approaches have made clear the difference between temporary memory and LTM.

Broadbent (1958), in his study, has explained the existence of transient store that is mainly backed up by rehearsal to maintain STM information. Similarly, Miller (1956) has added that human beings can maintain and manipulate information in the form of chunks of 7 plus or minus 2 items. This model has been developed, later in 1968, by Atkinson and Shiffrin; it focuses mainly on sensory registers and united STM and LTM stores. This model has revealed that output goes through several sensory registers that transfer information into STM store. Input, then, that remains in this store is transferred to LTM store (Hitch, 1980). Nevertheless, Baddeley (1995) puts that such a process does not guarantee successful learning since, in his study, patients with short-term memory difficulties have stored information in their LTM store.

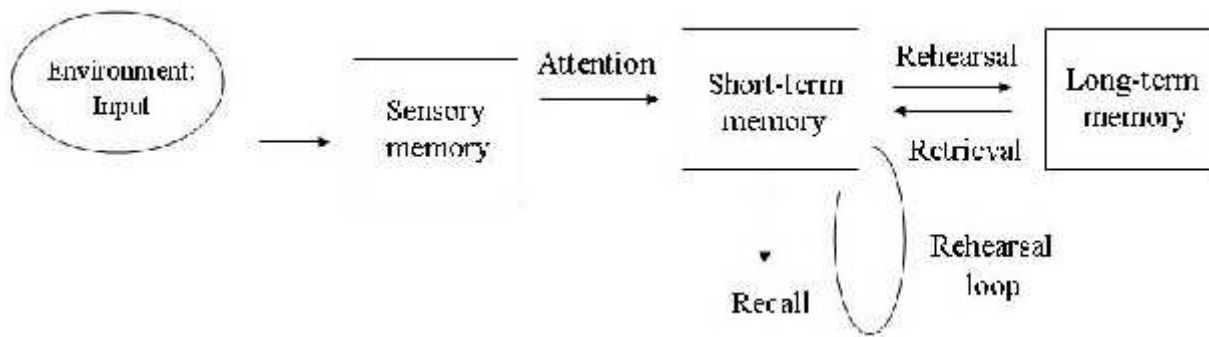
Such a deceiving finding model has led Baddeley and Hitch (1974) to examine STM functions which have resulted in the birth of a new component called *working memory*, which is different, with its several components, from the unitary STM system.

### **2.4 Models of memory**

It is essential to consider the different memory models that examine and explain the general construct to understand what the term working memory stands for.

### 2.4.1 Atkinson and Shrifin's multi-store model

This model is one of the prominent models of memory. Atkinson and Shrifin (1968) suggest that memory is made up of some structures that take the form of three memory stores: sensory memory, short-term memory and long-term memory (as illustrated in the following figure).



**Figure 2.1: Atkinson and Shrifin's multi-store model of memory. Adapted from *Human memory: A proposed system and its control processes (96)*, by R.C. Atkinson and R.M. Shrifin, 1968, New York: Academic Press**

This model is basically built upon the idea that the different memory stores have different characteristics in relation to their capacity, duration, encoding and control process. Capacity stands for the amount of information that can be maintained in the store, duration represents the amount of time needed for storing information, encoding refers to the way information is stored for future recall and the process of control that manages each of the stores (Atkinson and Shrifin, 1968).

Additionally, memory stores, in this model are explained by Atkinson and Shrifin (1968) as follows:

### **2.4.1.1 Sensory store**

Information comes from outside into sensory stores unconsciously. When input is not taken consciously, there are possibilities to lose it because of decay since it does not last more than 2 seconds. This represents an iconic and echoic memory (what is seen and what is heard). However, the information (up to 9 items) that is not lost is consciously processed and passes on to STM. This memory is not related to sounds and images only; all information that relate to the five senses are stored in the sensory memory but in different stores.

### **2.4.1.2 Short-term store**

This memory, with a relatively limited capacity, stores information for short periods of time that are considered, comparatively, longer than those of sensory memory. Short-term memory can maintain  $7 \pm 2$  items, that is known as The Magical Number Seven of Miller. This memory's capacity can develop using chunking; this occurs by grouping smaller parts of information to create larger chunks. This, actually, facilitates recalling information. What happens when STM is overloaded, the new input removes the oldest of all pieces of information. This store's duration, unlike that of sensory memory, is of about 15-30 seconds. For information to be transferred to LTM, rehearsal is needed.

### **2.4.1.3 Long-term store**

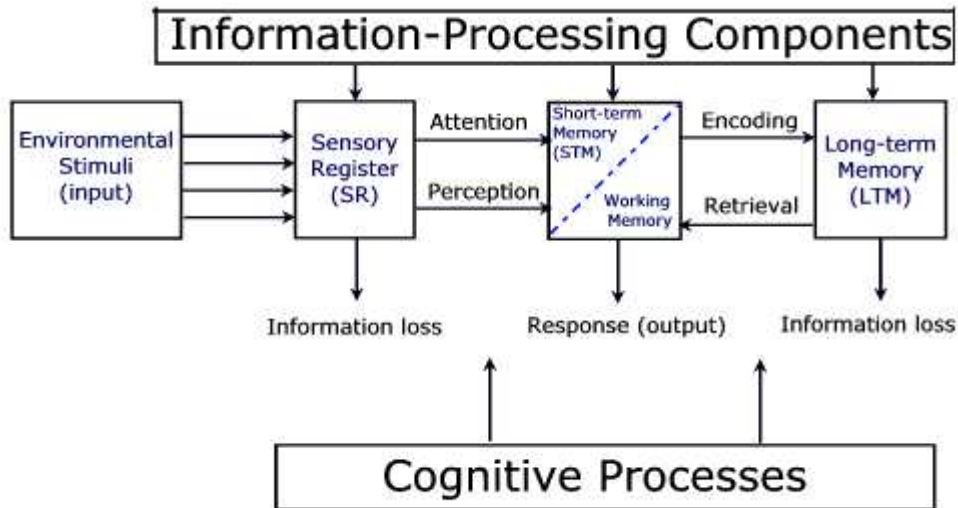
In comparison to the previously described stores, this is the one with the largest storage capacity and the longest storage duration; its capacity and duration make of it an unlimited and, to some extent, permanent storage system. In this system, the information is given meaning to be encoded semantically, contrarily to in short-term store that is encoded semantically. The retrieval of this information necessitates putting it back to STM store.

Although this model is considered by some researchers, like Baddeley, as too simplistic for a comprehensive memory model, it is a model that traces human memory in a linear process in an attempt to explain how information received from outside is being stored.

#### **2.4.2 Information-processing models**

These models, According to Woolfolk (1998), explain human memory from a connectionist point of view. That is, it deals with sensory data processing and interpretation and it seeks to explain how information can be gathered appropriately for future recall. Sensory information can be interpreted through figuring out whether the input is related to previous knowledge and needs to be remembered and by registering it in a form that allows its retrieval. Baddeley (1998) supports this by putting that “What we seem to remember best and recall when needed are data that we have already related to a given existing set of knowledge linked to our proper world.” This model, similarly to others, holds that human memory should be explained in terms of the different stages information goes through (Matlin, 1989). The following figure is a simplified representation of this model.





**Figure 2.2: Information-processing model of working memory. Adapted from *Cognition* (p.102), by M.W. Matlin, 1989, New York: Holt, Rinehart and Winston**

Information-processing models, differently from the Multi-store Models, do not focus on the idea of the existence of three memory stores. Instead of focusing on information storing location, Craik and Lockhart (1972) in their levels of processing models (LOP) emphasise on the importance of processing types that, depending on their depth, lead to more or less durable memory traces. In other words, if the processed information (e.g. words) is processed phonemically and orthographically, their memory trace will be too fragile that it is more likely to be forgotten. Conversely, when words are processed semantically, their memory trace will be strong and they are less likely to be forgotten (Eysenk, 1974, as cited in Gross, 1985).

Similarly to multiple-component models, information-processing models describe three memory components: sensory memory, short-term/working memory, and long-term memory. However, this model considers memory components in terms of information categories instead of input location. This is explained by Lieury (1996) who puts that information takes the form of a

network in which items are put together according to their conceptual category, and these concepts are linked using a description of their property or their mental image.

Other theorists, like Tulving (1973), suggest a different content-based categorization of memory types that are mainly declarative memory (knowing what to perform) which is divided into semantic and episodic memory, and non-declarative/procedural memory (knowing how to perform). Other psychologists, like Voss and Wiley (1995), use the very same categorization to describe the different types of long-term memory.

***Semantic Memory*** is one's accumulated knowledge about the world. Information, such as strategies, principles or even skills, is organized in the form of a network under different categories; these are best known as schemata. In fact, a schema is of a paramount importance in linking new input to the prior knowledge.

***Episodic Memory*** refers to the register of personal experience. It retains information in the form of mental compilation that represents a sequence of the things that happen, when they happen and the relation between them. It can also include a *flashbulb memory* that helps human beings remember one from the past event (or details about it) because of another one in the present moment.

***Procedural Memory*** is knowing/being able to recall how certain things are done, mainly the physical ones. This is the first infant memory system that develops, followed by the semantic then the episodic one.

The three long-term memory types, according to the information-processing model, are crucial in the context of learning. Nevertheless, this retention depends mainly on the type of information being retained (Conway, Cohen, and Stanhope, 1991). In the same direction of this approach, semantic input can be retained better than mere names. In fact, information retention is

most importantly influenced by the degree of learning (Bahrick and Hall, 1991). However, ability does not influence information retention since students with different abilities lose the exact same percentage of information through time (Semb and Ellis, 1994). Nevertheless, teachers can help students retain better when they get them involved in classroom activities using appropriate instruction (MacKenzie and White, 1982). To this end, educators need to take into consideration that they can improve their learners' retention abilities by presenting them with information visually and verbally instead of presenting it only episodically or semantically. This is what is referred to by Clark and Paivio (1991) as dual-code theory.

## **2.5 Models of working memory**

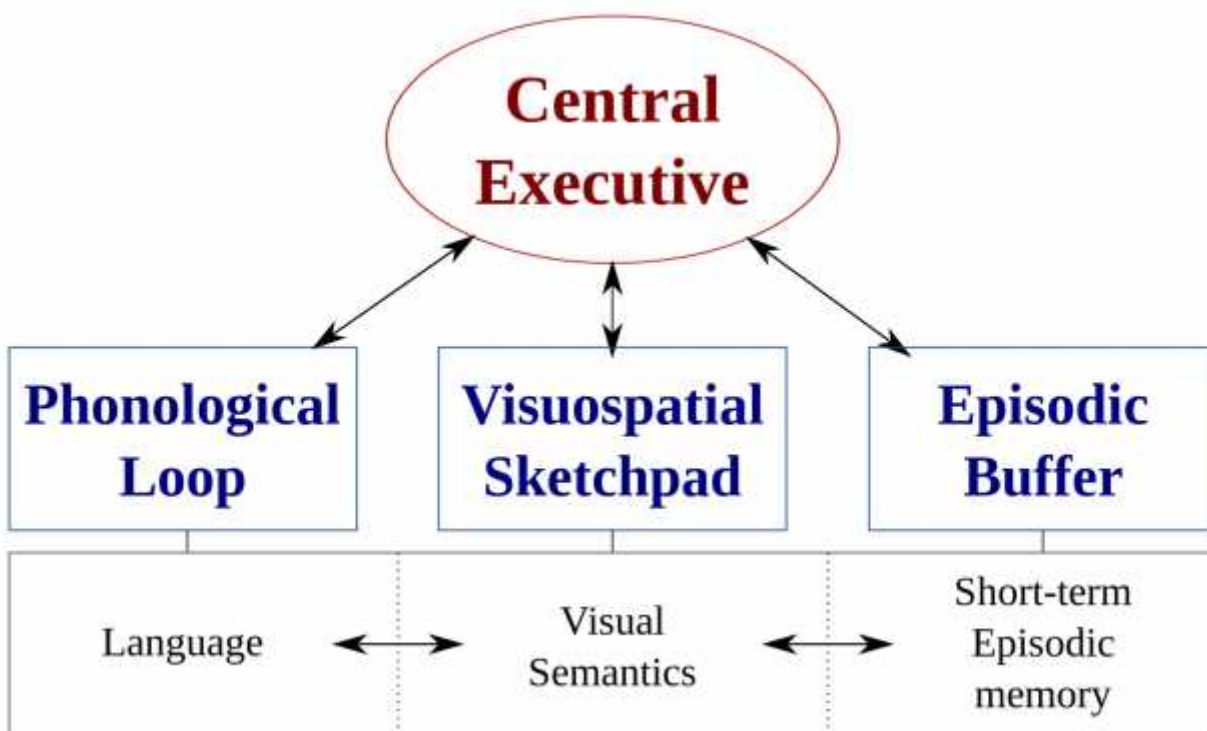
In this section, some working memory perspectives are presented. They show the importance that is attributed to the architecture of the working memory system and the function of its subcomponents for a better understanding of this concept.

### **2.5.1 Baddeley and Hitch's model**

This model has been proposed by Baddeley and Hitch in 1974 and then modified in 2000. It has emerged in reaction to some studies, like that of Atkinson and Shrifin (1968), which have suggested that short-term memory system assures input storage and processing during complex tasks and a long-term memory. Short-term memory consists of different stores. In his study, Baddeley (1990) has suggested that working memory is a flexible and complex system. He has proved that the complex tasks like comprehension, reasoning and retrieval tasks are not damaged even when memory is being overloaded (Hitch and Baddeley, 1974). This shows that short-term memory, even when it is full, can perform two tasks simultaneously- digit span task and reasoning task. To state it differently, it has been put theoretically that by the time digit span reaches 7 numbers, STM would be at its peak, and it will be impossible to perform the other task.

Unexpectedly, Braddely and Hitch (1974) have found that when capacity is at its maximum, the number of errors does not increase while the reasoning task is being performed; this provides evidence that, contrarily to Atkinson and Shrifin’s belief about the existence of a unitary system, short-term memory has different stores.

Baddeley and Hitch (1974) suggest that there memory system consists of isolated components. The point is that there is a core system that controls the other system components. This key component is what they call the *central executive*, which is assisted by the remaining components that are described as slave systems; this is what allows freeing some part of its capacity to be able to perform many other tasks. This is what shapes their tripartite model of memory. The following figure recalls the structure of this model.



**Figure 2.3: Baddeley Tripartite Model of Working Memory. Adapted from *Working memory*, by A.D. Baddeley, 1986, Oxford: Clarendon Press**

According to Baddeley explanation (1986), here is an explanation of what each memory system component stands for.

### **2.5.1.1 The central executive**

As put by Braddeley and Hitch (1974), this represents the core/controlling component in memory system. In fact, it is responsible for making decisions/plans and solving problems; it controls attention- the aspects that require attention and the extent to which they do. Furthermore, this component has control over the operations that take place between the other components. Additionally, it is a modality-free component; it can process information from all the body senses, yet its capacity is limited when attention should be paid to different items simultaneously. Another important function of the central executive is to activate information from long-term register.

The initial version of Baddeley and Hitch's model holds that the central executive either supports control processes or supplements storage at once. Nevertheless, a later revision of that model has revealed that this component has no storage capacity. It states that when the required storage capacity is superior to the current storage capacity of the slave systems, it is possible to access other subsystems or long-term memory (Baddeley, 1990). As stated previously, the central executive is the component that controls attention. This can be possible through activating schema that helps in performing routine activities, and being the Supervisory Attentional System (SAS) that interferes when the system might be mislead and use the usual kind of response when a new pattern is needed. In other words, when the actions are familiar, schemata (one or many) are activated automatically; in case they overlap because of their independent activation, the activation of one schema precedes the activation of the other more and takes more attention by a mechanism that is called contention-scheduling. Nevertheless, this operation is not too demanding since the activities in question are routine ones. Conversely, in cases of novel activities, the SAS focuses on

the regulation of what schemata the contention scheduling mechanism activates; the SAS prevails over routine schemata (Norman and Shallice as cited in Baddeley, 1990). This explanation shows that the more activities are familiar, the less pressure is exercised over the central executive; the less automatic the performance is, the heavier demands on this component are. As an example, a teacher might ask students to recall a series of numbers, events or any other sequential information. When they are stated following their usual order, it is the contention scheduling that controls the task; however, when they are supposed to recall them randomly, the SAS takes control over the contention scheduling to activate the appropriate schemata. Thus, it is clear that contention scheduling helps rapid production, while slower, unusual production is controlled by the SAS (Gathercole and Baddeley, 1993).

What raised debate about this executive component is whether it is a unitary system or it is a cluster of executive functions. Gathercole and Baddeley (1993) put that this issue is misleading and far from solved. Nevertheless, Engle, Kane, and Tuholski (1999) assume that this executive functioning can be organized similarly to that of *intelligence*. That is, it is hierarchically organized having a domain-free controlling component over the other domain-specific components. This controlling component, according to Baddeley and Hitch (1974), has control over two subsystems that are called *slave systems*. What follows is an explanation of what they mean and what their function is.

### **2.5.1.2 The phonological loop**

Also called the *articulatory system*, this slave system, according to Baddeley (1995), deals with auditory input. This system is made up of a phonological short-term store and a process of rehearsal. This, in fact, helps in explaining its role in performing acoustic evidence coding in short-term memory. That is, input that goes to the phonological store is speech or any oral information.

Input that does not take the form of speech goes through what Baddeley (1997) calls sub-vocal rehearsal process that restores late input into the store and transforms non-oral input into a phonological form. This is what happens when one reads words, for example. At first, they are visual information that will be read out loud to get their phonological form. This is of a paramount importance when students go through a phonologically long-term learning like the alphabet of a new language.

This component is, similarly to many others, of a limited capacity. Like long-term tasks, short-term ones are greatly influenced by the phonological loop. Many studies have proved that when an individual is required to recall a list of words that are phonologically similar, he is more likely to fail up to 25% in his serial recalling of these words. Baddeley (1998) explains such phenomena using the phonological similarity effect. This, for him, is explained in two ways. The first relates to situations where the listener recalls the wrong item because, phonologically, what he hears is similar to what he thinks, erroneously, that he is correctly retrieving. He might recall B when he is asked to recall G ...etc.; this error is caused by the listener. Similarly, it is harder to recall a series of items that are phonologically similar like CGBT than to recall series like SRVH.

Research has proved, in many studies, the existence of the articulatory loop. Some researchers have conducted studies in which they have observed that when participants recall visual digits, the occurrence of any irrelevant oral material, in the same of different language, disrupts immediately the recall operation. This phenomenon, called *articulatory suppression*, proves that recalling takes place at the level of sound. What stands as an exceptional oral sound from disrupting recall is noise or music sounds since there exists a kind of filter that keeps such sounds out of the short-term store (Baddeley, 1998).

In another attempt to prove the existence of phonological loop, Baddeley, Thomson and Buchanan have investigated the relationship between word length and memory span (as cited in Baddeley 1998). Their study has revealed that participants recall better when the words in the string are shorter. They have explained this with the fact that when words are long, participants will pronounce them under their breath; this is what is referred to as subvocal rehearsal. That is, when it takes them longer to say words, earlier words trace will disappear slowly. This could, however, improved if participants try to read words rapidly to make the process shorter and, thus, not to make early traces fade away.

### **2.5.1.3 The visuo-spatial sketchpad**

As its name indicates it, this slave system deals with visual/spatial input. In the memory system, it is the second major component. Its function is to hold visuo-spatial representations of input for very short periods of time; it, then, helps in creating coherent mental images and manipulating them (Baddeley, 2003). Like all memory systems, the visuo-spatial one is of a limited capacity; it does not go beyond three or four mental images.

This system is often referred to as one entity; nevertheless, neuropsychology refers to it as two distinct components which are the visual and the spatial. To investigate such an issue, Logie and Pearson (1977) have conducted a research in which they have revealed that there was a difference in development speed between the two aspects; the visual sketchpad aspect develops faster than the spatial one. In the same fashion, Ungerleider and Mishkin have pointed, in their study, to the existence of two aspects; the visual one is responsible for what is processed and how it is manipulated, and the spatial one determines items location in space (as cited in Baddeley, 2003). Similarly, Thierry (2004) puts that these two components are distinct and have different functions. The visual aspect stores, passively, visual input and spatial locations in the form of fixed



visual representations. Conversely, the spatial aspect is an active system for spatial rehearsal; through its manipulation, decaying input in the visual cache can be refreshed. With both aspects, the visuo-spatial sketchpad has proved to be more demanding than the phonological loop on the central executive since its components are more difficult to encode (Logie, 1995).

The previous explanations determine the role of the visuo-spatial sketchpad in the working memory system which is to provide storage of visual and spatial information for brief periods, to generate images and to refresh the decaying mental image in the visual cache. Hence, even with the development of the tripartite model of working memory, few questions have been left unanswered. Some of them relate to the exact function of the central executive since it has been described as a system that undergoes huge pressure while processing activities. Some other issues are about whether there is a connection between the visuo-spatial sketch pad and the phonological loop that would logically explain how these two subsystems work together. To respond to such questions, Baddeley (2000) has proposed a multimodal storage component that is referred to as the *episodic buffer* as a fourth component.

#### **2.5.1.4 The episodic buffer**

This system is located between the central executive, long-term store and the three slave systems discussed previously. It is argued to be a limited-capacity multimodal storage system that is, like all the other components, controlled over by the central executive. It creates interface between different systems; it holds multimodal information and it can combine it from the long-term memory the three slave systems to form one episodic representation of the received input. This system is assumed to be a passive one since it integrates input across space and time from several sources. That is, its function is to display input after its manipulation at other levels. Indeed, this system is able to isolate LTM information even if it is separate from the LTM store; this

isolation is what helps the episodic buffer in transferring information into working memory (Baddeley 2000, 2008).

Some experimental studies are at the origin of adding the episodic buffer to the tripartite model. According to Baddeley (2000), some of them have faced a problem at the level of the phonological loop; researchers could not explain how one can recall visually what is presented verbally at the same time that articulatory suppression is taking place since it disrupts input's rehearsal which results in the failure of its storage. Another negative issue about the model is the fact that Neath and Suprenant (2003) have unexpectedly found in their study that participants can recall a limited amount of knowledge even when memory span is altered. In some other contexts, the episodic buffer has proven to combine STM and LTM; participants have shown that they can recall serial sentences better than single items, something which cannot be explained in the limits of the phonological loop capacity. This, therefore, implies that LTM is accessed where information is chunked. This could not be possible when there is no specialized system of chunking from the STM that accesses the LTM (Baddeley, 2000). These cases have driven Baddeley's attention to the fact that there should be another system to operate for serial recall and several input storage when the slave ones are not and that is not restricted to any of the previously stated systems. This is the domain-general system that performs across memory components that he labels the *episodic buffer* (Baddeley, 2000, 2008).

### **2.5.2 Gathercole and Pickering's model**

Working memory and short-term memory are temporary limited capacities that are very close to each other; however, some researchers, like Gathercole and Pickering, emphasise on the importance of distinguishing between both capacities. They put that working memory tasks are more effort consuming for the central executive than STM ones since they target mental resources

that are made for active performance. In addition to that, working memory's function is essentially to store and to process information; however, STM is concerned with the transient storage of domain-specific information (Alloway, Gathercole and Pickering, 2006; and Gathercole and Pickering, 2000). These views have been based on some theoretical and empirical bases and have changed some researchers' definition of working memory. It is, then, viewed as a space where information can be stored while some mental tasks are being performed (Gathercole and Pickering, 2000). This has made them reconsider Baddeley's model by proposing an alternative model that considers, separately, STM as a system for storing and recalling information and working memory as a processing capacity.

This Baddeley's model alternative holds that WM and STM are two distinct systems. Their functions and demands on the central executive differ from one system to the other. Working memory is a domain-general component that backs up visuo-spatial and verbal WM. It is a robust storage and processing system. First, visuo-spatial WM is the transient capacity of the central executive the function of which is to process and store different types of spatial and visual input. Second, verbal WM, expectedly, stands for the central executive's limited capacity system that handles storage and processing issues of verbal input. As far as its measurement is concerned, WM is assessed using, most commonly, different span tasks that concentrate mainly on working memory capacities of storing and processing related or unrelated information simultaneously (Gathercole and Pickering, 2000).

Conversely, STM is a domain-specific capacity. Nevertheless, like WM, it is the composite of visuo-spatial and verbal capacities. Its function is to, passively, retain verbal information in the phonological loop. Additionally, it stores visual and spatial information in the system of visuo-spatial sketchpad. Contrarily to WM that is called upon for challenging tasks, STM can handle

only those no-processing tasks. It can also serve situations of storing serial information or holding passively tiny amounts of information that can be recalled serially. About its measurement, STM ability requires much less challenging tasks; they assess one's capacity to store information for a brief period of time (Gathercole and Pickering, 2000).

Later in time, Alloway and Gathercole (2006) have sought further evidence through empirical ground to confirm what is previously stated. They have found that the central executive is the main resource that backs up WM processing components, while STM components depend mainly on less active resources as the verbal and visuo-spatial ones.

### **2.5.3 Engle's model**

This model of working memory is based on individual differences. Engle's view of working memory is more functional than developmental; it considers working memory as a capacity that controls attention (Kane and Engle, 2002). This model holds that working memory system is made up of a store that consists of LTM traces that are over activated, processes that ensure the occurrence and the maintenance of such activations, and the system's content-free resource (Kane and Engle, 2000). What they mean by individual differences are the abilities that differentiate an individual from another in terms of the attention control; this, in Baddeley's model, is called the *central executive* (as cited in Engle and Kane, 2002). Executive attention, in this context, is important in working memory since it helps in maintaining single and multiple mental representations active and in a practically retrievable form (Engle and Kane, 2004). Engle and Kane add that by

“executive attention” we mean an attention capability whereby memory representations are maintained in a highly active state in the face of interference, and these representations may reflect action plans, goal states, or task-relevant stimuli in the environment. Critical

to our view is that, while the active maintenance of information can be useful in many situations, it is most necessary under conditions of interference. This is because in the absence of interference, task-relevant information or goals may be easily retrieved from long-term memory as needed. Under interference-rich conditions, however, incorrect information and response tendencies, are likely to be retrieved, and so such contexts set the occasion for the reliance on active maintenance of information. (Kane and Engle, 2002, p. 638)

In an attempt to check whether working memory is a domain-specific or domain-general capacity, Turner and Engle (1989) have investigated the correlation between working memory tasks and comprehension tasks. Although WM tasks' content varies between verbal and numerical data, the results show that all types of WM tasks correlate with those of comprehension; verbal and non-verbal capacities are found to be equally important in comprehension. On the basis of these results, Turner and Engle (1989) put that WM ability is a content-free capacity.

Subsequently, other studies have focused on interpreting individual differences in working memory by taking it into account as a domain-general capacity. The focus in these empirical studies is mainly on individual differences as being represented by differences at the level of available activation that ensures retrieving information from LTM, instead of differences at the level of processing abilities. In one of these studies, Engle, Cantor and Carullo (1992) have examined the system's processing time in tasks that require storage and those that do not. The results show that even when information processing time is steady, comprehension is still well predicted using the storage system.

To explain what WM really represents, Cantor and Engle (1993) suggest that it is based on the LTM items that are critically activated above the required amount, regardless of the task type.

The way knowledge is processed depends on the amount of its activation. To back this up, some studies have shown that because the amount of activation is limited, the number of available mental representations is similarly limited (Cantor and Engle, 1993). Similarly, Conway and Engle (1994), in parallel with the findings of Pascual-Leone's (2000), have shown that individual differences are expressed in different ways according to different situations. In some cases that require interference, the difference between high and low spans is remarkable even though activation limits of these spans are the same out of these competing conditions. This leads researchers to assume that individual differences are represented by their differences in the amount of activation, as stated previously, and the control over attention that keeps participants concentrated on the current task goals by avoiding interference, prohibiting irrelevant knowledge, reinforcing goal maintenance and discarding automatic processing. In sum, WM individual differences are reflected in their differences at the level of activation and inhibition (Kane and Engle, 2000; and Kane and Engle, 2003).

There is a variety of working memory models that could have been discussed in this chapter, but the ones that are selected are considered to be the most relevant to the aims of this research. Other theories, like those of Case or Pascual-Leone, are mainly based on the formulation of developmental perspectives/predictions of working memory through different life stages; that is not this study's concern. Conversely, the discussed models are regarded to be more relevant since they tackle mainly models that are adult experiment-based theories, like Baddeley and Hitch's and Gathercole and Pickering's models, and other models that are mainly based on individual differences. That is the main point of these models review is to explain WM concept moving from its hierarchical structure view (models of Baddeley and Hitch's, and Gathercole and Pickering's theories) to the domain-free one (Engle's theories).

## 2.6 Working memory assessment

Models of working memory consider this concept as a set of cognitive architecture and processes that enable the storage and manipulation of knowledge while performing complex cognitive tasks. This has resulted in designing a variety of methods that can be used to measure WM capacity. These tools take the form of span tasks that involve the storage and the processing of information to predict participants' performances in cognitive tasks, be it higher-order or lower-order activities (Kane, Bleckley, Conway, and Engle, 2001). The WM capacity measures that are widely used in cognitive psychology are counting span, operation span, and reading span tasks. Anderson and Lebiere (1998) note that these measures are methodologically reliable and valid; this explains, to some extent, why these tasks dominate the measurement landscape of WM studies. In fact, this section is devoted to reviewing Reading Span tasks and Operation Span tasks since there is more data for these tasks and they are the tasks used in this paper; they may serve as research tools for any researcher.

The WM span tasks are based, primarily, on Baddeley and Hitch's models of working memory that emphasise on the functional abilities of a WM system that stores information temporarily to use it in the current cognitive information processing. Consequently, these measures are used to assess storage and rehearsal capacities as well as the simultaneous processing of new information (Daneman and Carpenter, 1980). These tasks often present participants with some to-be-remembered items (digits, letters or words), in addition to a secondary processing task/activity which is a distracting task (understanding sentences, calculating operations or verifying equations) (Conway *et al.*, 2005).

The first task that has been developed to target storage and cognitive processing capacities is the Reading Span Task, designed by Daneman and Carpenter (1980). First, his task requires

subjects to read sentences and check their accuracy (this is the simultaneous processing); this prevents the participants from concentrating only on the to-be-remembered items and escape the processing part of the task. Additionally, they are required to remember the last word of each sentence. These sentences are grouped into fifteen sets of three sentences. The number of sentences that make up every set range from two to six sentences (Daneman and Carpenter, 1980). Later, this task has been modified to be even more reliable. In this version of Engle, Tuhloski, Laughlin and Conway (1999), a change has been made at the level of the to-be-remembered item. For them, the word to be remembered should be a new word that is independent from the sentence and that comes right after each sentence. This is due to the fact that it is possible in some cases that participants can remember the words with the help of the general idea of the sentence, not thanks to the episodic memory recall. In some other versions, every sentence is followed by a letter instead of a word (Kane *et al.*, 2004)

Other span tasks have been designed following the creation of the Reading Span Task and they aim, similarly, at measuring the participants' ability to remember items and process information simultaneously; the Operation Span Task is no exception. Created by Engle and his colleagues, this task is slightly different from that of Daneman and Carpenter (1980); however, the general premise is the same and task demands are unchanged. In this task, mathematical operations have replaced sentences in Daneman and Carpenter tasks; however, the number of sets, series and tasks is still the same (15 sets of operations with an increasing number of math operations and words to recall in each set; they range from 2 to 6). Participants are asked to read and verify a math equation and then to read and remember a word that is displayed right after the math operation. In doing so, Turner and Engle (1989; Engle *et al.*, 1999) have proved that it is possible to predict participants' verbal abilities and reading comprehension even though these tasks that do not require



sentence reading. They argue, then, that this means that there is a general supply of resources that can be used in several WM situations.

WM span tasks have been used to measure WM capacities of thousands of participants in more than a hundred researches. This implies that such measures are reliable and valid to some extent. To state it differently, they measure at an average level of accuracy what they are supposed to measure. In addition to that, they correlate with higher level cognitive activities such as reading comprehension, listening comprehension, writing, reasoning and vocabulary learning. Similarly, they correlate with lower order attention and perception tasks (Conway *et al.*, 2005). This makes them useful research tools that may, later in time, inspire the development of further and better research tools to measure WMC in cognitive psychology and other branches.

## **2.7 The difference between WM and STM**

Considering the different definitions and models that contribute to the understanding of what working memory is, two categories of researchers and psychologists can be distinguished. On the one hand, some experts see that WM and STM can be used interchangeably to mean the same concept or to refer to one of the two as the subcomponent of the other. On the other hand, some psychologists strive in complete opposition and consider that these two capacities are two distinct constructs. In the context of this research, the second view is adopted to choose the appropriate measures that would help in testing the study's hypothesis. This stand is based on the fact that several differences, as stated by Dehn (2008), exist between WM and STM. They are summarised as follows:

1-STM maintains input passively, while WM processes it actively.

2-STM is domain-specific capacity, whereas WM is domain-general resource.

3-WM correlates strongly with academic achievements and higher-order cognitive tasks, unlike STM which does not.

4-STM activates information in an automatic way from LTM (there is no conscious activation of what is necessary for the task); however, WM targets the needed information to be retrieved from LTM.

5-WM has executive functions; conversely, STM does not have any control functions.

6-STM functions independently from LTM, while WM is inevitably dependent on LTM.

7-Unlike STM that receives and holds information from the outer world, WM retains information that results from the different cognitive processes.

It is true that STM acts as a WM system that facilitates the processing and the manipulation of input simultaneously (Neath and Suprenant, 2003). This leads some researchers not to discriminate between the two systems and to consider their measurement to be effectuated using the exact same tasks/tools. Nevertheless, they are different systems and STM is constantly discussed in WM models for the fact that it is an important subsidiary system.

## **2.8 Working memory and reading comprehension**

Working memory makes a vital contribution to classroom learning. In fact, it is a key factor that supports learning over early school years, and it goes into adulthood. WM is necessary because it enables the storage of information at the same time other cognitive processes are taking place in classroom tasks; this, in fact, guaranties the acquisition and the development of higher-order cognitive skills. Young pupils, like adult learners, would fail in complex cognitive activities when they struggle with their WM capacities; their learning would be disrupted and delayed. One of these higher-order skills working memory purportedly contributes to is reading comprehension (Engle, 2002).

The previous chapter has presented a selection of reading comprehension models in which working memory capacity is more or less called upon (mainly in Kintsch's Construction-Integration (CI) Model and Just and Carpenter's Capacity-constrained (CC) Reader Model). Although WM capacity is operationally viewed differently, all models stand for the fact that it is central in the explanation of reading comprehension abilities. Reading comprehension requires, to a great extent, the abilities to maintain and process information that help the readers to create coherent mental representations of what is being read. WM capacity is, thus, seen as a major determinant of reading comprehension since it coordinates the different processes of reading comprehension (Kintsch and van Dijk, 1978). In this section, more attention is given to the relationship that exists between working memory and reading comprehension.

Working memory capacity is seen as a major reading comprehension determinant that is responsible for the executive control of the different reading process components. It controls information processing and storage and simultaneously retrieves information from LTM. This explains why WM capacity is required to build situation mental models. To put it differently, building text-based models require a recognition of the different text structures (Micro and Macro). When the text is clear, the situation model can be successfully mapped; however, when it is not, extra knowledge needs to be retrieved from LTM to complete the propositions that are derived from the text. This whole process helps the reader understand the text (Westby, 2004). These comprehension processes relate clearly to Baddeley and Hitch's WM model. It holds that when, at some points of reading, attention is required more than automaticity, huge demands are put on WM to build coherent text representations (Westby, 2004). By the same token, Vukovic and Siegel (2006) put that the reader is required to identify words, extract their meaning and use it for further inferences and correct any wrong meanings that are not coherent with what is being put in the text

using self-monitoring strategies; all these should be done simultaneously. In going through these processes, Baddeley, Wilson and Watts (1995) note that STM and WM is essential for text understanding and WM, specifically, is of a paramount importance to control and facilitate the cognitive processes and to store the final product.

According to Vukovic and Siegel (2006), research works on the relationship between reading comprehension and WM focus mainly on readers with disabilities in WM and Reading comprehension. Thus, very few researchers tackle the issue in normal reading contexts. These few studies are mainly researches that focus on the relationship between reading comprehension, WM and other influential factors that are involved in text understanding. Other researches have focused greatly on explaining poor comprehension in some readers by WM disabilities. In addition to that, some studies are more interested in investigating the impact of WM measure on written language comprehension.

For a research to be efficiently investigating the relationship between reading comprehension and working memory, both variables have to be shown to correlate with each other with control of other variables. An example of such researches that explain directly how contributive WM is in reading comprehension is that of Cain, Oakhill and Bryant (2000). Their research has revealed that 11.4% of the variance in text understanding is mainly influenced by high verbal WM, while other factors (word identification, vocabulary knowledge) are controlled. Four years later, Cain, Oakhill and Bryant (2004) have found out, in another research, that up to 69% of the variance in reading comprehension goes back to readers' verbal and numerical WM while factors like vocabulary capacity and word identification are controlled. A different version, that of Vukovic and Siegel (2006), has reproduced similar findings; it has revealed that WM contributes enormously in reading comprehension while factors such as rapid naming and

phonological awareness are controlled. Further studies have confirmed the relationship between a linguistic measure that includes verbal and numerical WM and text understanding (Seigneuric, Ehrlich, Oakhill and Yuill, 2000; and Swanson and Howell, 2001). However, Seigneuric *et al.* (2000) put that numerical WM is not as influential as verbal WM on reading comprehension since, for them, WM processes that are mostly needed in text comprehension are mainly specific to language processing. These findings explicitly show that verbal and numerical WM are contributive to text comprehension to different extents.

Some studies on reading have shed light on the importance of verbal WM, much more than that of visuo-spatial WM, in explaining reading comprehension abilities (Swanson and Siegel, 2001). They put that a strong positive relationship between verbal WM and reading comprehension is established, while a correlation between visuo-spatial WM and reading comprehension is not approved. Nevertheless, the combination of linguistic and visuo-spatial WM has proven to play a crucial role in text comprehension variance since language variables, on their own, cannot explain the relationship between text understanding and WM capacity (Vukovic and Siegel, 2006).

This being said, studies that explain reading comprehension variance in relation to WM have been focusing on the nature of this relationship; does it reflect a language-based or general system? Linguistic (verbal and numerical) and non-linguistic (visuo-spatial) WM have been spotted to be predicting, to different degrees, reading comprehension capacities.

Poor comprehension has been the core of many other studies in the field of reading. Some of these studies have focused on WM capacity in poor readers who do not have word identification problems. Cain, Oakhill and Bryant's (2000) study has shown that poor comprehenders do not struggle with lower-order processes such as word identification or phonological awareness; however, they meet difficulties when processing at a higher level since huge demands are put on

their WM. More specific explanations are put by Vukovic and Siegel (2006) who have found out that poor comprehension is not explained by deficits in lower-level processing. They have even revealed that in WM activities, poor comprehenders unexpectedly compare to and typical reading achievers. Nevertheless, poor comprehenders' verbal WM performance is lower than that of typical reading achievers, yet it is higher than that of poor readers. In the same fashion, Nation, Adams, Bowyer-Crane and Snowling (1999) have examined poor comprehenders' performance and have found out that they struggle with WM difficulties at the level of language system. Similarly, Vukovic and Siegel (2006) add that verbal WM as a specific WM language system is a major determinant of comprehension abilities; this is proved independently from lower-order processes. They add that such difficulties can be also explained by working memory's central executive power use. In other words, poor comprehenders divide their WM resources disproportionately between different lower- and higher-order processes (little is devoted to comprehension).

Given that these studies have explained poor comprehension in relation to verbal WM specifically, it is clear that their claim is mainly that a language-specific WM system, rather than a general system, is involved. Vukovic and Siegel (2006) assert that in some studies, some lower-order cognitive processing difficulties have been examined, which leads them to believe that more studies need to be conducted to clarify what is still unresolved; is poor comprehension caused by verbal WM or is this latter the outcome of poor comprehenders' language problems? Whatever the answer is, verbal WM explains, to some extent, comprehension abilities.

The third category of researches is interested in examining how WM measures correlate with those of language comprehension. Swanson, Howard and Sáez (2006) have conducted a research the aim of which is to find out about the different WM components that explain deficits

in three groups of less-skilled readers. The groups of readers are mainly: (a) readers with difficulties at the level of word identification and comprehension, (b) poor comprehenders (only comprehension deficits) and (c) poor readers that are characterized by difficulties at the level of word identification and comprehension, low verbal Intelligence Quotient. These subgroups are compared to those of good readers on WM, STM, phonological and executive processing and information processing speed measures. The findings of this study are summarised as follows:

1-less skilled readers' performance is lower than that of more skilled readers on WM and processing speed;

2-poor comprehenders perform better than readers with reading difficulties on WM, STM, processing speed and phonological processing measures; and

3-poor readers performed less than readers with difficulties on phonological processing and WM measures.

In addition to these comparisons, Swanson, Howard and Sáez (2006) note that poor performance on WM tasks in less skilled readers' groups is caused by storage system not phonological awareness problems. Furthermore, some differences are noticed between skilled and less skilled readers at the level of executive processing and storage that are not domain specific; this confirms that poor readers have a much smaller general WM power than that of skilled readers. These results reveal that, expectedly, different WM capacities lead to different reading comprehension performances. These capacities that relate directly to comprehension are mainly seen at the level of executive control.

Even though these results show how WM can explain reading comprehension, researchers advocate future studies that would explain clearly the complex relationship between text understanding and WM.

## **Conclusion**

Working memory is a central construct in cognitive psychology. It is considered as an active portion of LTM that, attentionally, stores and manipulates information, as it is also described in different models most relevant to the explanation of WM contribution in successful text processing. Thus, it is impossible to understand or explain reading comprehension without relating it to the readers' ability to store and process information simultaneously to build coherent mental representations of the text. During text processing, WM capacity helps in coordinating the different processes and levels of representation (propositional, text-based and situational models) that are created, maintained and processed. Then, to be able to build a mental coherent text representation, the reader needs to keep information active in his memory to select and retrieve the relevant pieces from his LTM. Linguistic information retrieval is needed to understand the different references to what has been encountered previously (past experience or previous parts of the text beforehand) and to follow the flow of ideas in the text. This retrieval takes place every time a word is read; the latter is, then, integrated with successive information (words, sentences and paragraphs). Thus, we can conclude that by controlling his attention, the reader must be able to maintain the reading purpose (understanding) and input in retrievable form while simultaneously reading and integrating information, avoiding any distractions and discarding irrelevant knowledge.



## Chapter Three

### Anticipation of Meaning and Reading Comprehension

*“You will get little or nothing from the printed page if you bring it nothing but your eye.”* Walter

B. Pitkin.

#### Introduction

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Conclusion

## **Introduction**

Reading is a complex cognitive task. It does not reflect a passive activity of accumulating information in the reader's brain. It is true that reading is a learning activity; nevertheless, it is an active one. In the context of foreign language learning, learners encounter difficulties in understanding some texts. Regardless of grammar, vocabulary and other linguistic requirements that are contributive to reading, this chapter is mainly concerned with the importance of reading strategies in reading comprehension abilities. Because it is impossible to discuss all the existing reading strategies in a single chapter, this study targets two important reading technique/strategies that teachers need to take into consideration if they are to help their learners with the comprehension difficulties they may encounter while processing the text. Anticipation of meaning is targeted by these strategies which help students activate their background knowledge before reading for a better understanding of the text. The teachers' role, then, is to set the appropriate pre-reading activities that activate the readers' prior knowledge. Therefore, this chapter explores the research questions by defining this section's keywords- reading strategies and anticipation. Moreover, it tackles reading comprehension issues from constructivist theories' point of view, mainly schemata theory. Furthermore, it highlights the importance of using pre-reading strategies to prepare students for a better text processing. Here, the strategies of concern are the anticipation guides and text previewing.

### **3.1 Definition of reading strategies**

Defining reading strategies may differ from one researcher to another. In the available literature on reading, they are labeled differently by scholars as cognitive abilities, techniques, conscious plans, conscious operations, language-processing techniques, problem-solving strategies ... etc. (Wenden, 1987). Strategies might be considered by some linguists to be the same

as skills; others see that they are different. To define what strategies are in general terms, Brown puts that they are “specific methods of approaching a problem or task, modes of operation for achieving a particular end, planned designs for controlling and manipulating certain information” (2007, p.119). These strategies are conscious and this helps them vary logically following the changing situations (Brown, 2007).

In the context of reading, strategies are defined “as generally deliberate, playful activities undertaken by active learners, many times to remedy perceived cognitive failure” (Garner, 1987, p.95). Using more specific words, reading strategies, according to Pani are “the mental operations involved when readers approach a text effectively to make sense of what they read... Good readers apply more strategies more frequently... and more effectively than poor readers” (2004, p.138). These definitions, then, suggest that reading strategies are of utmost importance for learners to process text effectively. This is put in the words of Brown (2001, p.306) who assumes that "reading for comprehension is a matter of developing appropriate, efficient comprehension strategies."

### **3.2 Definition of anticipation**

A huge body of evidence highlights the presence and the importance of anticipation in different cognitive tasks such as language use (Pezzulo, Hoffmann and Falcone, 2007). This concept is considered by some researchers as a strategy while some others view it as a phenomenon. DeLong, Urbach, Kutas (2005) define anticipation of meaning as a pre-activation strategy that requires readers to unconsciously building representations for upcoming concepts, features or forms that may or may not be encountered in the input. Thus, it is the prediction of source text units before their processing by the reader.

According to Posner and Petersen (1990), to be able to anticipate what is to come next, readers have to use some components that are integrated by WM, and, thus, they are able to refresh

their mental representations many times, which facilitates a better building of more coherent text representations. Nevertheless, anticipation ability is not fully explained by good WM. According to Corbetta, Miezin, Dobmeyer, Shulman and Petersen (1991), anticipation ability is the probabilistic reasoning that a reader makes starting from the knowledge stored in STM and LTM to predict, implicitly or explicitly, what will come next.

In this study, anticipation of meaning is seen as a strategy that is used by readers before reading; it enables them to activate their background knowledge and build a sort of curiosity about what is to be read. To this end, students might listen to or read some statements that include text's key issues and think about them. This is what stimulates students' motivation to read and their interest in the topic for a better and a more focused processing.

### **3.3 Constructivism in teaching/learning to read**

Philosophers have been developing several views on how we learn, think and understand for many centuries (starting from the sixteenth century). Some philosophical assumptions have been described as primarily objectivistic since they hold that the world is real and external to learners, and knowledge is a copy of reality which explains why learners are passive recipients (Jonassen, 1991). Since we are living in a fast-changing world, it is logical that many other alternatives would be developed. Such *objectivistic* views do not make the core of this section since this paper is mainly concerned with teaching/learning attitudes held in some *non-traditional* views the principles of which are more likely to lead to educational excellence in reading, namely *constructivism*.

#### **3.3.1 Description of constructivism**

Like many learning assumptions, constructivism is not new; it has its roots in philosophical, psychological and social studies such as those of Piaget, Bruner and Goodman. However, more

interest is being oriented toward this assumption lately (Perkins, 1991). Constructivism is a philosophical assumption which focuses on the fact that individuals construct their knowledge actively. Differently from behaviourism which considers learners as blank slates who receive information from their teachers, learning, under the constructivist view, occurs when they link the new information with the prior one, which is possible only when learners are actively involved in learning. Thus, knowledge is constructed within the individual, by the learner himself (Labonowich, 1998; and Tracey and Morrow, 2006).

Cognitivists and behaviourists believe that knowledge is *mind-independent*. Even though constructivists do not deny the existence of the real world, they assume that knowledge about this world requires an interpretation of one's personal experiences; it is about creating meaning, not acquiring it. To put it differently, knowledge is not transferred from the external world into the learner's memory; instead, the learner interprets the world around him using his personal experiences. Therefore, there is no objective reality that the learner wants to know since knowledge interpretations within an individual are constantly changing; knowledge is acquired in relevant contexts (Bednar, Cunningham, Duffy and Perry, 1992).

One core philosophical proposition of Constructivism is that cognitive puzzlement is a learning stimulus. Learners have a learning purpose that stimulates their knowledge acquisition in different learning contexts. In addition to stimulating their learning, learners' goals determine what they diligently work on and pay attention to and what previous experience is needed to understand the new information; this is how learning is organised (Rochelle, 1992). Piaget adds that when the new experience cannot be assimilated in existing schema, accommodation is inevitable (Piaget, 1977). Thus, learners' cognitive conflicts stimulate and organise their learning.

### **3.3.2 Constructivist theories of learning**

Constructivist approaches that are applied to the psychology of learning can be distinguished from the empiricist and the structuralist ones. Schunk (1991) asserts that empiricism emphasises on the importance of experience, as a primary source of knowledge, in marking the world structure in the individual's mind. Conversely, Paris and Brynes (1989) put that structuralism focuses on the 'innate categories' of knowing; individuals impose contexts on the outside world. Differently from these two traditions, constructivist approaches are based on individuals' transformation and organisation of the world (during the learning process) as a result to their interaction with this external world (Peters, 2001). To add to this point, Piaget asserts that "The cognitive development does not consist of passive increase of experiences, but of an active development of cognitive structures" (as cited in Peters, 2001). Thus, these views hold that effective learning is based on the learners' full/active participation in their learning content and process.

Constructivist psychology is made up of two schools: the Piagetian personal school and the Vigotskian social school. According Arends (2004), Piagetians put that learners, at any age, participate in their information acquisition process and the construction of their own knowledge. Additionally, knowledge changes every time individuals encounter new experiences; this contributes to the construction and modification of their background knowledge. In the same fashion, Piaget states that teaching/instruction "must involve presenting the child with situation in which (he or she) experiments in the broadest sense of that term—trying things out to see what happens, manipulating things, manipulating symbols, posing questions and seeking (his or her) own answers, reconciling what (he or she) finds one time with what he finds at another, comparing his finding with those of other children" (as cited in Arends, 2004, p.396). Considering these

assumptions, it is clear that constructivism in Piagetian schools is personal; no social aspects of learning are taken into consideration.

The Vigostkyan assumption, similarly to the Piagetian one, holds that learners build their knowledge when they face novel experiences and strenuously attempt to solve these problems. Here again, to understand new information and construct a new meaning, an individual has to refer to his background knowledge. Contrarily to Piaget, Vygotsky focuses on the social factors that facilitate learning; he assumes that to construct new ideas and develop intellectually, a learner has to interact socially with the other individuals (Arends, 2004). One of the social constructivist concepts Vygotsky is known for is the Zone of Proximal Development (ZPD). Arends (2004) puts that this concept refers to the existence of two distinct levels of development: actual development level and potential development level. Unlike the level of actual development that consists of an individual's ability to learn by himself, the level of potential development refers to what one can learn with the assistance of other individuals (Arends, 2004).

The principles of these constructivist theories influence the way learning is conceived. For Orlich (1998),

- 1.learning depends on the individual's background knowledge;
- 2.meaning is built by the learner himself;
- 3.learning depends on context:
- 4.learning pertains to a context;
- 5.learning occurs when individuals share and discuss their understandings;
- 6.intelligent instruction requires an understanding of the individuals' cognitive structures to help them using the appropriate classroom tasks;



7.instruction that aims at a conceptual change involves the use of many strategies and methods depending on the degree of compatibility between concepts and the individuals' understanding of them; and

8.“learning how to learn” should be focused on more than a mere accumulation of knowledge (the ‘HOW’ is more important than the ‘WHAT’ )

In the same fashion, Peters (2001) describes learning as follows:

1.learning is not a merely receptive process and it does not involve traditional models of expository teacher. Conversely, it is an individual process by which a learner is responsible for understanding and changing his cognitive structures to pave the way for effective learning to occur;

2. thinking and understanding are ‘circular’ processes, not ‘linear’ ones;

3.teachers are not required to fill learners brains with knowledge; they are supposed to encourage learners’ self-regulation in learning by providing them with the appropriate learning atmospheres (empowering individuals to learn in their specific ways).

Considering these claims, it is clear that the constructivist school focuses on the importance of learners in building their own knowledge and that of teachers in creating effective learning environment. That is to say, the main focus of classroom tasks is to teach learners following the how-to-learn process.

### **3.3.3 Constructivist outlook of reading**

As discussed previously, constructivism links the individual and the social domains of learning to make it more effective. At the individual level, learning focuses on the learner’s mind; at the social level, the emphasis is on social negotiations of meaning. Similarly, constructivist

overviews on reading are primarily based on individual meaning construction, background knowledge for understanding, contextual learning and collaborative learning (Cambourne, 2002).

Language classrooms are filled with diversity; they are made up of learners that have different cognitive abilities, cultures, learning purposes, learning problems and learning styles. These are, in one way or another, conducive to divergent reading capacities. Looking at reading from a constructivist point of view, Taberski (2000, p.3) puts that “children learning to read are active agents, initiating and assuming responsibility for their learning....[and] continually integrate new findings into their framework of knowledge about language and texts, replacing what no longer works with revised theories and fresh information.” That is to say, the individuals’ reading abilities differ, and so do their conceptualizations about reading.

At the individual level, the reading process is cognitively focused on with an emphasis on the complex mental processes of reading. Previously, more traditional views of reading have focused mainly on the reading product (what is understood or remembered after a reading task). Nevertheless, the constructive cognitive perspective considers reading as a set of cognitive processes that are involved in reading starting from lower-level decoding to higher-order comprehension operations; some of these operations are performed concurrently. The focus is, then, on what it takes a reader to build a coherent mental representation of the text, relying heavily on what s/he knows about the text topic (Sweet and Anderson, 1993).

These assumptions, therefore, show that constructivism views reading as an interactive process that requires the reader to make use of the information that is already stored in his memory to make sense of the text being read. This means that this constructivist view of reading is different from that bottom-up model in which the reader depends on small parts of the text to construct its meaning. Additionally, it is different from the top-down view that makes a reader give initially

interprets the text using the ideas he has about the topic and then confirms or rejects it through the course of text processing (Sweet and Anderson, 1993).

Additionally to the individual cognitive capacities, the constructivist view of reading emphasises on the social contexts of learning that help readers construct meaning. This view, differently from some traditional models, considers how reading comprehension and text-based learning can be influenced by classroom or teaching/learning environments as social contexts. The social school of constructivism, differently from the cognitive one that focuses on the learner's mind, emphasizes on the impact of the learning environments on different learning processes the reader's mind performs (making inferences, storing information or even retrieving information). In spite of the different considerations of the cognitive and the social constructivist schools, they do not conflict with each other; they complement each other by broadening the social dimensions of human cognition (Cambourne, 2002).

Viewing reading from a constructivist angle by considering the cognitive and the social dimensions, Cambourne (2002) summarises the constructivist conceptualisation of reading as follows:

- 1.it is impossible to separate what is learnt from the environment in which it is learned; the process and the product of learning are strongly related;
- 2.the learner's purposes of learning are essential; when reading is purposeless, attention will disappear and, thus, no effective learning will take place. Therefore, to engage actively in learning, learners must feel no anxiety while learning, believe in their learning abilities and realise the usefulness and value of what is being learned; and
- 3.the social construction of knowledge is realized with the help of 'negotiation', 'evaluation' and 'transmission.'

### **3.4 Schema theory**

To explain Schema Theory appropriately, this section defines the term ‘schemata’ and describes the different types of schemata.

#### **3.4.1 Definition of schema**

The term schema can be defined in various ways. This concept was first thought of and generated by Head in 1920 and then it was developed and defined cognitively by Bartlett in 1932 (cited in Li, Wu and Wang, 2007, p.18) as “an active organization of past reactions or past experiences.” Later, Rumelhart (1980) has introduced the concept of schema in reading to explain the crucial role of prior knowledge in text processing. He put that schema is “a data structure for representing the genetic concepts stored in memory” (Rumelhart, 1980, p.34). This term is also defined by other researchers like Anderson and Pearson (1984, p.42) who have defined it as “abstract knowledge structure,” and it is more specifically described by Medlin and Ross as “a general knowledge structure used for understanding” (1992, p.246). These definitions, put in different points in time, all agree that schema represents the background knowledge acquired through different past experiences and that is stored in memory. All these take the form of an abstract network/structure of knowledge.

#### **3.4.2 Description of schema theory**

Schema theory is an incarnation of constructivism. Similarly holding that individuals do not learn from scratch, schema theory, as a constructivist view of learning, explains how individuals use their prior knowledge and experience to understand and *create* new knowledge. In fact, Tracey and Morrow (2006) note that when a learner possesses a developed schema for a specific topic, learning new information will be much easier for him than for individuals with no rich schemata for the very same topic; they encounter more learning difficulties. These schemata,

according to this theory's principles, are units where individuals organise their whole prior knowledge and they represent a conceptual system of how knowledge is mentally represented and used (Rumelhart, 1980; and Cobb and Kallus, 2011).

A lot of researches have been conducted on schema theory and school achievements. Reading comprehension is one of these achievements that are assumed to be clearly explained by the schema theory. Indeed, while reading, individuals actively construct and modify their information and schemata (Tracey and Morrow, 2006). Schema theory supporters assume that a text does not convey meaning by itself; it directs readers to retrieve the appropriate background knowledge that enables them to construct meaning from the text. In explaining individuals' text processing, Taberski (2000) notes that "the closer the content is to their own experiences of a subject they know a lot about, the more capable they are at anticipating what will happen next – even which words might be used – and drawing implications for their own lives" (p. 3). That is to say, when readers process a text that tackles a topic that they are familiar with and knowledgeable about (past experience), they are more likely to predict what is to come next and, then, struggle less with text comprehension. In the same fashion, Cobb and Kallus put that "a reader comprehends a message when he is able to bring to mind a schema that gives a good account of the objects and events described in the message" (2011, p.97). This theory has gone later beyond the mere explanation of objects and events understanding to the precise relationship between them (Cobb and Kallus, 2011).

That being said, reading is affected by individuals' personal experience. It is clear that since readers construct meaning while reading by simultaneously integrating the new knowledge with the relevant developed schema and modifying it, learning, according to schema theory, differently from behaviourism, is not observable; it occurs internally and the individual is the one

who controls his own learning while a teacher is a mere assistant of this knowledge construction process (Tracey and Morrow, 2006).

### **3.4.3 Types of schemata**

Readers' schemata are ordered hierarchically, from the most general, at the top, to the most specific, at the bottom. On the basis of the nature of their contents, different types of schemata can be distinguished: (a) formal schemata that relate to the text structure/genre, (b) content schemata that relate to the text content, (c) cultural schemata that relate to cultural knowledge, and (d) linguistic schemata that relate to grammar and vocabulary aspects of the language in use (Urquhart and Weir, 1998).

#### **3.4.3.1 Formal schema**

Also referred to as lexical schemata (Swaffar, 1988), it is defined by Carrell and Eisterhold as the "background knowledge of the formal, rhetorical organizational structures of different types of texts" (1983, p.79). To put it differently, this type of schemata includes knowledge of the different ways texts are presented including their organization, grammar, vocabulary and degree of formality. According to Carrell (1984), formal schemata are abstract, encoded, coherent structures of different text organizations (meta-linguistic, textual and discourse) that help readers in constructing meaning while reading. That is, when individuals know about text genre, they are guided to make expectations about text content which facilitates written discourse comprehension. For example, when readers process a text that tells a story, the schema underlying text genre is composed of: (a) a setting, in which different aspects of the story like characters, time and place are recognized; (b) events, that take the form of episodes; and (c) a reaction. Therefore, knowing how this genre's structure differs from many others helps readers, to some extent, understand what

they read. Nevertheless, this type of schemata is less powerful than the other types of schemata in terms of facilitating text processing (Carrell, 1984).

### **3.4.3.2 Content schema**

Content schema, also labeled concept schemata (Swaffar, 1988), according to Carrell and Eisterhold, relates to “background knowledge of the content area of the text” (1983, p.80), or the topic being discussed in the text. Actually, it includes familiarity with the topic (knowledge about what generally happens in similar conditions and how episodes connect with each other to create a coherent image), past experience in the domain or even knowledge about culture. Content schema helps in text processing since it includes knowledge about the text’s content domain. It is a large set of episodes that relate to specific events. For example, the schema for travelling might include information about the airport, customs, luggage, planes and so on. Furthermore, content schema is not a mere combination of syntax and vocabulary; it constitutes of different language culture levels that help readers catch up on language difficulties by making predictions and choosing appropriate information to process texts efficiently. Thus, it can be largely culture-specific and, consequently, cultural schemata are classified as content schemata (Carrell, 1983).

Content schema is considered to be more influential on reading comprehension than the formal one. Many studies have found that knowledge about the topic has a great and direct influence on text processing. That is to say, to become a good text comprehender, an individual is supposed to know a lot about the texts’ topics and fields; a richer background knowledge guarantees a better understanding and storage of text information (Carrell and Eisterhold, 1983)

### **3.4.3.3 Cultural schema**

Brooks (1968) refers to culture as “the individual’s role in the unending kaleidoscope of life situations of every kind and the rules or models for attitudes and conduct in them [...] What is

important in culture [...] is what one is expected to think, believe, say, and do [...] in typical situations” (p. 218-221). For Fleck (1979), culture is a formation in a group of individuals who have similar experiences with other individuals belonging to the same community; these individuals are “mutually exchanging ideas or maintaining intellectual interaction” (p. 39). That is to say, people belonging to the same community share similar assumptions about its laws, traditions, ideas and so on, and these cultural assumptions are internalised in their mental patterns, which are cultural schemata.

In fact, knowledge about culture is important in reading comprehension. Steffensen, Joagdev and Anderson (1979) note that readers make culturally acceptable interpretations when the texts they read are from their culture. Conversely, when the texts being processed are based on a different culture from their own, their interpretations are more likely to be misshapen. Similarly, some studies have shown that a text can be interpreted differently by different groups (Steffenson *et al.*, 1979), and other researches, like that of Johnson (1981), have demonstrated that text ideas interact with readers’ prior cultural knowledge; this explains why texts that are based on the reader’s culture are better understood than those containing less culturally-familiar information. Thus, cultural schemata are more likely to be triggered when readers come through culturally-related ideas/knowledge; this awareness about culture is what leads to efficient or even total comprehension.

#### **3.4.3.4 Linguistic schema**

According to Eskey (1988), the term *linguistic schema* refers to the individuals’ knowledge about or proficiency in language grammar, vocabulary or even idioms; thus, they are the basis of formal, content and cultural schemata. Linguistic schemata are of a paramount importance in reading since they facilitate text processing. Eskey notes that “good readers are both decoders and



interpreters of texts, their decoding skills [sic.] becoming more automatic but no [sic.] less important as their reading skill develops” (1988, p. 94). This can be explained by the fact that “Language is major problem in second language reading, and that even educated guessing at meaning is no substitute for accurate decoding” (Eskey, 1988, p.97). Therefore, it is not possible for the reader to comprehend if decoding takes place in the absence of linguistic schemata; effective decoding skills are necessary for comprehension. That is to say, the more linguistic schemata an individual possesses, the better his text processing (comprehension) will be.

What these schemata share, in addition to their contribution in reading, is the fact that they are not stable; they change through time and experience (Davies, 1995). Individuals’ mental maps develop as they get older. For example, at a younger age, a child’s schema of what a dog is quite uncomplicated; he conceives this animal as a white domestic one he can handle and play with. Through time, this child, who automatically grows up, will go through different experiences and, thus, his knowledge about dogs will be richer; he may make a difference between different types/races, learn how they can be taken care of or even understand what they have to do or not to do to live longer. This explains how different schemata can be modified through time and experience (Comprehension instruction, 2000).

#### **3.4.4 The importance of schematic knowledge in anticipation**

Earlier in this chapter, the importance of schemata in reading has been raised. In fact, readers cannot attempt to understand print if they do not possess a good schematic knowledge. Hence, if the readers do not use their schematic information to anticipate what is to come in the text (prediction), their text processing would be almost impossible. O’Mally and Chamot (1990) note that a reader’s schematic knowledge helps him understand by guiding his anticipation/prediction. To put it differently, when a reader uses his prediction skills, he thinks

about some possible ideas (hypotheses) to be encountered in the text and eliminates some other alternatives; this, then, results in fast, less time- and energy-consuming reading. Later, the reader becomes more attentive by selecting his proves that prediction helps the reader becomes more attentive in his anticipation by focusing only on what has not been anticipated (anticipation by elimination). This proves, therefore, that the lack or total absence of schematic information leaves the reader with no prediction power and, thus, he is less likely to be successful in processing the text.

### **3.4.5 The role of anticipation in background knowledge activation**

According to Li and Cheng (1997), schemata activation is the process during which the text stimulates the reader to take a given direction and look for a specific schema in his memory to involve it in the reading activity. In fact, the use of words and text titles might signal a specific schema. The latter, according to Shuying (2013), can be affected in two ways. When a stimulus is sufficient for schema activation, the entire schema is activated. Nevertheless, some stimuli might not be highly suggestive of a specific schema and would just activate a slot that fits into several schemata. As the reader is presented with an increasing number of stimuli, the number of possibilities will decrease and the readers' attention would be directed to what the writer anticipates.

Shuying (2013, p.131) puts that "The other way textual stimuli affect schema is that an activated schema will give schema-specific significance to some of the textual stimuli which otherwise do not have much obvious connection to one another." To put it differently, text stimuli, once a schema is activated, are assigned the same significance even though they are not related to each other. She gives the example of the terms 'apron' and 'chair' that are *arbitrarily* related and one of their suggestions might be 'kitchen schema;' however, reading 'brush' and 'clip' can more

logically suggest 'haircut schema'. When the latter is activated, 'apron' and 'chair', as textual stimuli, "will be given a schema-related interpretation" in addition to recalling many other items that can be suggested by the previously stated stimuli such as shampoo, brush...etc. (Shuying, 2013, p.131).

Anticipation, like many other strategies, is an effective means to prepare the reader's mind for his reading task. In fact, the reader tries to set a hypothesis or many and then approaches the text to see if he can confirm them or not (Manya and DeLeew, 1965). Setting hypotheses leads the reader to activate his prior knowledge that takes the form of alternatives. After confirming or rejecting his hypothesis, the reader has to save the new knowledge and enlarge the schema knowledge or to replace and modify what is irrelevant or useless (O'Mally and Chamot, 1990).

According to Dutta, readers must use "their experience of the world, as well as their imagination and intelligence" to be able to read effectively (1994: 39). That is, additionally to individual's intellectual abilities, anticipation helps the reader to be actively involved when approaching a text; it makes him bring his background information and relate it to the knowledge the text offers to better his comprehension. To this end, the reader needs to make use of many text items to be able to predict/anticipate what is to come in the text: title, keywords, warmers, and illustrations (Dutta, 1994).

First, the title, in many cases, represents the summary of the text's content; it helps the reader build expectations about the topic to be actively engaged in the text. Nevertheless, in many other reading contexts, text titles are metaphoric. This results in making incorrect predictions since the reader will activate the irrelevant schemata and, thus, it leads to a later processing confusion in readers. Second, to be able to anticipate appropriately, readers have to make use of keywords; the vocabulary used in the print helps readers make predictions about text's content. This can be

applied with the help of teachers who can provide students with a list of keywords that relate to the text to enable their background knowledge activation. Third, Dutta (1994) suggests warmers that facilitate prediction. They can take the form of quotes or proverbs that invite the learners, before they start reading, to think about and discuss the topic. Like other prediction elements, this one helps readers activate the relevant schemata if they understand the warmers content. In case they do not get the gist of these warmers, a classroom discussion is more likely to make them exchange ideas and target more relevant schemata. Finally, illustrations, that generally take the form of pictures representing the general theme, are useful in making readers' anticipate what is to come in the text effectively. Similarly to titles, pictures might be misleading since, in some cases, they are used to grab the attention of the reader instead of giving him hints about the text's content (Dutta, 1994).

### **3.4.6 Schemata instantiation**

The term schema instantiation is defined as “the particularized representation of the general abstract and stereotypical schemata which the reader brings to task” (Shuying, 2013). In fact, a schema contains a ‘slot’ for each item that relates to the general knowledge structure. Those slots help the readers establish the connection between some elements. In fact, the reader is concerned with creating a link between appropriate schemata and text stimuli. However, what the text suggests does not always fill the slots; the reader might need to supply their own ingredients. As the relations between text elements and slots are constructed, the reader starts to comprehend the print. Therefore, when schemata slots are filled appropriately with “enough particular case, a schema is said to be instantiated” (Shuying, 2013, p.131). Before this instantiation takes place, the text representation cannot be mentally coherent (meaningful). To put it differently, Anderson, Reynolds, Schallert and Goetz (1977) put that text comprehension requires extracting knowledge

from the text and schemata until different slots are linked as one schema. Shuying (2013) notes that reconciling schemata is required to reach a semantic completeness. She illustrates this situation using the following sentences:

- He picked up his axe.
- He held it softly for a moment and blew sharp notes through its bell.
- The crowd listened and cheered him; they loved his saxophone playing.

The first sentence reading and interpretation lead to a specific schema production. When the reader continues reading and processes the second one, the constraints of 'blew', 'sharp notes', and 'bell', from the second sentence, and that of 'axe', from the first sentence, are not reconciled. This situation leads the reader to one of the two decisions; either to dismiss the *initial* schema or to attempt to reconcile the two sentences. Reading the third sentence, then, may create such schemata reconciliation by interpreting 'axe' as an instrument of jazz. The reader might, alternatively, keep the schema from the first sentence and impose an incorrect reconciliation. The mental image of text sentences is much more complicated than the mere words suggested in the text. Therefore, the first representation is more likely to be strong and, then, less likely to be interpreted. Solving this issue requires filling enough slots that would give meaning that leads to reconciliation. Here, the image is reconciled and, consequently, no new information can fill slots and contradict the already instantiated schema (Shuying, 2013).

That being said, schemata theory seems to neglect the fact that reading takes place in different contexts with different reading purposes. Thus, readers might be focusing on their reading skills and neglecting, at the same time, the required linguistic knowledge. Nevertheless, this theory is effective in explaining and helping the reading process, especially that readers think wrongly that texts can be read in the same way. That is to say, schema theory makes learners move from

lower-order sensory thinking to higher-order imaginative thinking; putting hypotheses before reading and aiming at confirming them involves the readers actively in the text processing task. This, actually, can be possible through the use of effective reading strategies.

### **3.5 Local and global reading strategies**

Reading is a complex process that requires the interaction of a variety of factors to build comprehension (Swaffar, 1988). Carrell (1984) and Taglieber, Johnson and Yarbrough (1988) note that local factors like vocabulary familiarity degree and text grade-level readability influence, to a great extent, readers' text processing. More than that, readers' motivation to read, interest in the topic, gender, age or level of language proficiency affect paramountly students' text understanding (Grabe and Stoller, 2001).

Without neglecting the previously-stated factors, many others, according to SLA researchers, are mainly related to the different reading strategies that guide readers for a better text processing. They are categorised, according to Barnett (1988), into two types; word-level and 'text-level strategies. Bernard and Hosenfeld refer to these terms, respectively, as local and global strategies (cited in Barnett, 1988, p.150). On the one hand, when using local strategies, readers make use of context clues to guess the meaning of unfamiliar words, recognise words' grammatical categories, follow reference words and construct meaning using word families and word composition (Barnett, 1988). For Carrell (1984), these are bottom-up/local are data-driven strategies that help in information processing; however, top-down/global strategies are more conceptually-driven techniques. Barnett (1988) explains that, on the other hand, global strategies make readers look at a text as a whole. These strategies include prior knowledge accessing, anticipating/predicting, using titles, keywords and illustrations, reading with a purpose, scanning and skimming.

It is true that, text-level and word-level strategies should be used simultaneously when approaching a text. Unfortunately, traditional methods of teaching reading have mainly emphasised on local strategies (Carrell, 1984). Nevertheless, research has started, through time and for several decades, to speculate about reading from both perspectives, the global and the local ones (Barnett, 1988; Carrell, 1984; and Swaffar, 1988). Unfortunately, this section, because of space limitations but not lack of interest, emphasises on global reading strategies that readers employ to access and activate their background knowledge that would, hopefully, result in more effective anticipation and, thus, better text processing.

### **3.6 Constructivist reading instruction**

Constructivist reading instruction holds that one crucial function of the teacher in classroom is to aid his learners activate, modify and store to build on their existing schemata. This is further explained by Schema Theory that has a variety of implications for reading classrooms (Cobb and Kallus, 2011). These assumptions are mainly about the teacher's role as a guide to help readers activate their background knowledge that smoothens their reading process. Moreover, when this knowledge is absent from readers memory, the teacher can help them, using specific tasks, build this necessary information. Teachers are supposed to think about designing classroom activities that aid students to recall what they already know when they interact with the text. They are also expected to understand that readers who struggle when approaching a text might not suffer from cognitive deficiencies; this may be due to a lack of schemata that relate to the text's content. Taking these into consideration, teachers would help students understand they are not blank slates; they possess a plethora of knowledge and experiences in empowering students to learn to love reading (Cobb and Kallus, 2011).

To help these readers become more independent, additionally to presenting them with the inner workings of a skilled reader's mind, teachers need to teach students a set of concrete strategies to comprehend effectively and independently what they read. Schoenbach, Greenleaf, Cziko and Hurwitz (1999, p.74) put that less skilled readers have to be shown the importance of "[...] reading with (their) mind as opposed to just reading with (their) mouth." Teachers, using these specific strategies, show readers that reading starts before they have a text in their hands. Similarly, Beers notes that

[...] comprehension begins prior to reading and extends into the discussions they have after they've finished reading. Many dependent readers think of comprehension only as answering questions correctly after reading the text. That's too late. Pre-reading strategies that focus on active engagement with the text help struggling readers do what good readers do—think all throughout the reading process, not just at the conclusion. (2003, p.101)

The concept of reading, then, would be that it is a process that necessitates critical thought before engaging the text as it requires it during and after reading. This chapter, nevertheless, is concerned with those strategies that are mainly used before reading since they are more likely to be neglected or even ignored by some teachers or students.

### **3.7 Overview on pre-reading activities**

Pre-reading activities are used to activate readers' knowledge about the text's topic, to prepare them linguistically to receive the text's message and to foster students' motivation to process the text (Celce-Murcia, 1991). These tasks, according to Tudor (1989) are labeled "enabling activities" since they represent the reader's background that helps them process their text effectively. To put it differently, these tasks present the readers with the reading purpose and help them construct the background that is essential to deal with text's form and content. Therefore,



pre-reading activities are used to elicit background information and direct readers' attention to relevant backup.

Greenall and Swan (1986) suggest many pre-reading techniques that activate the learners' background knowledge through using pictures, videos and role-plays. Each technique is more effective in a specific reading context and with specific readers' needs (Carrell and Eisterhold, 1983). These techniques are considered to be less formal for some researchers who see that academic settings require more formal pre-reading tasks; they are mainly summarized by Celce-Murcia (1991) as word association activities, topic discussion and text surveys.

To start with, word association activities get the students involved in the task by suggesting the ideas that cross their minds when the text topic is announced. These propositions are organized on the board in the form of semantic mind maps that link ideas to each other in some logical ways. In addition to that, strategies like discussions make the students think about the topic and exchange ideas with their classmates in order to activate their prior knowledge and develop their knowledge about the text. These discussions can be merely based on some questions that relate to the topic or through the use of 'anticipation guides' that include a series of provocative statements that target some of the issues tackled in the text and challenge the readers' knowledge about the text's content (these guides are the core of the next section). Nuttal (1982) adds that classroom discussions provoke an interaction between the students and the text, and they teach the students how to think critically about the topic since they exchange ideas with more skilled readers (they can take place in small groups). This technique works with learners at all levels, and students can even discuss the topic in their mother tongue if they do not master the target language. The third type of pre-reading techniques is text surveys. These activities work with many reading settings, but they are

often used with longer pieces of writing (for example, a whole section or chapter of a book). This task helps the readers recognise the text's structure and its key points (Celce-Murcia, 1991).

Differently from Celce-Murcia (1991), Tudor (1989) suggests other types of pre-reading tasks: (a) pre-reading questions that are answered *after* reading a text, (b) pre-reading questions that activate learners' prior information about the text content, (c) pre-reading content organisers (such as maps and summaries), (d) anticipations that are based on text titles, keywords, illustrations or skim reading, and (e) integrated preparation using all of the previous tasks. In a partial agreement on Tudor's categorization of pre-reading tasks, Taglieber (1988) assumes that the use of illustrations to provoke readers' predictions and the use of pre-reading questions are more effective than vocabulary pre-teaching in fostering students' comprehension of a text. This is interesting for Taglieber (1988) in the sense that good background knowledge helps readers use 'contextual clues' even in the presence of some sort of vocabulary lacuna. Since, in this chapter, the focus is mainly on the role background knowledge plays in facilitating text processing, anticipation guide and text previewing strategies, as two useful pre-reading strategies, are discussed in the coming sections.

### **3.8 Anticipation guide strategy**

Pre-reading strategies, as explained previously, aim at presenting the readers with the reading content before they approach a text; they offer them a chance to stimulate their prior knowledge on the topic in question. These strategies, thus, explore the core of the text and analyse its features for a better information organization; this is what helps students learn with increasing retention rates (Kozen, Murray and Windell, 2006).

### **3.8.1 Description of the anticipation guide**

Anticipation guide strategy was first introduced by Herbert in 1978 who aimed at making readers actively involved in their reading activity by making predictions about what they read before they approach a text (Richardson, Morgan and Fleener, 2012). That is, it is an interactive strategy that initiates readers' thinking about text thoughts. Forget (2004, p.2) defines an anticipation guide as a list of six to twelve (6-12) statements that are related to the text's topic, and readers are supposed to respond to these statements. Some of them should be clearly true and others should be false, yet some statements must be challenging to the readers' perception on the content to create controversy and argument. It is important that these statements identify the key concepts of the text (Kozen, Murray and Windell, 2006). Similarly, Dornan, Rosen and Wilson (2004, p.252) consider anticipation guides as a set of statements that reflect a specific concept in the text during which readers make binary choices (yes or no, agree or disagree ...etc.) in response to the guide's statements. These responses, according to Cramer (2004), are controlled by the readers' prediction skills.

Using anticipation guides through responding to several statements, readers have to compare their thoughts with the knowledge they learn from the print. Nevertheless, what these anticipation guides do not take into consideration the fact that readers might not be able to answer using yes/no or agree/disagree; they might not be sure about the statement. In fact, Lipson (1984) has remarked that readers can respond better to post-reading statements when they are allowed to express uncertainty in the anticipation guide instead of responding inaccurately to some statements. Thus, being aware of this uncertainty makes students refer back to the text more effectively in an attempt to find answers to post-test statements/questions. That is why Merkle (1997) suggests that including an 'unsure' option to respond to the statements guarantees less

random responses and makes readers evaluate their understanding of the points in question appropriately.

As the readers process the text, they can confirm or disconfirm their previous thoughts. This can be achieved through the comparisons they make between their previous thought and those beliefs encountered in the text (Merkley, 1997). That is, readers verify their predictions. According to Duffelmeyer (1994), when the knowledge encountered does not confirm their hypotheses (it is not compatible with previous knowledge), readers may need to alter their understanding of the concept. That is how readers integrate the new knowledge with that in their schemata.

### **3.8.2 Anticipation guide applications**

Anticipation guides are a non-threatening tool since they are not scored by the teacher; this makes them effective in getting readers involved in their text processing tasks. Kozen Murray and Windell (2006, p. 199) assert that “through prediction, reaction, and controversy, the guide acknowledges students’ interests, knowledge about a topic, and personal experience.” This, in fact, makes anticipation guides effective in any content area. The statements in the anticipatory set appeal to students since they can use them as a starter for a group work during which they interact with each other, engage in discussions and, thus, and exchange ideas. This makes them feel more interested in the lesson and comprehend better what is to come next, especially in reading assignments (Duffelmeyer, 1994). In the same fashion, Kozen, Murray and Windell (2006) note that anticipation guides get the students engaged actively in problem-solving processes through the use of inquiry. That is to say, students’ discussions supply feedback that reduces the variety of alternative conceptions readers might think of when they process a text; they target the most relevant conceptions that are more likely to facilitate their understanding of the print.

Anticipation guides are considered as important study tools. They enable students to evaluate their growth or change in comprehension skills. Here, students' understanding is gauged by the hypotheses and explanations they provide and the way they process a text to confirm their hypotheses. Moreover, even teachers use these guides as an assessment tool to check the students' comprehension of the text's thoughts (Kozen, Murray and Windell, 2006). Furthermore, by analyzing one's comprehension before and after the reading activity, the teacher can, like students, understand the degree of students' awareness of the knowledge learned from the text (Kozen, Murray and Windell, 2006).

Kozen, Murray and Windell (2006) have summarized the benefits of anticipation guides as follows.

- they are used across content areas.
- they are liked by students since they are put in clear and direct forms.
- they are easily implemented by teachers in the classroom.
- they address students with different needs and abilities.
- they engage students actively.
- they work in school improvement plans.
- they can serve as study guides for students who struggle with material learning to master content.
- they can make good formative assessment tools for students' comprehension and mastery of reading content.

### **3.8.3 Anticipation guide effectiveness**

To make an anticipation guide effective in promoting comprehension and long-term storage of the text's material, some adaptations are of a paramount importance. When individual reading does enable learners to comprehend what is being processed, visual and/or auditory

supplements are necessary to aid text understanding (Kozen, Murray and Windell, 2006). In some reading assignments, the text to be processed might be too long, which does not facilitate or even allow information retention for students. Here, it is possible to divide the text into smaller passages, and students will respond to different anticipation guides (with different levels of difficulty), each of which relates to one small passage information. This, therefore, facilitates the task of text processing for those readers who are less skilled and who are working on developing their comprehension skills (Kozen, Murray and Windell, 2006). This accommodates all the learners in the classroom.

The effectiveness of an anticipation guide depends highly on the kind of statements it consists of. To be reliable, the set of anticipatory statements must target readers' prior knowledge. When the student has a little prior information on the topic in question, the anticipation guide is not effective and its aim of activating students' background knowledge is not achieved. To avoid such ineffectiveness, the anticipation guide must not include statements about common knowledge since they are less challenging for readers' perception and they do not elicit rich discussions (Duffelmeyer, 1994). Conversely, anticipatory statements are more effective when they emphasise on the texts' central thoughts, not its details; central concepts provoke maximal discussions. Nevertheless, these details can be used by readers to support more general concepts; this creates a challenging problem-solving reading situation (Duffelmeyer, 1994).

### **3.8.4 Anticipation guides and reading comprehension**

Many researchers believe in the effectiveness of pre-reading strategies like Possible Sentences, Direct Reading Thinking Activity, Guided Writing procedure and Anticipation Guide in activating readers' background knowledge since this latter promotes students' reading motivation (Head and Readence, 1992). Research has revealed that using anticipation guides prior

to text processing activates readers' background knowledge, gets them actively involved in the reading task and increases their productivity in the post-reading tasks.

Kozen, Murray and Windell (2006) have conducted a study to examine the use and adaptation of anticipation guides. They have noticed that when readers move from lower levels to higher levels of education, they face some difficulties; these are related to readers' learning and their achievement in instructional classrooms. Therefore, the effective use of skills at different educational levels promotes success. In addition to that, Kozen, Murray and Windell (2006) have shown that "in middle school, instruction focus on acquisition and proficiency of subject matter rather than acquisition and proficiency in reading" (p.196). Their study sheds light on how specialists focus on content-area instruction.

Research findings also reveal that the most skilled readers encounter difficulties in the field of literacy, so the use of anticipation guides has been considered essential in increasing readers' content knowledge and their text processing abilities (Kozen, Murray and Windell, 2006). Equally important, anticipatory statements are considered as an appropriate strategy for improving "decoding skills, enhancing word meaning and strengthening comprehension" (Kozen, Murray and Windell, 2006, p.196). Studies that investigate the relationship between reading comprehension and anticipation of meaning have also found that even disabled readers can use anticipatory statements prior to their reading assignment since they are encouraged to make predictions about reading content and to have an active participation in class discussions. That is, they can learn how to deal with a text when they notice how skilled readers approach a text (Jacobs, 2010).

### 3.9 Text-previewing strategy (THIEVES)

Text-previewing strategy, similarly to the anticipation guide, is a pre-reading strategy that helps the students access their own prior knowledge store and connect with the to-be-read text. This strategy was first created by Suzanne Liff Manz (instructor and educational therapist) to help the learners comprehend texts better by previewing text structure in an organised way. To this end, the students are encouraged to be THIEVES (Manz, 2002). That is to say, they are required to preview the text so as to “steal” information; they must take as much information as they can. This strategy helps the learners identify the various components of a chapter or a text to consider them thoroughly prior to full reading. Therefore, readers’ anticipation skills are enhanced to guarantee more meaningful reading.

This strategy’s acronym, which is not easily forgotten, consists of 7 letters, each of which stands for a survey element that is targeted when previewing the text. Manz (2000) has identified these letters are identified as follows.

**[T]-Title.** This element is often neglected by the readers. It is considered as the gateway into the to-be-processed print since it provides the students with valuable knowledge about the topic and the chapter context. When examining the title, the readers can ask the following questions.

-What is the title?

-What do I know about this issue?

-How does this chapter/text/topic relate with the previous one?

-What do I think the content of the passage/essay will be about?

**[H]-Headings.** A heading represents the entrance into the important sections of the essay/chapter. They create a helpful visual organisation of the topics covered. When put together, headings can



even help the student make a summary of what is to be read even prior to processing it. While perusing the headings, the students may raise the following issues.

-What does this heading tell me about the text/chapter?

-What does it tell me about the paragraph it represents?

**[I]-Introduction.** Often placed between the title and the first heading, the introduction provides the readers with a possible arrangement of the text/chapter content. It often comprises the different objectives of the chapter/text. Looking through the introduction, the students may ask themselves the following questions.

-Is the first paragraph an introductory one?

-What does the introduction tell me about the content of the chapter/text?

-Does the introduction tell me something I already know?

**[E]-Every first sentence in a paragraph.** Painstaking readers examine the first sentence of the paragraph; they represent, most of the time, the topic sentences. They help the readers gather information in small amounts to get the general idea of the text/chapter. The readers who consider the topic sentences often ask the following questions.

-What does the first sentence tell me about the content of this paragraph?

-How do paragraphs relate to each other?

**[V]-Visuals and vocabulary.** The students may not be presented with several visual aids, but one picture may help them a great deal when trying to anticipate what the text/chapter will be about. Visual aids like graphs, tables, pictures, charts...etc. help the readers segue from the pre-reading to the reading phase. Perusing the visual aids to transform them into words helps the students learn about the target topic even before approaching the text fully. Here, the following questions can be raised.

- Are there any pictures, tables or graphs?
- What can I learn from these visual aids?
- How do these visuals help me comprehend the text?

Similarly to the visual aids, vocabulary helps the students have better pre-reading insights into the text/chapter. Some words may be highlighted by being italicized, bold or repeated in the print to refer to the most essential thoughts. To make better use of the text vocabulary prior to reading, the learners need to raise the following questions.

- Does the author of the text/chapter provide a list of key terms with their definitions?
- What do I know about the highlighted words?
- What do these words tell me about the topic of the text/chapter?

**[E]-End-of-chapter questions.** Such questions flag the most essential concepts of the essay/chapter. Be it they respond to all the questions or some of them, the students are alerted about the most significant concepts. In addition to that, even when they do not know the answer of these questions, a great deal of information is targeted and derived. By doing so, the students' reading purpose is established. It is still important for the readers to raise some questions, like the following ones, while considering the end-of-chapter questions.

- What are the points that these questions ask?
- What information is earmarked as essential?
- What do I learn from these questions?

**[S]-Summary.** Some texts provide a summary by the end of the chapter. Summaries provide a general framework for the detailed concepts that are tackled in the essay/chapter. By reading them, the students activate their background knowledge and get an idea about the most important ideas in the text/chapter.

THIEVES previewing strategy, according to Manz (2002), has been used in the reading courses of children and young adults. It is comprehensive of the most important elements of a successful text previewing and it is mainly workable for expository material (the main type of material students process in more academic settings). What is even more important about teaching the students how to steal information from a text is the fact that they can benefit from its use without the help of their teachers.

It is worth signaling that choosing anticipation guide and THIEVES previewing strategies as anticipation strategies in this study does not belittle the worth of any other pre-reading strategies that have proven to be, in many research works, to be highly effective for the students' reading comprehension. Because of time constraints, choosing more than two strategies would not be workable. In addition to that, the strategies that have been targeted in this thesis are the ones that have shown to be of the most successful strategies in setting the minds of the readers prior to approaching *expository texts* since they are widely used all along the students' academic years (in classroom activities or in the exams). These strategies help students get actively involved in the reading activity, use their prediction skills to better their comprehension and set their reading purpose.

### **3.10 Teachers' awareness about their teaching theories**

Theories, in education, are used to explain phenomena that relate to learning and teaching (Tracey and Morrow, 2006). It is important for people, in general, to be aware about the different theories they use. Thus, they can name them, think about them, discuss them and learn how to better practice them. In fact, knowledge about one's theories is important since they are related to one's behaviors/practices. Parallely, it is important for teachers to be conscious about the teaching theories from which their practices extend to improve their teaching skills. This, therefore, helps

them use the most effective interventions for specific classroom situations (Tracey and Morrow, 2012). Similarly, Hayes (1997) that teachers' awareness about their teaching theories impacts their teaching practices. He puts that:

During instruction, teachers continually interpret the events surrounding their interactions with learners...Their thinking concerns several variables always present during instruction: learners, subject matter, materials, procedures and time...How teachers think about and deal with these matters ultimately depends on their overall orientation to teaching, as well as the structures of thinking and acting suggested for achieving their goals...Thus,...Classroom practice is never entirely neutral, but carries with it its own implicit theory of instruction. (p.50)

Doubtlessly, all teachers have some theories that guide their teaching. Nevertheless, only some of them can describe their theories explicitly. That is to say, teachers may or may not know that specific theories influence their understanding of the concept of teaching and the way they practice it in classrooms; however, these theories are present and affect everything they do. Their knowledge about their own teaching theories helps them understand different classroom situations that are, to some extent, the result of their teaching practices. Therefore, teachers must be aware about their theories because "teachers with a firm grasp of educational and psychological theories have a clear basis for making instructional decisions" (Tracey and Morrow, 2006, p.6). To put it differently, these teachers are more likely to make better instructional decisions since their decisions are built on a clear and a strong foundation. Similarly, Pressley *et al.* (2001) put that teachers whose theoretical background is compatible with their classroom practice can explain their instructional decisions. Consequently, knowing about the theories that drive one's instruction leads to more explicit alignment between theories and practices and, thus, better teaching practices.

Additionally, understanding the theories that back up one's practices in classroom helps educators explain/justify their use of a specific strategy in a specific classroom situation. This, consequently, takes learners to new success levels in classrooms (Tracey and Morrow, 2006).

That being said, it is crystal clear that knowing about one's strategies of teaching and theories that, acting as a driving force behind teachers' practices, back up teachers' pedagogical stance leads to the development of students' learning, which is the ultimate goal of teaching.

## **Conclusion**

Anticipation is an essential life characteristic. It is everywhere since organisms can anticipate changes that surround them. This ability, often considered as a strategy, is crucial in life, generally, and in education, specifically. At all educational levels, it is of a paramount importance that learners read to understand, to learn and to remember. Here, individuals' anticipation is what accomplishes these demands, especially in reading; it enables readers to succeed since it motivates them to read and makes them participate fully in learning. However, these achievements are not possible in the absence of teachers' instructional flexibility. Teachers who believe less in traditional models of learning and more in constructivist theories of teaching realise that comprehension does not come from scratch; it involves activating individual's prior knowledge that is to be linked to the text's concepts to enhance students' comprehension. Therefore, reading teachers can use pre-reading strategies, like anticipation guides, that accomplish a lot of reading demands, mainly comprehension. These strategies are student-led tasks that motivate students to explore their comprehension capacities and to understand what is being processed using prediction. Hence, using anticipation guides and text previewing as pre-reading strategies helps teachers meet their students' needs. It is a stimulating activity that develops readers' positive response to the

written material through motivating them to read; it gets the students inside the text through creating a positive receptivity mood.

## Chapter Four

### Processing Speed/Automaticity and Reading Comprehension

*“I am not a speed reader; I am a speed understander.”* Isaac Asimov

#### Introduction

#### 4.1 Definition of fluency

#### 4.2 Definition of processing speed/automaticity

#### 4.3 History of research on reading fluency and automaticity

#### 4.4 Characteristics of automatic information processing

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##### 4.8.1 Repeated reading

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#### 4.9 Reading automaticity assessment

#### Conclusion

## **Introduction**

To enjoy what one reads and see its meaning without making efforts or even being aware of the processes required to get the gist of it, an individual needs to be fluent. In language instruction, many attempts have been made to produce more fluent readers. This interest in fluency is justified by the fact readers do not have to decode the majority of text words intentionally; they are more likely to identify words automatically and accurately. This, therefore, results in saving more time, energy and attention for comprehension as a higher-order cognitive activity. Fluency is one of the important characteristics of successful readers; its lack or absence, therefore, is a determining characteristic of poor readers. This chapter is concerned with how to make readers approach a text in a less laboured way, just like daily automatic habits, without focusing on word decoding that makes text processing difficult or, in some cases, even impossible. Therefore, the focus is on automaticity as one important fluency component. It reviews, in its space limitations, the literature on automaticity as one important correlate of reading comprehension. The main focus of this review is on the conceptualisation of reading automaticity that is based on fundamental theories of automaticity. Additionally, it seeks to help the teachers assess their students' information processing speed in an attempt to improve their automaticity and, thus, enhance their comprehension of the written discourse.

### **4.1 Definition of fluency**

Fluency is necessary for efficient reading abilities that guarantee successful text processing (Grabe, 2009). In this dissertation, fluency represents the reader's rate of reading (Kostewicz, 2012). In more precise terms, Lo, Cooke and Starling define reading fluency as "the ability to read with speed, accuracy and proper expression" (2011, p.115). These definitions, and many others, agree that fluent reading comprises three key components: automaticity, accuracy, and prosody



(Kuhn and Stahl, 2003). Even though accuracy and prosody play an undeniable role in successful reading, they are not the major concern of this chapter.

#### **4.2 Definition of processing speed/automaticity**

Automaticity refers to a set of fast processing operations that are unconscious and uncontrolled (Shiffrin and Schneider, 1977; Logan, 1979; and Grabe, 2009). In different terms, Rasinski (2012) defines automaticity as the automatic or effortless recognition of words. Automaticity, for West (1978), enables readers to process a print rapidly and smoothly, with little or no awareness about the different cognitive tasks that occur while text processing. These definitions agree, clearly, that automaticity refers to mental cognitive processes that require no effort or control.

Automaticity is also called, by some researchers as *reading rate*; it consists of “the speed and fluidity a reader uses as he/she reads a text” (Evanchan, 2010, p.12). This rate is considered by LaBerge and Samuels (1974) as the heart of fluency. Nevertheless, fluency is not only about fast reading since focusing on speed might tell students, with no useful purpose, that it is, at the expense of understanding, the goal of reading (Schwanenflugel, Meisinger, and Wisenbaker, 2006). Readers, at earlier stages, might need, according to Allington (2009, p. 17), “glued-to-print, word-by-word reading” that helps them become better readers; they are not required to be that fast during earlier school stages. Automaticity is also considered as the core of accurate reading since it refers to the ability to decode language rapidly and correctly; this leads to leave readers attention free for text processing. Consequently, comprehension is increased (Schwanenflugel *et al.*, 2006).

When compared to controlled processing that is voluntary, slow, and attention-dependent, automatic processing is the activation of some learned element sequences in the LTM, without requiring attention (Schneider and Shiffrin, 1977). Processing new tasks relies mainly on

controlled processes; these tasks, through time and with practice, become more automatic (Logan, 1979).

### **4.3 History of research on reading fluency and automaticity**

Automaticity has been given a flurry of attention in the last few decades since educators and researchers have become aware about its importance in text processing. Some researchers have attributed their understanding of the term automaticity to Huey who, in 1905, considered it to be important in the development of reading skills. He has focused on the importance of practice, as well as consciousness, in learning new concepts (LaBerge and Samuels, 1974). Nevertheless, this concept was considered a couple of decades before by William MacKeen Cattell in 1886, the psychologist whose main interest was the human speed in reading that exceeds that in speaking; humans are more automatic in reading than in speaking. Unexpectedly, not many studies were interested in reading automaticity during those early century decades. At that time, behaviourism was the dominant approach in psychology (Pillsbury, 1947).

During the 1940s, 1950s and 1960s, fluency was considered as elocution by Hyatt (1942). In fact, oral reading was used only for entertainment, yet its importance in education was neglected. Later in time, Smith, Grany, Bray, Wood and Anderson (1952) works on reading have highlighted the importance of elocution in the development of reading skills. Later researchers, consequently to previous research findings, have started to be interested in the description of the reading process. Goodman, for example, has found out that intonation can be related to text meaning. That is, fluent readers use text prosodic features like grammar and any visual cues to regulate their reading voices; this leads to appropriate text understanding (Schwanenflugel *et al.*, 2006). Furthermore, Farrell (1966) is another researcher who has focused on the importance of fluency in reading. He has suggested that young readers can become fluent through the reading aloud method. In the same

fashion, Chall (1967) has thought about improving readers' fluency through applying audio-assisted reading; this makes students listen to a story and read at the same time from the book. Farrell's and Chall's methods are still in use in the current learning classrooms (Kuhn and Stahl, 2003).

By the 1970s, focus was put on automatic reading that was considered as a complex task for children. The psychologists who have contributed to our understanding of this concept are LaBerge and Samuels (1974). They have introduced an influential information-processing approach to reading fluency that they call Automaticity Theory. Their interest is mainly in explaining how reading words fluently helps readers process a text better. Other theories, like Stanovich' compensatory model (1980) and Allington's fluency model (1983), have emerged to bring more interest and solidify the place of fluency and automaticity in reading. Even though many other competing theories have seen light automaticity theory is still influential in current research on reading. This theory is, actually, the core of this study's chapter and it is described in the following section.

#### **4.4 Characteristics of automatic information processing**

Studies on automaticity have been focusing on the characteristics that differentiate automatic processing from controlled one. That is, any task that is characterised by those criteria would be considered as an automatic process. This chapter does not consider all the properties since automaticity characteristics' lists differ from one researcher to another. Thus, this review of literature focuses on the common characteristics that are relevant to most automaticity definitions (Logan, 1997). These criteria are: speed, effortlessness, autonomy, and lack of conscious awareness.

#### **4.4.1 Speed**

First, automatic information processing is fast; conversely, the controlled processing is slow. Nevertheless, according to Newell and Rosenbloom (as cited in Logan, 1997), it is hard to define a specific speed that is required for a process to be considered automatic since speed is in constant variation, especially through practice. The importance of speed in automaticity is explained by the fact that an increasing speed (leading to a decreasing reaction time) leads to an increasing automaticity. Additionally, researchers assume that processing information becomes faster when learners practice more. Newell and Rosenbloom (as cited in Logan, 1997) have referred to what is called a power law. It holds that practice keeps decreasing reaction time until it reaches some limits where it is not possible to reduce it anymore. In the same fashion, Logan (1997) agrees that practice increases speed; however, changes in speed are more remarkable in earlier practice trials and later they become less easy to be achieved.

This law is proven to be reliable since researchers have checked how speed relates to automaticity. They have found that a learner's performance after 10 trials is better than his performance after 1 trial; his performance after 100 trials is faster than his performance after 10 trials. This logically shows that practice makes learners process more rapidly and, thus, more automatically (Logan, 1997). This law, according to Seidenberg and McClelland (1989), applies to reading automatization; learners read high frequency words (the ones that are more practised) more rapidly than low-frequency ones.

#### **4.4.2 Effortlessness**

In addition to being fast, automatic information processing is effortless whereas controlled processing is effortful (Logan, 1997). This information processing effortlessness can be explained by the fact that automatic processing is easier than more controlled processing. Furthermore, an

individual can perform simultaneously an automatic task and another one (Logan, 1979). For instance, one can eat while driving or sing while taking a shower. When such two tasks are performed simultaneously, at least one of them is automatic (Schneider and Fisk, as cited in Logan, 1997).

In the field of reading, some researchers assume that the criterion of effortlessness helps readers process a text more automatically. For example, the study of Posner and Boies (1971) has revealed that, through the use of dual-task interference, letter encoding is an automatic process. In the same fashion, Becker and Herdman (as cited in Logan, 1997) have put that, using a dual-task interference, high-frequency words are more automatically accessed than low-frequency words.

#### **4.4.3 Autonomy**

Equally important, automatic information processing is autonomous. This means that it starts and finishes with no intention (Logan, 1997). For Bergen, Grimes, and Potter, (2005), autonomy is defined as the ability to start a task without active engagement. The autonomy of the automatic information processing can be explained by the Stroop effect. In this task, individuals are supposed to name the ink colors that are used to write words; individuals are more likely to be reading words instead of naming the colors since word processing is said to be much faster than color processing (Stroop, as cited in Logan, 1997). This is considered as autonomy since individual's try to stop reading words and, thus, avoid any interference that is the result of incongruence between written words and ink colors. The following figure is an example of a task that is based on Stroop effect.



**Figure 4.1: Stroop effect task. Adapted from *Automaticity and reading* (p.127), by G.D. Logan, *Reading and Writing Quarterly*, 1997.**

Researchers that are interested in the autonomy of automatic processing have revealed that practice helps develop Stroop interferences. Schiller (1966) has shown that the more young learners practice reading, the more strategic their interference skills will be. In the same fashion, Tzelgov, Henik, and Leiser (as cited in Logan, 1997) have revealed that interference develops through practice. Participants in their study were bilinguals who could strategically modulate Stroop interference in their mother tongue but not in the target language. These levels of automaticity show clearly that autonomy, as automaticity characteristic, is reflected in strategic Stroop interference.

#### **4.4.4 Lack of conscious awareness**

Automatic processing, unlike controlled processing, does not rely on consciousness. Everyday experiences can justify such a claim (Logan, 1997). For example, an individual wears his shoes or reads some written letters/words without being aware of the whole cognitive process that is required to perform such automatic tasks. Before practice, one individual needs to be conscious about the different processing steps; their execution is effortful and slow. Nevertheless,

capturing such intuitions has always been almost impossible for researchers in laboratories. According to Logan (1997),

Many researchers have tried to show that automatic processing is unconscious (or does not give rise to conscious awareness), but their work has been highly controversial. Serious methodological and theoretical criticisms have been raised, sometimes so strenuously that it seems that researchers either believe or disbelieve in the phenomena and their beliefs cannot be shaken by evidence. (126-127)

Conversely, experiments could be more reliable and explanatory. The study of Meyer and Schvaneveldt (as cited in Logan, 1997) offers evidence about *semantic priming* where participants have been presented with the term DOCTOR as a prime that has speeded individuals' responses to the target term NURSE. In the same fashion, Marcel (1983) has presented his participants with the prime for a very brief time and then it has been masked; still, the priming effect has been successfully obtained.

That being said, automatic information processing occurs while the individual is not aware about what stimulates the required processes. Theoretically speaking, Logan (1997) asserts that what makes it difficult to explain such phenomena is that what cannot be reported is, actually, what is unconscious.

#### **4.5 Theories of automaticity**

Several strength and chunking theories have been developed to explain automaticity. This study's aim is not to create a review of all of them; only two predominant theoretical frameworks are reviewed in this dissertation because they highlight strongly the importance of automaticity in reading comprehension: LaBerge and Samuel's theory and Logan's model.

#### **4.5.1 LaBerge and Samuels' theory of automaticity**

The first theoretical framework is a foundational theory in the research on reading comprehension that offers an explanation of how fluency, which results from accuracy and automaticity, facilitates text comprehension. It explains how, where and to which degree information processing occurs. LaBerge and Samuels have proposed this model to ascertain that “The journey taken by words from their written form on the page to the eventual activation of their meaning [in the mind of the reader] involves several stages of information processing” (1974, p. 293). Here, they assume that reading is a complex skill the execution of which requires a fast and complex coordination of many processes. Those processes' combinations may take skilled readers a second's fraction to occur unlike less skilled/novice readers who devote more time and energy to word decoding; this results in leaving less attention for higher-order processes like comprehension. To put it differently, Schrauben (2010) asserts that a novice reader uses attention to recognise words and then he directs his attention to text comprehension; unfortunately, this slow process is more likely to overload his memory. Relating to that point, LaBerge and Samuels (1974) put that individuals can achieve very few things at a time; that is why when word identification necessitates the use of attention, very limited comprehension can be achieved. Nevertheless, many processes may be performed all at once when only one of them requires attention. To make the situation clear, Samuels and Flor (1997) compare this reading situation to car driving. Novice drivers, just like beginning readers, need attention when they focus on the road, check other vehicles and control their own car; their whole attention is directed to driving and any other performance would distract their attention and, thus, influence negatively their driving performance. Contrarily, advanced car drivers can drive and do other things at once such as eating, talking on the phone, talking to a passenger...etc. This means that these skilled drivers might need



attention for only one process of all the ones that are being performed at once since driving, for them, is an automatic process. Relating this to reading, word-level automaticity leads to a better reading performance since less attention is used on decoding to be saved for comprehension. This, according to Schrauben (2010), results in putting fewer demands on readers' memory.

LaBerge and Samuels' theoretical premise considers essentially two components of fluency: Accuracy and automaticity (LaBerge and Samuels, 1974). Since working memory is a limited capacity in text processing, reading automatically and accurately will free up memory for text comprehension (Schrauben, 2010). In this very same context, Savage *et al.* (2005) put that working memory is the first external information filter; its processes input that individuals encounter in the text. Then, they have to select the appropriate input to be retained in their memory. This stored information helps readers become more acquainted with what they read and, thus, become more automatic when processing texts. This explains that the reader's working memory helps him gain proficiency at the level of automatic processing. Therefore, when reading processes are automatic, working memory is less loaded and comprehension is fast and successful. Conversely, when they are controlled, comprehension, due to WM overloads, will be slow and less successful.

Samuels and Flor (1997) put that learners are interested in achieving accuracy and neglect their automaticity; however, an accurate reader is not systematically an automatic one. For any skill to become automatic, practice is essential. To explain this, Huey (as cited in Carr, 1992) has put that

To perceive an entirely new word or other combination of strokes requires considerable time, close attention and is likely to be imperfectly done, just as when we attempt some new combination of movements, some new trick in the gymnasium or new "serve" at

tennis. In either case, repetition progressively frees the mind from attention to details, makes facile the total act, shortens the time and reduces the extent to which consciousness must concern itself in the process. (p. 104)

Huey believes that complex cognitive abilities might integrate through practice. This latter improves the individual's processing rate and helps the reader process a text without using attention on details. That would guarantee that more attention would be directed to text understanding. Similarly, Schrauben (2010) puts that in many areas, the development of any skill requires individuals to work on both automaticity and accuracy; reading is one of these skills. In the same context, it is possible, for instance, for an individual to read or recite the alphabet letters but the amount of attention required to be able to do so remains unknown.

LaBerge and Samuels (1974) have also based their automaticity theory on the component of accuracy which is considered, in addition to automaticity, as a characteristic of a proficient reader. An accurate reading requires the learner's ability to combine letters to make meaningful words that, then, give meaning to the encountered message. As these words are encountered in several reading situations, they will reside in his long-term memory. Here, a proficient reader is fast in retrieving the information from his LTM. Therefore, being accurate in using one's knowledge to recognise words is important for a successful text processing.

As explained in this chapter, the human brain cannot focus an individual's attention on many reading processes at once; therefore, automaticity is required for some of the reading subskills to help the individual become a proficient reader and, thus, a better comprehender. This theory focuses on the importance of achieving automaticity, in addition to accuracy, to free up some attention for text comprehension. Through time, younger readers learn to become proficient readers since their word recognition processes become automatic which allows a simultaneous

performance of decoding and understanding print by devoting most of the reader's attention to text comprehension.

In a nutshell, Automaticity Theory does not account for a comprehensive description and explanation of fluency since it relates to accuracy and automaticity and neglects prosody. This pushes researchers like Schrauben (2010) to assert that LaBerge and Samuels' theory should be amended to take into account the necessity of prosody in achieving reading fluency. Researchers, therefore, have attempted to offer more comprehensive theories that would take into account the three components of fluency: automaticity, accuracy and episodicity. This is the main concern of Logan's Instance Theory of Automaticity (1988), which is the core of the next section.

#### **4.5.2 Logan's Instance theory of automaticity**

Instance theory, as proposed by Logan (1988), is an alternative theory to that of LaBerge and Samuels (1974) since it has brought some modifications to be more comprehensive in defining reading fluency. Logan's model (1988) is based on the concept of memory, and it considers automaticity as an "item-based" instead of a "process-based" phenomenon (Kame'enui and Simmons, 2001). This model, according to Logan (1988, 1997), is based on three essential principles: Obligatory encoding, which holds that one exposure/attention to a word is enough to leave the needed memory trace that makes this word automatically recognized when encountered by the reader another time; obligatory retrieval and instance representation; obligatory retrieval, which explains that a single exposure to an event, an object, a word...etc. is sufficient to activate and retrieve knowledge (events, objects, words...) that is associated with it from LTM; and instance representation, which assumes that past events or objects traces are encoded, stored and retrieved from the memory separately even though they have been experienced more than once in the past.

First, obligatory encoding represents the mechanism of learning. Being exposed to events or objects while an individual is involved in an activity creates a base of task-relevant knowledge that will be developed in memory through performing later tasks. Literature on obligatory encoding presents this assumption's central evidence in "the equivalence of incidental and intentional learning when attention is equated between conditions" (Craig and Tulving, as cited in Logan, 1997, p. 131). Learning is not influenced by the individual's intention to learn; however, intention leads attention to be directed to the things to be learnt (Logan, 1997).

Second, obligatory retrieval, as another instance theory assumption, represents automaticity expression in any task performance. When an individual's attention is directed to objects or events while performing a familiar task, he is more likely to recall the relevant information. Here, the more input there is, the more is retrieved. Therefore, memory starts to respond strongly to facilitate the task performance, and performance, thus, thanks to memory retrieval, is more likely to become automatic (Logan, 1997). Evidence for obligatory retrieval can be seen in the Stroop effect that has been explained in the autonomy component of automaticity. For MacLeod (as cited in Logan, 1997), individuals cannot stop reading even in the situations where it is in their own interest to "turn it off". According to Logan (1997), "a familiar word at the focus of attention retrieves things associated with it in the past, like its meaning and the motor program for pronouncing it. The motor program interferes with the motor program for pronouncing the name of the color, and reaction time is prolonged as the interference is resolved" (p.131). This shows that, following the instance theory, the Stroop effect can be explained as a retrieval phenomenon.

Third, the instance representation principle, according to Logan (1997), is the most controversial of the three assumptions since phenomena that underlie it are not as well established

as those underlying obligatory encoding and obligatory retrieval. What makes some researchers in the field of memory psychology and learning psychology consider this assumption as counterintuitive is the fact that every trace is separately encoded, stored and retrieved (Logan, 1997). Nevertheless, thanks to testing grounds, instance theories, also called ‘multiple trace’ theories, have been explained and supported to offer more interesting data accounts than some ‘strength’ theories such as LaBerge and Samuels’ automaticity theory (1974). This has paved the way for these instance theories to dominate theories that account for concept learning data (Medin and Ross, as cited in Logan, 1997).

The assumption of instance representation is of a paramount importance for the instance theory evolution. The model holds that in the retrieving phase, the different traces race to finish and, thus, control performance (Logan, 1997). For instance, when an individual is asked to calculate the sum of  $5+5$ , every trace that represents  $5+5=10$  is retrieved, and the individual can respond right when the first trace finishes. This shows that many traces can be equivalent and an individual can perform correctly when the first trace finishes, regardless of when, in the past, he has learnt this knowledge (primary school, university...etc.).

Logan (1997) puts that traces’ race is responsible for reducing reaction time and, therefore, developing automaticity. The more traces memory holds, the faster the trace retrieval will be. Practice, in addition to the number of existent traces, accounts for speeding up retrieval. Nevertheless, Logan puts that “..., the speed-up will have diminishing returns. Adding one trace to 100 will have less of an impact on the race than adding one trace to 10 or one trace to 1. The fastest of 100 traces is likely to be pretty fast, and it is unlikely that the fastest of 101 traces will be much faster” (1997, p. 132). This is seen by Logan (1997) as being responsible for the negative acceleration of the function of power. Newell and Rosenbloom (as cited in Logan, 1997) see that

by using these mathematical predictions, Logan could prove mathematically that trace outcome is more likely to follow the power law that is the main characteristic of the concept of automaticity. This reflects how strong the instance theory is.

This being said, it is no surprise that Logan's instance theory (1988) is the source of some changes in the way automaticity has been conceptualised for many decades. Theories that have preceded Logan's theory related automatization to a change in specific processes such as letter identification processes (Posner and Boies, 1971), lexical access processes (Becker, as cited in Logan, 1997) and semantic access processes (Neely, as cited in Logan, 1997). Nevertheless, instance theory of automaticity regards automatization as the change *to* a specific processing; all the processes change to be memory-based, taking memory retrieval as the basis of process automatization. Therefore, automaticity is not viewed as a "property" of one specific process and automatization does not represent any shift that a specific process undergoes; automaticity processing is memory-based and automatization is a change from "algorithmic processing to memory retrieval (Logan, 1997). That is to say, differently from the earlier theories of automatization that support the existence different types of automaticity which depend on different memory systems, the considerable change in the concept of automatization under Logan's theory is that all automatic processing depends on the same memory system (Logan, 1988, 1997).

In a nutshell, instance theory considers automaticity as a phenomenon that is proven theoretically and empirically to be controlled by memory. This interesting conceptualization paves the way to new interests in the field of cognitive psychology and many other domains.

#### **4.6 Repetition priming in word-level automaticity**

Logan (1997) defines repetition priming as performance changes that occur after repetition. Repetition priming usually represents positive changes such as speed in reaction and better accuracy. Roediger (1990) considers repetition priming as a phenomenon that is related to memory. Logan's instance theory of automaticity, that supports priming, holds that automaticity is the sum of many repetition priming effects (Logan, 1997). Empirically speaking, supporters of the instance theory automaticity concentrate on the changes that one or two presentations might bring. Then the results obtained from these repetitions would be generalized to many presentations. This implies that one presentation can be enough to develop individual automaticity and, thus, the effects are always the same regardless of how many repetitions the learner has gone through. In fact, repetition priming and automaticity are mainly influenced by memory, not the frequency of presentations (Logan, 1990). This belief illustrates the all-or-one learning principle of Logan's instance theory of automaticity which suggests that automatization can occur after one trial. In this paper, without denying the importance of letter-level and text-level automaticity, the focus is on the importance of this strategy in improving word-level automaticity; it is more relevant to the content of this paper.

The use of repetition priming strategy in word-level automaticity has been the concern of many studies. Logan's study (1990) interprets automaticity as a huge repetition priming. In his research, he has shown proved that priming and automaticity have three common features: they are item-based concepts which rely heavily on the items that are used in the repetition strategy; they are associative since they rely on item/interpretation or item/response links instead of focusing on item strengthening; and they prove the "power-function speed-up" which is an automaticity feature.

In his study, one of Logan's interests is to train learners on lexical decision activities. These are tasks that require participants to make decisions about whether or not a letter group makes a correct word. In evaluating subjects' decisions, he takes into account the types of words presented; some of them are new words and some others are non-words that he keeps using in different trials. The repeated items have been improved, conversely to the new ones. In addition to that, an improvement in repeated words reaction time follows a power-function; this, once again, proves that automaticity is massive repetition priming (Logan, 1990).

To prove that automaticity and repetition priming are associative, Logan (1988) has presented participants with correct words like BRAT, pronounceable non-words like BIAT, and unpronounceable non-words like BRJT, that subjects need to repeat sixteen times. In performing this task, participants have to make two decisions. First, they need to say whether the letter group makes a word; this shows their ability to differentiate between what is a word, a pronounceable non-word and unpronounceable non-word. Second, they need to judge the word's pronounceability; they need to check whether or not words and non-words are pronounceable.

To find out whether or not subjects' improvements in repetition drills are due to item/interpretation associations, he has presented two groups of participants with the same words and non-words for the same number of repetitions. Here, a group has shown a similar interpretation of items in the different times they have been presented; however, the second group has given different interpretations for items by making decisions on lexicality in one task and pronounceability in another one. Thus, Logan (1988) has proved that automaticity and repetition priming are based on item/interpretation connections (lexicality or pronounceability). In conclusion, performance relies on the number or times an item is interpreted in a specific way, not the number of items it is presented.



To sum up, these findings clearly relate repetition priming effects to automaticity. This is quite helpful in interpreting research results that consider the link between repetition priming effects and automaticity; the former is the proof of the latter. One repetition priming effect paves the way to automaticity. Therefore, what affects repetition priming effects affects automaticity.

#### **4.7 Automaticity in reading**

As a component of reading fluency, automaticity is as important as reading accuracy. Actually, it would not be enough to decode the word when huge cognitive efforts are needed to be able to do so. Automaticity, in many contexts, facilitates comprehension by freeing up some cognitive resources that would be better used in higher-order reading skills (LaBerge and Samuels, 1974).

If one speculates about the role of automaticity in reading from Logan's corner, one important aspect would directly come to the surface: learning is seen as all or none. That is to say, a single exposure to one object may lead to its learning. When this is applied to reading, it would mean that it is possible for automaticity to occur after a single trial (Logan, 1988). Even though automaticity is a memory-based capacity that builds up gradually since every reading activity adds many traces to memory, strong memory responses can occur even after a single trial. Here, practice helps automaticity but it is not obligatory to produce it (Logan and Klapp, 1991).

Since there are several processes in reading such as higher order and lower order processes, from letter identification to meaning comprehension, single-trial automatization helps automaticity to occur at these different levels. The reader, thus, needs to encode the different possible structures such as letters, words and ideas in memory and then, from this single trial, he can retrieve them when he rereads them in another passage (Logan, 1997).

Strength theories, such as LaBerge and Samuels' (1974), see that automatization is predictable mainly at lower-order reader levels; however, it is very difficult to reach automaticity at higher-order levels processing. The point here is that strengthening does not occur at once; it is a progressive process that necessitates several trials to reach its peak. That is to say, automatization requires many repetitions contrarily to the assumptions of the instance theory of automaticity (LaBerge and Samuels, 1974). The main issue here is that at higher level processing, repetition probabilities become lower. In the English language, for instance, there are twenty six letters that are repeated so many times during any day reading. Words, however, outnumber letters by far since they exist in hundred thousands. This implies that either words are high frequency or low frequency, they will be repeated much less than letters because of their huge number in comparison to that of letters. Similarly, propositions that emerge from words are less repeated than words, and so are propositional structures. This proves that strengthening is more likely to occur at lower order level processes while it remains rare at higher order levels' (Newell and Rosenbloom, 1981).

Either researchers support the instance theory or other strength theories of automaticity, the common assumption of most of them is that poor readers, contrarily to good ones, are known for their slow, effortful reading. That is why many reading interventions focus on increasing reading automaticity to improve reading comprehension (Mastropieri, Leinart and Scruggs, 1999). Similarly, Moats (2001) notes that slow readers are more likely to fail in completing their reading task and lose interest in reading at all.

Empirically speaking, many researches have endeavoured to check whether or not an increase in fluency leads to an improvement in reading comprehension abilities. In spite of the theoretical explanations which assume that fluency, including automaticity and accuracy, is a key reading comprehension facilitator, many conflicting results have been reported by several

researchers; some of them have confirmed the existence of a strong positive correlation between fluency and reading comprehension while some others have not come up with the same confirming findings.

In this context, Reutzel and Cooter (2012, P.186) note that “Some educators believe that fluency is the key that unlocks the door to comprehension. But this is only partially true. Fluency may unlock the door, but it does not open the door to reading comprehension.” This implies that fluency paves the way to comprehension but it does not guarantee it. In the same fashion, Samuels and Farstrup (2011) have made a comparison between a fluent driver and a fluent reader. The idea is that a fluent driver can perform many tasks simultaneously such as paying attention to traffic, moving from one lane to another and chatting with passengers. To become that fluent, drivers need a lot of practice; the same thing applies to reading. Teachers help learners become more fluent readers by making them practise intensively, which is more likely to make them understand better what they read.

Some researchers like Rasinski, Rikli, and Johnston (2009) see that there is a need to use more complete fluency assessment tools that go beyond automaticity because prosody is the component that relates the most to reading comprehension. Their study has revealed that prosodic reading is more significant in reading comprehension than the automatic reading. They put that “The finding of the robustness of the prosodic measurement of reading fluency suggests a significant link or association between the prosodic component of fluency and reading comprehension” (Rasinski, Rikli, and Johnston, 2009, p.359). Fluency, therefore, needs to go beyond automaticity if it is required to improve learners reading comprehension. Additionally, they assume that speed reading does not mean skillful reading. That is to say, students are not supposed to focus only on their reading speed if their aim is to understand what they read.

In another study, the focus has been mainly on incarcerated adolescents' reading fluency. In his research, Courbon's (2012) interest has been to find which fluency component (automaticity, accuracy or prosody) correlates more significantly with reading comprehension. The study's results have revealed that automaticity and prosody correlate identically with reading comprehension while accuracy has been declared to be less efficient in reading comprehension. Another study has been conducted with similar objectives by Berninger, Abbott, Vermeulen and Fulton (2006). This research has revealed that automaticity and accuracy, as fluency components, correlate significantly with reading comprehension at the level of words and texts. Even though their study's results are highly significant, Berninger *et al.* (2006) add that these fluency components are just part of the subskills that have a great impact on reading comprehension. In the same vein, Neddenriep, Fritz and Carrier (2010) have aimed at finding out about the nature of the relationship between fluency components and reading comprehension. In their study, they have used the repeated reading technique with feedback to teach learners fluency. The results have revealed that an increase in learners' speed of word reading leads to an increase in their comprehension.

Other researchers could come up with more encouraging results which prove that there exists a significant correlation between reading fluency, mainly automaticity, and reading comprehension (Breznitz, 1987; and Rasisnski, 1990). Fuchs *et al.* (2001, p.239) assert that fluency "represents a complicated, multifaceted performance" that influences the different reading processes including word meaning accessing, linking prior knowledge to encountered information, inferencing and connecting words. Similarly, Fuchs and Fuchs (1992) and Hasbrouk and Tindal (1992) have found in their interventions that reading automaticity predicts reading comprehension.

They believe that automaticity can be used by learners as a means to improve their monitoring skills, which is more likely to result in a better understanding of what they read.

That being said, further studies might investigate the link between fluency components, especially automaticity which seems to be the source of many conflicting results, and reading comprehension. The aforementioned researches have already presented a conclusive relation between reading comprehension and reading fluency.

#### **4.8. Fluency/automaticity instruction**

In the recent decades, an increasing interest in the importance of fluency in reading has been noticed. This makes educators think about paying more attention to learners who struggle with their fluency to achieve comprehension. To help students gain fluency in reading, teachers need classroom instruction that is based on previous research findings. Many instructional interventions have been confirmed to be effective in enhancing reader's fluency, in general, and automaticity, in particular. There is a wide range of activities that enhance readers' fluency. Some of these activities, including the ones described in this chapter, focus mainly on the importance of practice in improving readers' fluency and, thus, their reading comprehension.

Nathan and Stanovich (1991) put that the more significant learners' practice in reading is, the faster their word recognition will be. This implies that practice helps students process a text cognitively in a way that improves their recall abilities. Thus, practicing more makes them depend on their mental resources that facilitate rapid word recognition and, therefore, automatic reading. Consequently, this chapter is mainly concerned with two of the many interventions that focus on practice to improve fluency: repeated reading and word previewing.

#### **4.8.1 Repeated reading**

Repeated reading (RR) is seen by Bryant, Vaughn, Linan-Thompson, Ugel, Hamff and Hougen (2000) as a strategy that fosters learners reading abilities, including comprehension. It has also been reported by the National Reading Panel 'NRP' (NICHD, 2000) as one of the most effective techniques that enhance automaticity. The NRP has reported many research works that are based on RR as a technique to enhance readers' fluency and comprehension at different levels and ages. In fact, RR is seen as a simple, strong and universal strategy that helps learners who struggle with reading to enhance their reading skills, namely fluency (Samuels, 1979).

Samuels (1979) and Dahl (1979) have introduced the repeated reading strategy that aims at constructing novice English language readers' word-level automaticity. This technique is backed up by LaBerge and Samuels' (1974) theory of automaticity which assumes that individuals' automaticity can be improved through several reading trials. Samuels (1979) and Dahl (1979) note that an individual needs to be accurate in recognising words. Here, practice is what makes him process print with an increasing speed that is more likely to result in a better automaticity. This assumption is what they have taken into consideration when RR has been presented; it takes into account automaticity and accuracy. When following this technique, individuals reread a passage silently or aloud several times till they become able to read it with no efforts; the focus here is on automaticity. When the required level of this text's reading automaticity is achieved, the students are presented with a new passage to be processed similarly to the previous one (Samuels, 1979; and Dahl, 1979).

In addition to the previously described unassisted RR method, there exists an assisted RR strategy. Contrarily to the unassisted RR, with the assisted RR, the teacher gets the students to read a passage orally while the teacher models the reading task orally (Dowhower, 1991). Many

researches have been conducted to check to what extent assisted RR strategy is efficient for learners reading rate. Dowhower (1987) has conducted a research to confirm or disconfirm Chomsky's (1976) study in which an assisted RR technique was applied using, as a new method, audiotapes. Chomsky's study has revealed that participants reading accuracy and automaticity have increased after using assisted RR technique. There were not a lot of empirical investigations on the importance of assisted reading in enhancing automaticity and accuracy until Dowhower (1987) has conducted a research where the findings have shown to be to some extent different from those of Chomsky's study. Dowhower's study has revealed that when assisted and unassisted RR strategies were used on two different groups, the results have shown that similar improvements are noticed in both groups. Thus, assisted RR strategy is not more efficient than unassisted RR method.

Many research works (Dowhower, 1987; and Kuhn, 2004) have provided evidence that RR strategy, be it assisted or unassisted, is an effective method teachers can use in reading classes to improve readers' automaticity and accuracy. Nevertheless, results of research works on whether or not RR strategy use is effective in improving learners' reading comprehension are not similar (Mathes and Fuchs, 1993, Bryant *et al.*, 2000; and Vaughn, *et al.*, 2000). In some studies, the results are not very significant. Dahl's (1979), and Carver and Hoffman's (1981) studies, in which many strategies have been used including RR, have revealed similar results; RR improves accuracy and automaticity, and improves micro-level comprehension, while it does not correlate with any other comprehension measure. Conversely, some researchers have come up with more positive results that reflect the relationship between RR strategy and reading comprehension. Dowhower (1987), as mentioned previously, has used assisted and unassisted RR strategy in her study. Expectedly, the results have revealed that rereading improves readers' automaticity, accuracy,

prosody and comprehension. In addition to that, this positive influence has been noticed even when students read unpractised passages that are similar to the practiced ones.

It is noteworthy that RR strategy has been described as an effective strategy for enhancing readers' fluency to a great extent, and their reading comprehension to moderate extents. Since this strategy develops fluency components simultaneously, it is no surprise that it accounts for the success of readers in processing a text. This strategy abides by the assumptions of LaBerge and Samuels' (1974) automaticity theory which holds when learners practice, their levels of accuracy and automaticity increase. Parallely, it is consistent with Logan's (1988) instance theory of automaticity since it asserts that extensive reading trials improve automatic reading and, thus, help the reader make sense of what he reads. That being said, it is relatively safe to say that RR strategy use, assisted or unassisted, improves all fluency components and, thus, aids readers' comprehension.

#### **4.8.2 Word previewing**

According to Schwanenflugel, Hamilton, Kuhn, Wisenbaker and Stahl (2004), word recognition correlates strongly with reading comprehension and it is essential for reading fluency. In relation to this point, LaBerge and Samuels (1974) note that rapid word identification represents the bottleneck theory's key concept; when the reader cannot recognise words immediately, this problem blocks the way to automaticity which, then, results in comprehension problems. Therefore, rapid word recognition paves the way for a better meaning construction.

To improve readers' fluency at word level, word previewing task is one possible option. When teachers use this activity, they present their students with words, regardless of whether they are context free or context dependent. Using words out of a specific context to train their word identification skills has not proven a remarkable influence on their comprehension (Samuels,



1979). Using words in a specific context has shown to be more successful and influential on fluency (Fuchs, Fuchs, Hosp and Jenkins, 2001). Conversely, other studies have reported different findings. Dahl (1974) and Dahl and Samuels (1977), for example, have similarly had learners involved word identification training where no increase in fluency or comprehension has been noticed even though the read passages contain words that have already been used in the word identification training exercises. This implies, then, that even though word recognition is an important component of reading fluency, it is not enough, on its own, to improve reading fluency.

Another research, by Eldredge (2005), has been conducted to check how word previewing influences learners reading fluency. This study has revealed a noticeable increase in some learners' general fluency and a remarkable growth in some other learners' automaticity and accuracy. This study, contrarily to Dahl and Samuels' (1977), has proved that training students' word recognition skills, even in the absence of a specific word context, results in an improved reading fluency (automaticity and accuracy) and comprehension. Therefore, it is evidence for theories which assume that fluency improves reading comprehension.

Many other researchers, like Spring, Blunden and Gatheral (1981), have been interested in improving readers' word recognition speed using word lists as a word previewing method. Expectedly, their study' results have shown that, once again, such word previewing methods foster readers' automaticity and accuracy although no noticeable influence has been reported on reading comprehension. Nevertheless, Dahl's (1979) research results have taken an opposing direction. Her study shows that her participants have not benefited from word previewing to improve their reading automaticity and accuracy. Such differences in results might relate to the way such training exercises are used or even the number/type of words used in these task lists.

The National Reading Panel (2000) admits that such a strategy improves learners' recognition of the practiced words, yet it does not help readers transfer this automatic recognition when words are put in a specific context. This chapter reviews the previewing method of context free and context- dependent words that have been validated by many researches to be reliable in improving learners reading comprehension through enhancing their fluency, regardless of which one is more influential than the other.

#### **4.9 Reading automaticity assessment**

Automaticity theories, including LaBerge and Samuels' (1974), have always considered automatic word identification as an important component of reading fluency. This is what explains, according to Rasinski (2004), how automaticity evaluation explains learners' fluency and reading comprehension.

Since fluency has three components (automaticity, accuracy and prosody), the best way to assess it is to measure each component separately using different tools of reading fluency (Rasinski, 2003; and Valencia *et al.*, 2010). Informal reading inventory (IRI) is one of these tools that measure reading fluency. It consists of word lists, passages and questions that evaluate readers' fluency and comprehension. The disadvantage of such tools is that they are time consuming and cannot be applied on large research samples. Consequently, a more practical consideration of fluency assessment has been developed; it is curriculum-based measurement (Deno, 2003).

Deno's curriculum-based measurement approach (CBM) holds that to assess readers' fluency, they are required to read a text that corresponds to their level for one minute while the researcher measures the reading time and errors to calculate reading speed and accuracy. One of the possibilities of calculating speed and accuracy is by dividing the number of words a text

consists of by the entire reading duration in minutes (words correct per minute WCPM) (Coman and Heavers, 1998). Since this tool is more practical, the researcher can administer many passages in a single assessment session to achieve more reliable results. This enables researchers who conduct longitudinal studies to assess their students' fluency growth repetitively during a long period of time to, simultaneously, adopt the best reading instruction. In their description of these CBMs, Valencia *et al.* (2010, p.272) note that they are “[...] reliable and valid, simple and efficient to administer, easily understood by teachers, and inexpensive.” What probably makes these tools efficient is that they enable educators to determine students' fluency problems and design appropriate reading instruction that helps struggling readers to, quickly, get over their reading difficulties during the very same academic year.

According to Morris *et al.* (2013), Automaticity can be assessed through reading rate measures since rapid reading represents automatic word identification. As explained earlier in this chapter, automaticity, in the theory of LaBerge and Samuels (1974), is said to be important in reading because it helps the reader free up some cognitive resources that are more needed at higher-level processing which is, in this case, reading comprehension. In the same vein, Fuchs *et al.* (2001) assert that “reading development presumes increasing word recognition speed, which is associated with enhanced capacity to allocate attention to integrative comprehension processing when engaging with text” (p.242). Consequently, using CBMs to measure students reading rate makes it possible to measure their reading automaticity and, automatically, their comprehension. That is to say, such fluency assessment tools reflect readers' automaticity and higher-order text processing abilities.

As many measurement tools, the CBMs have been criticized. Even though they help educators to adopt better instruction for struggling readers, Murray, Munger, and Clonan (2012)

have claimed that they are insufficient indicators of the major sources of fluency problems and learners' needs in reading. Nevertheless, those proponents believe, just like CBMs proponents, that to assess fluency accurately, different assessment tools are required to target the different fluency components.

Differently from CBMs that use context-based words in assessing fluency, some researchers believe in the reliability of context-free word recognition tests; they are known as timed automatic word-recognition assessment tools (TAWRA). Using a list of context-free words, according to the proponents of TAWRA, gives a more accurate image about readers' rate in reading since it does not allow them to rely on a specific text as a support (Frye and Gosky, 2012). These tools, according to Morris *et al.* (2012), assess the readers' speed to recognise words, and thus, they reflect their reading rate. This latter, according to Morris *et al.* (2011), "indicates the ease or efficiency with which a student can process text of different difficulty levels" (p.225). That being said, students' reading fluency abilities can be determined from the measurement of their reading rate, which, then, reflects their comprehension abilities.

The main issue about isolated word recognition tests is whether such assessment tools really need to be timed. Much earlier, Durell and Betts have been measuring readers' word-recognition abilities by displaying images for brief moments. The aim behind this technique is to see whether or not a reader can recognise a word even though it is displayed for a second fraction. When readers, using flash score, cannot recognise the word in the timed phase of the test, they are given a second chance in an untimed phase of the test. This phase is definitely not accounting for reading automaticity; it measures accuracy only contrarily to the first phase that accounts for accuracy and automaticity (Betts, 1946). Even though using flash score has become a good predictor of learners reading abilities until late seventies (Stauffer, Abrams, and Pikulski, 1978),

many researchers have started to see no importance for timing such tasks. The main reason is that there are no specific norms relating to the flash display duration; this makes every researcher time their flash scores differently. In the same vein, Morris *et al.* (2012) have conducted a research to check the reliability of timed and untimed word list presentation to check if there is any difference in the extent to which each one reflects reading automaticity. Their research has revealed that timed and untimed techniques predict oral and silent reading abilities. Nevertheless, no evidence is given to prove whether or not longer word presentations guarantee a better reading ability prediction. Researchers are definitely called for further research in this area.

## **Conclusion**

It is purposeless to read without understanding since the main purpose behind reading is to comprehend the text. This might occur when readers, mistakenly, believe that good reading means fast reading. Then, it is the researchers' job to remedy educators' misconception of what fluent reading is. Fluency has always been demonstrated as a significant correlate of reading comprehension. Therefore, research has been focusing on developing the different components of fluency that are automaticity, accuracy and prosody. It is undeniable that automaticity, which is the core of this chapter, has been the concern of psychology, for more than a century, and the center of interest, for several decades, for cognitive psychologists. Earlier conceptions of automaticity have considered its characteristics and conditions. Since considerable advance has been made in the last few decades, the consideration of automaticity has become sophisticated. This chapter, thus, has reviewed literature on automaticity in relation to fundamental, time-tested theories of automaticity that explain this concept as a memory-based capacity. They mainly explain how reading automaticity helps readers free up some cognitive resources for higher-order comprehension processes. Therefore, reading becomes fast and effortless at the level of decoding

to become more effective at the level of understanding. To clarify the link between automaticity and reading comprehension, some instructional methods like repeated reading and previewing have been briefly reviewed. These methods are described to be successful since they target the different fluency components', including automaticity, and reading comprehension and make struggling readers gain in reading automaticity and, thus, in reading comprehension. This would make educators of poor readers recognise the necessity of incorporating fluency-based instruction into their reading curricula for a more effective and comprehensive reading instruction.

## **Chapter Five**

# **A Correlational Study of the relationship between Reading Comprehension and Working Memory**

### Introduction

#### 5.1 Research questions and hypothesis

#### 5.2 Target population, sampling, and participants

##### 5.2.1 Target population

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###### 5.6.2.1 Reading span task

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5.7.2.1 Reading span task

5.7.2.2 Operation span task

5.8 Correlation coefficient 'r' analysis

5.8.1 General correlation

5.8.2 Partial/component correlations

5.9 Discussion of the results

Conclusion



## **Introduction**

The current chapter is designed in order to analyse the nature of the relationship between readers' working memory capacities and reading comprehension of a text written in English as a foreign language. That is to say, it considers the importance of students' capacities to recall and process information simultaneously on their text processing efficiency. To test the research hypothesis and answer the study's questions, a correlational study is conducted and reported in this chapter. Therefore, this section reports the study's method, research instruments, and collected data analysis. To make this possible, the working memory capacities and reading comprehension abilities of 100 third year English language students have been tested using working memory span tasks and MCQs respectively. In order to check the nature of the relationship between the participants' working memory capacities and reading comprehension abilities, calculating the correlation coefficient 'r' is inevitable. The Pearson Product-Moment Correlation Coefficient 'r' is estimated and reported to mirror the relation between WM capacities and reading comprehension and, thus, to confirm or reject the study's hypothesis.

### **5.1 Research questions and hypothesis**

This chapter examines the relationship between working memory and reading comprehension. Therefore, this chapter sets out to answer the following questions that guide this correlational study.

- What role does the students' working memory play in their reading comprehension?
- How does the working memory system facilitate complex span tasks that are related to language processing?
- What is the limitation in working memory that leads to individual differences in reading comprehension?

In an attempt to answer these questions, it is possible to state the following hypothesis: High memory spans are better comprehenders of a text written in English as a foreign language than low memory spans. The current chapter aims at confirming the truth of this prediction.

## **5.2 Target population, sampling, and participants**

The quality of a research paper does not stand only by the appropriateness of its methodology and tools; the target population, the sampling strategies and the participants have also to be accounted for (Cohen, Manion, and Morrison, 2000).

### **5.2.1 Target population**

The term target population refers to the whole group the researcher tries to understand (Brown, 1988). The study results are, later, generalized to this target population since all the members have significant traits in common (age, sex, level of education, intelligence quotient...etc.) (Lavras, 2008). It is noteworthy that targeting a specific population is based on the research's assumptions.

The results of the current investigation are generalised to the population of third year students of English as a foreign language at Frères Mentouri University, Constantine, Algeria. 465 students are enrolled as third year students in 'applied language studies', 'language sciences', and 'language, literature and civilization' during the academic year 2014/2015. Students, at this level, do not take any reading subjects; reading is practised and integrated with some other skills when receiving different modules, namely speaking and writing. This has made the study a little bit difficult to be conducted. Fortunately, the researcher is a written expression teacher who has integrated reading skills in her writing classes to make it possible to carry out this investigation. Written expression module is devoted one hour and a half per week.

This population is targeted to carry out the study's investigation for many reasons. Actually, third years are students who have already studied English for seven years or more (elementary, secondary and university). This implies that they have achieved a given language proficiency, be it at the level of grammar or vocabulary, which is more likely to make the researcher face fewer limitations (at the level of language) when conducting the research. That is to say, students are less likely to encounter language problems when they approach texts that are written in English as a foreign language. In addition to that, working memory has been highlighted as an important cognitive capacity in the reading comprehension of children and adults (Swanson, 1996). This compares to many research works that consider working memory, among other capacities, as a cognitive development regulator which helps individuals perform cognitively demanding tasks, such as reading comprehension, successfully and develop their cognitive processing abilities (Hasher and Zacks, 1988; and Salthouse, 1992).

### **5.2.2 Sampling**

Collecting data from every participant in the study population is next to impossible because of some time, accessibility or even expense factors. That is why the researcher needs to make some sampling decisions to gain information from a smaller group. In this study, instead of determining the minimum number of participants that will be involved in the study (bottom-up method), a top-down method is applied to make decisions about the required sample. That is to say, the researcher considers the total population first and then works down to a smaller sample (Bailey, 1978).

In this quantitative study, two sampling methods are suitably used in combination: stratified random sampling and opportunity/convenience method. The stratified random sampling uses random selection which assures that all the students in the population have the same probabilities of being selected by the researcher. Participants, following this method, are already

put into groups or strata based on specific criteria (age, sex, level ...etc.). As far as opportunity or convenience method is concerned, it helps select participants because of their easy access or availability. The researcher, thus, can gather data easily and quickly (Coolican, 1994). In this study, the students are already classified into different groups (strata) according to their study level and they are taught by the researcher, which makes their accessibility easy.

Equally important, the researcher needs to make decisions concerning the size of the study sample. According to Blalock (as cited in Cohen, Manion and Morrison, 2000), a study sample size in a quantitative study can be calculated in relation to accuracy level and probability level that are required and accepted by the researcher. Taking into consideration Blalock's formula, the different calculations of this research sample size are summarized as follows:

a)- if the researcher is satisfied to be within + or – 0.5 of a scale point and accurate 8 times out of 9, then a sample of 29 out of 465 students is required.

b)- if the researcher is satisfied to be within + or – 0.5 of a scale point and accurate 45 times out of 46, then a sample of 51 out of 465 students is required.

c)- if the researcher is satisfied to be within + or – 0.5 of a scale point and accurate 464 times out of 465, then a sample of 93 out of 465 students is required.

d)- if the researcher is satisfied to be within + or – 0.25 of a scale point and accurate 464 times out of 465, then a sample of 310 out of 465 students is required.

The calculation that is found to be suitable and, thus, adopted in this study is c). Actually, calculations a) and b) suggest a very limited sample that is not likely to represent appropriately the population in question. Conversely, calculation d) is almost perfect but it is not possible to conduct a research on 310 students because of time constraints and administrative reasons.

### **5.2.3 Participants**

Following the previously-presented calculation of the sample size, the experimentally accessible population includes 100 third year English language students (22 males and 78 females) at Frères Mentouri University, Constantine, Algeria. They are taught written expression by the researcher; this makes access to the sample easy. As explained previously, these healthy young adults (mean age = 22.27) have been selected from the target population using stratified random sampling and opportunity/convenience method. The researcher has felt the need to overestimate the required sample size. This is due to the probability of attrition and participant mortality. That is to say, some students may be absent in some sessions and, thus, will not participate in some of the method tasks.

### **5.3 Overview of the study method**

For some researchers, experiments are seen to be better and more scientific research methods than correlations that could be seen as unscientific. Discussing which of the two is better would actually be, at best, a *naïve* question. Therefore, the best research method is the most direct and defensible in addressing the research questions and hypotheses, be it a correlation or an experiment. Therefore, to test the research hypothesis that targets the relationship between working memory and reading comprehension (as reported in this chapter), a correlational study is seen to be the most appropriate research method.

Under some research conditions, it is impossible or inappropriate to manipulate factors that are said to relate to each other. In such situations, a correlation stands as a better option for the quantitative researcher. A correlational study, as its name indicates it, helps the researcher establish a relationship between two variables. He assumes that a couple of variables are linked to each other, and he measures both of them in two different contexts to check whether or not a relationship

exists between both of them; this correlation is reflected in a statistical significance (Cohen, Manion, and Morrison, 2000). To put it differently, when a researcher is engaged in a correlational study, the researcher relies on situations that occur naturally to collect and manipulate data statistically and make conclusions. Notwithstanding, natural situations are very scarce to occur to make it easy for the researcher to conduct his study. It is noteworthy that correlational studies require the researcher to control the nuisance variables to be able to reveal more reliable conclusions.

In this part, the relationship between reading comprehension and working memory is investigated through a correlational study. In this part of the research, participants' working memory and reading comprehension capacities are measured (the tools are described in the following section) and transformed into scores. Then, a correlation 'r' is calculated, using scores obtained in the different reading comprehension and working memory tests, to measure the degree of the relationship that exists between reading comprehension and working memory as linear related variables or independent ones.

#### **5.4 Pilot study**

Pilot studies, also referred to as feasibility studies, are mini or "small scale versions" versions of the main study (Polit *et al.*, 2001). They are an important element of a successful study design because they serve to test a specific research tool before being used in the full scale study. Even though feasibility studies do not guarantee success in the main study, they increase its chances to be successful. This is possible thanks to the different advantages of these pilot studies.

A feasibility study is required in this research since it provides the researcher with valuable insights into the instruments content and administration. Given that measures in this study have been either modified or administered to native speakers of English, it is important not to take the

risk and administer them directly to the study's sample. This way, the researcher can be warned and informed about the level of appropriateness and difficulty of the research instruments.

This pilot study has tested the validity of a reading comprehension measure and two working memory span tasks. It took place in October 2014, a couple of weeks before the administration of the tests in the full scale study. The students who have participated in this feasibility study are 50 third year English language students from the English Language Department, Frères Mentouri University, Constantine, Algeria. Here, it is noteworthy that pilot participants are different from the ones to whom the main research measures are administered; this prevents any possibilities of contamination. That is to say, the researcher avoids any headaches that may come from using the same participants in the small scale and full scale study. Actually, when participants have already been administered the measures in a pre-testing study, they are more likely to respond differently from those who are being administered the instruments for the first time. Thus, this influences tremendously the reliability of the results.

#### **5.4.1 Reading comprehension measure**

Reading comprehension measure that is used in the pilot study has been allocated one hour. It consists of two sections. The first one includes 2 items about the author's general purpose in the passage. Then 2 items raise the point of the passage's main idea and 2 about its conclusion. After that, participants are presented with 4 vocabulary items in which they try to guess the meaning of words in bold from the sentences they occur in. Following that, 2 items test the students' capacity to understand decontextualised sentences, 1 item measures their understanding of supporting details, 5 items to find the relationship between two sentences and 2 items that require extracting implied information. The second section consists of a 394 words narrative passage which is

followed by 8 MCQ about some events in the story. Each question is followed by 5 response options.

The analysis of data obtained from this test and the students' self-evaluation questionnaire 01 (See Appendix I.1) has given the researcher better insights into this measure. From the students' performance on the test, the major remark that can be made is that many questions were left unanswered even by the best performers. This could mean that participants have found those questions to be too difficult/ambiguous or they have had no time to finish all the questions. Thus, to bring appropriate modifications to the test, the pilot participants' response to self-evaluation questionnaire will help a lot. What follows is a report of what the majority's response to each statement is.

- 1- 73% of students agree that test items in general are of a medium level of difficulty.
- 2- 54% of participants strongly agree on the fact that the test's short passages can be understood easily.
- 3- 51% agree that reading and understanding the test is easy.
- 4- 46% agree that the text can be remembered easily.
- 5- 41% claim that the text cannot be followed easily.
- 6- 56% of the participants see that the text is demanding (requires a lot of efforts).
- 7- 71% of the participants remain neutral about the length of the text in the second section.
- 8- 35% claim that the different options are confusing.
- 9- 56% strongly agree that vocabulary is familiar.
- 10- 43% of the participants are neutral about the logical flow of text ideas.
- 11- 58% of students strongly agree on the absence of awkward ideas.
- 12- 59% of learners agree that the information required to understand the text is found there.



13- 47% agree that ideas are well organised.

14- 86% strongly agree that time allocated is not enough to process all passages and answer carefully all the questions.

15- 11 students out of 50 have given some similar suggestions. These can be summarized in the fact that one hour is too short for the test. In addition to that, it is claimed that the different options get the students more confused when they need to opt for one answer.

In the light of what has been reported, the modifications that have been brought to the test are summarized as follows. First, students should be presented with 4 instead of 5 options in each question in section one. Furthermore, the number of items, in the first section, is moving from 20 to 15 items. The ones that have been removed are: 1 item on text general purpose, 2 items about guessing the meaning of words from context, 1 item from decontextualised sentence understanding and 1 item about sentence relation understanding. Here, all the types of items are kept but the number of items per category has changed depending on the degree of this component's importance in reading comprehension. In the second section, no modifications are seen to be necessary for the text since it is said to contain, to some extent, familiar language and clear/well organized ideas. Nevertheless, the number of MCQs that relate to it are reduced from 8 to 5 questions, 5 response options for each. These 20 items are allocated, then, 45 minutes to be, hopefully, processed.

#### **5.4.2 Working memory measures**

Checking the feasibility of working memory measures is necessary. First, the version used in this study is a modified version of Daneman and Carpenter's (1980) and that of Engle and Turner (1989) because these tests have been designed and administered to native speakers of English. Thus, they have been modified to, hopefully, become more appropriate for the EFL learners who

participate in this research. This pilot study has been conducted in October 2014, one week after that of reading comprehension measure. Given that this measure is more time consuming than reading comprehension measure, students have been divided into 5 sub-groups of 10 pilot participants to take the test which has been administered on two different days (Monday for RST and Thursday OST).

In the pilot study, DataShow tool is used to facilitate group testing. As far as the RST is concerned, students have been presented with 60 sentences that are grouped into 15 sets that contain an increasing number of sentences, from 2 to 6 sentences per set. Each sentence, followed by a separate letter, is displayed for 7 seconds; by the end of each set, students are given 6 seconds to recall the target words. For the OST, pilot participants have been presented with two sections. The first section is made up of 22 items; they require students to remember letters, solve operations and do both simultaneously. Concerning the second section, it is made up of 60 strings that include a mathematical equation to be verified and a word to be recalled. Each string is displayed for 7 seconds each.

When analysing the pilot participants' performance on the RST and OST, some points need to be polished up. First, many students (64%) have left some items unanswered; this is clearly remarkable in the second section of the OST. This might be due to the difficulty of the items even though these missed items are classified as less difficult than some other items. In this case, a more logical explanation is that students need more time to respond appropriately to all the items. Not understanding the instruction is less likely to be the reason of their failure responding to some items because they have been explained the task twice and they have been presented with practice example; they have confirmed their understanding of the task.

In the light of participants' performance and the suggested explanations, a major finding has to be considered. The time of presentation of separate sentences has to be taken into consideration again. It seems like 7 seconds are too fast for students to process a string, be it in the RST or the OST. After asking them about this possibility, the majority confirmed this time obstacle. Taking these into consideration, it has been decided that RST and OST (section 2) strings should be devoted 9 seconds instead of 7. That could be less difficult but still challenging to some students; the task does not have to be easy and accessible to everybody.

Another modification relates to the number of strings in the OST; they should be reduced to 42 items instead of 60. Actually, the OST consists of 2 sections; presenting students with less items can make them perform more seriously without feeling exhausted which guarantees, to some extent, more reliable results. In addition to that, the to-be-remembered items in the RST have to be changed from letters to words (final word in the sentence) since students seemed to find it easier to recall letters without judging sentences correctness appropriately. Moreover, section 3 in the OST that consists of displaying a letter, then verifying an operation and, finally, displaying a second letter has been accessible to all participating students. Thus, to make it more challenging, it has been modified; students are displayed a letter, an operation, a letter and an operation. This makes them process more items and, thus, only high spans can recall the letters in their order while verifying the equations.

After considering the participants' performance and their scores on both tests, a correlation coefficient 'r' has been calculated to predict the main study's results. The obtained correlation coefficient 'r' is 0.716. This indicates that there is a positive correlation between working memory and reading comprehension since the obtained 'r' is superior to the required one (the value of

critical 'r' is 0.275). Nevertheless, the results in the full scale study might differ completely from the ones of the small scale study.

## **5.5 Research tools**

This section describes the different tools that are used to measure reading comprehension, and working memory. They consist of a reading comprehension test (MCQs) and two working memory span tasks, namely the reading span task (RST) and the operation span task (OST).

### **5.5.1 Reading comprehension measure**

This measure is broken down into two sections (See Appendix II.1). Both of them are inspired by the Nelson-Denny Reading Test (NDRT). This test is used to measure high school and college students reading abilities; it helps researchers find out about the students who need remedial reading instruction. In its original version, the NDRT consists of two subtests of vocabulary and comprehension (one for each) using multiple choice questions (Cummins, 1984). In this study, focus is not on vocabulary even though it is admitted to be crucial for comprehension; this explains why both sections focus on reading comprehension. In addition to that, the original test is not adopted for it has been claimed to be difficult for non-native speakers of English (Heise, 1984); this clearly influences the validity of the results. Therefore, to avoid the tremendous amount of difficulty that students may face while taking the test, the purpose of the test is kept, with 20 MCQ, while the content is completely modified.

The first section of the test includes 15 MCQ which are followed by 4 answer choices. These questions target the different abilities a reader needs to process a text successfully. These exercises are drawn from the Accuplacer Standard Test (Coleman, 2012). This measure, in its complete form, consists of different sections: Reading, writing and math skills. To serve the purpose of this study, only reading comprehension tasks are adopted from this test. The first task,

in this section, determines the authors' general purpose of writing the presented expository passage. Then, participants have to respond to two questions about the main idea of a short expository paragraph. Then, to make the task more challenging, the participants are asked to find logical conclusion/end to what has been understood in two successive passages. Vocabulary is, to limited extent, tackled in this section; students are required to guess the meaning of two words using their context, which is in this case a couple of sentences. Later, the students' abilities to understand separate sentences are measured; they are required to understand a decontextualised sentence. Then, they are required to extract the supporting details of the main idea. Four questions, after that, are more demanding than all the previous ones; participants are asked to find out the relation that exists between successive sentences where no linkers or transitional expressions are used. Finally, students are required to be able to read between the lines to get the implied information of hidden message. It is noteworthy that these tasks are ordered, according to the level of their difficulty, from the least challenging (general) to the most challenging (specific). The second section of the test consists of a longer narrative passage of 394 words. It is followed by five MCQ, and each question is followed by five response options to choose from. Since the text is narrative, the questions main concern is the chronological order of events in the passage, which may not be always easily understood.

In spite of the fact that MCQ, as a reading comprehension measure, might be thought of to be unreliable by some researchers, they are chosen in this study because of some reasons. First, the different items (choices) reflect the different representations of the reading comprehension construct; this makes the task challenging for the participants. In addition to that, participants are more likely to consider MCQ as a problem solving task rather than a comprehension task, which may put less pressure and demands on learners as they read to understand. Furthermore,

participants use a combination of mental resources interactively to determine an appropriate choice (Rupp, Ferne and Choi, 2006). More than that, students have shown a lack of interest in answering ‘open’ questions using their writing skill; this may result in giving incomplete answers, awkward answers (at the level of grammar, content or diction), or no answers at all. Additionally, this task can be easily administered to large samples and its scoring is more practical than other reading comprehension measures.

### **5.5.2 Working memory measures**

Memory span tasks are used in this study because they have come to prominence thanks to their methodological merit. WM tasks, including reading span and operation span tasks, are valid and reliable tools for assessing WMC. Based on the assumptions of Baddeley and Hitch’s (1974) WM theory, these tasks have been first designed by Daneman and Carpenter (1980) and then modified by Turner and Engle (1989). These tasks target the immediate memory system which is said to be functionally important in storing a limited amount of knowledge to ensure an ongoing mental process. To put it differently, the system’s capacity to maintain task-relevant information active and retrievable while some demanding cognitive tasks are being executed is what these tools measure. That is why these measures are said to assess individuals’ storage, rehearsal and retrieval capacities simultaneously with additional input processing. To this end, these tasks present participants with to-be-remembered information (they may take the form of words or digits) in addition to a to-be-processed complex task (sentence understanding and equation verification). These instruments are documented in the following part.

#### **5.5.2.1 Reading span task**

This task is the first one that targets WM functions of storage and processing (Daneman and Carpenter, 1980). This measure is a simple word span task in addition to sentence

comprehension task (See Appendix III.3). Here, the to-be-remembered information is the last word (one- or two-syllable length noun) in the sentence; this latter needs to be simultaneously understood while storing and recalling the word of interest. When performing this task, participants are supposed to store, for a later retrieval, the last word of each presented sentence and to verify sentence accuracy.

Taking into consideration the fact that participants are not native speakers of English like the ones to whom original reading span tasks have been administered, some modifications have been brought to the task. The number of sets is still the same. Nevertheless, some sentences have been modified to be less demanding while some others have been kept to make the task, to some extent, challenging. Sentences, in this task, consist of 13 to 16 words, and they are grouped into 15 sets of three sentences; each of these sets consists of a number of sentences that range from 2 to 6 sentences, 3 sets for each.

This study has adopted the version of Daneman and Carpenter (1980) in terms of the number of sentences and words per sentence and that of Turner and Engle (1989) that has brought some modifications to the original one. Here, the fundamental premise of the task is still the same. However, this later version asks participants to make judgments on whether or not the sentences are semantically and syntactically correct (e.g., “The taxi up turned Avenue Michigan, they where had a view clear of the lake”) instead of testing them on the veracity of these sentences using true (T) or false (F) options. Therefore, 50 % of the sentences are grammatically and semantically correct while 50 % are incorrect.

Other modifications have been brought to this task. Nevertheless they have not been seen to be efficient in this study. A recent of the reading span task is that of Kane *et al.* (2004). In this version, the to-be-remembered items are letters instead of words. This has sounded to be less

reliable, at least in the context of a research where young adults are being tested, since it will be easier for participants to remember letters. Here, they can make words or non words out of the to-be-remembered letters to make it easier to recall them later. Thus, using words (one- or two-syllable words) makes it more challenging to keep these items in a retrievable form.

### **5.5.2.2 Operation span task**

In designing the RST, Daneman and Carpenter (1980), as explained previously, put that to predict reading abilities, working memory span task must have reading as an integral component. Conversely, Turner and Engle (1989) have proved that reading ability could be predicted using a working memory span that does not have to include sentence reading as a potential component; it may even work with no reading tasks. This is how the operation span task has been created.

The OST demands are similar to the RST ones. Similarly to the RST, OST presents participants with to-be-remembered information simultaneously with some cognitively demanding tasks (See Appendix III.3). Since reading is not seen as a crucial component in this task, verifying mathematical equations has replaced reading sentences. This task is designed to measure the participants recalling capacities using letters, words and mathematical equations. It is, similarly to the RST, a modified version of the original task since this latter is of a higher level of difficulty for participants. The OST is divided into two parts. The first one consists of 22 questions; some require a mere storing and recalling of letters in the exact same order of display, other questions require the participants to verify some mathematical equations, and the most challenging questions in the test require the students to, simultaneously, verify two equations and store and recall two letters in their order of display.

The second part of the OST is quite similar to the RST in its general structure (excluding reading activities). It consists of 42 strings of mathematical operations, including two practice



strings, which are made up of a mathematical equation; this latter consists of two arithmetic operations and a suggested solution (See Appendix III.2). These operations are a) a division or a multiplication and b) a subtraction or addition problem. 50% of the suggested solutions are correct and the remaining ones are incorrect (e.g.,  $(13*2)-5=?20$  (FALSE), and  $(39/13)+3=?3$  (TRUE)). Similarly to RST sentences, the OST strings are organized, in an ascending order, into different sets (12), and each three sets consist of two, three, four and five strings. The mathematical operations in this task are followed by a to-be-remembered a one- or two-syllable word; together they make the test stimuli. Nevertheless, ordering the different sets is not similar to that in the RST. There is no ascending order that is followed in organising the different sets. That is to say, a participant may encounter a set of 5 strings in the beginning of the task and a set of 2 strings by the end of the task. In making this modification, Engle *et al.* (1999) have explained that using an ascending order in this task helps the participants guess the number of words that they will be next required to remember. This, according to them, makes the subjects rely on some helpful strategies in order to know how many items need to be recalled. This anticipatory action that helps participants deal with expected changes is called proactive interference (Lustig, May, and Hasher, 2001). This modification is brought to the OST in this study. Nevertheless, the organization of the different sets is not 100% random since the five-string sets are not presented earlier in the task not to make participants encounter difficult tasks right from the beginning and, thus, get them discouraged to finish their task.

It is noteworthy that in the RST and the OST, the words that are being used do not relate to each other, at least directly, for this can help participants make some associations that would help them recall easily the to-be-remembered words. Furthermore, using two-syllable words, in

addition to one-syllable nouns, makes it more challenging for participants to, later, recall the words in question.

## **5.6 Procedure**

This section reports the research procedure that has been followed to investigate the relationship between working memory and reading comprehension. Therefore, it reports the conditions under which the study's tools have been administered.

### **5.6.1 Reading comprehension task**

MCQ exercises have been administered to 100 undergraduate third year students, who are healthy young adults, to measure their reading comprehension abilities. The first exercise, as described previously, aims at measuring the students' different comprehension abilities like a) understanding passage general purpose, b) extracting the paragraphs' main idea, c) drawing a conclusion, d) guessing words' meaning from their context, e) understanding decontextualised sentences, f) grasping the supporting details of the main idea, g) recognizing sentence relations and h) reading implied information or hidden messages. The second exercise in this task consists of simply reading a longer narrative passage and answering five MCQ that relate to it.

This measure has been administered during the normal class timing. This is facilitated by the fact that the researcher is the teacher of the study's participants. Actually it did not last for a whole class; it has lasted for 45 minutes. This duration has been judged to be fair enough to read a 394-words passage, 8 passages and some related or separate sentences and answer multiple choice questions about them. This type of questions, as described in Chapter One, are less time-consuming, less demanding in relation to writing/grammar skills, and, thus, readers will focus more on reading and understanding than on looking for the appropriate/correct way of writing answers (given that the measure focuses on reading abilities, not writing skills). This, hopefully,

makes students feel less anxious while taking the test. In addition to that, students have been told that their answers will remain anonymous and that the best performers are more likely to be rewarded. This, in fact, has made students feel more motivated to read and answer questions seriously, which is definitely needed to be able to give more reliable results by the end of the study.

## **5.6.2 Working memory tasks**

In this study, two main span tasks have been used; reading span task and operation span task.

### **5.6.2.1 Reading span task**

This measure assesses third year students' recalling capacities using reading. This is a modified version of the original task since the participants are not native speakers and, thus, administering the original version will not result in reliable findings. This task that consists of 60 sentences to be read and processed along with 60 words to be recalled has been administered to 100 participants in the regular classroom timing. Because of the large sample, administering the RST individually is impossible. Thus, a group testing is the only available option; participants are divided into groups of ten to facilitate the task of controlling them for the teacher. To administer the test in groups, DataShow, as a presentation tool, is inevitable. The teacher, who is the researcher, is the one to control the display of different sentences.

As explained previously, the different sets of sentences consist of an increasing number of sentences, from 2 to 6 sentences per each. Each sentence is displayed for 9 seconds; this sentence is read orally by the teacher and silently by the students. The teacher's reading replaces the oral reading students perform in the original version of the task since it is impossible to make all the students read aloud simultaneously. During these 9 seconds, the students have to judge, while reading the sentences, whether or not they are grammatically and semantically correct and to keep

the to-be-remembered word in a retrievable form. By the end of each set, students are given 6 seconds, regardless of the number of words to be recalled, to write down the words in question.

To make sure students have understood the task, the researcher has presented them with the following set of sentences to demonstrate what they are supposed to do with the remaining sets of the task.

1. Driving in the rain is dangerous because of reduced adhesion to the road.
2. After out of the jumping, the relieved paratrooper parachute was when his finally opened plane.
3. The teens took a hike with their picnic basket all the way to Shyer Falls.

Here, they are asked to read each sentence for 9 seconds, to judge its semantic and grammatical correctness and put it on an answer sheet, and to recall remember the last word of each sentence. By the end of each set, they are given 6 seconds to recall the words in the same order of display. In the model set presented here, sentences 1 and 3 are grammatically and semantically correct while sentence 2 is incorrect (grammatically and semantically). In addition to that, the words to be remembered are 'road', 'plane', and 'falls' in this order.

#### **5.6.2.2 Operation span task**

This task is administered to third year students to measure their recalling capacities using letters, words and arithmetic equations. Taking into account the number of students who have participated in this study and the time allocated for testing, it is impossible to use individual testing; it is difficult for the researcher to find extra sessions, additionally to the regular weekly sessions, to administer the test. Here again, students have been divided into smaller groups of ten students to take the test. Similarly to the administration of the RST, DataShow use has facilitated group testing.

As far as the first part is concerned, students have been presented with 22 items that have been displayed for 5 seconds each. Some items require the mere recalling of a group of letters or the verification of an arithmetic equation; others are more demanding and require both. At the beginning of each item category, the participants are given a clear instruction on how to proceed with the items, and then they are presented with a practice item to get them familiar with how the task works and to make sure they have understood what they need to do with the remaining items. The first category consists of 3 items.

To explain the first category of items (3 items), the students are told that 4 letters will appear one at a time. Their job is to try to remember each letter in the order presented. After all the letters have been shown, they are told that they will see a list of 12 possible letters. Then, they have to select each letter in the order presented by writing a number next to the appropriate letter. The participants' attention, here, is drawn to the importance of getting the letters in the same order as they see them. To make sure the task is well understood, the following example is introduced as a practice exercise.

D		
H		
R		
N		
R	S	H (2)
O	B	L
D (1)	R (3)	T
M	J	N (4)

Items in the second category are different. Students are asked to compute the correct answer of 14 math problems *mentally*, one at a time (the use of papers and pens or calculators is not allowed). Then, they are required to consider the suggested solution and put a check mark in the

appropriate box (True or False). To make the task clear, the following practice exercise, which consists of two mathematical problems, is given to the participants.

-  $(2*2) + 1 = ? 6$  (FALSE) / the correct answer is '5'

-  $(2*1) + 1 = ? 3$  (TRUE)

The four exercises in the third category are expected to be the most challenging since participants are required to recall letters and solve math problems simultaneously. They are told that the following set, they are given a letter that they try to remember. After that, one of the math problems will appear; they need make a mental calculation without writing. After that, another letter will appear; they need to remember it later. Then, another math problem will appear to be solved. Once they are done, they are presented with a list of letters; they need to try their best to remember the letters, find them in the list and write next to each one the number that represents the order of its appearance. Here, they are reminded of the importance of solving math problems quickly and accurately. Once again, a practice exercise, which is stated below, is displayed to make sure the task is well understood.

B

$(9*2) + 5 = ? 24$  (FALSE)/ the correct answer is 23

F

$(32/4) - 4 = ? 4$  (TRUE)

-Try to recall the letters in their display order

D	P	N
B (1)	L	K
M	S	Q
H	F (2)	R

Because the first part of the test is cognitively demanding, it has been administered separately from the second part. One week later, small groups of ten students have been administered the second part of the OST. Similarly to the first part and because of the huge number of students who participate in the study, DataShow has been tremendously required. This task, as described previously, does not involve sentence reading; participants are asked to verify mathematical equations while remembering words. Mathematical equations consist of two arithmetic operations, and the to-be-remembered items are one- or two-syllable words (nouns). Participants are presented with a string that consists of a mathematical equation and a word at once; each string is displayed for 9 seconds. The teacher, at that time, reads out loud the equation and the word to be remembered. Participants try to compute the operation and check the appropriate box (True or False) before the following string is displayed. By the end of each set, students are given 6 seconds to recall all the words of the set in their order of display. To make participants understand better, the following practice exercise is displayed.

-Is  $(3/1) - 1 = ? 1$  (FALSE) Snow

-Is  $(7*3) - 3 = ? 19$  (FALSE) Blade

There exist different methods for scoring RST and OST. The one that is adopted in that study is the strict scoring method. That is to say, storage performance component is computed as the total number of correct words that are recalled in their exact order of display, the participants judgment about the grammatical and semantic correctness of sentences (in RST), and the correctness of the arithmetic operation solution (in OST). This method is chosen because it has been proven to be of a high reliability and to give results that correlate with reading comprehension scores (Friedman and Miyake, 2005).

## 5.7 Data collection and descriptive analysis

This part of the study investigates the relationship between the students' reading comprehension, as the ability to construct meaning from the text, and their working memory capacity. To this end, the measures that have been designed, described and tested are used to collect data that is reported, in a comprehensive way, and analysed in this section.

### 5.7.1 Reading comprehension measure (50 points)

As described earlier in this chapter, this measure (See Appendix II.1) consists of 2 sections. The first one comprises 15 MCQs (2.5 points for each correct answer); the second one is made up of 5 MCQs (2.50 points for each correct answer). The students' answers are reported in the following table.

Question/Answer Number	A	B	C	D	E
Question 01	61%	09%	30%(Correct)	0%	---
Question 02	02%	13%	69%(Correct)	16%	---
Question 03	26%	12%	42%	44%(Correct)	---
Question 04	56% (Correct)	35%	5%	4%	---
Question 05	22%	30%	14%	34%(Correct)	---
Question 06	54% (Correct)	20%	16%	10%	---
Question 07	58%	01%	11%	30%(Correct)	---
Question 08	22%	38%	55%	35%(Correct)	---
Question 09	21%	17%	39%(Correct)	23%	---
Question 10	11%	10%	13%	66%(Correct)	---
Question 11	18%	59% (Correct)	02%	21%	---
Question 12	37%	20%	33%	10%(Correct)	---
Question 13	89% (Correct)	03%	01%	07%	---
Question 14	29%	43%	23%	05%(Correct)	---



Question 15	25%	13%	27%	35%(Correct)	---
Question 16	05%	02%	86%(Correct)	06%	01%
Question 17	18%	32%	06%	34%(Correct)	10%
Question 18	19%	10%	40%(Correct)	20%	11%
Question 19	55% (Correct)	26%	03%	07%	09%
Question 20	60%	40% (Correct)	0%	0%	0%

**Table 5.1: Students' performance on the reading comprehension test**

Test questions and the students' answers that are reported in the previous table are described as follows.

### **Section 01**

In this section, different components of reading comprehension are targeted. That is why each question (sometimes more than one question) falls into one of the following categories: Recognising text purpose, constructing main idea, drawing a conclusion, guessing meaning of words from context, understanding a decontextualised sentence, extracting main idea support, understanding relations between sentences, and extracting implied information.

#### ***Recognising text purpose***

This category consists of one question (Question 01). Students are asked to read a short passage and to find the purpose of the passage. They are given 4 options to choose from. Two of the options (A and C) seem to be closer to the passage than the others. This could explain why only 30% of the participants have opted for 'factual information' (C), which is the correct answer. The remaining participants have opted for wrong answers; 61 % of the participants have considered it as 'a personal observation' (A) while 9% have chosen 'a solution to a problem,'

though no problem is really exposed. That can reflect students' comprehension difficulties, lack of concentration or random choice of the answer.

### ***Constructing main idea***

This category consists of two questions (Questions 02 and 03). Each of the two questions requires the participants to read two passages (one passage for each question) and to give the main idea of that paragraph by choosing one from the 4 response options. In question 02, 69% of the students have opted for C (the correct answer) while in question 03 only 44% have found the right answer (D). Both passages contain familiar language which is supposed to facilitate understanding for students. Thus, the failure of some students might be due to the fact that the options that are suggested are confusing for them or that they do not concentrate when they read which pushes them to opt for any response that relates to a point that is discussed in the passage, even though this idea is not the passage's main idea.

### ***Drawing a conclusion***

In questions 04 and 05, participants are asked to draw conclusions that follow logically the passage they have read. In responding to question 04, 56% of the students have shown abilities to draw logical conclusions and have opted for answer 'A'; question 05, however, has proven to be more challenging for participants since only 34% have opted for the correct answer 'D'. It is suggested that students who have given wrong answers have been confused by some of the suggested options since they do not represent a logical conclusion but a mere paraphrase of some details in the passage. To make the difference between both, it is necessary for readers to understand the passage and the suggestions carefully to make better choices.

### ***Guessing meaning of words from context***

Students are given a couple of words that are expected to be unfamiliar to them. They are, then, supposed to guess their meaning from their context which is made up of two sentences that offer definition clues. Question 06 requires students to guess the meaning of the word ‘macho’ and question 07 asks them to find the meaning of ‘suave’. 54% of the students have guessed the meaning of *macho* which is mainly ‘having an exaggerated sense of masculinity’ (answer ‘A’) Only 30% have defined *suave* correctly as being ‘agreeably smooth and courteous’ (answer D). It is noteworthy that the definitions that are suggested are confusing for students and they require their attention to realize which one works logically with context surrounding the word. It is expected that guessing the meaning of the second word would be more difficult since the word *macho* is used in different languages that students might master such as French, Spanish, Italian or even Portuguese. This fact gives more possibilities for the word to be familiar for the students. Students who may not know the word in either language can guess its meaning since the sentences use terms like ‘contact sports’, ‘fast cars’, and ‘war movies’ to make students think about a feeling of strength or a sense of masculinity. Even though the term ‘suave’ exists in French and Spanish, 70% of the participants have defined it as energetic which is, to them, needed to handle any social situation graciously.

### ***Understanding a decontextualised sentence***

To target students’ abilities to understand a decontextualised sentence, question 8 presents students with a single sentence and asks about one detail in that sentence. Here, the suggestions relate to the sentence but only one option represents the meaning of that sentence. The response options have confused 65% of the participants since all the options relate to the sentence in a way or another; only 35% of the participants have opted for answer ‘D’. The sentence is simple in its

structure; however, to answer the question, students may require, at least, one sentence to make the required information more explicit to them. This ability is important in reading comprehension since readers may encounter an information in the text that is not supported by a backup context and which can hinder their understanding of one or many ideas.

### ***Extracting main idea's support***

To check the students' ability to grasp supporting details of the main idea, question 9 is designed. It requires participants to read a narrative passage and answer a question about a supporting detail that relates to the events described. Here, 39% of the participants have opted for the right response (C). The remaining students may have failed in spite of the fact that the text is narrative and, thus, less demanding than an expository one. This may be explained by the length of the passage, in comparison to the previous ones, or the variety of details in the story that made it harder for them to retrieve what best answers the question. Here again, the options are put in a way to make it confusing for students who have not understood the passage to find the right option. It is important in comprehension to find, understand and remember the main details that back up the main idea to guarantee a smooth reading and a successful comprehension without ambiguities.

### ***Understanding relations between sentences***

Questions 10, 11, 12, and 13 are related to sentence relation understanding. They suggest two sentences that relate to each other, in a way or another, and require the students to find out about the nature of this relationship. Question 10 suggests repetition; both sentences express the same idea but in different words. 66% have realised this repetition in ideas (answer 'D'); this can be said to be, to some extent, easier to be detected than other relations that could be less explicit. Question 11 seems to be more challenging since 59% have understood that the second sentence is a restatement of the first sentence's main idea (answer 'B'). Illustration is what relates sentences

in question 12. This, expectedly, seems to be the most challenging question in its category since only 10% have opted for the right response 'D'. The illustrating sentence is seen by the majority of students as a restatement of the main point in the previous sentence. That may be due to the fact that they are not familiar with the term 'bloodhound' which refers to the category of dogs that are famous for their strong smelling ability. Question 13 happens to be the easiest for students to answer since 89% of them have seen the contrast that exists between the two suggested sentences (answer A).

Targeting this capacity using four questions is important. Students read sentences and do not see or even think about how these sentences relate to each other; they need always to be assisted by a transitional marker to direct their reading. Their main concern may be just to understand each sentence on its own, neglecting the fact that relating sentences and ideas to each other lead to a successful comprehension of the whole text.

### ***Extracting implied information***

Testing this ability is the focus of questions 14 and 15. Students are required to recognise implied information. 5% and 35% of participants have performed successfully on the two questions respectively ('D' is the correct option in both questions). These questions are expected to be the most challenging because they target the ability of identifying implicit information/ideas. To be able to read implied ideas, readers must be able to make inferences and draw conclusions to define relations between the different parts in the passage. In addition to that, readers must be able to think critically and analyse what is being read. The failure of many students in this question may be due to the fact that these two questions, in particular, require students to recall specific ideas after reading and to link them to understand a hidden information/message.

## Section 02

This section consists of a narrative text to be read and five MCQs to be answered. This 394 words text uses, to some extent, simple language since the focus is mainly on comprehension, in general, not vocabulary difficulties, in specific. The questions that relate to this text are mainly designed to make students identify the different actions/events that have taken place during the course of the story. Nevertheless, the task is not supposed to be as simple as it may be to identify events in a story.

Question 16 targets the event that took place first in the story. This seems to be less challenging to be answered. 86% of the participants have identified it (answer 'C'). Those students have probably noticed that some events have taken place later in John Muir's life (A, B, and D). Another event that is suggested (E) has not been referred to in the text, neither implicitly nor explicitly. Therefore, students have been left with one clear/logical answer.

Question 17 requires the students to identify when a specific event took place. Only 34% of the participants have given the correct answer (D). For 66% of the participants, this question is challenging. This could be explained by the fact that the required time of the event in question is not indicated using a point in time that could be easily detected and retrieved. They are required to refer to another action, instead of a specific date/day. Because many actions have taken place and have been suggested, that has made the task confusing and challenging.

Question 18 requires students to recognise two successive actions/events. Here again, no time determiner is suggested to help them identify the correct answer. 45% of the students have given a correct answer (C). Some events ('B' and 'D') that are suggested are already mentioned in the passage; that is why students who focus less get confused or rush to choose the one they remember about the text thinking it is the correct answer. Some events aim at making the question

more challenging and, thus, they are similar to some events in the story, but they are completely irrelevant ('A' and 'E'). Such answers make the readers believe they have read the same thing in the text while they have never been indicated in the passage.

Question 19 requires students to find the period where one of the events falls. 55% of the participants have opted for the right answer ('A'). Students need to focus to identify the exact period of time. Although this question seems to be easy, readers need to read and relate all the events that are mentioned in the text by ordering them chronologically. This, thus, can help students find the appropriate answer. Therefore, such questions require students to link different ideas/events for a better understanding.

Question 20 asks the students to identify the action that has taken place last in the chronological order of events. What makes it difficult for 60% of the students to find the right answer is that the event that is described last in the last paragraph is not the one that happened last in the series of events; that is why they have opted for answer 'A' which has been indicated in the last paragraph. Only 40% of the participants have realized that the event that is indicated in the first paragraph is the one that happened last (answer 'B'). This shows that students may rely on text organization but in a wrong way; they may think that what is narrated first happened first and what is described last occurred last.

## **5.7.2 Working memory measures (60 points)**

### **5.7.2.1 Reading span task (30 points)**

This task (See Appendix III.1) as described earlier, measures participants recalling capacities using the reading skill. It consists of 60 sentences; 0.5 point is attributed to each correct sentence (0.25 point for correct sentence judgment and 0.25 for correct word recall in the correct order). That is to say, students' are required to recall correct words in the correct order and they

have to give correct judgments about sentence form and meaning. This guarantees, to some extent, that they have been processing sentences and recalling the to-be-remembered item simultaneously, which is the main ability this measure targets. The students' performance is summarised in the following table.

Sentence sets	Average percentage of correct answers
2-sentence sets	Set 1 (98%), Set 2(89.25%), Set 3(88.5%)
3-sentence sets	Set 1 (82.33%), Set 2(66.5%), Set 3(70.5%)
4-sentence sets	Set 1 (58.75%), Set 2(54.12%), Set 3(46.5%)
5-sentence sets	Set 1 (56.4%), Set 2(45.8%), Set 3(42.7%)
6-sentence sets	Set 1 (43%), Set 2(42%), Set 3(42.25%)

**Table 5.2: Students' performance on the reading span test**

These answers are described and analysed in the following section.

### ***2-sentence sets***

After dealing with the practice exercise, students are presented with 3 sets that consist of 2 sentences. Students are required to read the 2 sentences of each set and to make grammatical and semantic judgments about them. 98%, 89.25%, and 88.5% of the participants have performed successfully on sets 01, 02 and 03 respectively. These sets are, expectedly, the least challenging of all the sets since students can recall 2 words easily because they are required to process only 2 sentences per set. Sentences seem to be easy to be judged since they can show directly whether they are correct or not, like 'The sat lieutenant beside man the walkie-talkie with the and stared at muddy the ground' which can be immediately recognised as a wrong sentence, grammatically and semantically. In addition to that, the to-be-remembered words are short and familiar, which helps learners recall them better and faster; they are 'campfire', 'ground', 'one', 'learners', 'lake' and



'God'. Thus, the students' success can be related to the presented sentences, which are easy to be processed and judged, and the recalled words, which are short and known.

### ***3-sentence sets***

These sets require the students to read 3 sentences, judge their correctness and try to remember the last word of each sentence. As reported in table 5.2, 82.33%, 66.5%, and 70.5% of the students have performed successfully on test sets 1, 2, and 3 respectively. It is noticed that the percentage of correct answers has decreased in comparison to that in 2-sentence sets. This is expected since students, in this part of the test, have to remember 3 words instead of 2, which may make the task more challenging. 'Town', 'doubts', 'while', 'gleam', 'door', 'temper', 'object', 'album', 'money' are the to-be-remembered items in the three sets. Students have had no difficulties trying to recall those words except for 'gleam;' this word has been challenging for 61% of the students since it is expected to be unfamiliar. Similarly, sentences are not difficult to be processed in general. Nevertheless, the following sentence has shown to be challenging for 73% of the students.

Sentence 13: 'I imagine that you have a shrewd suspicion of the visit of my early object.'

This sentence has trapped a lot of students, especially the ones who have not processed it with much concentration, since, at first glance, it seems to be correct grammatically and semantically. Unfortunately, that is not the case; this sentence is grammatically correct but semantically incorrect. The two words 'object' and 'visit' have been interchangeably placed in the sentence. This has preserved the grammatical correctness but influenced the semantic one.

### ***4-sentence sets***

These sets present students with four sentences each; expectedly, this makes it more difficult to make correct judgments and recall all the to-be-remembered words in the correct order.

58.75% of the participants have passed the set 01 successfully, 54.12% have judged the sentences of set 02 correctly and recalled all the words in the correct order, and 46.5% have managed set 03 successfully. The percentage of correct answers, which are supposed to represent successful performances, has decreased, here again, because the task, at that level, has become more challenging. First, the words ‘smell’, ‘thought’, ‘seat’, ‘pictures’, ‘look’, ‘pinch’, ‘glum’, ‘life’, ‘gum’, ‘fire’, ‘earth’, and ‘vision’, that are present the to-be-remembered items, are not all familiar to the participants; words like pinch and glum seem to be new and difficult for the participants to be recalled later. This may explain why 69% of the students have not recalled them. In addition to that, 10% of the students who have not performed successfully have recalled even the unfamiliar words, but they used a wrong order. This can be explained by the fact that these students have focused on processing sentences than on trying to remember words; managing a cognitively demanding process has consumed their energy that they could not keep the words in a retrievable form. Furthermore, the number of sentences has had an influence on the students’ performance quality; logically, processing 4 sentences per set is more difficult than processing 2 sentences or 3. Plus, the following sentence has made the task for students even more challenging.

Sentence 16: The woman hesitated for a husband to taste the onions because her moment hated the smell.

68% of the students have mistakenly judged this sentence, which is, actually, grammatically correct but semantically incorrect. When one reads it rapidly, because of time pressure, or even slowly, without concentration, he will consider it as a correct sentence because only two words have been put in the wrong place in the sentence, ‘husband’ and ‘moment’. That is, the less items are displaced, the less likely students are to identify the problem.

### *5-sentence sets*

In this set of sentences, students are required to recall 15 words, 5 by the end of each set, and to process, carefully, 5 sentences. As has been noticed so far, the longer the sets get, the more difficult the task will be. The 5-sentence sets are no exception; set 01 has been successfully performed by 56.4% of the participants, 45.8% have responded correctly to items in set 02, and Set 3 seems to be the most challenging since only 42.7% have given correct answers. 'Hand', 'land', 'aim', 'face', 'errors', 'key', 'law', 'dust', 'snaps', 'dish', 'page', 'love', 'voice', 'man', and 'panes' are the words that students are required to remember. 'Dust' and 'snaps' seem to be unfamiliar for students since 78% of the students have not recalled. That could also be explained by the fact that students, at that level, process 5 sentences, which may consume their time and energy and make them fail in recalling some words; the unfamiliar ones, here again, are more likely to be forgotten.

At the level of sentences, the following ones have been, to some extent, confusing for students.

Sentence 30: To do in so directions that are for adaptive mankind would be a realistic objective.

Sentence 31: Slicing out it carefully with his knife, he creasing folded it without the face.

Sentence 39: The basic heroes of the characteristic in the preceding stories is their sensitivity love.

Sentence 41: Had she patronized him when was he a teased schoolboy and when him he was a man.

72% of the students have rushed to make grammatical and semantic judgments in relation to sentence 30; they consider this sentence to be correct at all levels. Here, moving a couple of words is made in a way that keeps the sentence grammatical correctness and influences its semantic correctness. As far as sentences 31, 39 and 41 are concerned, 68%, 75%, and 59% of the

participants, respectively, have not processed them correctly. These sentences are grammatically incorrect and semantically meaningless. These students seem to be less attentive or tired at that point of the task. Here again, it is clear that when a task is cognitively demanding, participants may not be able to manage the storing of the to-be-remembered items and the cognitive processing of sentences. In this case, students have probably concentrated on the storing/recalling of information while less cognitive efforts have been saved for sentence understanding; they could not manage two tasks simultaneously.

### ***6-sentence sets***

It is expected that processing 6 sentences successively and trying to remember 6 words is not an easy task. This is the most challenging part of task; that is why it is found to be last one. Here, students have shown much more difficulties in, simultaneously, processing sentences and trying to remember the target words. This is what might explain, to some degree, why only 43%, 42%, and 42.25% of the participants have succeeded in judging the displayed sentences and recalling the required words. The 6-set sentences are designed, logically, to be more confusing for students. First this is true because of their number; recalling six sentences, even as a separate task, is difficult, let alone when students are also required to remember words. Actually, what makes these sentences challenging is not only their number, but also the way they have been designed to get the students confused when processing them. The following sentences are found to be the most difficult/confusing for participants to process.

Sentence 43: His heart he covered it both with hands to keep hearing from anyone the made noise.

Sentence 48: The intervals of progressively silence grew longer; the drove delays him out of his mind.

Sentence 51: There was more than breakfast still before an hour, and the house was in complete silence.

Sentence 52: He leant on the bridge of the parapet and the two policemen watched him from distance.

Sentence 55: The digital products of electronics will play your role in an important future.

Sentence 58: The train of an approaching sound woke him, and he started to his feet.

It is noticed that these sentences, once read under pressure or without concentration, may seem to be correct, semantically and grammatically, which is not the case. Sentences like 43, 48 and 51 have misled 68%, 53% and 61% of the participants who have judged them to be correct at both levels, semantically and grammatically. The truth is that, although they might look to be correct, these sentences are incorrect semantically and grammatically. The sentences that have caused more confusion in 84%, 76% and 69% of the students are sentences 52, 55, and 58 respectively. Because these sentences are grammatically correct, this influences the participants' judgment about their semantic correctness; they are semantically incorrect. Conversely to sentences, the to-be-remembered words in this part of the task ('noise', 'world', 'shape', 'hatred', 'corn', 'mind', 'cold', 'friends', 'silence', 'distance', 'stare', 'head', 'future', 'cheating', 'group', 'feet', 'building', and 'style') are challenging in terms of their number but they are not difficult to be recalled since most of them, apart from 'stare', seem to be familiar. Here again, the number of processed sentences, their quality and the number of the to-be-remembered words create obstacles for students to pass the set; it has always been noticed in the all the sets of this task that the more items students have to process and remember, the less successful they are in managing tasks simultaneously.

### 5.7.2.2 Operation span task (30 points)

This is another working memory measure that targets students' recalling capacities. Nevertheless, it does not relate to the reading skill; it uses mathematical equations. It consists of 2 tests the data of which is reported and analysed in the following section.

#### *Operation span task 01*

This task consists of three parts: recalling letters, verifying mathematical equations and recalling letters while verifying mathematical equations. The percentage of students' performance (correct answers) on that task are reported in the following table.

Question numbers	Q1-7	Q8-12	Q13-17	Q18-19	Q20	Q21	Q22
Percentage of correct answers	100%	70%	50%	20%	10%	5%	0%

**Table 5.3: Students' performance on the operational span task 01**

#### *Letter recalling part*

This section consists of 3 questions. Each one requires students to recall 4 letters in the correct order. Mistakes in the order or the letter are not accepted. The following is an example of the items displayed.

1-

F

P

T

Q

Select the letters in the order presented using numbers.

F(1)

H

J

K

L

N

P(2)                      Q(4)                      R  
S                              T(3)                      Y

100% of the students have recalled the correct words in the correct order (items 01, 02 and 03). Expectedly, these questions are quite easy since students are supposed to focus all their attention on remembering and recalling the letters; no cognitively demanding tasks are processed simultaneously with the recalling process and this makes it easier for the students to keep the target letters in a retrievable form.

### ***Equation verification part***

In this section of the test, students are required to verify mathematical equations. Each equation consists of 2 arithmetic operations with a suggested solution. Then students have to calculate mentally and choose *True* or *False* option. Equations are ordered progressively from the easiest to the most difficult. The following is an example of the least challenging equations.

Item 06:  $(7*3)-3=?$  18 (TRUE)

Here, students are supposed to calculate, mentally, the 2 arithmetic operations (multiplication and subtraction) and verify whether or not the suggested solution is correct. 100% of the participants have performed successfully on items 4-7. However, items 8-12 seem to be more challenging since 70% have managed the mental calculations of the suggested operations, 50% of the participants have performed successfully on items 13-17, and only 20% have found the right answer in item 18. The following example is one of the items that are found to be more challenging for students.

Item 13:  $(86/2) + 7= ?$  52 (FALSE; the correct answer is '50')

It is clear that the arithmetic operations used are still the same (addition, subtraction, multiplication and division), but the numbers used are getting larger. This may explain why students, even though

they are required to perform only one task at a time, find it more difficult to make mental calculations.

***Multitasking part***

This part is made up of 4 items (items 19-22). This is by far the most challenging part of the task. Actually, students are required to try to remember 2 letters and to verify 2 mathematical equations; these items are processed alternatively (letter, equation, letter, then equation). The following item is an example of the 4 items students have been presented with in this section.

-Item 19

R

$$(49/7) + 6 = ? 13 \text{ (TRUE)}$$

K

$$(81/3) - 2 = ? 24 \text{ (FALSE)}$$

F            H            J

K(02)       L            N

P            Q            R(01)

S            T            Y

Trying to remember an item while processing another one has always been challenging for students, let alone when they are required to recall 2 items and process 2 others in the same set. This may explain why only 20% of the students have performed successfully on item 19, 10% have answered responded correctly to item 20, 5% have managed item 21 and no participant has performed correctly on item 22. In processing the items of this category, students are interrupted by an arithmetic equation while trying to recall a letter. The point is that the mathematical



operations in this part are cognitively more demanding than the ones in previous sections. In this situation, one of the processes influences the other one; either the students use their energy in solving the mathematical operations or in trying to remember the letter. Only high spans are expected to be able to do both at the same time without succeeding at one at the expense of the other.

***Operation span task 02***

This is the second test in the operation span task. It consists of 40 strings; each one includes an equation with a suggested solution and a word (See Appendix III.2). It requires students to make mental calculations, to verify equations and to try to remember the target words. The students’ performance is reported in the following table.

Set Number	Percentage of correct answers
Set 01 (3 sentences)	69%
Set 02 (3 sentences)	73%
Set 03 (4 sentences)	62%
Set 04 (5 sentences)	42%
Set 05 (2 sentences)	72%
Set 06 (3 sentences)	59%
Set 07 (2 sentences)	79%
Set 08 (4 sentences)	54%
Set 09 (4 sentences)	58%
Set 10 (5 sentences)	39%
Set 11 (5 sentences)	35%

**Table 5.4: Students’ performance on the operational span task 02**

### ***2-string sets***

This category includes 2 sets. They require students to verify a mathematical equation and to try to remember a one- or two-syllable noun. The following is an example of what this set looks like.

-Is  $(4*3) + 4 = ? 16$  (TRUE) Burst

-Is  $(24/3) + 2 = ? 12$  (FALSE) School

72% and 79% of the participants have performed successfully on sets 05 and 07 respectively. Here, participants are supposed to verify 2 mathematical equations and to remember 2 words (one at a time). In set 05, students are asked to recall 2 words, 'burst' and 'school'. All the students who have failed in this set have not recalled the word 'burst'. This might be due to the fact that it is unfamiliar and it comes first in the list of words; it is logical that students are more likely to keep the last words in a more retrievable form than that of earlier words. In set 07, the words to be recalled are quite familiar for the students-'trip' and 'lunch'. Therefore, the students who have not recalled the words appropriately have been hindered by the mathematical operation  $((11*9) - 8 = ? 91)$  that seems to be complicated to be calculated and verified mentally. Thus, when students cannot keep the to-be-remembered words in a retrievable form, this could be due to the unfamiliarity of the words or the level of difficulty of the second cognitive task.

### ***3-string sets***

Here, students are required to recall 3 words and to verify 3 mathematical equations. What follows is set 06 which belong to the current category.

-Is  $(30*2) - 15 = ? 15$  (FALSE) Bloomer

-Is  $(15*3) - 12 = ? 33$  (TRUE) Week

-Is  $(4*5) - 5 = ? 16$  (FALSE) Campus

Considering the percentage of successful performances (see table 5.4), this category of sets seems to be challenging for students. 69%, 73% and 59% have responded correctly to the different strings of sets 01, 02, and 06 respectively. What might make the task, in these sets, more challenging is the increasing number of the mathematical equations and the to-be-remembered words. That is to say, the more equations the students verify, the less likely they are to recall the words; concentrating on the mathematical equation verification prevents students from saving some energy to recall the target words. In addition to that, some words (like ‘bloomer’ which is stated first in the list of words of set 06) have not been recalled because they are unfamiliar and they are stated earlier in the set; that makes it hard for the participants to verify many equations and keep an unfamiliar word in a retrievable structure.

#### ***4-string sets***

It goes without saying that this category of sets makes it hard for the participants to verify 4 mathematical equations and recall 4 words in the appropriate order. Here is set 08 with different strings it consists of.

-Is  $(39/13) + 3 = ? 3$  (TRUE) Glass

-Is  $(16*2) - 3 = ? 30$  (FALSE) Image

-Is  $(3*8) - 1 = ? 23$  (TRUE) Hole

-Is  $(35/7) + 5 = ? 10$  (TRUE) Exam

The percentage of correct answers has decreased with the increase of the to-be-processed items. 62%, 54%, and 58% of the participants have managed successfully sets 03, 08, and 09. Here again, having less successful performances is the result of the increasing level of task difficulty. The students have found it difficult to verify some arithmetic operations ( $(46/2) + 2 = ? 26$ ) or to recall some unfamiliar words (‘maze’ and ‘bumper’). One student has recalled ‘gaze’ instead of

‘maze’. This may not mean that word is unfamiliar to him; it is rather possible that his phonological loop has confused him because he has read the word out loud and then kept repeating it mistakenly as ‘gaze’ since they have some phonological similarity.

### ***5-string sets***

It is no doubt expected that this category of sets will show to be the most challenging. It requires students to recall 5 words while verifying 5 mathematical equations. To show what such sets look like, the following is a relevant example (set 11).

36-Is  $(13*2) - 5 = ? 20$  (FALSE) Crown

37-Is  $(6*5) + 6 = ? 17$  (TRUE) Grudge

38-Is  $(33*3) - 9 = ? 90$  (TRUE) Smile

39-Is  $(6/3) + 6 = ? 9$  (FALSE) Phone

40-Is  $(3*1) - 2 = ? 1$  (TRUE) Chain

Students’ performances on these sets tell a lot about the strings level of difficulty. 42%, 39%, and 35% of the participants have recalled words in their correct order while verifying (correctly) the suggested equations. Such a decreasing level of performance is expected. These sets contain more unfamiliar words such as ‘blur’ (set 04), ‘disdain’ (set 10), and ‘grudge’ (set 11). Those are the words that have been challenging for students to be recalled. It is first due to the fact that they unfamiliar to them. Plus, each of these words is placed in the second string of each set. This means that students have to verify 3 extra mathematical equations, after reading this unfamiliar word, to be finally requested to recall it. Therefore, the students are less likely to recall unfamiliar words when many cognitively demanding tasks are being performed.

To wrap it up, students performance on working memory tasks is, to some extent, influenced by the unfamiliar words they encounter and their order in the list; this, in some cases,

makes students either concentrate on the processing of the to-be-remembered items or the demanding task that is being processed simultaneously. This explains why some students have recalled some words, even though they are unfamiliar, and have processed the sentence or verified the mathematical equation successfully. In addition to that, the difficulties may result from the suggested solutions that are, in some strings, more confusing than helpful; many answers are made similar to the right response. Furthermore, the number of to-be-processed and to-be-remembered items is extremely influential on the students' performance.

### **5.8 Correlation coefficient 'r' analysis**

In line with the study's hypothesis, this correlational study has been conducted. Since it examines the nature of the relationship between working memory capacities and reading comprehension abilities, the correlation coefficient 'r' is required. This coefficient expresses the degree of correspondence between two variables' scores (Paler-Calmorin and Calmorin, 2006). In the context of this study, these variables are working memory and reading comprehension scores. Hopefully, this correlation shows that increases in the magnitude of working memory lead to increases in the reading comprehension one.

Depending on the nature of the relationship between the study's variables, there are many correlation coefficients to choose from. Since the nature of the relationship between the two variables in question is linear, then the Pearson Product-Moment Correlation (PPMC) is the most appropriate one to be used. The equation for this correlation coefficient 'r' is:

$$r(x) = \frac{xy}{(N)(S)(S)}$$

### 5.8.1 General correlation

In this study, 'x' symbols relate to working memory scores, and 'y' symbols relate to reading comprehension ones. These symbols are defined as follows.

)  $r(xy)$  represents the obtained correlation coefficient (between working memory and reading comprehension).

) represents the sum/total.

)  $x = (X - Mx)$  refers to the deviation of x scores (working memory) from the mean M ( $Mx$  is the mean of x scores: the sum of x scores divided by the number of cases N).

)  $y = (Y - My)$  is the deviation of y scores (reading comprehension) from the mean ( $My$  is the mean of y scores: the sum of y scores divided by the number of cases N).

)  $xy$  indicates the cross-products (multiplication of x and y deviations).

) N is the number of cases/participants.

)  $SDx = \sqrt{\frac{\sum x^2}{N}}$  refers to the standard deviation of X scores.

)  $SDy = \sqrt{\frac{\sum y^2}{N}}$  represents the standard deviation of Y scores.

-The value of 'r (yx)' ranges from "-1" (to indicate a perfect negative correlation) to "+1" (to indicate a perfect positive correlation).

To obtain the study's correlation coefficient 'r', the previous equation symbols are replaced by their real values that are the students' scores from working memory and reading comprehension assessments. With this one-tailed test, we predict a positive correlation between working memory and reading comprehension, at 0.05 level of significance and with 98 degrees of freedom (DF=N-2). After the computation of Pearson product-moment correlation coefficient 'r' between working

memory and reading comprehension, the value of 'r' obtained is 0.81. Since the critical value of 'r' is 0.165, the results are statistically very significant and are well in the direction of our hypothesis.

The following table reports the detailed computation of the correlation coefficient 'r'.

<b>Participant Number</b>	<b>X</b>	<b>Y</b>	<b>x</b>	<b>Y</b>	<b>x<sup>2</sup></b>	<b>y<sup>2</sup></b>	<b>XY</b>
<b>01</b>	34.25	45	10.15	21.95	103.02	481.802	222.792
<b>02</b>	38	42.5	13.9	19.45	193.21	378.302	270.355
<b>03</b>	25	22.5	0.9	-0.55	0.81	0.302	-0.495
<b>04</b>	20	22.5	-4.1	-0.55	16.81	0.302	2.255
<b>05</b>	27.5	32.5	3.4	9.45	11.56	89.302	32.13
<b>06</b>	38.75	42.5	14.65	19.45	214.622	378.302	284.942
<b>07</b>	9.75	10	-14.35	-13.05	205.922	170.302	187.267
<b>08</b>	34.25	42.5	10.15	19.45	103.022	378.302	197.417
<b>09</b>	21.25	22.5	-2.85	-0.55	8.122	0.302	1.567
<b>10</b>	11.5	10	-12.6	-13.05	158.76	170.302	164.43
<b>11</b>	44.25	45	20.15	21.95	406.022	481.802	442.292
<b>12</b>	27.5	30	3.4	6.95	11.56	48.302	23.63
<b>13</b>	35.25	40	11.15	16.95	124.322	287.302	188.992
<b>14</b>	21.25	35	-2.85	11.95	8.122	142.802	-34.057
<b>15</b>	13	10	-11.1	-13.05	123.21	170.302	144.855
<b>16</b>	9.75	10	-14.35	-13.05	205.922	170.302	187.267
<b>17</b>	34.25	30	10.15	6.95	103.022	48.302	70.542
<b>18</b>	28.5	27.5	4.4	4.45	19.36	19.802	19.59
<b>19</b>	20	37.5	-4.1	14.45	16.81	208.802	-59.245
<b>20</b>	9.75	10	-14.35	-13.05	205.922	170.302	187.267
<b>21</b>	38	45	13.9	21.95	193.21	481.802	305.105
<b>22</b>	30.5	35	6.4	11.95	40.96	142.802	76.48
<b>23</b>	18.5	17.5	-5.6	-5.55	31.36	30.802	31.08
<b>24</b>	28.5	32.5	4.4	9.45	19.36	89.302	41.58
<b>25</b>	38.75	35	14.65	11.95	214.622	142.802	175.067
<b>26</b>	25	22.5	0.9	-0.55	0.81	0.302	-0.495
<b>27</b>	13	10	-11.1	-13.05	123.21	170.302	144.855
<b>28</b>	35.25	45	11.15	21.95	124.322	481.802	244.742
<b>29</b>	11.5	10	-12.6	-13.05	158.76	170.302	164.43
<b>30</b>	44.25	45	20.15	21.95	406.022	481.802	442.292
<b>31</b>	30.5	10	6.4	-13.05	40.96	170.302	-83.52

32	9.75	10	-14.35	-13.05	205.922	170.302	187.267
33	18.5	15	-5.6	-8.05	31.36	64.802	45.08
34	37.5	32.5	13.4	9.45	179.56	89.302	126.63
35	16.5	10	-7.6	-13.05	57.76	170.302	99.18
36	20	40	-4.1	16.95	16.81	287.302	-69.495
37	16.5	10	-7.5	-13.05	56.25	170.302	97.875
38	11.5	10	-12.6	-13.05	158.76	170.302	164.43
39	13	10	-11.1	-13.05	123.21	170.302	144.855
40	9.75	10	-14.35	-13.05	205.922	170.302	187.267
41	13	10	-11.1	-13.05	123.21	170.302	144.855
42	14.5	10	-9.6	-13.05	92.16	170.302	125.28
43	25	20	0.9	-3.05	0.81	9.3	-2.745
44	16.25	12.5	-7.85	-10.55	61.622	111.302	82.817
45	20	35	-4.1	11.95	16.81	142.802	-48.995
46	11.5	10	-12.6	-13.05	158.76	170.302	164.43
47	16.5	10	-7.6	-13.05	57.76	170.302	99.18
48	26.5	20	2.4	-3.05	5.76	9.3	-7.32
49	14.5	10	-9.6	-13.05	92.16	170.302	125.28
50	18.5	10	-5.6	-13.05	31.36	170.302	73.06
51	27.5	12.5	3.4	-10.55	11.56	111.302	-35.87
52	33.75	32.5	9.65	9.45	93.122	89.302	91.192
53	28.5	25	4.4	1.95	19.36	3.802	8.58
54	21.25	37.5	-2.6	14.45	6.76	208.802	-37.57
55	30.5	15	6.4	-8.05	40.96	64.802	-51.52
56	28.5	25	4.4	1.95	19.36	3.802	8.58
57	25	17.5	0.9	-5.55	0.81	30.802	-4.995
58	27.5	27.5	3.4	4.45	11.56	19.802	15.13
59	34.25	40	10.15	16.95	103.022	287.302	172.042
60	21.25	32.5	-2.85	9.45	8.122	89.302	-26.932
61	16.5	12.5	-7.6	-10.55	57.76	111.302	80.18
62	11.5	10	-12.6	-13.05	158.76	170.302	164.43
63	20	30	-4.1	6.95	16.81	48.302	-28.495
64	25	17.5	0.9	-5.55	0.81	30.802	-4.995
65	30.5	27.5	6.4	4.45	40.96	19.802	28.48
66	27.5	25	3.4	1.95	11.56	3.802	6.63
67	20	30	-4.1	6.95	16.81	48.302	-28.495
68	13	10	-11.1	-13.05	123.21	170.302	144.855
69	14.5	10	-9.6	-13.05	92.16	170.302	125.28
70	16.5	15	-7.6	-8.05	57.76	64.802	61.18
71	9.75	10	-14.35	-13.05	205.922	170.302	187.267
72	14.5	10	-9.6	-13.05	92.16	170.302	125.28



<b>73</b>	9.75	10	-14.35	-13.05	205.922	170.302	187.267
<b>74</b>	11.5	10	-12.6	-13.05	158.76	170.302	164.43
<b>75</b>	44.25	40	20.15	16.95	406.022	287.302	341.542
<b>76</b>	44.25	40	20.15	16.95	406.022	287.302	341.542
<b>77</b>	38	42.5	13.9	19.45	193.21	378.302	270.355
<b>78</b>	37.5	25	13.4	1.95	179.56	3.802	26.13
<b>79</b>	25	22.5	0.9	-0.55	0.81	0.302	-0.945
<b>80</b>	35.25	42.5	11.15	19.45	124.322	378.302	216.867
<b>81</b>	13	10	-11.1	-13.05	123.21	170.302	144.855
<b>82</b>	16.5	12.5	-7.6	-10.55	57.76	111.302	80.18
<b>83</b>	27.5	25	3.4	1.95	11.56	3.802	6.63
<b>84</b>	33.75	35	9.65	11.95	93.122	142.802	115.317
<b>85</b>	20	27.5	-4.1	4.45	16.81	19.802	-18.245
<b>86</b>	25	20	0.9	-3.05	0.81	9.3	-2.745
<b>87</b>	28.5	15	4.4	-8.05	19.36	64.802	-35.42
<b>88</b>	14.5	10	-9.6	-13.05	92.16	170.302	125.28
<b>89</b>	16.5	10	-7.6	-13.05	57.76	170.302	99.18
<b>90</b>	9.75	10	-14.35	-13.05	205.922	170.302	187.267
<b>91</b>	21.25	20	-2.85	-3.05	8.122	9.3	8.692
<b>92</b>	21.5	20	-2.6	-3.05	6.76	9.3	7.93
<b>93</b>	28.5	12.5	4.4	-10.55	19.36	111.302	-46.42
<b>94</b>	34.25	37.5	10.15	14.45	103.022	208.802	146.667
<b>95</b>	38	30	13.9	6.95	193.21	48.302	96.605
<b>96</b>	38	27.5	13.9	4.45	193.21	19.802	61.855
<b>97</b>	25	17.5	0.9	-5.55	0.81	30.802	-4.995
<b>98</b>	37.5	37.5	13.4	14.45	179.56	208.802	193.63
<b>99</b>	44.25	37.5	20.15	14.45	406.022	208.802	291.167
<b>100</b>	27.5	15	3.4	-8.05	11.56	64.802	-27.37
	2410.25	2305	0	0	9933.748	14632.19	9791.822
	24.1025	23.05					

$$SDx = \sqrt{\frac{\sum x^2}{N}} = \sqrt{\frac{9933.748}{100}} = \sqrt{99.33748} = 9.966$$

$$SDy = \sqrt{\frac{\sum y^2}{N}} = \sqrt{\frac{14632.19}{100}} = \sqrt{146.3219} = 12.096$$

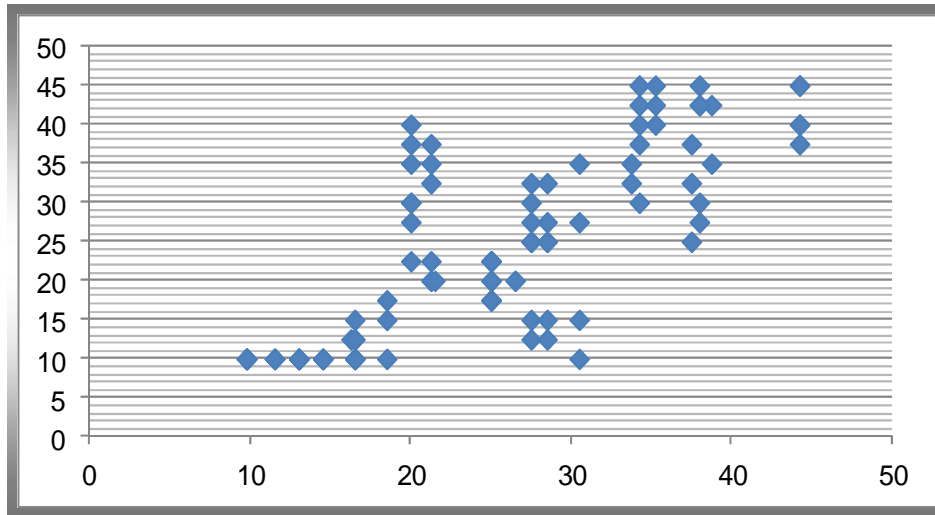
$$r(x, y) = \frac{\sum xy}{(N)(SDx)(SDy)}$$

$$r(xy) = \frac{9933.748}{100 \times 9.966 \times 12.096} = 0.81$$

$$r(xy) = 0.81$$

**Table 5.5: Computation of the Pearson-product moment correlation coefficient 'r'**

The following scatter graph represents the correlation between working memory and reading comprehension.



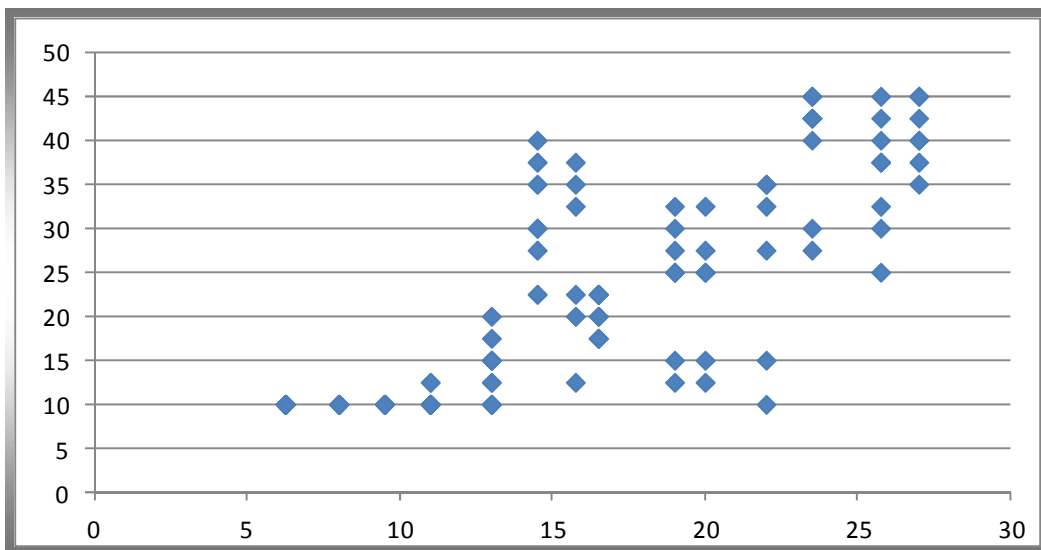
**Figure 5.1: Correlation between working memory and reading comprehension**

Each of the scattered points in the previous graph represents the crossing point of each participant's scores. The horizontal axis represents working memory scores and the vertical one represents the reading comprehension marks. The distribution of these points indicates the strong positive correlation between working memory and reading comprehension since it shows that most participants occupy the same position in both variables (high working memory capacity high reading comprehension ability; low working memory capacity low reading comprehension ability). These reported results show that working memory explains, to a great extent, the reading comprehension capacities in young adults. They go well in the direction of Daneman and Carpenter's (1980) belief that working memory is a limited capacity processing resource that has proved its relevance in reading comprehension. This study supports the point that the reader needs

higher working memory capacities to be able to receive, maintain and manipulate information (selection of relevant information and suppression of irrelevant ones) while constructing a mental representation of the text beforehand (Gernsbacher *et al.*, 1990).

### 5.8.2 Partial/component correlations

Since 2 tools have been used to measure working memory, a partial correlation is required to find out how working memory measure correlates with the reading comprehension tool. With the study's one-tailed reading span test (one directional), at 0.05 level of significance, with 98 degrees of freedom, the critical value of the required 'r' is 0.165. Given that the value of 'r' which is obtained in this study is 0.809, a strong positive correlation exists between the RST as a working memory measure and reading comprehension measure (MCQ exercises). The following scatter graph reports this correlation clearly.

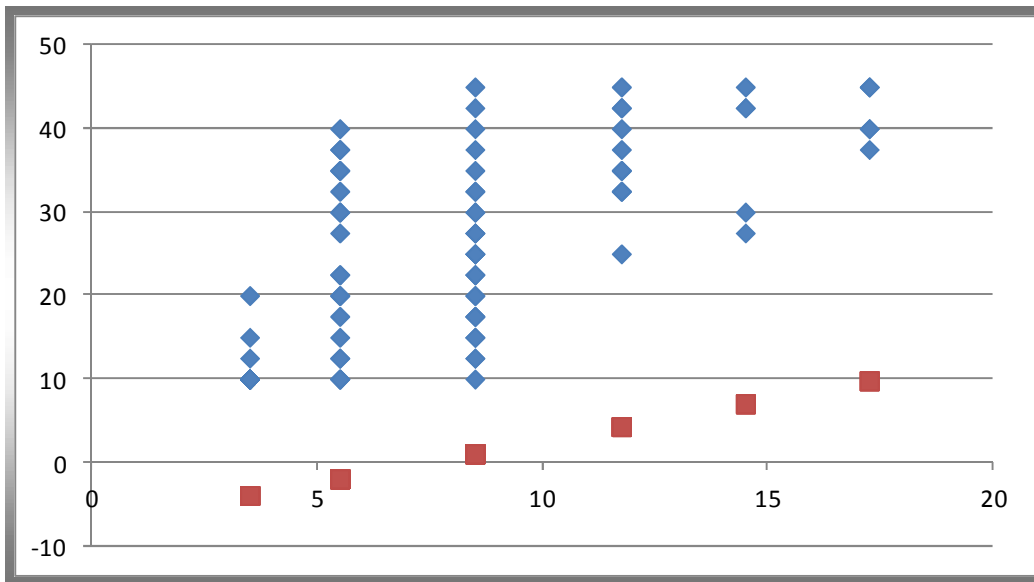


**Figure 5.2: Correlation between RST and MCQ measures**

The displayed points in this diagram represent the cross point between RST and MCQ scores. The former ones are organized using the horizontal axis while the others are ordered on the vertical axis. Overall, the points are moving from the lower left corner to the higher right corner.

This indicates that there is a positive correlation between both measures. It is noticed, then, that these results have come in the direction of Daneman and Carpenter's (1980) argument which holds that to predict reading abilities, and thus correlate with reading measures, reading is a necessary component of the working memory span and participants must use their reading strategies. Actually, this is based on the assumption that working memory capacity is strategy specific.

The OST, as a secondary working memory measure, has been correlated with the MCQ reading comprehension test. The value of 'r' is 0.750; compared with the critical value of 'r' (0.165), it is clear that the correlation is positive and strong. Therefore, a positive correlation between both measures has been concluded from the significant results that are obtained. The results are reported in Figure 5.3.



**Figure 5.3: Correlation between OST and MCQ measures**

The points in this scatter graph are moving from the lower left corner to the higher right one, but they are not as coherent as those in Figure 5.2. This shows that there exists a positive but less strong correlation between OST and MCQ tests than that between RST and MCQ. This strong correlation compares to Engle and Turner's (1989) belief that working memory capacity is not a

task-specific capacity. That is to say, it is possible to predict reading abilities, and naturally correlate with reading measures, using working memory span tasks that do not involve reading as an integral component. That is how mathematical operations have replaced sentences in the task. Expectedly, this working memory task correlates strongly with the reading comprehension measure.

## **5.9 Discussion of the results**

This correlation analysis has quantified the relationship between reading comprehension abilities and working memory capacities; they seem to correlate significantly. This descriptive analysis guides this discussion section and addresses the relationship between working memory and reading comprehension. But before linking findings from both measures, it is required to discuss the results obtained in each measure.

Reading scores reflect students' passage comprehension. These scores range from 10/50 to 45/50 (See Table 5.5). The mean score is 23.05/50; this indicates that the group level is less than average. Such results can be explained in different manners. In this study, some participants have made more mistakes in answering inferential questions than in answering questions about details. This means that a successful text processing requires successful inferential processes. This is due to the fact that such inferential processes make use of many cognitive resources differently from the processes that aim at recalling a detail from the text. Here, inference drawing abilities are significantly different between good and poor comprehenders. In addition to that, less skilled readers are noticeably more hampered than more skilled ones in answering MCQs; they have taken more time to answer the questions. This, once again, is remarked mainly at the level of inferential questions, not detail questions. This indicates that skilled readers or good comprehenders can

understand a text better than less skilled ones because they have developed a more selective processing mode during reading.

Working memory scores, that have also taken part in the correlation, mirror the participants' ability to recall information using reading skills and mathematics. These scores range from 9.75/60 to 44.25/60 (See Table 5.5). The mean score for this test is 24.10/60; this indicates that the overall group level is inferior to the average. This task has proven to be somehow difficult for the participants. This could be explained by the fact that both memory tasks, RST and OST, engage storage and additional processing components that activate attentional resources. That is to say, students are required to, simultaneously, try to remember an item and to process another one that is cognitively demanding; this cannot be managed by low spans. This is true because the different storage and processing elements are taxing on working memory resources. This has made low spans find difficulties, more than high spans, in maintaining the to-be-remembered items in a retrievable form while processing some cognitively demanding items.

It is noticed that those students who have performed well on reading comprehension MCQs are also those who have performed well on working memory span tasks. Participants who are considered as high spans have not engaged working memory to process text since the reading activity is not, for them, cognitively demanding. Therefore, the attentional demand to process the text is minimal for such participants. Similarly, processing verbal information differs from high spans to low spans. When participants, who are in this case high spans, possess domain-specific knowledge, less executive attention is required from working memory; some stored strategies help students process the text effortlessly. This shows that the amount of attention required impacts the number or type of working memory resources that need to be engaged. This naturally leads readers to reach a given level of automaticity; no more working memory resources will be taxed.

Analysing the low-achieving participants' performance (low spans), it can be suggested that such individuals have not acquired necessary proficiencies and skills to draw on domain specific knowledge and, thus, perform successfully on cognitively demanding tasks such as mental calculation or sentence processing. Acquiring these skills enables learners to engage less working memory resources for lower order activities. That is to say, the difference between high spans and low spans performance relates to the extent to which controlled attention is needed. Their performance, then, is a reflection of the effort that is necessary to process information successfully. Once students develop their processing skills, fewer demands will be put on working memory resources.

Even though the correlation reported in this study between working memory and reading comprehension is strong, it is still weaker than some correlations that have been revealed in previous researches. In the study of Daneman and Carpenter (1980), the correlation was very strong ( $r = 0.90$ ). This is quite logical since many differences exist between both researches. First of all, the version of the test being used in this study is different from the one used by Daneman and Carpenter (1980); the original version, as explained earlier in this chapter, is designed for the native speakers of the language and, thus, will be too difficult for the learners of English as a foreign language. In addition to that, some procedural differences are worth mentioning. Students in Daneman and Carpenter (1980) study have read sentences aloud, at their rate, while participants in this study have read their sentences, that have been displayed for a limited time, silently (the teacher has read sentences aloud for them, given that they have taken the test in groups, not individually). It is noteworthy that in spite of these dissimilarities, the results compare and are still reliable in both researches. Therefore, the results in this study are less strong but significant.

In another study conducted by Harrington and Sawyer (1992), results have shown to be less significant than those reported in the current study. The obtained 'r' value in their study is '0.54', which is inferior to the one in this study ( $r=0.81$ ), but the results are significant. Such differences in the value of 'r' can also be related to the reading comprehension measures that differ in both studies. In the current study, these measures are designed in the form of MCQs while in Harrington and Sawyer (1992) cloze procedure is used to assess students' reading comprehension ability. In spite of such differences, the present correlation can be said to vouch for findings in previous studies.

So far, it has been demonstrated that the results reported in this study confirm the ones that have been revealed in previous researches. Actually, a homogeneous performance between the different tasks in this study exists since both mean scores are almost the same (23.05 in reading comprehension and 24.10 in working memory). Nevertheless, it is noticed that there are some participants who have performed differently from the hypothesis direction; this does not influence the nature of the correlation that exists between working memory and reading comprehension. These participants' scores are represented in the previous scatter graphs as those points that are separated from the diagonal group; they represent some exceptions that correlated unexpectedly and, thus, do not go in the direction of the study's expectations.

In this study, two types of exceptional performances have been noticed; some high spans performed less than expected on the reading comprehension test while some low spans have proven, unexpectedly, to be better comprehenders of a text. On the one hand, participants like students 31, 55, 78, 93 and 96 have performed well on the memory span tasks, but their performance on the reading comprehension test has been inferior to what is expected. This could be explained by the fact that they have some linguistic difficulties that have prevented them from



understanding appropriately even in the presence of good storage and processing abilities. This might also be the result of a lack of interest in what is being read or a random choice of the response options that have been suggested. On the other hand, students like participants 14, 19, 36, 45, 54, and 60 have shown good comprehension abilities in the presence of less-than-required working memory capacities. These results can be explained by the fact that many factors, other than working memory capacity, can influence positively reading comprehension. Students' linguistic knowledge can help a great deal in understanding the text and performing successfully. A developed automaticity can also replace working memory in helping students understand a text without any efforts or controlled attention. Efficient decoding, in this context, helps in reducing the demands of working memory resources. Another expected possibility is that students have selected randomly one option that has happened to be the correct one and which makes this student ranked as a good comprehender while he is not.

Taking the study's findings into consideration, working memory capacity can be said to account for a significant variance in the reading comprehension levels among the readers. Readers' working memory capacities help task relevant information remain in an active state and regulate controlled processing. Additionally, when students are involved in cognitively demanding tasks, the great cognitive load will require more working memory resources to be engaged to guarantee a successful processing, which is in this study represented by reading comprehension. Therefore, this storage and processing capacity is confirmed to be a strong predictor of young adults reading comprehension abilities.

## **Conclusion**

The goal of this study, in this particular chapter, is to investigate the contribution of working memory to reading comprehension in third year students at the University of Frères

Mentouri. It aims at proving how working memory, as the ability to maintain information in a retrievable form, can be an important mediator of students' differences in reading comprehension abilities. To confirm or disconfirm this study's prediction, both capacities have been tested.

Following the works of Daneman and Carpenter (1980) and Engle and Turner (1989), the participants' working memory capacity has been assessed using modified versions of the RST and the OST; these tasks are supposed to tap on the different components of working memory. These are kinds of tasks that require an individual to try to hold a limited amount of information while simultaneously processing other input. Concerning reading comprehension testing, an MCQ test has been administered to target the different component skills of reading comprehension. They aim at assessing readers' abilities to build general construct, understand supporting detail or even draw conclusions.

The correlational analysis of the results obtained from two working memory span tasks and a reading comprehension test has helped in shedding light on the nature of the relationship between the two variables and it has shown how individual differences in working memory account for dissimilarities in text processing capacities. Hence, this study has demonstrated how working memory capacity produces differences in reading comprehension performance in the study's sample. The results are statistically significant and support the study's hypothesis that higher spans process a text more successfully than lower spans. Participants' high working memory capacity has helped them construct the general idea of a text by keeping the text details in an active state to be, later, put together and make a coherent representation of the text. They have also understood the supporting details by relating them to each other while reading. The most demanding cognitive task of comprehension is mainly seen in the students' ability to draw inferences/conclusions; only high spans have managed such cognitive processes.

In this study, working memory has proved to be relevant for text processing. That is to say, for individuals to build a coherent mental representation of the text, they need to maintain input in an active/retrievable state while manipulating other information. In light of these results, conclusions are drawn about the contribution of WM in text processing. It is argued, then, that a comprehensive account of individual differences in working memory necessarily entail differences in reading comprehension.

## **Chapter Six**

# **An Experimental Study of the Relationship between Reading Comprehension and Anticipation of Meaning**

### Introduction

#### 6.1 Research questions and hypothesis

#### 6.2 Participants

#### 6.3 Overview of the study method

#### 6.4 Pilot study

##### 6.4.1 Reading comprehension tests

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#### 6.5 Research tools and materials

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#### 6.6 Pre-reading strategies

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#### 6.7 Procedure

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#### 6.8 Data collection and descriptive analysis

##### 6.8.1 Reading comprehension pretest

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##### 6.8.3 Reading comprehension posttest

6.8.4 Comparison of the groups' means and students' performances

6.9 T-test analysis

6.9.1 Definition of the t-test

6.9.2 The computation of the obtained ' $t$ '

6.10 Discussion of the results

Conclusion

## **Introduction**

This part of the study is conducted to investigate the impact of students' anticipation skills, which are enhanced through background knowledge activation, on their reading comprehension abilities. In the context of this study, the participants' cognitive pump is primed using anticipation guides and previewing strategy to help them recall appropriate background knowledge and prior experiences from their LTM. This prior knowledge is manipulated in this research to, hopefully, enable students build a coherent mental representation of the text. This chapter describes the research's method, the different tools and instructions, the data and the results obtained in this part of the study. In the context of this study, an experimental study has been conducted to address the research's hypothesis and questions. To this end, two groups of students (50 participants per group) have participated in the study: an experimental group which receives the treatment (following strategy-specific instructions) and a control group which does not. Prior to the treatment, both groups have taken a reading comprehension pretest which is used in this study as a baseline measurement. At the end of the treatment phase, participants have taken a reading comprehension posttest. To check whether or not the treatment has been beneficial for the experimental group, it is necessary to compare the students' performances on both tests (pretest and posttest). Because of the large number of participants, comparing performances individually is impossible. Therefore, the use of t-test is paramountly required. This statistical test analyses the results obtained in this experiment to, then, confirm or disconfirm the study's hypothesis.

### **6.1 Research questions and hypothesis**

Since the premise of this chapter is to speak to the contribution of anticipation of meaning in reading comprehension, the following questions are addressed to guide this study.

- How does the anticipation of meaning help the students understand the print better?

- Is the students' prior knowledge about the text's topic necessary for their understanding of the written discourse?
- Do pre-reading strategies help the students make active links between their existing knowledge and text information?
- Does the instruction of anticipation guides and text previewing pre-reading strategies enhance the students' reading comprehension by activating their background knowledge?

In addition to answering the previous questions, this chapter aims at testing the following hypothesis: If the students anticipate what is to come next in the text using anticipation guides and previewing strategies, their reading comprehension of a text written in English as a foreign language will be improved. The truth of this prediction might be confirmed or disconfirmed.

## **6.2 Participants**

The participants that the researcher is interested in understanding are third year English language students at the University of Frères Mentouri, Constantine, Algeria. They are the same students who have participated in the correlational study reported in Chapter Five. Thus, it is needless to report, again, the sampling strategy used in this research. Nevertheless, this phase of the study requires the division of the 100 participating students into two groups of 50 students who are chosen randomly to be given equal opportunities to be selected. These participants are assigned randomly to take part of the conditioned or unconditioned phase of the experiment. That is to say, one group functions as an experimental group which receives the experiment's treatment and the second group is a control group that receives no treatment (the teacher uses traditional methods).

Targeting the population of third year students at the University of Frères Mentouri is not done randomly. First of all, these students do not study reading as a module. This means that they do not know a lot or at all about the reading strategies that help students process the text they

approach. Thus, the students who will not receive the treatment will not make use of any strategies that would represent, in the context of this study, nuisance factors. Therefore, participants in the control group are less likely to be using any reading strategies while students in the experimental group will be taught how to use specific strategies to approach a text successfully.

Another reason that makes this population suitable to this research is that they are expected to have a decent background knowledge the researcher is interested in activating prior to reading; at less advanced levels, students might know less and, thus, chances are that the researcher will encounter problems in conducting the experiment. This point is supported by Carrell (1987) who has put that to take advantage of schema activation before reading, readers must reach a given level of proficiency; that is to say, the required schemata should be available for activation.

At this phase of the study, participants are divided into two groups of 50 students; an experimental group and a control group. The students of the experimental group study in the same group. This, according to the researcher, guarantees that all the students belonging to the experimental group receive the exact same instructions, discussions, questions, answers and explanations (any difference in these may influence the students' reception of the treatment and, thus, the experiment's results). The 50 remaining students who make up the control group are divided into two groups; 25 students, in each group, are selected randomly to give everybody equal chances to participate (no need is felt to put them in the same group since they do not receive any specific treatment during the course of this study).

### **6.3 Overview of the study method**

This part of the study investigates extent to which students may understand a text when they use their anticipation skills through activating their background knowledge. In order to activate the participants' prior knowledge, anticipation guides and text previewing strategies are



used. This would show how important it is to use background activation strategies to better the students' approaching and, thus, processing of a text.

In order to address the relationship between readers' background knowledge activation for a better meaning anticipation and reading comprehension, the experiment is seen as a decently defensible method. An experimental research is a controlled study in which the researcher has physical control over the independent variable and tries to check what happens when a change (or some) is introduced in this variable. When an alteration leads to other factors' changes, the researcher is, then, in a position to make conclusions about the causal relationship that exists between the two variables- independent and dependent (Cohen, Manion, and Morrison, 2000). Nevertheless, the variables that change simultaneously through coincidence should not be taken into account when drawing conclusions. Therefore, he needs to diminish or, if possible, eliminate the influence of such nuisance variables. In the context of this study, readers are encouraged to anticipate text content by activating their prior knowledge about the text topic. This, in this research, is the manipulated independent variable. Hopefully, this manipulation introduces a change in the students' reading comprehension performance, which is considered as the dependent variable.

This experimental study is divided into three stages. The first stage consists of testing students' reading comprehension abilities; this pre-test would help the researcher later to find out whether or not there is a growth in the students reading comprehension abilities. The second stage of the experiment, which is the core of the experiment, is the treatment. Here, the students' anticipation is enabled by activating their background knowledge about the topic. This is possible through the use of two pre-reading strategies- anticipation guides and text previewing. This treatment is what makes the difference between the students' experience in the control group and

the experimental group. That is to say, only students who belong to the experimental group receive a treatment. After the intervention course is complete, the study is taken to the next level- the post-testing phase. At this stage, reading comprehension, which is the study's dependent variable, is measured. It is required that this post-test mirrors the pre-test as much as possible to give a reliable comparison of the students' performance on both tests (pre-test and post-test). To compare the results of the pre-test and the post-test, a statistical analysis of the data obtained is necessary. This is possible through running a t-test by the calculation of some basic descriptive statistics. In fact, this determines the extent to which anticipation skills, as assisted by prior knowledge activation, contribute in the growth of students' reading comprehension.

#### **6.4 Pilot study**

The feasibility study that relates to this experiment has put to test the reading comprehension tests (pretest and posttest) and the different materials that are to be used in the experiment treatment classes. To this end, 50 pilot participants (different from the ones who have participated in the full-scale study) have been selected randomly to take the tests and read the texts (with no questions or discussions).

##### **6.4.1 Reading comprehension tests**

The comprehension measures that have been used in the pilot study have been allocated one hour. Each test consists of a long text (407 words for the pretest text and 427 words for the posttest text). Each text is followed by ten MCQs where students need to pick up the best response option. In addition to that, they need to justify their choices briefly. These tests have been taken in separate sessions to give students enough time to process the text and answer questions.

Through analysing the students' answers, a major issue has expectedly come to surface; all the students have not finished answering their questions. Some students have finished answering the MCQs but have not justified all the answers. Some others have answered some MCQs with their justifications and have left the other questions unanswered. This may mean a lot of things. It could be that they have not understood the questions, they have not read the whole text, they have had no time left to finish the task, they have not found the appropriate language or information to express themselves in writing or they got confused by the different response options.

#### **6.4.2 Reading materials**

This part of the small-scale study targets the evaluation of the materials that are expected to be used in the treatment period. The students have been presented with ten texts to read. This time, they are not required to answer any reading comprehension questions since the texts are used in teaching strategic reading; the aim behind such a training is to make students read more strategically without measuring their comprehension. Here, students are given 10 minutes to read each essay; this is enough to make them read, understand, and, consequently, evaluate what they have read. Then, starting from the students' evaluation, five texts are chosen to be used in the treatment phase depending on the students' degree of interest in the texts, passage's level of difficulty and the amount of background knowledge they have about each topic.

To understand the real difficulties students have encountered while taking the tests and processing the experiment materials, a self-evaluation questionnaire 02 (See Appendix I.2) has been administered. The following table summarises the data collected from these questionnaires.

<b>Evaluation statements</b>	<b>Students answers' percentage</b>
1. The level of difficulty of both tests can be expressed as follows:	-88% of the students see that the pretest and the posttest have the same level of difficulty. -12% of the participants consider the posttest to be more difficult than the pretest.
2. I did not answer some test questions because...	-92% of the students consider that the time allocated to test is not enough -2% of the participants find that test texts are boring -2% of the learners find it difficult to understand test questions. -4% of the participants find it difficult to justify their answers in writing.
3. The texts are... a-Very difficult b-Difficult c-Of average difficulty d-Easy e-Very easy	-66% of the participants see that test texts are of an average level difficulty. -28% of the students consider that the test texts are difficult. -4% of the participants think that tests texts are very difficult. -2% of the respondents see that the texts are easy.
4. The texts that I enjoyed reading are... 1 2 3 4 5 6 7 8 9 10	-Texts 1, 4, 6, 7, 8, 9, and 10 are seen by 84% of the students to be interesting.
5. The texts that discuss topics that I am knowledgeable about the most are...	-72% of the participants see they are knowledgeable about the issues discussed in texts 2, 4, 5, 6, 8, 9, 10.

**Table 6.1: Data obtained from piloting experiments' tests and materials**

Taking into consideration the participants' responses to the evaluation questionnaire, some modifications are seen to be of a paramount necessity while some other aspects seem to be appropriate enough to be kept the way they have been administered in the pilot study. First, what needs to be changed about the pretest and posttest is the number of reading comprehension questions; instead of giving them more time, it would be more convenient, because of the session's

duration, to make them answer six MCQs and justify their answers. Moreover, the pretest and the posttest are considered by the majority of students to be of a similar level of difficulty; thus, they serve the purpose of pre-testing and post-testing the dependent variable. In addition to that, five of the ten suggested texts have been selected since the majority of students consider them to be of an acceptable level of difficulty, are interested in their topics and are knowledgeable about the issue discussed in these passages (texts 4, 6, 8, 9, and 10 have been selected to be used in the treatment phase). This point is of a paramount importance because when students are not knowledgeable about a given topic, it is really useless to use any pre-reading strategies to activate prior knowledge which is naturally absent in the readers' long-term memory.

## **6.5 Research tools and materials**

This section describes the research instruments that are used to measure participants' reading comprehension and the materials that are used during the treatment phase. These experiment's tools and materials are adopted from Khashoggi, Carlough, Manna, Patel, and Astuni's (2014) reading comprehension workbook for advanced students.

### **6.5.1 Pretest and posttest**

The pretest represents the baseline measurement in the experiment while the posttest helps determine the growth of the students' reading comprehension capacities. The pretest (See Appendix II.2) consists of a 407 word expository text that is followed by 6 reading comprehension questions (MCQs). Similarly, the posttest (See Appendix II.3) is made up of a 427 word text and 6 MCQs to be answered about this long passage. These texts are chosen to be expository and this is definitely not a random choice. Given that students are supposed to anticipate what is to come next in a text, it would be useless to activate their knowledge about a narrative text that describes any unexpected event. That is to say, even the best comprehenders do not find enough schemata

to activate. In fact, texts that present students with factual information are more likely to require background knowledge activation for their full understanding. In addition to that, expository texts, which are referred to by Butler (2014) as non-fiction texts, are seen to be more cognitively demanding than the narrative ones. This makes the task of reading more challenging for students.

Alderson (2000) has suggested that a single assessment method is limited in the image it can provide about what is being measured. That is to say, whatever technique will be used by the researcher, it will always remain imperfect. His idea, thus, suggests that using different techniques always results in less imperfect measurements. On the basis of this point, the MCQ tests used in this experimental study are different from the ones used in the correlational study reported in chapter five. Questions in the pre-test and post-test require students to answer in two steps: a) they have to choose the best of the 5 response options and b) they must justify their answer in one sentence. This is seen to give more reliability to the data obtained since it is a good proof of whether or not students have processed text to understand what it is about and answer comprehension questions about it. Here, the students are required to justify their option using *only* one sentence because they expressed a lack of motivation to write longer answers. More than that, the researcher will not find problems in understanding longer sentences that contain mistakes which hinder his understanding.

Questions in the pre-test and the post-test raise different points about a text. They relate to the general idea of the text, the supporting details of the main idea, the tone of the author, and implied information or author's conclusion. It is worth mentioning that the pre-test and the post-test are chosen to be similar in terms of the text length, text type, level of difficulty, number of questions, and type of required information. This helps the researcher avoid any nuisance variables

that would influence the performance of the students and, thus, lead to less reliable results that do not test the study's hypothesis adequately.

### **6.5.2 Treatment texts**

The materials that have been used in the treatment phase are five texts; 4 non-fiction (expository) texts and one narrative-informational text (See Appendix V). Informational texts, contrarily to the narrative ones, have always shown to be more challenging for students since they represent a major source of information for the learners (Armbruster *et al.*, 1990). Therefore, this study attempts to help students connect their prior domain knowledge and the new information that is presented in this factual expository material through the use of two pre-reading strategies-anticipation guides and previewing. Further to this, the informational texts used in this experiment do not contain technical language since it may hinder the students' understanding (even those who possess the required background knowledge to comprehend what they read) and lead to less reliable results.

The different texts used in this experiment have no titles; the researcher has added one in order to facilitate the use of the pre-reading strategies, especially previewing. The first text is entitled 'Celebrating Love'. This is a 547 word text in which the author investigates the different origins of Valentine's Day, a Western holiday that celebrates love and gift-giving. The text that has been used second in the treatment phase is entitled 'An Introduction to Relativity'. This passage consists of 419 words. As its title indicates it, this passage introduces the concept of relativity as speculated about by Albert Einstein. The third text, as compared to the previous ones, is relatively long; it is a 651 word informational text. In this passage, the author develops a specific theory about the societal usefulness, or lack thereof, of selfishness. The fourth passage, which is entitled 'The Changing Technology', is the longest of all the texts; it is made up of 719 words. The

author uses narration (including personal anecdote) and description in this text to discuss the fast pace of changing technology. The last passage that has been used in the treatment period is a 647 word long text (excerpted from an extended essay). It is entitled 'Detective Novels'; its author describes murder mystery novels.

## **6.6 Pre-reading strategies**

Pre-reading strategies have always proven to facilitate the process of activating readers' background knowledge as a preparation for the new concepts they encounter in the text and, consequently, to make the reading task easier and more successful. Researchers have developed many pre-reading strategies that tap readers' background knowledge and arouse their curiosity about what is to come next in the text. Using several pre-reading strategies in one experiment is near to impossible. That is why in the treatment phase of this study's experiment, two pre-reading strategies have been used- anticipation guides and previewing.

### **6.6.1 Anticipation guides**

This pre-reading strategy causes students to use their prediction/anticipation skills before they read a text (Bean, Readence, and Baldwin, 2007). Briefly, it is used to tap the students' background knowledge prior to reading, help students use what they already know during reading and make them evaluate their predictions in relation to what has been understood from the text. To help the students focus their attention on the issue discussed in the text, they are presented with a set of teacher-generated statements (true/false or agree/disagree) that relate to the text's topic (See Appendix V). To activate the students' thoughts about the topic, these statements have to be worded in a way that makes them sound challenging to the students conceptions. Actually, statement structures that challenge their thoughts make them feel more curious and motivated to read and discover how the author's conception is similar or different from theirs. Then, students'



misconceptions will be brought out and changed as a reaction to the text. That is to say, after reading the text with the new information, the students are more likely to change their way of conceiving a given topic.

Many principles are involved in the construction of an anticipation guide. The anticipation guides used in this study are constructed with respect to Bean, Readence, and Baldwin's (2007) assumptions. First of all, the main concepts that students are supposed to learn from a text are identified in the guides' statements. To this end, the material ideas have been carefully considered. Equally important, these statements have been put to be challenging for the students' thoughts. This is possible since it possible for the researcher, to some extent, to take into consideration the students' age, interests and prior experiences and to determine what statements could challenge their thoughts and raise their curiosity about the text to be read.

Second, the number of these statements differs from one anticipation guide to another. Generally speaking, they range between three to ten statements. In this study, taking into consideration the length of the texts, five anticipatory statements have been created to challenge students' thoughts about the issue in question. They have been arranged following the order that sounds to be the most appropriate. Here, the concepts are presented in the anticipatory statements following the same order of their appearance in the text (sequence in which ideas are referred to in the passage). This, according to the researcher, helps the students concentrate and understand better what they read. Consequently, concepts, be it in the text or the statements, are organised from the most general to the most specific; this guarantees a smooth processing of the text.

All in all, anticipation guides can be easily used with students in the classroom. The most challenging part about them is the creation of appropriate anticipatory statements. These statements have to make the students consider their thoughts about some topics to raise their

curiosity about what is to be read. This can be achieved mainly when the statements evoke a controversy instead of mentioning information that could be clearly responded to as true or false.

### **6.6.2 Previewing (THIEVES)**

Similarly to the anticipation guide, previewing is a pre-reading strategy that is used to help readers activate their prior knowledge about the text's topic. This strategy helps readers be ready to process the text right from the beginning; this enables them to remember and understand what they read better since the required schemata are activated to help them connect to the text being read. In this study, the previewing strategy that is used is THIEVES strategy. Manz (2002), the creator of this strategy, puts that this pre-reading strategy helps readers understand the text by previewing the passage in an organized way. It is called THIEVES since students "steal" information before approaching the text for understanding. This acronym stands for the following points.

**T-** It refers to the "Title" that provides readers with information about the passage topic or the chapter's content.

**H-** It refers to the "Headings" that signal the main sections of the text or the chapter. They help learners find out about what is discussed in the chapter or the passage.

**I-** It refers to the passage's or chapter's "Introduction". It provides the readers with an overview of what is to be read, including goals and objectives.

**E-** It stands for "Every first sentence". Topical paragraphs' first sentences are most of time the topic sentences of these paragraphs. Reading these topic sentences helps the students anticipate what is to come in this paragraph.

**V-** This letter stands for "Visuals/Vocabulary". It is helpful for students to consider visual aids like pictures, tables and diagrams to know what the topic is about prior to reading the text or the chapter.

In addition to that, skimming through the text by noticing its vocabulary gives students useful hints about the content to be read. To facilitate this, some words may be highlighted to grab the attention of the reader.

**E-** It stands for “End-of-chapter questions”. These questions are asked to indicate important points from the passage or the chapter. These questions help the students understand concepts that are essential in the text and it helps them set a reading purpose.

**S-** This letter refers to the text or chapter’s “Summary”. Most pieces of writing contain a summary at the end, be it an essay or a whole chapter. Such summaries help the readers guess what the text’s important ideas are. Consequently, they will activate relevant schemata to understand what they are about to read.

When first created, this strategy was used to “set the stage” for readers to approach textbook chapters. In this research, like in many other works (Gear, 2008), it is used to preview a shorter piece of writing- a long passage. With the help of the teacher/researcher, students use such a strategy to set their mind for the reading activity in an attempt to make it less challenging for all readers, especially the struggling ones.

Opting for anticipation guides and previewing strategies is not a random choice. These strategies have been used because they have proved, in many researches, to be effective in activating the students’ background knowledge in the classroom. When using an anticipation guide prior to reading, students have to be assisted by a teacher since he is the one who is supposed to create the anticipatory statements that work best with the readers (age, experience and knowledge); readers cannot establish the statements that activate their own schemata. Notwithstanding, previewing using THIEVES is a strategy that a student can use on his own to monitor his comprehension through the way he approaches a text. Here, he needs to practise it at least once

with the teacher in the classroom to learn about how to view a text and the types of questions he needs to raise to activate relevant schemata. Then, he will be able to use previewing by himself.

## 6.7 Procedure

The current experimental research has been carried out in three phases. First, students reading comprehension abilities, which stand for the dependent variable, are pretested in advance of a specific instruction. Then, students who belong to the experimental group receive a treatment for five weeks while control group students go through their reading activity in a traditional way (reading and answering some questions about the text). Finally, to measure the growth of the students' reading comprehension capacities and, thus, find out to what extent the study's treatment has been beneficial for them, they are post-tested. This experimental pattern is summarised in the following table.

GROUP	Pretest	Treatment	Posttest
Group 01 Experimental group	-Reading comprehension Test (MCQs)	-Teaching two reading strategies: anticipation guides and text previewing	Reading comprehension Test (MCQs)
Group 02 Control group	-Reading comprehension Test (MCQs)	-Traditional method of reading (reading a text and answering MCQS)	Reading comprehension Test (MCQs)

**Table 6.2: Research's overall experimental pattern**

### 6.7.1 Reading comprehension tests (pretest and posttest)

These tests have been designed to test the students' general comprehension of a text. They contain expository texts that are similarly long (407 and 427 words long). The pretest text is written by an anthropologist who documents the different legends that relate to the owl. In the second text,

the author discusses the viability of sports as a profession by presenting the musings of an aspiring athlete. Each of the two tests consists of six MCQs. These questions target readers' abilities to construct the general idea from a text, to understand the supporting details, to extract implied information and to draw conclusions. To make the task more challenging, students are required to, in addition to choosing for the best response option, justify in *one sentence* their answer. This would make the tests gain more reliability by finding out whether or not students have read the texts seriously.

Both tests have been administered under the same conditions. The experimental group and the control one have taken a pretest before the treatment phase and a posttest after the instruction period. Both tests have been administered in one hour (extra sessions). This seems to be fair enough for long passages to be read twice or even thrice to be understood. In addition to that, students need time to understand and think carefully about the five response options that are, most of the time, more confusing than helpful. Then, they need to give a logical justification to their choice. The pretest took place one week before the beginning of the treatment phase (November 12<sup>th</sup>, 2014) and the posttest took place right by the end of the fifth week of treatment (December 18<sup>th</sup>, 2014).

### **6.7.2 Treatment phase**

In this phase of the experiment, students process experiment materials differently. On the one hand, group one, which is the experimental group, receives instruction about how to use anticipation guides and previewing strategies to be able to anticipate what the text is about. On the other hand, group two, which is the control group, does not receive any instruction on how to use any reading strategies; they read the same materials and answer MCQs about them. This way, the instruction period enables the researcher to manipulate the independent variable, which is the

students' ability to anticipate what is to come in the text before reading it, and to analyse any possible growth in the students' reading comprehension abilities.

As far as the control group is concerned, the traditional method has been followed to separate this group from the rest of the experiment. That is to say, participants in this group do not receive the same instruction as the students in the experimental group. Here, participants are presented with five texts during five weeks (See Appendix V). In each session, the students are presented with a text, which is presented to the experimental group students. The teacher makes them read the text then answer MCQs about it; no instruction is given on how to approach the text. Therefore, students start directly reading the text and, then, answer the suggested reading comprehension questions. When the students finish their task, they discuss their answers with each other, in small groups, then with the teacher to see how well they have performed on this exercise. This way, students learn about their reading comprehension difficulties but they are not taught how to read strategically to better their comprehension. Therefore, the aim behind using this traditional method is to keep this group as a benchmark to be compared with the treated group (subjects) and figure out how the study's treatment has been beneficial for the participants' reading comprehension abilities.

Differently from the subjects in the control group, participants in the experimental group follow an untraditional method of reading in the classroom. This treatment period focuses on teaching students how to read strategically. That is to say, they are taught how to use anticipation guides and text previewing (THIEVES) to approach a text successfully. To tell the truth, these reading strategies are not used separately since the aim of this experiment is not to test the strategy's ability to activate students' background knowledge and make him understand better. Actually, it aims at using any of the effective reading strategies that help students read better. That

is to say, the focus is on the importance of activating students' prior knowledge in their reading comprehension, not on how a specific strategy is successful in doing so.

Students have been trained, for five sessions, on how to use anticipation guides and text previewing strategies to pour out ideas that are most relevant to the text's topic prior to reading. During each reading session, students follow the teacher's instruction to approach the text using specific strategies. First, they are given the anticipation guide; the teacher reads the anticipatory statements out loud then participants read them silently and think about whether they agree or disagree on what the statements suggest. Then, they discuss their answers in groups of four to see how similar or different their answers are. It is believed that a peer's different answer can lead the student to think about his own response and, thus, activate some more schemata that may be relevant to the text being read. After that, the students are presented with the text to preview it for 2 to 3 minutes. Here, they look at the title, the introduction, the topic sentences, the vocabulary and the conclusion. Stealing information in this manner gives them a better idea about the text. The teacher, once again, helps the students steal ideas from the text by using some questions that guide their use of this strategy. At that point of the session, students start reading the text; it takes them 15 minutes to read the text twice or even thrice. Here, students are required to read without anxiety to make sure they are adequately relating what they already know with what they encounter in the text. When they finish reading, students are asked to go back to the anticipation guide to respond to the post-reading part and see how answers in the pre-reading part and the post-reading one compare. Here, they can refer back to the evidence they have just encountered in the text to confirm or disconfirm their responses on the anticipatory guides (before and after reading).

In order to present the participant with these strategies, a brief discussion about their reading habits has been raised. This discussion has revealed that all the students who have

participated take a text and start directly reading it (a traditional method of approaching a text). Here, the teacher has introduced both strategies. First, anticipation guide strategy has been introduced. The teacher has compared this reading strategy to the different brainstorming activities students may be presented with in some classes such as oral expression. Students have said that their oral expression teacher never gives them the topic to be discussed directly; he makes them guess what the topic is by using pictures, word games or some clues written on the board. They have also revealed that this makes the speaking class more interesting since they like to compete with each other in such activities. In doing so, they are actually activating their background knowledge that would help them anticipate what the topic is going to be about. This idea has been compared to what they need to do when they approach a text to make it more interesting. Students have expressed a great excitement towards using new strategies for reading. This is how anticipation guides have been introduced. The teacher has explained that this strategy helps the students think about ideas that relate to the topic; consequently, their reading task is more likely to be less challenging. They have been shown what these statements look like using the following example. These statements are used to illustrate what anticipatory statements look like and to draw participants' attention to some important issues about reading.



Before reading Agree/Disagree	Anticipatory statements	After reading Agree/Disagree
-.....	1- The purpose of a reader influences his reading.	-.....
-.....	2- A good reader should never start reading a text directly.	-.....
-.....	3- It is important to ask questions about a text before reading it.	-.....
-.....	4- Good readers can understand a text without using their past experience or previous knowledge.	-.....
-.....	5-Teachers can help their students understand what they read.	-.....

**Table 6.3: Anticipation guide example**

Reading these statements and explaining them to the students has made them think about important concepts about reading. They are created in a way that makes students think about what a reading purpose, a good reader, a pre-reading question, past experience and a teacher’s role in students comprehension are. This discussion has shown to be beneficial in introducing the second strategy- text previewing.

To present students with the unfamiliar THIEVES strategy, it is important to make them see how necessary for a reader to detect the best places in the text that contain the most important information; this is essential because a text may contain a lot of information that may not be that necessary for their topic understanding. To teach the students how to look for essential points in a passage using THIEVES strategy, a comparative example is thought to make the idea clear for them. The teacher has asked the following question: “Why do thieves break into others’ houses?” Students have answered that they do so to steal some precious things or sometimes even less

valuable objects are targeted. Then, they have been asked about how these ends are achieved, and students have said that thieves have an idea about where most precious things could be kept and, thus, they go directly to check those places; they have given, as examples, bedrooms, wardrobes and behind wall paintings. Here the teacher has compared the students' suggestions with the reading strategy in question. They have been told that it is important to be a thief to be a successful reader. That is to say, a good reader must know where the important information is stated in the text the same way a thief knows where precious objects are kept. The students have expressed a great curiosity and interest in learning to become thieves when they read. Then, the teacher has explained how students can become thieves by referring to the title, the introduction, topic sentences, vocabulary and conclusions.

These strategies have been introduced and explained separately. But during the treatment period, they have been used in combination to make the reading task more interesting for the students. The five texts have been approached similarly using both strategies simultaneously. It is true that some topics have been discussed more than some others. This depends on how students are knowledgeable about the topic or interested in it. Nevertheless, the steps followed to approach each of the experiment's texts are the same.

Every reading session is divided into three stages: a pre-, during- and post-reading phase. Each of these activities is devoted a specific amount of time. This division is illustrated in the following table.

Reading activities	Time allocated for each activity
-Responding to anticipatory statements	10 minutes
-Discussing students' responses to anticipatory statements	15 minutes
-Text previewing	3 minutes
-Answering text previewing questions	15 minutes
-Text reading	10 minutes
-Responding to post-reading statements (anticipatory ones)	10 minutes
-Discussing students' responses to anticipatory statements	10 minutes

**Table 6.4: Time division of reading sessions**

As described in the previous table, each reading session takes students 73 minutes. It is noteworthy that each reading activity is given the time it needs; to some extent, this guarantees the success of each activity in improving students' reading comprehension.

***Illustration of one of the reading sessions using anticipation guides and text previewing***

At the beginning of each reading session, the teacher presents the anticipation guide to the students. He hands them an anticipatory statements sheet that relates to one of the five texts (See Appendix V). At this level, it is important that the teacher reads the statements orally and to answer students' questions about the form or the content of these statements. The teacher, then, gives the following instruction:

“Read carefully the following statements and write ‘agree’ or ‘disagree’ in the ‘before reading’ column.”

Here students are given 10 minutes to respond to the statements; each statement may take 2 minutes to be processed appropriately and responded to. This helps students recall information/past

experience that relate to the concept discussed in the statement. Once they finish responding to the statements, the teacher gives the following instruction:

“Now that you have responded to these statements, make groups of four students and compare your answers. Feel free to discuss those similarities and differences”

Cooperative learning has proved, in many cases, to be more beneficial than individual efforts in improving students’ achievements (Wood, 1987). That is why using subgroups for the discussion process is seen to help in accomplishing the task of the anticipation guide. This group activity helps students pay attention to some more information/experiences that they have not recalled while responding to the statements. Here, some of the relevant schemata that have not been activated before are activated while discussing the statements in groups.

Before the 15 minutes elapse, the teacher grabs the students’ attention to start a discussion about the five anticipatory statements (this takes 5 to 7 minutes from the general discussion time duration). Here, students are asked to raise their fingers to show whether or not they agree with each anticipatory statement to make them see how many students agree or disagree with them. As some students go on and explain why they are for and others counter-argue and say why they are against, some participants assess their own thoughts by comparing them to other classmates’ beliefs. Then, this discussion helps students a lot in remembering what they already know about the topic. More than that, it makes the students speculate about the topic from different corners and, thus, makes them more motivated to read and to discover what opinion is supported by the author- their opinion or that of their classmates.

When all possible points are raised about the statements, the students are handed the text. Here, the teacher gives the following instruction:

“Take a quick glance at the following text. Try to steal as many information as possible. Remember! You are allowed to look at it for no more than 3 minutes.”

Here, students already know about the different elements of the text they have to consider to get an idea about the topic of the passage; they have been explained this process prior to the reading classes. The students, in this activity, have shown a great level of excitement given that they are using a new strategy that strangely compares to real-life stealing; they are impatient to apply it to their reading task.

By the end of the previewing time, the teacher asks students some questions (this process takes them about 15 minutes) that relate to the text’s features; they are discussed one by one to help students who have not understood what previewing is catch up on this strategy. These questions can be summarised as follows.

**a. Text title**

- What do you know about this topic?
- What do you think you will be reading about?

**b. Introduction**

- What clues does the introduction give you about the content of the passage?
- What are the concepts that seem to make the core of the text?
- Do you have information about what the introduction suggests?

**c. Topic sentences**

- What does the first sentence tell you about the content of the paragraph?
- What do you know about the central idea of the paragraph?
- How does this paragraph relate to others paragraphs?

#### **d. Vocabulary**

- Are there any italicized/bold words?
- Are there any repeated words?
- Are there any words that relate directly/indirectly to the title? What do you know about them?
- Are there any words that you do not know?

#### **e-Summary**

- What do you understand and remember from what you previewed?
- How accurate are your predictions so far?

These questions are asked by the teacher to make the students learn how to preview a text effectively. Nevertheless, they are not assisted by their teacher in the following reading sessions; they have to remember the questions and ask them to themselves while previewing the remaining texts.

In the next step, the teacher directs the students to read the text carefully to check if the text contains the information they expected and to find out about the author's opinion. While processing the text, participants keep in mind their opinions and those of their classmates to compare them with that of the author, their responses to the anticipatory statements and their answers to the teachers previewing questions. It takes the students about 10 minutes to read the text twice or thrice; they need to read once to discover , in general, what the text is about, a second time to understand the text with its details and third reading may help some struggling readers to catch up on what is missed in the previous readings.

When the students finish reading, the teacher gives them the following instruction.

“Go back to the anticipation statements you have responded to before reading and write agree/disagree in the “after reading” column. Your answers should be based on what you have just read.”

This time, the students reactions to the statements are not based on what they already know; they are backed up by what the material they have read reveals. Similarly to pre-reading statements, post-reading statements are discussed with the teacher for about 10 minutes. His role in this discussion is to help students see how they can be wrong or right in making predictions about what is to come next in the text. They can also learn to compare the thoughts they have about a topic before reading it with the ideas they encounter and learn after reading it. In addition to that, the teacher helps them see any inaccuracy of their pre-conceived thoughts in relation to the topic in question. That is to say, students learn to recognise and control the changes that can be brought to their beliefs after reading a text. It is noteworthy that students are not obliged to agree with the author; they are expected to compare thoughts, analyse them and make the changes they see to be beneficial for their thoughts and beliefs.

To conclude the session, it is important to tell the students that this strategy is effective in getting the readers mind ready for the passage. That is, if they make predictions about what the text will be about, recall what they already know about the topic, determine what information is important in the text and target essential concepts, then reading becomes much less demanding and much more pleasurable.

## **6.8 Data collection and descriptive analysis**

The primary aim of this experimental study is to investigate the effect of anticipation abilities, through activating background knowledge, on the students’ reading comprehension. Prior

to the treatment period, the participants have been administered a pretest as a baseline measurement before the manipulation of the independent variable takes place. Coming to the instruction phase, the students have been divided into two groups- an experimental group (group 01) and a control group (group 02). The experimental group, on the one hand, has received treatment for five weeks. In this period, no assessment of their reading comprehension has taken place; the major issue is to teach students how to use strategic reading. On the other hand, the control group has been processing materials following a traditional method- reading the text, answering MCQs and discussing students' answers in subgroups and with the teacher. After five weeks of controlled experiment, the students have taken a posttest to enable the researcher evaluate the expected growth of students' reading comprehension abilities. Data collected in pre-testing, post-testing, and treatment phase are reported and analysed in the following section.

### **6.8.1 Reading comprehension pretest (60 pts)**

This reading comprehension measure, as described earlier in this chapter, consists of a text to be read ("Owls"), six MCQs to be answered and a one-sentence justification to be written. Each question is attributed 10 points for the correct choice and the acceptable justification. The students' answers are reported in the following table.



Questions/justifications	Percentage of correct answers
-Question 01 -Justification of answer1	-73% of the students have chosen the correct answer. -51% of the participants who have opted for the right answer have given a logical justification.
-Question 02 -Justification of answer2	-80% of the students have given the correct answer. -66% of the participants who have chosen the right answer have given a correct justification.
-Question 03 -Justification of answer3	-49% of the students have opted for the correct answer. -31% of the participants who have given the right answer have written an acceptable justification.
Question 04 Justification of answer 04	-41% of the students have chosen the correct answer. -50% of the participants who have opted for the right answer have given a logical justification.
Question 05 Justification of answer 05	-31% of the students have opted for the correct answer. -27% of the participants who have picked up the right answer have written a correct justification.
Question 06 Justification of answer 06	-61% of the students have picked up the correct answer. -43% of the participants who have opted for the right answer have given an acceptable justification.

**Table 6.5: Students' performance on the reading comprehension pretest**

The students' performance on the baseline measurement test is described in the following section.

### ***Question 01***

This question requires the students to find out how owls, in general, are considered in the text. That is to say, they have to give the text's general idea. 73% of the students have opted for the correct response; they have realised, or seem to realise, that owls are depicted in the whole text as 'cultural symbols' (answer E). This indicates, at that level, that a lot of students have understood how owls are depicted in the text in general. When asked to write a justification, only 51% of those successful students have written a correct justification. These students have referred to keywords that correctly relate to cultural symbols such as 'wisdom', 'warning', and 'ability to repel illness and negative influence'. This implies that some students have understood the general idea but could not justify their answers (lack of time or writing skills). Another reason of failure would be that students have not really understood the general idea and have randomly picked one answer. In either case, the mark is reduced to reflect more reliably the students' comprehension level.

### ***Question 02***

In this question, the participants are required to find out how owls are depicted in the *first paragraph*. This time, 80% of the students have answered that owls are animals that foreshadow future events (answer C). To get a clearer idea about the students' comprehension level, students have been asked to justify their answers. Here, 66% of the correct responses have been logically justified. Many students have put that owls are associated with the future by referring to words like 'harbingers' and 'prognosticating'. This implies that students find it easier to get the central idea of a paragraph rather than that of a whole passage. This may mean that students' short term memory and working memory may not be functioning adequately to enable them keep the different

information they encounter in a text in an active retrievable form. Therefore, when they finish reading, they do not remember a great deal of the information encountered in the text.

### ***Question 03***

This question requires the students to extract a supporting idea that is referred to in the second paragraph. 51% of the students have failed in answering this question. They have not found out that the author discusses the several cultural viewpoints indicative of the symbolic nature of an animal (answer B). Expectedly, not all the justifications are correct; only 31% of the correct answers have been justified logically. This minority could understand that the author relates to the different cultural understandings, including Kenyan, Native American, Cameroonian, and Malaysian, of the owl's symbolism. Fortunately, this gives a more precise idea about the students' understanding of what they read. Nevertheless, there may always be a number of students who understand what they read but who fail in justifying their answers. That is why answering a MCQ and justifying the answer are expected to give more reliable results.

### ***Question 04***

In answering this question, readers are supposed to compare two supporting details to understand an idea. That is, students are asked to understand the two ways in which the term 'myth' is used. This seems to be easy for 41% of the participants. The other participants have failed to understand that the word 'myth', in its first use, refers to certain societal beliefs and, in its second use, to untrue stories (answer C). Unfortunately, not all the students have justified their answers correctly. Half of the successful respondents have written logical justifications for their choices. They have correctly referred to the difference in describing the term 'myth' in the text as 'several cultural interpretations' and its conventional definition. This, once again, shows that students select

answers randomly or face language problems in trying to express themselves correctly in writing; 7 students have written no justifications.

### ***Question 05***

This question requires the students to extract implied information from the text. This question has expectedly shown to be the most challenging of all the questions. Actually, only 31% of the students have opted for the right answer. *Maybe* they have understood that the idea that is implied in the third paragraph is that ‘a common fear underlies the truth in cultural perceptions’. Considering how the participants have justified their answers, only 27% of the successful students have given acceptable justifications of their answers. Their sentences have reported that, using different structures, the author has written that the phenomenon suggests an ‘interesting, universal’ and ‘fear of the unknown’. This leads the researcher to think about the level of understanding of those participants who have chosen correct answers but who have failed in justifying their options. Understanding implied information has always been a challenging part in the comprehension test; even students with the best comprehension skills may fail in extracting hidden information. This may also be due to the time pressure the students are put under; it makes it hard to extract explicit information, let alone less explicit one.

### ***Question 06***

The last question in this test requires the participants to recognise the type of information that is used by the author. Only 32% of the respondents have answered that the author has used citations. This may be due to the fact that the participants have misunderstood the term ‘citations’ that is one of the five options; they must have been looking for words that are put between inverted commas. Nevertheless, the option ‘citations’ (answer C) refers to a list of analogies that are stated by the author. This may explain why only 43% of these successful students have justified their

answers correctly and cited the different analogies that the author has referred to ('like...a judge on his high bench' and 'a teacher surveying'). The students' choices, this time, have been highly influenced by their understanding of the questions. It is of a paramount importance for the readers to understand a specific question to respond to it and, thus, show the truth about his comprehension abilities.

### **6.8.2 Treatment reading tasks**

During treatment period, the experimental group has received the teacher's instruction on how to use anticipation guides and text previewing to set their brains for the reading activity and, thus, to make this task less challenging.

#### ***Control group***

Materials that have been presented to the students in the control group sessions are the same texts used by participants in the experimental group in the treatment phase (See Appendix V). Here, students, in every reading session, approach a text following a traditional method, answer six MCQs about it and discuss their answers with their classmates and the teacher to find out how well they have performed on this exercise. It is noticed that students in the control group do not use any pre-reading strategies that help them get ready for the reading activity. All of them approach the text directly by reading it twice or thrice until they achieve a level of understanding that, according to them, enables them to answer the set of reading comprehension questions.

Taking into consideration the students responses in the reading comprehension exercises, some points have been noticed. The students' performances vary from above average (20/30) to very (05/30). The students' weaknesses can be interpreted differently. In the post-reading discussions, some students have revealed that they face difficulties when they read because they cannot concentrate on what they read; some others believe that long texts make them lose their

concentration. More than that, some students have simply said that they do not like to read and that the text's topic can sometimes be the reason; they lack motivation to approach and process texts, in general, and passages that contain unfamiliar/difficult topics, in specific. This implies, therefore, that they need the teachers to be more creative in their reading classes to make their students get involved in the reading tasks. Equally important, teachers have to think carefully about the texts' topics because when students read about an issue they are, to some extent, familiar with, they can engage easily in the reading strategy. Contrarily to the subjects who have not performed successfully on the reading comprehension exercises, some students believe that they can achieve because they like to read and learn new information. Their motivation and readiness to learn have helped them feel cognitively ready to process a text and receive new information.

### ***Experimental group***

As explained earlier in this chapter, students in the experimental group have been taught how to use anticipation guides and text previewing to set their minds for the reading task using the same texts that are approached by control group students; no MCQs are given to these participants (See Appendix V). At that level, these pre-reading strategies are used to motivate the learners to read, not to assess how much they know and how well they can answer comprehension questions. It is noticed that when these strategies have been introduced for the first time, they were new and the students have expressed some feelings of excitement and anxiety towards using new methods; this is true about the first reading class. Starting from the second class, students have started to think about using the new methods of approaching a text automatically. Before the teacher gives the instruction, they can easily guess what they are supposed to do. This shows that pre-reading has started to take part in the students' reading habits, at least in the classroom.

### ***Text 01***

In the first session, students have been guided by the teacher to approach the first text that is entitled “Celebrating Love”. In response to the five anticipatory statements, students have expressed opinions and exchanged ideas about a topic that, according to their reactions, seems to be interesting for them. Students’ conceptions about this celebration can be summarized as follows.

-50 students have agreed that Valentine’s Day is a mysterious day.

-48 participants have responded positively to the second statement which holds that only one saint is recognized a valentine and he was martyred.

-16 respondents believe Valentine used to marry young couples in clandestine ceremonies.

-For 33 students, the ‘heart’, synonymous with Valentine’s Day, most likely came from the note St. Valentine sent to Julia just before his execution.

-10 participants believe that Valentine’s Day originates from a celebration centred on mirth and productivity.

After previewing the text to steal information, students have recognized some differences between what they know about this celebration and what the author suggests; this has been noticed from the way they answered the previewing questions that have been asked by the teacher. This means that students have been previewing new information and comparing it to what they already know about ‘Valentine’s day’. After a more detailed reading of the text, students have responded to the guides and have changed their minds about some issues as a reaction to the author’s presented information. Some of the new information they have encountered and expressed in the post-reading phase are:

-The Catholic Church recognizes at least two different saints (not one) that were both named Valentine, or Valentinus, and who were both martyred.

-The 'heart', synonymous with Valentine's Day, came from, as the legend goes, the times when Valentine cut out parchment hearts and gave them to persecuted Christians and soldiers.

-The Valentine's Day originates from a celebration that is centered on harvest and courting (not mirth and productivity).

It is believed that students' knowledge about this day has helped them relate to the text and feel motivated to read it. Even though it is a celebration that does not relate to the Algerian culture, many Algerians celebrate love; this makes these students acquainted with the topic to some extent. This amount of knowledge is what the researcher has tried to target when creating the anticipatory statements.

### ***Text 02***

The second text that has been treated in the instruction period is the one entitled "An Introduction to Relativity". The pre-reading phase has revealed many thoughts students have about the concept of relativity. They have exchanged such ideas and discussed them in small groups and with the teacher. Some of the beliefs students have expressed are:

-36 students believe that philosophy is not necessary to science.

-36 participants see that philosophy hinders science.

-41 students believe that subjective time is not influenced by personal experiences

-49 participants have responded to the fourth statement believing that experiences cannot feel more scientific.

-08 students have put that experiences have to be made only into rigid structures.

It is noticed that some conceptions are common to the majority of students. For example, almost all of them see that one's experience cannot feel scientific. Another thought that is noticed to be wrongly conceived by students is the difference between the terms 'philosophy' and



'philosopher'. Here, the same students who have said that "philosophy is not necessary to science" are the ones who have put that "philosophy hinders science". Such responses reflect a lack of concentration or a misconception of the terms. It is clear that students do not make a difference between the role of philosophy and that of philosophers in science. This reflects a lack of knowledge about how philosophy and philosophers contribute to science.

After discussing their beliefs and previewing the text using THIEVES strategy in the pre-reading phase, students have read the text to encounter new information that is to confirm or disconfirm what they have expressed previously. Some students have changed their minds after reading the text while some others have just acquired new information without having to change their opinion about the issue. Some of the ideas that have been revealed by the author to be different from the students' thoughts are summarized as follows.

- Philosophy is necessary to science.
- Philosophers often hinder science.
- Subjective time is influenced by personal experiences and opinions.
- Experiences can feel scientific.
- Experiences can be made into rigid structure while relating to irrational feelings.

A lot of students have expressed their interest in this topic even though they are not very knowledgeable about it. This motivation to approach this text has created some curiosity in the readers to know what information they will encounter. This, then, has lead them to put all the possible ideas they already know about 'relativity' and 'Einstein'. It is true that the amount of information they have about a topic is important, but the researcher believes that being eager to activate what they already know can guarantee, to some extent, the students success in processing the text and thinking analytically about its topic.

### ***Text 03***

The third text is entitled “The Usefulness of Selfishness”. The title seems to be inviting or many students, especially the ones who have always considered selfishness as a negative thing. Their responses to the anticipatory statements are somehow expected. They are summarised as follows.

-45 students see that altruism is always good.

-47 participants believe that self-sacrifice always refers to real altruism.

-21 respondents agree that being watched leads people to be generous/altruistic.

-All the students see that the main reason for people’s niceness is public image.

-18 participants believe that free riders, those selfish persons who benefit from the altruism of others, should not be punished.

Students have not expressed a great level of disagreement when they have discussed these statements in small groups or with the teacher. Most of them have been describing selfishness as a negative feeling and altruism as a positive one. It is worth mentioning that students may not express their real thoughts about a given topic because they want to build a specific public image. Nevertheless, what is really important in using these pre-reading strategies is to make students think actively about the topic, not what they pretend to be thinking.

After reading the text carefully for two or three times, students have responded differently to the anticipatory statements in the post-reading phase. The following responses have been noted.

-Altruism is not always good; people may become altruistic for more personal reasons than helping others (e.g. when they are watched).

-self-sacrifices do not always refer to real altruism; sometimes, they are just considered as another form of selfishness.

-Being watched leads people to be altruistic.

-People do not have to be nice for their public image; they must be nice for their personal growth.

-It is important to punish those selfish people who take advantage from the altruism of other persons.

Students, after reading the text, have realised, or confirmed secretly, that altruism is not always good and selfishness is not always bad. This text seems to be easier for the students to be understood. One possible explanation is that they are more familiar with the issue of selfishness and, probably, the importance of being selfish. Such prior information helps them approach the text confidently.

#### ***Text 04***

“The Changing Technology” has been selected by all the pilot students as the most interesting topic. This must reflect the students’ love for technology or they enjoy reading texts that are not totally informative since the author of this passage uses the narrative method in the first part of it. The students’ responses to the anticipatory statements are summarized as follows.

-The telephone, for all the students, was first used as a substitute for writing letters.

-47 participants believe that telephone use should not be ruled by etiquette.

-18 respondents put that phones, as used in the past, protected their users’ privacy.

-43 students believe that continuous communication allows people to connect intimately with their acquaintances.

-42 participants consider that a lull in communication causes friends’ relations to become weaker.

Considering the students’ responses to the anticipatory statements, it is clear that they have not read the first statement carefully since the phone started to be used in addition, *not substitution*, to letters. Here, most of the students believe that phone use should not be controlled by etiquette; this is part of their past experience since a lot of people do not think, for example, about the

appropriate time to call someone. That is why they have responded in the following statement that no privacy was protected by phone uses in the past.

After reading the text, the students have processed the author's ideas to discover how different they are from theirs. They have been comparing their ideas with the writers' beliefs to understand what the new information is about and to decide whether or not to agree with him and change their minds about the topic. The new ideas they have understood from the text are summarised as follows.

- Telephone was not used as a substitute for writing a letter but was used in addition to writing.
- Telephone use should be ruled by definite etiquette.
- Phones, as used in the past, protected their users' privacy.
- Instant and constant communication between people inhibits their ability for self-reflection and creating boundaries.
- People do not have to be in constant contact to make good friends; a lull in communication should not be disappointing.

To approach this text, students' prior knowledge about the phone and its use in communication have been activated through anticipatory statements and previewing strategy. The different ideas students have encountered in the text have changed, to different extents, their thoughts about communication.

### ***Text 05***

The last text that has been used in the treatment period is the one entitled "Detective Novels". Students have expressed feelings of interest and curiosity about the topic. Most of them are familiar with this type of novels while the others have simply watched movies that are inspired by detective novels. To activate the students' prior knowledge about this kind of novels, they have

responded to anticipatory statements. The following summary represents what their responses look like.

-All the students believe that crime novels have a trying effect on the reader's brain.

-32 respondents have put that reading murder novels makes the reader feel anxious and unsatisfied.

-all the students consider Americans to be the best murder fiction writers.

-34 participants think that all detective novel writers are men.

-22 students see that male-only detective fiction has to be encouraged because men are more intelligent than women.

During class discussion, students have expressed many disagreements that may come from a lack of knowledge or certainty about the ideas being expressed. Students who have shown more knowledge about the topic have given examples about some crime novels like "The Adventures of Sherlock Holmes", "Throne of Glass", "The Coffeshop Murder", "Garwood Village" and many others. It is true that students' prior knowledge has revealed some misconceptions about the issue in question.

Students have read the text many times to be able to compare what they already know with what is presented by the author. This is more likely to make them critical readers who compare different thoughts to understand what the author tries to convey. After a full reading of the text, a post-reading discussion has revealed the different points students have learnt from the text. The following points summarise the points raised (similarly or differently from participants' thoughts) about the topic.

-Crime novels do not have a trying effect on the reader's brain; they are relaxing.

-Reading mystery novels generally makes readers feel satisfied.

-English novelists are the best murder fiction writers (not the Americans).

-Murder novels are written by male and female writers.

-Agatha Christie is a female detective writer that has made the change with her intelligence.

To approach this text, students' knowledge about novel crimes, American writers and men/women intelligence has been activated using anticipation guides and text previewing to set their mind for the reading activity. Recalling such details has been helpful especially for those students who have found a similarity between their thoughts and the ones expressed in the texts. Other students have been curious to read a text that challenges their prior knowledge; this is believed to be helpful for them to approach a text successfully.

As expected, this treatment has taught students how to anticipate what will come in the text, to activate their prior knowledge by stealing information from different sections of the text, to get motivated in the issue and to engage in active reading right from the start. Anticipation guides and text previewing (THIEVES) have been helpful even for low spans since anticipation does not require, as supported by (Johnston and Afflerbach, 1985), huge WM resources. This makes strategic reading a solution for some struggling readers.

### **6.8.3 Reading comprehension posttest (60 pts)**

This final test is quite similar to the baseline test. It consists of a text, which is entitled "The Musings of an Aspired Athletes", and 6 multiple choice questions; students are required to pick up the best option response and to justify each answer in one sentence. For each correct answer and relevant justification, students get 10 points. The following table reports the answers.

<b>Question N°</b>	<b>Percentage of correct answers</b>	<b>Percentage of correct answers</b>
<b>Justification N°</b>	<b>Experimental group (gr. 01)</b>	<b>Control group (gr. 02)</b>
-Question 01	-84% of the answers are correct	-60% of the answers are correct
-Justification 01	-62% of the justifications are logical	-58% of the justifications are correct
-Question 02	-72% of the answers are correct.	-38% of the answers are correct
-Justification 02	-68% of the justifications are correct	-50% of the justifications are logical
-Question 03	-52% of the answers are correct	-54% of the answers are correct
-Justification 03	-56% of the justifications are logical	-70% of the justifications are correct
-Question 04	-48% of the answers are correct	-34% of the answers are correct
-Justification 04	-72% of the justifications are logical	-68% of the justifications are correct
-Question 05	-62% of the answers are correct	-46% of the answers are correct
-Justification 05	-48% of the justifications are logical	-58% of the justifications are logical
-Question 06	-82% of the answers are correct	-40% of the answers are correct
-Justification 06	-42% of the justifications are correct	-48% of the justifications are correct

**Table 6.6: Students' performance on the reading comprehension posttest (experimental and control groups)**

The students' performance on the final test is described in the following section.

### ***Question 01***

This question requires the participants to find out how wealth is, in general, conceived in the passage. Students in the experimental group have been a little bit more successful than those in the control group (84% and 60% of correct answers respectively). They have answered, according to the text, that wealth is a boon for those with athletic talent (answer C). This may indicate that students, in both groups, have not faced problems in extracting more general concepts from the text. To make their responses more trustworthy, students' justifications have to be taken into consideration. 62% from the successful students in group 01 and 58% of them in group 02 have given acceptable answers. They have backed up their answer using the following quotation from the text: "While money does factor in the education of an athlete, it is more a testament to how much you're willing to sacrifice to follow your dream than a lever towards success." Some students have paraphrased this quotation and others have simply extracted keywords. Students from the experimental group are expected to use previewing strategy that, according to the researcher, is helpful for them to get the general idea of the text even before reading it. Thus, full reading serves, for the experimental group, to confirm the idea they build during previewing while it serves, for the control group, to learn about the topic for the first time. This is what explains the success of participants in finding the general idea of the passage.

### ***Question 02***

The second question asks the participants to describe the tone a writer has used in writing a group of sentences. Expectedly, students in the experimental group (72%) have performed more successfully than those from the control group (38%). Students who have succeeded in answering this question have recognised, or seem to recognise, that the author uses an emphatic tone in the suggested short passage. Unfortunately, a lot of students have failed in justifying their answers.



68% of the successful students have justified their answers logically while much less students (50%) have done it in the control group. All the students who have justified their answers correctly have referred to the clue which is the author's use of the exclamation mark (!). The researcher has expected that students in the experimental group will find it less challenging to find out about the author's tone than those from the control group. What has really helped students from the experimental group to understand the tone is the fact that they have practiced previewing texts for their different features and they have discussed such features with their teachers in the classroom. As far as the control group successful students, it is suggested that their good knowledge about the linguistic features of a text has helped them recognise the tone even though they did not practice this in the treatment period; this may come from previous practices prior to the experimental study.

### ***Question 03***

The third question in this test targets a supporting detail of the text's general idea. Here, students are supposed to extract the author's claim in the whole paragraph. 52% of the students from experimental group and 54% of the students from the control group have found the correct answer. These students have answered that the author's claim in the second paragraph of the passage is that the athletic ability is primarily inherent (answer E). To check whether or not students have chosen this option as a result of a real understanding of the author's claim, it is necessary to consider their justifications. Here again, students from the control group have unexpectedly performed more successfully than those from the experimental group. Students who have really understood the author's claim have referred to the use of 'intrinsic' in the text, which describes the athletic ability, as being synonymous with the adjective 'inherent' that is suggested among other choices. This implies that students previewing strategy has not helped students in extracting a supporting detail because the key to success this time is to inevitably understand the

meaning of the word. That is to say, whatever pre-reading strategy is used, it is not helpful when the understanding of a detail is based on the meaning of a word.

#### ***Question 04***

In the fourth question, students are required to find out the main idea's supporting detail. This question seems to be challenging for students in both groups. Still, experimental group students have proven to be more successful; 48% of the experimental group students and 34% of the control group students have understood that an athlete's failure can be LEAST attributable to lack of financial funding (answer C). Out of the students who have picked up the best response options, 72% in the experimental group and 68% in the control group have given correct/logical justifications. Some of them have referred to the following excerpt: "With so many children clamoring to improve, it's impossible for the coaches and trainers to turn them all into champions. Some children just don't have either the talent or the motivation to cross the hurdles that will block their way in becoming a professional athlete." Some students have simply paraphrased that part of the paragraph. Some other students, in both groups, have given no justifications at all; this shows how random their choice of the response is. What makes this question challenging is the way information is structured in the text and presented in the response option. At first glance, they seem to be describing different information; however with concentration, they do represent the same thought. Here again, it is expected that the success of experimental group students is due to the previewing strategy they have used prior to reading; it enables them to consider every first sentence of the passage and the paragraph's topic sentence in this question is very helpful.

#### ***Question 05***

This question raises the issue of the importance of money in athletes' careers/life. 62% of the experimental group participants and 46% of the control group respondents seem to understand the

author's opinion; money, according to the author, is secondary to innate skill (answer C). Nevertheless, it seems like students who have failed in answering the question have relied on their own opinion, not that of the writer. That is why they have chosen to put that money is 'as important as training to success' or 'the most important element to success'. They may not have understood or even read the passage in question. To uncover the truth about the successful respondents' success, it is important to analyse their justification. About half the correct answers have been justified correctly; students who have read the paragraph carefully and understood that they have to express the author's opinion have supported their answer by the following paragraph sentence: "No matter how much money you pour into hunting down the best coaches, the best environment, and the best equipment, if you don't have the skills or passion for the sport, your efforts will never bear fruit." Students who have failed in answering this question might not be able to understand the relation between the different parts of the sentence; this could be attributed to a lack in working memory resources. These can help students process long or short passages by keeping the relevant information active for future understanding (the coming words, sentences or paragraph)

### ***Question 06***

The last question relates to the author's tone in the whole passage, not in a specific paragraph. Here again, experimental group students have shown to be more knowledgeable about authors' tones in texts. 82% of them have given correct answers while only 40% of the experimental group students have picked up the best response option. These students have realised, or seem to understand, that the author's tone is an optimistic one. As far as the students' justifications are concerned, less than half the successful students have given relevant justifications. They have mentioned the different positive thoughts the author has about many issues in athletes' lives and careers, including money. Students have been expected to perform

more successfully even if they are not very knowledgeable about the different tones a writer can use. Thus, it is suggested that either they did not understand the text well or they have been confused by the different options since they relate, to a small extent, to the text.

#### 6.8.4 Comparison of the groups' means and students' performances

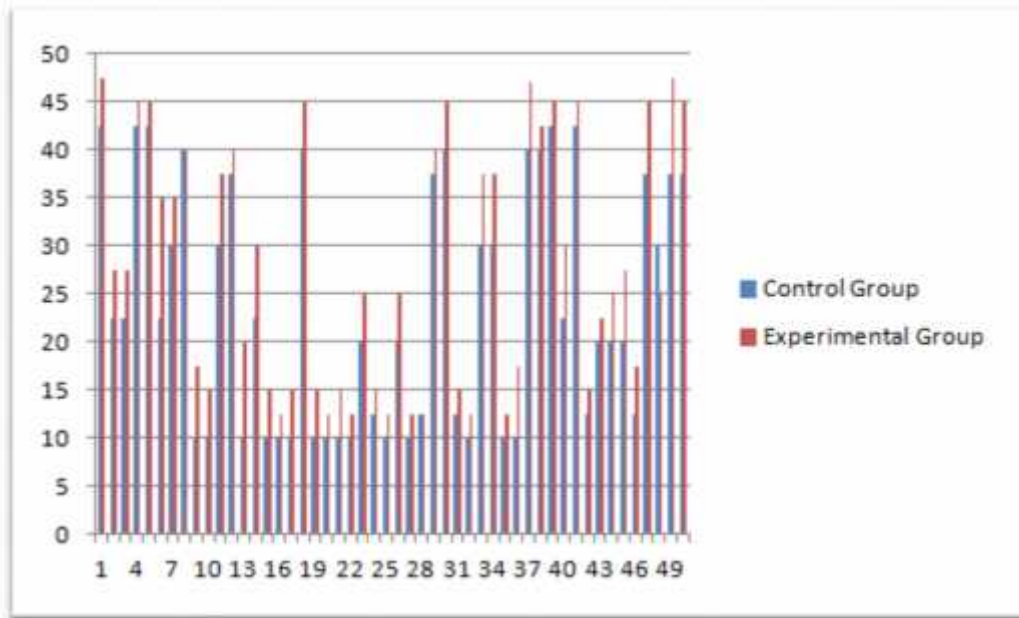
As reported earlier in this chapter, students have been pretested, instructed for five weeks (experimental group), and post tested. To measure the growth of students' reading comprehension, it is important to start by calculating the means of both groups; they are obtained through the division of the scores' sum on the participants' number. The obtained means in both tests (pretest and posttest) are summarised in the following table.

	<b>Pretest scores' means</b>	<b>Posttest scores' means</b>
<b>Experimental group</b>	23.50	28.09
<b>Control group</b>	22.6	23.35

**Table 6.7: Means of the experimental and control groups (pretest and posttest)**

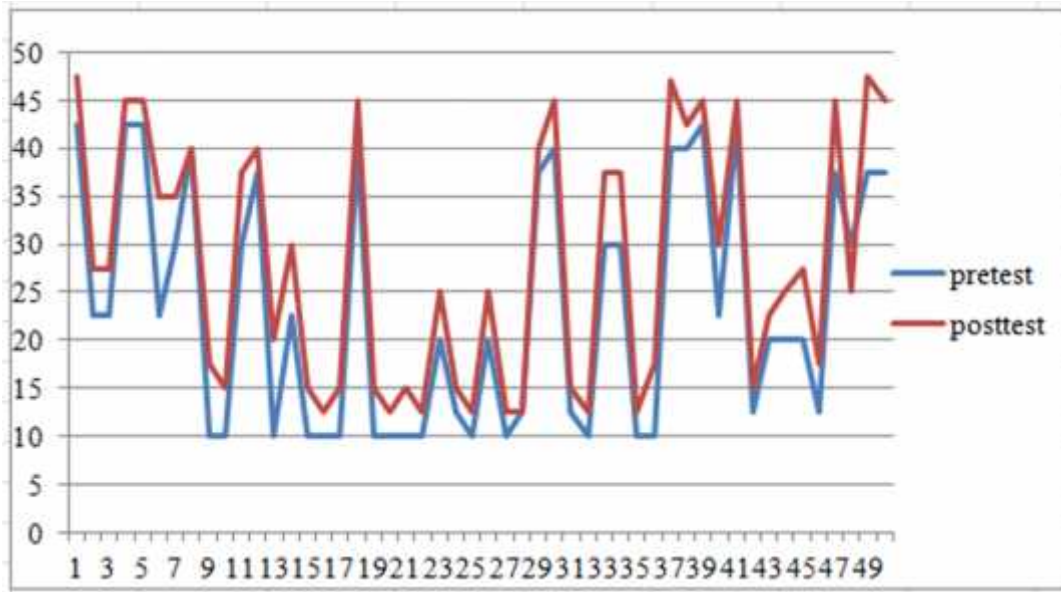
This table helps in comparing the groups' means in the pretest and the posttest. On the one hand, there seems to be no significant difference between the pretest groups means. This implies that students in both groups have similar reading comprehension abilities (good, average and poor). In the experimental group, scores range from 10.00 to 42.50; in the control group, students' marks range from 10.00 to 45 (See Appendix IX). At this level, no huge similarities or differences are expected since students have taken a baseline measurement without any previous reading treatment. On the other hand, the posttest group means reveal, as a preliminary conclusion, that

students in the experimental group have outperformed the participants in the control group. These scores are better summarised in the following figure.



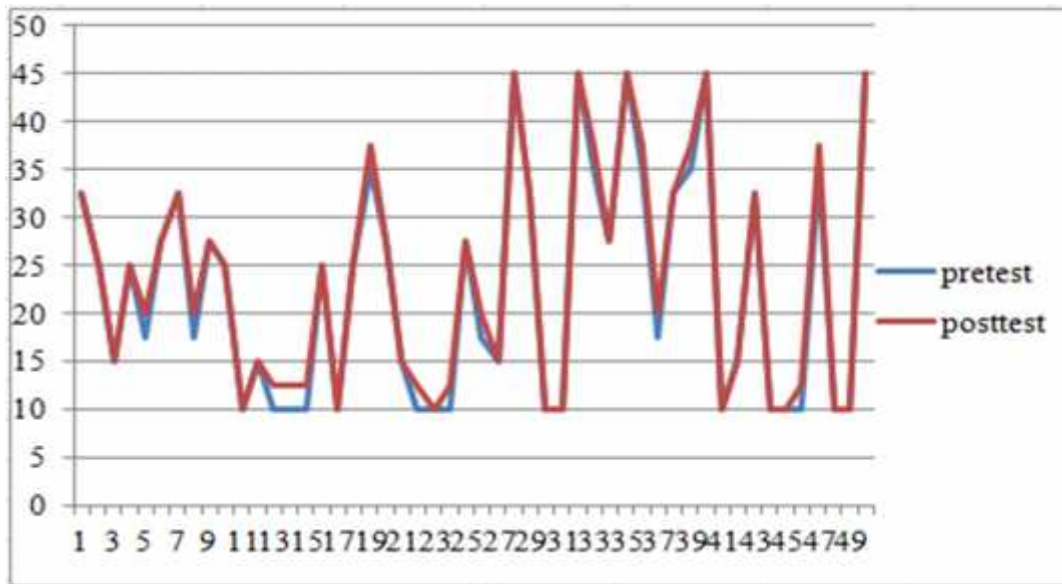
**Figure 6.1: The experimental and control group students' marks (posttest)**

The students' marks in the experimental group range from 12.50 to 47.50; it is noticed that the best and the worst marks in this group have improved. As far as the control group is concerned, the participants' scores range from 10 to 45. Here, the general level seems to be the same. Nevertheless, an analysis of the individual marks of students reveals some changes at the level of some students; some students have scored better in the posttest while some others have been more successful in the pretest. The following 2-D line graphs better represent the differences in the performance of the same group in both tests.



**Figure 6.2: Experimental group students' performance on both tests**

The inferior blue line represents the students' performance in the pretest while the red one refers to their performance in the posttest. It does not require a deep analysis to remark that the performances of many students in the posttest test are, in general, better than their performances in the pretest. This difference is said to be significant since the groups mean has increased from 23.50 to 28.09.



**Figure 6.3: Control group students' performance on both tests**

Differently from the lines' movement in figure 6.2 that show to be separate in many points in the graph, the two lines in this graph are almost identical; they are separated in very few points. Those differences in lines represent differences in the students' performance. This means that very few students have performed differently in the pretest and the posttest; for the others, the level of performance is exactly, or almost, the same. In the control group, the mean in pretest is 22.60 and in the posttest it equals 23.35. It is crystal clear that the difference in students' performances is near to inexistent.

These comparisons of group means and performances indicate, to some extent, that the experimental group, contrarily to the control group, has gained growth in reading comprehension. Even though these results seem to be encouraging, they still represent a preliminary conclusion about whether or not there has been a significant growth in the students' reading comprehension abilities as a positive change that is attributed to the reading treatment. Therefore, building strong interpretation of these results is not possible yet. Hence, to draw more reliable conclusions, it is important to go through a t-test analysis to confirm or disconfirm these findings.

## 6.9 T-test analysis

In language studies, researchers have always considered the t-test as a powerful test; it is a reliable tool in determining the significance of the experiment's findings. Therefore, it establishes the relationship between the dependent and the independent variables.

### 6.9.1 Definition of the t-test

A t-test is a commonly used test of significance. It is used in experimental studies to compare the means of two groups by taking into account data variation. This test is more than a descriptive tool of the numbers obtained; it draws conclusions about the relationships between dependent and independent variables by proving that differences in group means are more than a product of chance. This study uses the related/paired t-test since the same participants are pre-tested then post-tested.

### 6.9.2 The computation of the obtained 't'

To calculate the value of the observed 't', the following computational formula is applied.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

To understand the calculation of the formula, it is important to understand what each component stands for.



$\bar{X}_1$  stands for the mean of group 01 (experimental group)

$\bar{X}_2$  stands for the mean of group 02 (control group)

$S_1$  stands for the standard deviation of group 01 (experimental group)

$S_2$  stands for the standard deviation of group 02 (control group)

$N_1$  stands for the number of participants in group 01 (experimental group)

$N_2$  stands for the number of participants in group 02 (control group)

To calculate the value of obtained 't', all the components of the formula have to be substituted with their real values (See Appendix IX). They are calculated as follows.

$$\bar{X}_1 = \frac{\sum X_1}{N_1}$$

$$= 28.07$$

$$\bar{X}_2 = \frac{\sum X_2}{N_2}$$

$$= 23.35$$

$$S_1^2 = \frac{\sum X_1^2}{N_1} - \bar{X}_1^2$$

$$= \frac{4}{5} - (28.07)^2$$

$$= 164.356$$

$$S_2^2 = \frac{\sum X_2^2}{N_2} - \bar{X}_2^2$$

$$N_1 = 50$$

$$N_2 = 50$$

### -The 't' value

$$t_{(98)} = \frac{2.0 - 2.3}{\sqrt{\frac{1.3}{5} + \frac{1.9}{5}}}$$

$t_{(98)} = 1.94$
-------------------

The value of the obtained 't' is 1.94. At this level, it is impossible to confirm whether or not the results are significant. To do so, it is important to find out the critical value of 't' and to compare both values- the obtained and the critical ones. To search for the tabulated value, it is important to consider the level of significance, the degrees of freedom and the study's directions. In this study, the researcher has used a significance level of .05; this represents the likelihood of the null hypothesis being rejected by the statistical test. Concerning the degrees of freedom, it is possible to calculate them as follows.

$$df = (N_1 + N_2) - 2$$

$$df = 98$$

It is worth mentioning that this study is testing for the possibility of the relationship between reading comprehension and anticipation skills in *one* direction; it disregards the possibility of any other directions. This means that it uses a one-tailed test (one-directional) since he is sure about the direction of his hypothesis by expecting some specific changes.

That being said, for a one-tailed test, at .05 significance level and with 98 degrees of freedom, the critical value of 't' is 1.66. Since the value of the obtained 't' is larger than that of the critical 't' ( $1.94 > 1.66$ ), then the results can be said to be statistically significant. Therefore, it is possible to confirm the preliminary results stated earlier in this chapter; there is a significant difference between the posttest groups' means. This means that there is a probability of less than 5% that these experimental results are the outcomes of a chance stroke; this implies that there is a

possibility of 95% that these results are statistically significant and mirror the expected positive influence of the study's reading treatment on the students' reading comprehension in the experimental group.

## **6.10 Discussion of the results**

It is hypothesised in this study that the students' reading comprehension would increase if they anticipate what comes next in a text using anticipation guides and text previewing strategies. To test this hypothesis, the groups' means in the reading comprehension posttest have been compared. The mean ( $M=28.07$ ) and the standard deviation ( $SD=164.356$ ) of the experimental group are larger than the mean ( $M=23.35$ ) and the standard deviation ( $SD=131.903$ ) of the control group. In addition to that, the calculated  $t$  value ( $t=1.94$ ) is greater than its critical value ( $t=1.66$ ). Given that these results are well in the direction of the study's hypothesis, it is possible to confirm that using anticipation guides and text previewing strategies to help students anticipate what comes in a text has a positive influence on their reading comprehension. These findings can be summarised as follows.

1-Students in the experimental group have shown an improvement in their reading comprehension as a result to the use of anticipation guides and text previewing strategies they have been using during the treatment period.

2-The use of the instructed reading strategies differs from one student to another; some students take their time to get ready for the reading task while some others go through the pre-reading strategies rapidly without taking huge advantage of them; this does not improve their reading comprehension to a noticeable extent.

3-Most of students have expressed their interest in using these strategies. This raises their curiosity about the text and their motivation to read; these are keys to success in reading.

4-The participants, in both groups, like to read texts about which they have enough background knowledge; they do not like to read about unfamiliar topics. This has helped students whose prior knowledge has been activated feel more engaged in the reading task, make predictions about how similar or different the author's thoughts will be and check how right or wrong their predictions are.

5-Expository texts have shown to be difficult for the students to be comprehended. It is true that such texts present the students with new ideas that make the reading task more challenging.

In this study, it is important to discuss to which extent the use of anticipation guides and text previewing strategy brings about the students' reading comprehension growth. Except for very few students, experimental group participants have obtained higher scores than those of control group students. This superiority is more likely to be attributed to the experiment's treatment. That is to say, the experimental group students' superior performance in reading comprehension tests is explained by the students' strategic reading that they have, to some extent, developed in the treatment period through the use of anticipation guides and text previewing (THIEVES) strategies. In this phase, students have learnt to prepare themselves psychologically to approach the text; this helps them read the text smoothly (linking ideas easily) and remember the information they encounter while reading. On the contrary, participants in the experimental group approach a text directly without setting their minds for the reading activity. It is logical that not being prepared for something makes doing it more difficult; the same applies to reading. When the students are not encouraged to activate their background knowledge to anticipate what they will encounter in the text, they are less likely to understand the text and to remember what is being read for future use.

Taking into consideration students' responses to the anticipation guides and text previewing questions, it is clear that respondents have had recourse to their prior knowledge to

respond to anticipatory statements and answer teacher's questions that guide their text previewing strategy. Even students who are less knowledgeable about the text's topic have learnt from the group discussion some information that is needed for text understanding. Keeping this retrieved/learned knowledge in an active state helps the students link what they have been discussing (in small groups or with the teacher) and what they read; they encounter in the text words and ideas that are the same or relevant to the ones discussed prior to the reading task. At this level, their focus is oriented to what is new/unfamiliar and how to link it to what they have already retrieved and discussed. This is believed to cause a kind of confidence and comfort in the students before processing a text.

In group 02 (control group), readers have approached the texts with an expected lack of preparation and confidence. They have not been taught how to approach a text strategically. Therefore, they have processed all the treatment texts and the tests' passages using no pre-reading strategies. Here, they approach a text without setting their minds about what it is about. Some students have said that they have not even read the title; they have started reading the first sentence directly. Then, they encounter familiar and unfamiliar ideas at once; this makes it difficult for some students and impossible for some others to understand the text's ideas and to link them to understand the text successfully. To put it differently, they process simultaneously what experimental group students process in two phases (pre-reading and reading). Consequently, this may cause students' memory to be overloaded by engaging more cognitive resources than needed in the reading task. Naturally, the task would be cognitively more demanding for the control group readers and, thus, they will be less successful in approaching the text.

In this study, four expository texts have been used and a text that is narrative in its first half and expository in the second part. The expository texts that have been used in the treatment period

are more difficult for some students than for others. This relates to how knowledgeable a participant is about the text's topic or how complex the passage's topic is for the students. When he reads an informative text, a student is more likely to encounter a considerable concentration of complex concepts. This makes it difficult for the participants to understand and retain what they read. Some of the texts that have been used in the treatment period have shown to be more challenging for the students. For example, text 02 (See Appendix V) that introduces the concept of relativity tackles a challenging topic for students; it is true that some students are interested in science, but for the majority of them, they have always been humanities' students and science is far from being a field of interest for these students. Similarly, the "Detective Novels" text (text 05) has been pretty difficult for students, especially those who are not interested in reading or even knowing about the different types of novels. The remaining texts (01, 03, and 04) seem to be less challenging; they discuss topics like Valentine love celebration, selfishness, and telephone technology. Here, participants have shown to be more knowledgeable and interested in the topics in the pre-reading stage. This has made them feel more curious about the text and more comfortable while approaching it. It is noteworthy that such texts have been chosen by many pilot participants who have confirmed their interest in the topics and knowledge about them. This has, therefore, encouraged the researcher to use these texts in the instruction period; full-scale study participants may have some different interests.

It is worth mentioning that in spite of the encouraging results that go in the direction of the study's hypothesis, some students, from both groups, have performed unexpectedly; they represent the study's exceptions. These students can be divided into two categories. The first one is that which includes the students (from the control group) who have obtained good and even better scores in the posttest (in comparison to those obtained in the pretest) even though they have not

received any treatment. This could be explained by the fact that such students have good linguistic abilities and the processing of the five texts has improved their vocabulary. Another possibility would be that some students consider the title of the text before reading it; even though this does not help a great deal, on its own, in understanding a text, it might help students anticipate what the passage will be about. Control group students who have performed successfully in both tests may have good working memory capacities that help them recall and link information while reading; they do not need some pre-reading strategies to set their minds ready for the reading activity. That is to say, these students possess a cognitive ability of automatic brainstorming while reading. That being said, students who master the language and possess good working memory capacities may not need, in some cases, the pre-reading strategies to process a text successfully. Nevertheless, pre-reading strategies make them perform even better.

Pre-reading activities, in this study, do not seem to be effectively activating some students' background knowledge and, thus, not beneficial for their comprehension. These students make up the second category of exceptions. They are students in the experimental group who have received the strategic reading treatment for five weeks. Such failures may be due to different factors. The major reason that would explain less good performances when students receive the treatment is the quantity and the quality of their background knowledge. It is obvious that tapping on information that is not enough, wrong or unavailable is a useless process. Similarly, when students possess some incorrect ideas (misconceptions), pre-reading strategies are not likely to activate such knowledge; even if it does, these ideas do not help the students comprehend a text simply because irrelevant schemata are being activated. In this case, students' comprehension is not supported; it may even be undermined because students' predictions about the text's topic are completely wrong. Some other reasons that have led to comprehension failures among

experimental group students would be related to (a) a lack of concentration in the pre-reading or the reading phase, (b) the complexity of the text or the topic, (c) working memory problems that make it difficult or impossible for the students to maintain information in an active state for further use, (d) the teacher's presence that makes students pretend that they are anticipating the text's topic while actually they do not, (e) the students' real language problems that hinder their understanding of all the types of texts no matter how strategically they try to read (these are problems that are noticeable when students speak or write their justifications; they are more likely to apply to reading), (f) no use of the instructed pre-reading strategies (these students may be lazy or tired of all the reading sessions they have attended in the treatment period).

Now that the results have been presented and discussed, it is clear that the implementation of anticipation guides and text previewing (THIEVES) as pre-reading strategies has resulted in a positive change in the students' reading comprehension and, probably, reading habits. These strategies can be used with the help of a teacher (anticipation guides) and even in his absence (text previewing) as an attempt to build the text's main idea before reading it using anticipation skills. Presenting students with topics they are knowledgeable about makes the anticipation of ideas effective by making readers economise on their working memory resources during reading; these cognitive resources are better used later to help the reader compare his initial prediction (hypothesis) with the encountered information since both of them should be maintained in an active state. Nevertheless, these anticipation strategies have failed with those participants who have low or no knowledge about the text's issue.



## **Conclusion**

The present study has examined the impact of the instructional teaching of reading using anticipation guides and text previewing strategies on students' reading comprehension. In this research, the 'transmission model' of reading is rejected; students should not be considered as passive receptors of knowledge that they encounter in a text's static message. In this study's experiment, participants are encouraged to build, by themselves, meaning from the text by referring back to their background knowledge. This results in a negotiation between the reader (participant) and the passage's writer which leads to an active construction of meaning. That is why students, in this study's experiment have been encouraged to use the background knowledge to anticipate what the text's topic is and, consequently, to gain a portion of familiarity with the to-be-processed passage (issue).

The descriptive and statistical analysis of the obtained data has helped the researcher consider to which extent the use of anticipation guides and text-previewing as pre-reading strategies has helped students anticipate the text's content and facilitated their understanding of this text. The experimental group students have received the treatment and made noticeable progress in their reading comprehension performance (post-test). To check the truthfulness of such findings, the statistical t-test has been conducted and has confirmed the significance of the previous results. This, therefore, leads to the conclusion that helping students anticipate the content of a text develops their reading comprehension performance.

Foreign language teachers are encouraged to create less traditional classroom settings. Constructivist education should be put into practice; this can be realised by engaging the students, motivating them, and helping them create their connection to what is being learnt. To this end, teachers are called to become better coaches in their reading classes by guiding the learners to be

ready to receive new information from texts. Anticipation guides strategy has proven through time to be, with the help of the teacher, an intriguing way to make the students feel more enthusiastic about reading. While the use of this strategy is impossible without the teacher's guidance, text previewing strategy can make a good alternative. Teachers are solicited to teach students how to set their minds for the reading activity even in the absence of their mentor since reading takes place inside and outside the classrooms. That being said, adopting more constructivist teaching methods leads to more successful students (with better attitudes) who are able to monitor their own learning.

## **Chapter Seven**

### **A Correlational Study and an Experimental Investigation of the Relationship between Reading Comprehension and Processing Speed/Automaticity**

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Conclusion

## **Introduction**

In this study and in many others, the literature review on the importance of automatic information processing in reading comprehension has often called for more research in the area of university students' automaticity. The correlational and experimental studies that are reported in this chapter aim at investigating to what extent students' automaticity influences their text comprehension. Hopefully, this study intends to add to the findings of other researches on the impact of automatic information processing on text comprehension.

This research consists of a correlation and a controlled experiment; these are the two methods that are reported in this chapter. In the correlational study, students' automatic information processing and reading comprehension abilities are tested. In the experimental part, students are divided into an experimental group and a control one. After taking a pretest (baseline measurement), students in the experimental group receive a treatment while students in the control group follow more traditional methods of learning. At the end of the treatment phase, the students, in both groups, take a posttest. Here, the main concern of the researcher is to observe the changes that occur at the level of the students' reading comprehension abilities after receiving the teachers' instructions on how to read automatically.

### **7.1 Research questions and hypothesis**

This chapter is concerned with the relationship between automatic information processing and reading comprehension. To this end, the following questions are raised to stimulate the current study.

- Does speed reading mean speed comprehension?
- How can teachers help the students to spend no effort on word recognition for a more successful comprehension?

- How can teachers help the students become faster comprehenders, not faster readers using highlighted texts?
- Does the structured repeated reading method improve the students' reading automaticity?

By answering the previous questions, it is possible to confirm or disconfirm the following hypothesis: The more automatic the students' information processing is, the better their reading comprehension of a print will be. Setting the truth of this prediction would establish the nature of the relationship between the students' rapid word recognition and their text processing abilities.

## **7.2 Participants**

The students who are involved in this study are the same students who have participated in the studies that are reported in chapters Five and Six. They are 100 third year English language students at the University of Frères Mentouri, Constantine, Algeria. In the correlational part of the study, the students' group division is not taken into consideration since no treatment is required. In the experimental study, the students are divided into two groups of 50 students that are selected and assigned randomly, by drawing lots, to take part of the conditioned or unconditioned phase of the experiment. One group is designed as the experimental group (group 01) which receives the treatment and one control group (group 02) that takes part of the unconditioned part of the study (no treatment).

The researcher is interested in this population for some reasons. First, third year students are expected to possess the vocabulary knowledge that enables them to recognise some basic words that are used in the automaticity test; a very poor vocabulary makes it impossible to identify even basic words. In addition to that, many researchers, like Chall (1996), have asserted that fluency has to be mastered in elementary grade levels; that is why they have been targeting primary grades when tackling the issue of reading fluency/automaticity. This has clearly discriminated struggling

readers at higher educational levels. Therefore, researchers have started to investigate the importance of fluency in older learners' reading comprehension. Rasinski, Reutzel, Chard, and Linan-Thompson (2011) suggest that reading fluency is a reading concern at different levels since interventional researches have revealed that an increase in fluency improves students' reading comprehension. Another reason that makes third years a suitable population for this research is the fact that learners, at this level, are expected to be linking interactive processes related to WM with automatic processing (Just and Carpenter, 1992).

### **7.3 Overview of the study method**

This study, at this particular level, investigates the relationship between students' reading comprehension and their automatic information processing. To this end, a correlational study and an experimental research have been conducted. Each of the two methods establishes the nature of the relationship between both variables and confirms or disconfirms the results that are obtained in the other study.

In the correlational part, the relationship between the dependent (reading comprehension) and the independent (automatic information processing) variables is investigated through a measurement of the students' reading comprehension capacities and an assessment of their reading automaticity. The respondents' performances are transformed into scores to enable the calculation of the Pearson Product-Moment Correlation coefficient 'r'. The level of significance of these results helps the researcher draw a preliminary conclusion that needs to be confirmed in the second part of the study.

The experimental phase, which is the second part of the study, is divided into three stages. First, the students' reading comprehension abilities are pretested; this baseline measurement helps the researcher consider the existence of any growth at the level of text processing capacities. After

that, students in the experimental group receive a treatment; it consists of teaching them how to read more automatically using several automaticity-specific texts. Nevertheless, students in the control group do not receive any instruction that helps students read automatically; the teacher, with these participants, makes students read the treatment material in a traditional way. At the end of the experiment's intervention, the learners' reading comprehension is post-tested. The results that are obtained in both tests are compared using a t-test; this is expected to determine whether or not automatic reading contributes in the growth of the readers' comprehension of a text.

#### **7.4 Pilot study**

It is very important to put to test the different assessment tools and materials before using them in the experiment treatment. In this feasibility study, 50 pilot participants (different from the ones who have participated in the full-scale study) have been chosen to take the reading comprehension tests and to read the materials and choose the ones they see to be the most interesting.

##### **7.4.1 Automaticity test**

Automaticity test in this study does not aim at counting the number of correct words per minute (CWPM). It targets the students' decontextualised words automaticity. That is why the test consists of word-list viewing. Students are presented with 16 lists of words; each list consists of 25 target words and 5 suggested words for each target word. Students are given 25 seconds to process each list.

The students' performance has revealed that the average of recalled words do not differ a lot with the changing lists; the results show that the average number of recalled words ranges between 11 and 16 out of 25 words. Similarly, each of the 50 students has performed on the tests similarly even when he reads a new list of words. This implies that these lists are approximately



at the same level of difficulty for students. Very few students have not finished the task before the end of 30 seconds; this may be due to time constraints or stress.

Taking into consideration the pilot students' performance, it is important to take some points into consideration to edit the final version of automaticity test. First of all, the time allocated to each list is to be increased to 30 seconds instead of 25 seconds. Moreover, given that test lists have proven to be of similar level of difficulty, it is needless to make the students read more word lists. Therefore, the number of lists is reduced to 8 lists instead of 16. The lists that are kept for the full-scale study test are those that consist of the commonest words to make sure the test is reliably testing students' word (or group of words) automaticity.

#### **7.4.2 Reading comprehension tests**

This small-scale study puts to test three reading comprehension measures: the correlation test, the pre-test and the post-test. The correlation test consists of a to-be-read text and 10 to-be-answered MCQs; students have to justify each answer in one sentence. In the second test (pretest) and the third one (post-test), students are required to read two passages that discuss the same topic in different ways, then they need to answer 15 MCQs that relate to both passages in 75 minutes.

Considering the students' performance, it is noticed that some questions are left unanswered and some answers are not justified. This could be interpreted in different ways; it may be due to time constraints, difficulty of the item or lack of motivation to read. Before deciding on what changes need to be brought, it is important to make the students respond to self-evaluation questionnaire (See Appendix I.3) to confirm the researcher's interpretations. The pilot participants' responses to the questionnaire have revealed some issues about the three tests; they are summarised in the following list.

-48% of the students find that the text can be understood easily.

- 50% of the participants find the texts to be long.
- 38% of the students see that the options are confusing.
- 58% of the learners consider texts' vocabulary to be familiar and easy.
- 30% of the respondents see that some ideas in the text are awkward.
- 68% of the pilot participants see that the passage contains all the information they need to understand the text.
- 70% of the students agree that the time allocated to take the test is enough to read the text and answer all the questions.
- The level of difficulty of both tests (pretest and posttest) is seen by 76% of the participants to be the same.

In the light of these responses, some conclusions can be drawn. First, texts can be kept since they seem to be, in spite of their length, easy to be understood and to contain familiar vocabulary that does not hinder students' understanding of the text. For some respondents, the questions are, to some extent, confusing; since they represent a minority, changes at the level of questions are not seen to be necessary. The major issue is that of time; most of the students see that the time allocated is not enough. Given that it is administratively impossible to allocate more time, it is possible to reduce the number of the to-be-answered questions to 8 MCQs in the correlation test (60 minutes) and to 10 MCQs in the pretest and the posttest (75 minutes). This is seen to improve the workability of the three tests.

## **7.5 Research tools and materials**

This section describes the different tools and materials that are used in the correlational and the experimental part of this study. They consist of three reading comprehension tests and ten texts.

### **7.5.1 Automaticity test (word-list)**

Most researchers measure automaticity in terms of reading speed. That is to say, they consider the number of words read per minute or the length of time that is required for a reader to finish reading the passage. Nevertheless, this is not adopted in this research. The measure that is used in this paper, which is the academic word list, is considered by Frye and Gosky (2012) as a purer tool to assess the students' automaticity since there is no possibility for the students to rely on contextual support.

This test is referred to in the literature review (Chapter Four, Section 4.9) as timed automatic word-recognition assessment tool (TAWRA). As its name indicates it, this instrument is a timed word-recognition exercise; it is taken from Folse's (2010) workbook for developing word automaticity in reading. It puts to test the students' ability to automatically recognise words. This measure is made up of eight academic word lists (See Appendix IV). Each list consists of 25 items and each item takes the form of another list of words; a target word to the left of the vertical line and five suggestions (one correct option and four distractors). It is important to take into consideration the students' knowledge about such words; that is why frequent academic words are used in this test.

### **7.5.2 Reading comprehension tests**

All the reading comprehension measures that are described in this section are taken from Khashoggi, Carlough, Manna, Patel, and Astuni (2014) reading comprehension advanced practice series.

#### **7.5.2.1 Correlation test**

This reading comprehension measure is used to assess the students' comprehension and see how it correlates with their automatic word reading as assessed in the previously-described

measure. This test (See Appendix II.4) consists of a 705 word expository passage that is followed by 8 MCQs. To make this measurement less imperfect, students are required to justify their answers to check how well they understood the text in question. These questions raise different points about the text. They target the students' understanding of a) the passage's purpose, b) the paragraph's purpose, c) the hidden message, d) text analogies, e) compared thoughts, and f) author's tone.

### **7.5.2.2 Experiment tests**

As in any experimental design, the necessity of a pretest (baseline measurement) and a posttest is unquestionable. These are tests that are used in conjunction, in this study's experiment, to measure the students' growth in reading comprehension. The pretest (See Appendix II.5) consists of two passages; a 402 word and a 437 word expository text. Each of the two texts is followed by 10 MCQs. Similarly, the posttest (See Appendix II.6) is a reading exercise that requires the students to read two passages of 411 and 489 word passages. Here again, they are required to answer 10 MCQs. In both tests, the students are required to justify their answers; this gives more reliability to the test's results. These tests' questions raise some points about the text that reflect the students' comprehension of the passage. They similarly tackle a) vocabulary issues, b) implied information, c) supporting details, d) single sentence understanding, and e) comparison of different paragraphs' ideas.

It is worth mentioning that the use of two passages in this experiment is not a random decision. This choice has been made in relation to the experiment's objective. It is clear that students who cannot read automatically are more likely to be slow in reading. Therefore, suggesting two to-be-read passages is expected to enable students with more automatic reading

manage their time to process both texts and answer questions that raise points about either passages or compare both of them (at the level of ideas).

### **7.5.3 Treatment texts**

The materials that have been used in the treatment phase are ten 1000 word texts. These are texts that are taken from Butler's (2014) fast reading exercise's book (See Appendix VII). In creating these texts, Butler focuses on a method that allows readers to more effectively grasp what they read in a shorter time amount. His method is different from all the other speed reading methods in that it does not emphasise rapid eye movement over text to promise comprehension. Butler's reading method aims at teaching students fast reading by thinking conceptually. To this end, he uses a specific method of displaying text. It attempts to guide the readers' attention to different short, understandable pieces of information that are originally a part of the sentence. The following excerpt from Butler's (2014, p.62) workbook.

“No one would have believed in the last years of the nineteenth century that this world was being watched keenly and closely by intelligences greater than man's and yet as mortal as his own; that as men busied themselves about their various concerns they were scrutinized and studied, perhaps almost as narrowly as a man with a microscope might scrutinize the transient creatures that swarm and multiply in a drop of water.”

In this example, “No one” is the first unit of meaning, “would have believed” is the second, and “in the last years” is the third. The writer of the passage has used the alternative black and gray text to signal the different meaningful pieces of thought and help the reader quickly focus his eyes on them; this makes them easier to be grasped at a glance. It is worth mentioning that 800 first words of the texts are highlighted while the 200 last words are left to the students to practise highlighting.

The students' knowledge about the text is not an essential criterion to choose the exercise's texts. These are texts that are thought to be interesting and that could result in a more pleasurable reading; that is why narrative texts have been opted for. These texts are less challenging for the students, especially that they are using a new reading method that requires the readers' concentration. In the context of this study, combining a new method with a challenging text (informative text) would be more difficult for the students to manage and would create a lot of obstacles for the treatment to be beneficial for its receivers.

It is worth mentioning that the materials discussed in this section are to be used in a more structured adaptation of the repeated reading method. This study's method combines using highlighted texts and the repeated reading strategy more than one time (it depends on how classroom time is managed). This repeated reading method relates to the two automatic information processing theories that have been discussed earlier in this thesis. It supports Laberge and Samuel's (1974) model that focuses on the importance of various rereading to improve readers' automaticity and Logan's theory (1988) which holds that a single trial may be enough to build up individuals' automaticity (See Chapter Four, Section 4.5).

#### **7.5.4 Treatment automaticity practice exercises**

These are word recognition exercises (See Appendix VI) that are taken from Folse's (2010) workbook of rapid reading practices. They take the same form of the word automaticity test. They are designed to develop the students' reading proficiency, mainly reading rate. To this end, consistent practice is of a paramount importance. 15 exercises have been used in the treatment phase; this is believed to maximize the participants' improvement in reading rate. These exercises train the students' eye movements in a left-to-right pattern. In addition to that, they provide learners

with practice that helps them recognise similar-shape letters and letter combinations. These suggested items consist of a correct option and four distracters.

## 7.6 Procedure

This part of the study has been carried out in two parts. The first part consists of a correlational study and the second one takes the form of an experimental design.

### 7.6.1 Part one

#### 7.6.1.1 Automaticity test

This test has been administered to 100 third year students of English at the University of Frères Mentouri, Constantine, Algeria. As described earlier in this chapter, this timed task puts to test the students' word automaticity (See Appendix IV). The students have been presented with eight lists of 25 items (academic word list). Then, the researcher asks them to read the word to the left and then find it in the group of options that are suggested to the right. To make the task confusing for the students, the options are chosen so that they create confusion within participants. Therefore, four distracters that have similar shapes are suggested and only one word is the correct answer. Here, the students are required to read the target word to the left and to read to the left to find the correct option. The following example is taken from this study's exercises (the words that are presented in bold characters are the correct options).

1.communication	comprehensive concentration consequences <b>communication</b> contemporary
2.evaluation	economic equipment <b>evaluation</b> equivalent expansion
3.environment	enforcement exploitation established <b>environment</b> encountered

Students are administered this test in small groups of ten students to help the researcher to better manage the classroom. They are allowed to process each 25-item list in 30 seconds as

suggested by the creator of this test. Before taking the test, the previous example has been written on the board to better explain what the participants are required to do. When the students express a full understanding of the task's principles, they are administered the test. Every time the students finish processing a list, they are given a five-minute rest before they start processing the following list items. The whole session has taken about 1 hour (39 minutes for the test+20 minutes for the classroom organization and the explanation of the task).

#### **7.6.1.2 Reading comprehension test**

This measure assesses the students reading comprehension of a 705 word expository text that is entitled "Cultural Superstitions" (See Appendix II.4). The students are not given any instruction on how to approach a text (reading strategies). They are presented with the text and 8 MCQs that they have to respond to in relation to their understanding of this text. After that, they have to justify their answer in one sentence; language mistakes, in this case, do not influence the students' answers since the main purpose for such a justification is to measure the students' understanding, not his writing abilities. The students understanding of the text is mainly reflected in their understanding of the text's purpose, the implied information, analogies and the author's tone.

This test has been administered in one hour. It has not taken place during the timing of the written expression class. In reality, the researcher has programmed an extra session not to take a lot of time from the written expression classroom time. Students are familiar with this type of tests; that is why the use of an example before the test is not seen to be necessary.

#### **7.6.2 Part two**

This experimental study has been conducted in three phases. In the first stage, students' reading comprehension abilities are pretested. Then, the experimental group (group 01) students



receive a treatment for 5 weeks whereas the control group (group 02) students do not receive any treatment. When the treatment period is over, the students' text processing abilities are post-tested. Such a testing method enables the researcher to measure the growth of the students' reading comprehension that is more likely to be attributed to the received treatment. The general pattern of the experimental research is summarised in the following table.

GROUP	Pretest	Treatment	Posttest
Group 01 Experimental group	-Reading comprehension Test (MCQs)	-Teaching the students to read in small units of thoughts using specific display texts. -Developing word automaticity through rapid reading exercises	Reading comprehension Test (MCQs)
Group 02 Control group	-Reading comprehension Test (MCQs)	-Traditional method of reading usual text display.	Reading comprehension Test (MCQs)

**Table 7.1: Research's overall experimental pattern**

### **7.6.2.1 Reading comprehension tests (pretest and posttest)**

These tests are created to assess the students reading comprehension 'See Appendixes II.5 and II.6). These tests are used to measure the extent to which the students' reading comprehension has been developed. The students are required to read two passages in each test and to answer MCQs about them and to justify their answers to leave no room for any doubts about the reliability of the results. Some of the questions that follow the passages target one of the two texts while some other questions raise a point of similarity or difference between the two passages. These

questions are said to assess the students' reading comprehension because they reflect the students' understanding of the supporting details, single sentences, or hidden messages.

The pretest and the posttest have been administered under the same conditions. The teacher has programmed extra sessions for the students to take their tests; the pretest has been taken one week prior to the treatment (February 1<sup>st</sup>, 2015) and the posttest has been administered one week after the treatment period (March 19<sup>th</sup>, 2015). Each test is allocated 75 minutes; this makes the test-taking procedure more workable for the participants since they are required to read two texts, to answer 10 questions, and to justify their answers.

#### **7.6.2.2 Treatment phase**

In this phase, the materials that have been described earlier in this chapter are processed. Doubtlessly, these texts are not approached similarly in both groups. In the experimental group, students are taught how to use specific text display to think conceptually while reading a text (See Appendix VII). In addition to that, they receive some rapid reading practices that develop their word automaticity in reading. Contrarily to these practices, the reading method that is used in the control group is purely traditional. In this unconditioned part of the experiment, the students are presented with the same texts that are used in the conditioned part of the experiment, but the texts do not highlight the different units of information. Following the students reading, the teacher guides an oral discussion about the topic or asks the students to write in response to the text. Any activity that does not enhance the control group students' automatic information processing is acceptable in this case. This procedure helps the researcher manipulate the independent variable which is in this case the students' automaticity in reading.

By using the experiment's treatment, the researcher aims at teaching students how to read with the brain, not with eyes. That is to say, they are instructed and guided to be able to think

conceptually about the text in question. In addition to this reading method, other reading automaticity exercises are used to maximise the students' benefits from the treatment's classrooms. Therefore, different activities are used by the researcher/teacher as an attempt to enhance the students' reading automaticity. These activities are summarised in the following table in addition to the division that is adopted to manage the allotted time of every reading session.

<b>Reading activity</b>	<b>Time allocated</b>
Text 01 reading	35 minutes
Text 02 reading	35 minutes
Word-automaticity exercises (03)	5 minutes

**Table 7.2: The treatment session's time division**

In the first reading class, it is always necessary to present the students with an example to help them discover what the method is about and to model it for a more successful future performance. The teacher has given the following exercise to introduce this reading method.

-Instruction: Memorise the following letters QUICKLY:

**U P S F B I J F K N A S A S M S N A T O**

No student could memorise those letters. At first glance, the idea seems to be definitely impossible. Then, the teacher has suggested a method that is more helpful to memorise these letters; it is to group the letters into six little words (or non words). The students are presented with the following words.

**UPSF BIJ FKNA SAS MSN ATO**

This time, very few students could memorise those letter groups while some others have memorized only one or two (including MSN). This means that a more meaningful grouping of

the words is more likely to help the students memorise those letters. The third time, the teacher has suggested the following.

### **UPS FBI JFK NASA SMS NATO**

Here, the students have found it less difficult to memorise those words. Indeed, the same letters are used in the same order and are gathered to make six words. However, word grouping is different. Contrarily to the first selection of letter groups, the second selection has presented the students with letters that are grouped into meaningful units of information. Therefore, this exercise has successfully introduced the students with the idea of parceling thoughts into meaningful chunks.

Before presenting the students with the first text, its introductory lines are written on the board using no highlighting technique. This excerpt is taken from the highlighted text that is entitled "Pride and Prejudice"; the teacher has presented the students with this paragraph to compare it with the highlighted one and see the differences between both passages.

"It is a truth universally acknowledged that a single man in possession of a good fortune, must be in want of a wife. However little known the feelings or views of such a man may be on his first entering a neighborhood, this truth is so well fixed in the minds of the surrounding families, that he is considered the rightful property of someone or other of their daughters."

As reported in table 7.2, the first and the second reading activities are quite similar. The students are presented with a specific-display text to be read; this lasts for about 35 minutes. Here, the students are not required to answer any comprehension questions since the main objective of this activity is to develop the students' reading speed. The students take turns reading some parts of the text to give an opportunity to all the students to read at least once. They try to highlight the last 200 words of the text that are not highlighted; this helps them understand better that new

method of reading and it helps the researcher understand whether or not the participants are able to cut a text down into smaller pieces of information.

It is noteworthy that this is used as a repeated reading strategy since the same text is read many times. This repeated reading helps the participants get used to the words of the text to facilitate their recognition later and it helps the students practise, even when someone else is reading, the new reading method they are acquainted with and, thus, become able to divide the different sentences into smaller packages of knowledge. When the 35 minutes are over, students are presented with the second text to be processed in the exact same way.

After the students spend 70 minutes practicing repeated reading using highlighted texts, they take a break of 5 minutes to start with the third activity. At that point in the reading session, students are presented with a practice exercise that targets the students' word-level automaticity. It presents them with a list of frequently encountered words from the Academic Word List (AWL). They are asked to read the target word and to find it in the group of suggested words to the right. The distracters are chosen to be confusing to the respondents. That is why they contain the same or similar letters as those of the target word.

In this practice exercise, the students are presented with 3 lists since Folse (2014) has pointed out that for such an exercise to be effective, it has to be practised from three to five times in each session. As far as the activity time duration is concerned, the participants have to process each list in 30 seconds and to take a rest of 1 minute between each 2 exercises. Therefore, it lasts about 5 minutes at the end of each reading session. It is noteworthy that these three activities are different in their conception but they are similar in their objectives. Each one aims at bettering the students' reading automaticity using single word or full text practices.

## 7.7 Data Collection and descriptive analysis

### 7.7.1 Part one: Correlational study

This correlational part of the research investigates the relationship between the students' reading comprehension and their automatic information processing. The previously-described research instruments are used to collect data which is reported and analysed in the present section.

#### 7.7.1.1 Reading comprehension test (50 points)

In this test, the participants are required to read a 705 word text and answer MCQs about it. Then, they have to justify each of the eight answers in one sentence. The students' performance is summarised in the following table.

Questions/justifications	Percentage of correct answers
-Question 01 -Justification 01	-78% of the students have chosen the correct answer. -59% of the participants who have chosen the right answer have given a correct justification.
-Question 02 -Justification 02	-67% of the students have given the correct answer. -60% of the participants who have opted for the right answer have given a logical justification.
-Question 03 -Justification 03	-31% of the students have opted for the correct answer. -64% of the participants who have opted for the right answer have given a logical justification.
-Question 04	-29% of the students have chosen the correct answer.

-Justification 04	58% of the participants who have given the right answer have written an acceptable justification.
-Question 05 -Justification 05	-37% of the students have opted for the correct answer. -53% of the participants who have opted for the right answer have given an acceptable justification.
-Question 06 -Justification 06	-49% of the students have picked up the correct answer. -62% of the participants who have picked up the right answer have written a correct justification.
-Question 07 -Justification 07	-48% of the students have given the correct answer. -65% of the participants who have picked up the right answer have written a correct justification.
-Question 08 -Justification 08	-69% of the students have opted for the correct answer. -40% of the participants who have picked up the right answer have written a correct justification.

**Table 7.3: Students' performance on the reading comprehension test**

### ***Questions 01 and 02***

These questions require the students to find the purpose of the general text and that of a single paragraph. These two questions do not seem to be challenging for the students since 78% of the participants have performed successfully on the first question and 67% have given the correct answer of the second question (the correct answers are B and B). To make sure the students' correct answers are the result of their comprehension of the text and paragraph's purpose, it is inevitable to consider their justifications. Participants have given less successful justifications; 59% and 60% of the participants have given correct/logical justifications to their answers to

questions 01 and 02 respectively. Some interpretations can be suggested at this level. It could be that students have opted for an answer randomly. Another explanation would support the idea that some students may fail in justifying their answers because of time constraints or language problems. Moreover, the confusing options may create a conflict within the student even when he understands what the whole text or a single passage is about. Whatever the explanation is, the students' scores are reduced to reflect a less imperfect assessment of the students' comprehension.

### ***Questions 03 and 04***

These questions target the students' understanding of analogies and hidden messages. Such questions have previously proved to be challenging for the students in the previous parts of this study as reported in chapters five and six. This part of the study is no exception; expectedly, 31% and 29% of the participants have responded correctly to questions 03 and 04 respectively. Out of these students who have given correct answers, only 64% and 58% have managed to give acceptable answers to questions 03 and 04 respectively. It is true that the response options are pretty confusing. Nevertheless, a good concentration while reading can help the students a great deal in answering correctly. Therefore, understanding implied information has shown, once again, to require a lot of concentration while reading.

### ***Question 05***

Here, the students are asked to find the writer's shift in topic. This relates mainly to how ideas are organized. That is to say, the students' ability to focus on ideas and their logical direction is put to test. Only 37% of the respondents have opted for the right answer and 53% of these correct answers have successfully justified their answers. This is quite understandable since students have problems with coherence. Such issues are reflected in their writing and are systematically encountered when processing a text. When a student cannot understand the direction of ideas, this



could reflect some working memory difficulties. That is to say, some students cannot keep some necessary information in active/retrievable state to be able to use them to understand knowledge that comes next in the text. Therefore, students are not likely to understand the author's shift in ideas simply because they possess no active information that would be compared appropriately with the new one.

### ***Question 06 and 07***

At this point, students are required to express their understanding of a supporting detail of the main idea. This question seems to be less demanding than some other questions in this test. Half the sample has managed to give a correct answer (49% for question 06 and 48% for question 07). Nevertheless, this does not guarantee any understanding of the supporting detail. To check their level of understanding, a consideration of their justifications has proven to be necessary. 62% and 65% of acceptable justifications remain somehow low percentages since the present question targets a supporting detail that has proven, earlier in this thesis, to be much less challenging than other confusing comprehension questions. It is noteworthy that many respondents (23/100) have given no justifications. This does not necessarily mirror a lack of understanding; the main reason could be time constraints. Therefore, the interpretations that are given to students' answers may not always reflect the students' real comprehension capacities.

### ***Question 08***

The last question puts to test the students' ability to describe the tone of the author. It has revealed, from the students' responses, to be the second least challenging question since 69% of the participants have chosen the correct response option. However, the students' justifications have revealed the exact opposite; only 40% of those correct answers have been justified logically. Most of the students who have failed in justifying their answers have not read the question carefully.

The author’s ‘tone’ they that has been raised in this question relates to final sentence of the passage in question. Unfortunately, many students have been thinking about the author’s tone in the whole passage. In this case, even the student has understood the text, a lack of concentration in reading the question may masquerade his real level of text comprehension.

**7.7.1.2 Automaticity test (50 points)**

As described in previous sections, this test consists of responding to 8 academic word lists (See Appendix IV). It puts to test the learners’ word-level automaticity. The lists are not organized following any order of difficulty since all of them are equally challenging. That is why no high or low performances are expected in specific parts of the test. The respondents’ answers are reported in the following table.

Exercise number	Students’ general mean in the exercise
Exercise 01	03.50/06.25
Exercise 02	04.50/06.25
Exercise 03	02.75/06.25
Exercise 04	03.00/06.25
Exercise 05	03.50/06.25
Exercise 06	03.75/06.25
Exercise 07	04.00/06.25
Exercise 08	04.75/06.25

**Table 7.4: Students’ performance on the automaticity test**

As table 7.4 reports it, the participants’ performances differ from one exercise to another. In exercise 01, most students have had problems recognizing some words like “welfare, discretion, sustainable, assume, and consumer.” Exercise 02 has shown to be less challenging for the students

since only 'marginal and retained' have been recognised with difficulties. Exercise 03 is one of the most challenging exercises; students have obtained the lowest mean in this part of the test. Words like 'affect, impact, perceived, resolution, and sector' have been recognized incorrectly by many students. Another exercise that has created difficulties for the respondents is exercise 04. It is admitted that the words it contains may not be unfamiliar, but they may be much less used than many other words in the same list. The most unrecognised words in this exercise's list are 'enforcement, legislation, constitutional, bond, regulations, and subsequent'. Exercise 05 has presented the participants with some words that have not been identified even though they are not expected to be unfamiliar to the students. These words are 'circumstances, assessment, interpretation, potential, and perspective'. As far as exercise 06 is concerned, four words have been mostly unrecognised by the participants; they are 'constraints, fees, revenue, and expansion'. In exercise 07, students have encountered some long and unfamiliar words that are, for them, difficult to be identified. They are 'constitutional, interval, commitment, and sector'. Students have performed on exercise 08 differently; it seems to be the least challenging of all the exercises. The term 'investment' is the only word that has caused most of the respondents' recognition failure.

It has been mentioned previously that these automaticity exercises are not arranged following an order of difficulty since all of them are used for students in the upper-intermediate/advanced level. Nonetheless, there may be some reasons that lead students to perform well in some exercises and not in others. It is noteworthy that students who have failed in their responses are divided into two categories: some students have circled the wrong word while a few participants have just left the item with no choice. Such failures may be, in some cases, due to the unfamiliarity or even the length of some of these words. In some other situations, especially when the unrecognised words are at the bottom of the list, it is suggested that the students have not

managed their time to consider the last items and circle one option; they have spent more time trying to identify the first words that no more time is left for the last items. In addition to that, it is expected that random choices may explain why some wrong or even correct words are circled. Unfortunately, this influences negatively the interpretation of the students' responses and leads to less reliable results. For some students, the fact of presenting them with distracters that are chosen to be similar in spelling to the target word makes the students with less automaticity capacities hesitate and lose time trying to choose the best option; such choices are very confusing for them while those who have a more automatic reading may opt for the correct word in the allocated time.

The different word lists that are used in this test contain some words that are repeatedly stated in different lists like acquisition, potential, purchase, issue, impact, sector, section, major...etc. Therefore, when the students process the word lists, they may encounter some items for the first or the second (or more) time. In case where words are encountered for the first time, the degree of familiarity with these words facilitates, to different extents, the students' choices. Nevertheless, when the students are not familiar with the item, they need a previous exposition (or many) to the word to recognise it later. Following this idea, the participants can be classified into two categories. First, there are respondents who have recognised a word, even when it is unfamiliar, after a single exposition to the word. These learners confirm Logan's (1988) instance theory which holds that a single exposure to a word, among other things, is sufficient to make the students retrieve it when it is encountered in the future. Unfortunately, this is not the case of all the students. Many students have proved that a single exposition to an item is not enough to keep a trace of it in the student's memory so that his reaction time, when he encounters this word in the future, is shorter. Such cases confirm Huey's (as cited in Carr, 1992) belief that for a skill to

become automatic, it is essential to practise. Here, practice refers to the repetition which frees the mind progressively from attention and reduces the reader's reaction time in recognising words.

### **7.7.2 Part two: Experimental study**

This experimental study investigates the impact of automatic information processing on the participants' reading comprehension. Before receiving the treatment using which the researcher manipulates the independent variable (automatic information processing), the students' reading comprehension abilities are pretested. After that, the experimental group (group 01) students have received the treatment for five weeks while the control group (group 02) students have received no specific treatment on how to become more automatic in reading (traditional method of reading). It is worth mentioning that no assessment has taken place during the treatment phase since the main objective of such an intervention is to teach the students how to become more automatic in reading. At the end of the treatment phase, the students' capacities to comprehend a text have been post-tested. What follows is a report and the researcher's personal analysis of the data obtained from both tests and the instruction phase.

#### **7.7.2.1 Reading comprehension pretest (50 points)**

Differently from the reading comprehension measures that have been used earlier in this study, this baseline test requires the students to read to passages that describe bullying (See Appendix II.5). Then, they are asked to answer MCQs and to justify their answers in a single sentence. Every question is attributed 05 points that can be obtained when the answer is correct and well justified. The students' responses are summarised in the following table.

Questions/justifications	Percentage of correct answers
-Question 01 -Justification of answer1	-68% of the students have picked up the correct answer. -78% of the participants who have opted for the right answer have given an acceptable justification.
-Question 02 -Justification of answer2	-66% of the students have opted for the correct answer. -29% of the participants who have picked up the right answer have written a correct justification.
-Question 03 -Justification of answer3	-62% of the students have chosen the correct answer. -84% of the participants who have opted for the right answer have given a logical justification.
-Question 04 -Justification of answer4	-54% of the students have chosen the correct answer. -44% of the participants who have opted for the right answer have given a logical justification.
-Question 05 -Justification of answer5	-72% of the students have opted for the correct answer. -86% of the participants who have given the right answer have written an acceptable justification.
-Question 06 -Justification of answer6	-78% of the students have chosen the correct answer. -50% of the participants who have opted for the right answer have given a logical justification.
-Question 07 -Justification of answer7	-48% of the students have opted for the correct answer. -36% of the participants who have picked up the right answer have written a correct justification.
-Question 08	-56% of the students have opted for the correct answer.

-Justification of answer8	-28% of the participants who have given the right answer have written an acceptable justification.
-Question 09 -Justification of answer9	-64% of the students have picked up the correct answer. -32% of the participants who have given the right answer have written a logical justification.
-Question 10 -Justification of answer10	-70% of the students have given the correct answer. -25% of the participants who have chosen the right answer have given a correct justification.

**Table 7.5: Students' performance on the reading comprehension pretest**

### ***Questions 01, 03, and 05***

These questions assess the students' understanding of the main idea's supporting details. Such questions have proved to be less confusing for the students in the reading comprehension measures that have been used earlier in this research. This test is no exception; 68%, 62% and 72% of the respondents have opted for the correct answer to questions 01, 03, and 05 respectively. It seems that more than half the sample has understood the supporting details in question. Participants' justifications are analysed to check to what extent these answers reflect the students' comprehension of supporting ideas. Expectedly, a high percentage of logical/correct justifications is obtained; 78%, 84%, and 86% of the correct answers to questions 01, 03, and 05, respectively, are acceptable (regardless of the students' language problems). This means that many participants do not face problems when reading and grasping supporting details.

### ***Questions 02, 04, and 07***

Previously in this study, questions that target implied information or author's conclusion have shown to be the most challenging reading comprehension questions. Often, many students

manage to choose for the correct response option, but a lot of them fail when they are asked to justify their answers. Here again, such questions have shown to be difficult for the students. 66%, 54%, and 48% of the participants have opted for the correct responses of questions 02, 04, and 07 respectively. Such percentages may reflect some random choices. To confirm or disconfirm such a hypothesis, students' one-sentence justifications are considered. Their analysis reveals that only 29%, 44%, and 36% of the answers to questions 02, 04, and 07, respectively, are correct/relevant. This confirms how random a lot of respondents' choices are. It is expected that students can extract explicit information from the text easily while more implied knowledge is less likely to be grasped by the majority of the students. One of the intellectual abilities that may help students comprehend what is implied is their reasoning abilities; they can use what the author writes to understand what he does not say explicitly.

### ***Question 06***

This question requires the students to compare two different words that are used similarly in the text. Considering the percentage of correct answers (78%), this question may seem to be easy. Notwithstanding, the students' justifications have shown that it is challenging; only half the correct answers have been justified correctly (39 students have written correct justifications). Such a question requires the students to understand how two words may describe the same point in the text. Here, understanding the relationships between sentences is very important to formulate a meaningful mental representation of the passage in question. In addition to that, this question requires good working memory capacities that help the students keep the previous information in an active state while processing the following pieces of information to see how similar they are.



### ***Questions 08, 09, and 10***

These questions, as expected, seem to be the most challenging of all the test's questions. They require the students to compare and contrast both passages over specific points. The percentages of correct answers may tell that many students have understood how similar or different the passages are in some points; 56%, 64%, and 70% of the respondents have picked up the correct response option. Nevertheless, answers justifications reveal something else. In fact, some students have left these answers unjustified and some others have given wrong justifications. This may mean that the questions are not clear or difficult or that time allotted to the test was not enough for them. The first reason is less likely to be true because this test has already been put to test and many students have answered and justified their answers correctly. One possible explanation is that students have had difficulties reading two passages before answering questions about them. This may lead to a lack of concentration or confusion within the students because of time pressure and the amount of reading they are presented with. Students who have managed their time to read both passages, answer the questions correctly and justify their answers logically are thought of to be more automatic readers; they have spent less time and efforts in identifying what is being read and have saved their cognitive resources to the process which is cognitively more demanding (comprehension).

#### **7.7.2.2 Treatment**

The treatment, as described previously, has not been received by both groups. The control group students have been through some reading/discussion without being taught any aspects that enhance their reading automaticity. Contrarily to this, participants in the experimental group have received the treatment that aims at teaching them how to process a text automatically without doing it at the expense of comprehension.

### ***Control group***

Students have been presented with the same texts that have been used in experimental group sessions (See Appendix VII), but they are not highlighted like the ones used in conditioned part of the experimental research. In every reading session, the students read 2 texts and discuss their content in smaller groups then with the teacher who guides the oral discussion using some questions that relate to the text. These questions do not aim at assessing the students' comprehension of the text; they guide the classroom discussion and encourage students' interaction with their teacher.

Many of the texts have shown to be relating to some stories that students have read about previously. They have expressed some interest in reading them. Their out loud reading has revealed that some students can read faster than some others. Nevertheless, when discussing the texts, not all the students who have been faster in reading could give correct answers to the questions raised. Some of them are believed to read fast to impress their classmates or their teacher without actually understanding what they are reading. Similarly, some other students have proved that slow reading does not always lead to successful comprehension; some students read slowly because they encounter a lot of words that are unfamiliar to them or simply because they are not confident about their pronunciation of the words they read. These two cases have helped the researcher pay attention to what takes place in the experimental group to make the students take benefit from the treatment they receive.

### ***Experimental group***

Students in the experimental group have received a treatment that aims at improving their reading automaticity. The passages they have been dealing with in their reading classes are texts (See Appendix VII) in which smaller pieces of information are highlighted to help the readers

process a text more conceptually and, thus, faster with a better comprehension. At the end of each session, the students practise 3 word-automaticity exercises to, hopefully, enhance their word-recognition capacities (See Appendix VI). At the beginning of each reading session, the students are given an evaluation of their performance on the automaticity exercise they have done in the previous session to encourage them do better by the end of the current session.

### ***Session 01***

At the beginning of the first reading session, the students have been explained what the new reading method is about. Then, they have been introduced with the first passage that is excerpted from “Pride and Prejudice” by Jane Austen. Some students have not participated at first; they have waited for someone to model the task for them. Some other students have shown more excitement and courage to read the excerpt and respect the highlighted display of it. Some students have represented those black and gray pieces of knowledge by raising and lowering their voices. In the 35 minutes that are allotted to this reading exercise, the passage has been read 6 times; each time it is divided to 6 parts that are read by 6 students. This division helps the teacher get 24 students involved in reading the text out loud. All the other students keep reading silently meanwhile they take turn and read aloud. The same has applied to the second excerpt that has been dealt with in this session; it is taken from “The Wonderful Wizard of Oz” by L. Frank Baum. Most of the students have felt less comfortable reading the first text; that is probably true because the method is new to them. Nevertheless, reading the second text has brought more motivation and interest in the activity.

As far as the non-highlighted part is concerned, students are supposed to use their highlighters to break the last 200 words into smaller packages of information. 13 students have successfully highlighted these pieces of information in the first text and 16 students have managed

it with the second text. Unfortunately, the others have not been completely successful. Therefore, some examples have been discussed to help the students who have difficulties in thinking conceptually about the texts find their way and do better in the next activity.

After reading both texts, the students are presented with 3 word-automaticity exercises (See Appendix VI) Means are used to represent the group’s performances in these exercises. They are reported in the following table.

Exercise Number	Experimental group mean
Exercise 01	01.75/05.00
Exercise 02	02.00/05.00
Exercise 03	02.00/05.00

**Table 7.6: The experimental group means in automaticity exercises (session 01)**

As shown in the previous table, the students’ means show that, at that level, their automaticity level is somehow below the average. This implies that some students have performed above the average while some others have serious automaticity problems. With some more practice, the group means are expected to be improved.

***Session 02***

In the second session, the students have expressed a great enthusiasm towards reading as long as they are not being evaluated and they use a method that helps them, as they have been told, become faster and better readers. The first passage they have read is excerpted from Mark Twain’s “The Adventures of Tom Sawyer” and the second one is an extract from “The Voyages of Dr. Dolittle” by Hugh Lofting. Each of the two passages has been read for 7 times in the 35 minutes that are allotted to each excerpt. Every text has been read by 6 students. In this reading session, a

lot of students have participated to take turns and read the text; 8 students have read once and 42 students have read twice.

In the highlighting activity, the students have shown better results in this session. The last 200 words of the first text have been successfully highlighted by 21 students and those in the second text have been correctly broken into small pieces of information by 23 students. This implies that the students have learnt how to create a conceptual division of the text. Another explanation may refer to the students' interest; it may be that they start to feel more interested in this new fast reading method.

As far as the automaticity exercises are concerned, students have done three of them. Their performances are better summarised in the following table.

Exercise Number	Experimental group mean
Exercise 01	01.50/05.00
Exercise 02	02.75/05.00
Exercise 03	02.25/05.00

**Table 7.7: The experimental group means in automaticity exercises (session 02)**

As reported in table 7.5, the students' performances reflect different student levels of word-automaticity. In exercises 01 and 03, the group's levels are below the average. In exercise 02, the mean shows that students have an average level of automaticity. If these means are compared with those in table 7.4, a slight improvement can be remarked in the means of exercises 02 and 03. This may reflect an improvement, which is still unimportant at this level, in the students' word automaticity, or that may be due to the use of shorter and commoner words than those used in the previous exercises. Future exercises may confirm or disconfirm the reasons of such changes.

### *Session 03*

In this session, the participants have processed two texts; an excerpt from “The Life and Adventures of Robinson Crusoe” by Daniel Defoe and an extract from “Gulliver’s Travels” by Jonathan Swift. The students are more familiar with the first story that they have shown a great interest in processing the text. This reading session represents a great opportunity for them to read the same story using a different method. That is why almost everybody has participated to read (especially the first excerpt). 7 students have read the first extract and 6 students have read the second one. This means that 12 students have read once and 38 students have read twice.

At this level of the experiment, the students have started to feel more familiar with the information-highlighting activity. In this session, half the group has highlighted the text correctly while the other half has highlighted it with some mistakes. Such a performance means that students started to adopt this method appropriately; it has probably become a reading habit for some students. More practice in the remaining sessions is believed to be even more beneficial.

By the end of this reading session, the students have processed 3 automaticity practice exercises. The group means are reported in table 7.8.

Exercise Number	Experimental group mean
Exercise 01	02.50/05.00
Exercise 02	02.75/05.00
Exercise 03	02.75/05.00

**Table 7.8: The experimental group means in automaticity exercises (session 03)**

The previous table reports the group means in the 3 word automaticity list that the students have processed. The means that are reported are equal to or slightly above the average. This means that the participants have performed better this time. That could mean that the students have

improved their automaticity through practice; even though the change is not that significant, it still indicates a positive change that can become, through practice more noticeable.

#### ***Session 04***

In the fourth practice session, the students have processed and extract from “The Three Musketeers” by Alexandre Dumas and an excerpt from “Moby Dick” by Herman Melville. A few students have expressed familiarity with the first story (they have already read it in French) and few others are knowledgeable about the second one (they have read it in English). Being motivated gets the students involved in the task and helps them excel at what they are doing. All the students have participated to take part in the out loud reading part. Both texts have been read 6 times; each reading is divided between 6 students. Therefore, 28 students have read orally a small passage of the text once and 22 students have read twice.

By the fourth session, practice has proved to be really beneficial for the students. Here, 27 students have succeeded in highlighting the first text and 31 students have managed dividing the second text into small, meaningful units. This indicates that students have improved their capacities to think conceptually about the text by breaking it into meaningful units of thought. This is what helps some students become faster in reading the treatment materials.

After 70 minutes of repeated reading, students have taken a break to do 3 automaticity exercises. The performance of the group is reported using its means in the following table.

Exercise Number	Experimental group mean
Exercise 01	03.25/05.00
Exercise 02	03.50/05.00
Exercise 03	03.50/05.00

**Table 7.9: The experimental group means in automaticity exercises (session 04)**

All the group means, as reported table 7.9, are above the average. Doubtlessly, this indicates an improvement in the students' performances in such exercises. This, then, means that the students' reaction time is reduced; it takes them a shorter time to recognise words. It is worth mentioning that some words have been used in more than one list. This means that the more the participants encounter these words in the exercises, the faster they become in recognizing them. For some students, a single exposition has proven to be enough to recognise those words while some slower students have had to encounter the word for more than once to be able to identify it rapidly in the following academic word lists.

### ***Session 05***

This is the last reading session during which students receive the experiment treatment. First, they have processed an extract from "Little Women" by Louisa May Alcott, followed by a text that is taken from "Anna Karenina" by Leo Tolstoy. The first text has been read 7 times and the second text has been processed 6 times. Each reading time, the text is divided between 6 students; this means that approximately each student reads about 160 words. This way, all the students have read the text orally at least once; 23 students have read the text orally once and 28 participants have read it twice. This makes good repeated reading practice for students.

By the last reading session, the researcher's expectations are, to some extent, met. An increasing number of students who can divide the text into meaningful units of information is noticed. In this session, 33 and 35 students have managed to highlight the unformatted parts of the first and the second text respectively. This means that the students have appropriately followed the teacher's instruction and used the highlighted part of the text to practise picking out phrases on their own. It is clear that reading highlighted parts of the text in each reading session has given the students a bit of a running start at the remaining unformatted words.



Similarly to all the previous reading sessions, this last session ends with 3 automaticity practice exercises. The group means in the 3 exercises are reported in table 7.10.

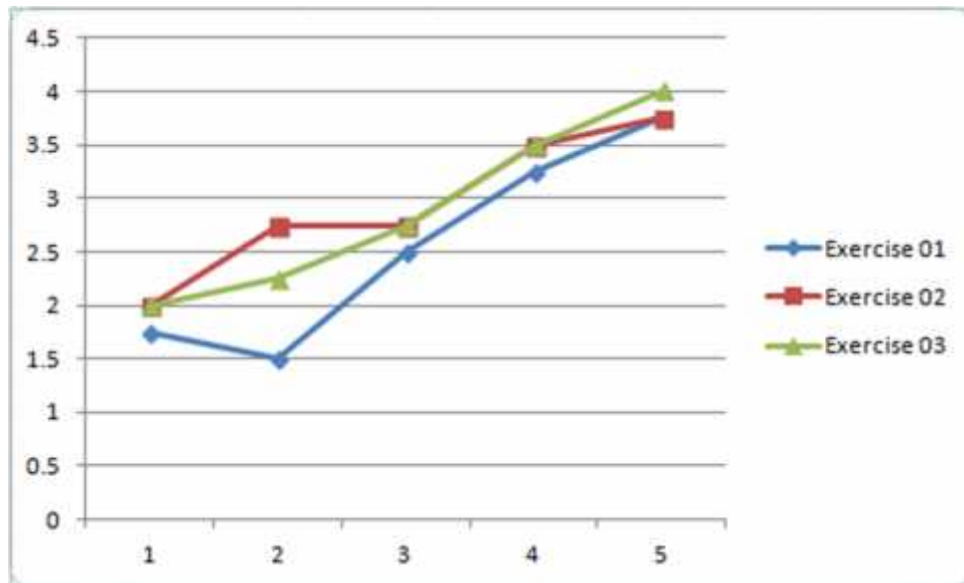
Exercise Number	Experimental group mean
Exercise 01	03.75/05.00
Exercise 02	03.75/05.00
Exercise 03	04.00/05.00

**Table 7.10: The experimental group means in automaticity exercises (session 05)**

The group means, as noticed, are well above the average. This means that the students' automaticity has improved through practice in the 5 treatment sessions. Many reasons have helped the students become faster in recognising words. First, getting used to reading as a skill makes the students feel more comfortable processing the texts and, thus, faster in recognizing the different pieces of information. In addition to that, the intensive practice has helped the students in recognizing information that is encountered many times in the texts and in the word lists. That is to say, given that the word list that is used in the practice exercises consists of academic words and these words are already used in the suggested excerpts, this gives extra chances to the students to go through the same words many times and, therefore, become more automatic in reading them. Another factor that may be referred to here is the students' motivation to do better in their automaticity exercises. As stated earlier in this section, the students, at the beginning of each reading session, are given an evaluation of their performance on the automaticity exercises they have been presented with in the previous session. Each student records his score on the progress chart (See Appendix IIX) that is given to them to keep track of their automaticity development and to be motivated to outperform themselves in the coming exercises.

At the end of the treatment period, it is important to check the students' understanding of the highlighted-text reading method that has been practiced for five weeks. To this end, the students have been given an unformatted text that is excerpted from "Treasure Island" by Robert Louis Stevenson. The students have been given 5 minutes to highlight the text before reading it out loud. Most of the students have found the task to be really interesting; this has been remarked in the way they have been processing the text. After checking their texts, half of the group has managed to be, to some extent, successful in highlighting the text. This shows that to some degree, the students' ability to think conceptually about reading has improved.

Concerning the students' automaticity, almost all the students have noticed an improvement in this recognition ability either by considering how fast they are at reading texts or by examining at the recorded performances on their individual charts. The following is a progress graph that reports how participants' performances have been improving through the five reading and practice sessions.



**Figure 7.1: Progress graph of the experimental groups' word-reading automaticity**

This chart reports the progress of the students' responses, which reflect their automaticity level, in the 3 automaticity exercises that are practiced at the end of each reading session. The blue, the red and the green lines represent the groups' performance progress in exercises 01, 02, and 03 respectively. As it is noticed, the direction of each of the 3 lines is from the left lower corner to the right upper corner of the graph. This indicates an increase in the groups' performance on the exercises which systematically reflects an improvement in the students' reading automaticity. This positive change is more likely to be attributed to the treatment the students have received in the instruction phase. Notwithstanding, checking to which extent this has influenced their reading comprehension is another matter that needs to be confirmed later in this chapter.

### 7.7.2.3 Reading comprehension posttest (50points)

Similarly to the baseline measurement, the posttest requires the students to read 2 informative texts that discuss the impact of standardised testing on society (See Appendix II.6). As a response to these passages, the students have to answer 10 MCQs and to justify each one of their answers in one sentence. Their performance is reported in the following table.

<b>Question N°</b> <b>Justification N°</b>	<b>Percentage of correct answers</b> <b>Experimental group (gr. 01)</b>	<b>Percentage of correct answers</b> <b>Control group (gr. 02)</b>
-Question 01 -Justification 01	-68% of the answers are correct -76% of the justifications are logical	-62% of the answers are correct -52% of the justifications are correct
-Question 02 -Justification 02	-54% of the answers are correct. -70% of the justifications are correct	-48% of the answers are correct -64% of the justifications are logical
-Question 03 -Justification 03	-70% of the answers are correct -90% of the justifications are logical	-60% of the answers are correct -86% of the justifications are correct
-Question 04	-62% of the answers are correct	-64% of the answers are correct

-Justification 04	-68% of the justifications are logical	-50% of the justifications are correct
-Question 05 -Justification 05	-60% of the answers are correct -84% of the justifications are logical	-72% of the answers are correct -66% of the justifications are logical
-Question 06 -Justification 06	-52% of the answers are correct -58% of the justifications are correct	-48% of the answers are correct -56% of the justifications are correct
-Question 07 -Justification 07	-54% of the answers are correct -62% of the justifications are logical	-52% of the answers are correct -58% of the justifications are correct
-Question 08 -Justification 08	-72% of the answers are correct. -60% of the justifications are correct	-60% of the answers are correct -38% of the justifications are logical
-Question 09 -Justification 09	-84% of the answers are correct -64% of the justifications are logical	-52% of the answers are correct -24% of the justifications are correct
-Question 10 -Justification 10	-68% of the answers are correct -62% of the justifications are logical	-36% of the answers are correct -40% of the justifications are correct

**Table 7.11: Students' performance on the reading comprehension posttest (experimental and control groups)**

The students' performances are compared and analysed as follows.

***Questions 01, 03, and 05***

These comprehension questions measure the students' understanding of the main idea's supporting details. Considering the percentage of correct answers, the students from both groups are said to be average comprehenders. Their justifications, nevertheless, lead the researcher to rethink their level of comprehension. Here, the experimental group students have slightly outperformed the control group participants. This means that the students in the experimental

group face fewer problems when processing supporting details than the control group participants. Notwithstanding, students from both groups have performed above the average.

### ***Questions 02, 04, and 06***

Questions that target implied information have proven, in the context of this study, to be challenging for the students from both groups. This posttest confirms such findings. It is true that the experimental group students have performed better than those from the control group. Nevertheless, the students level of comprehension remains average in both groups. When considering the percentage of correct answers, another difference between both groups' answers enlarges slightly the gap between the students' comprehension in the experimental group and the control one. That is to say, the experimental group students are better than the control group participants in identifying what is implicitly referred to in the text

### ***Question 07***

An earlier reading comprehension assessment in this thesis has shown that students face fewer difficulties in answering vocabulary-related questions than some other high-order skills questions (relating to analogies...etc.). The percentage of the students' correct answers has confirmed it once again in this posttest. Here again, the experimental group respondents have performed more successfully than those from the control group. The difference in performances is, once again, not really significant. Since this question may rely on the readers' working memory more than their automatic reading, the students are found to be similarly performing on the test's question even though they have not been through the same treatment period.

### ***Questions 08, 09, and 10***

Comparing and contrasting two passages over some points in a limited amount of time has never been an easy task. Fortunately, some factors may help the students deal with the situation.

Comparing the percentages of the correct answers and the logical justifications, it is crystal clear that the experimental group respondents have outperformed those from the control group. The experimental group students have answered all the questions and have justified all the answers (be it correct or incorrect) while few control group students have left their questions unanswered or their answers unjustified. The key to answer such questions successfully is time management. The students from the experimental group are luckier than those in the control one since they received treatment on how to process a text faster. Using the method they have been taught in the treatment phase can be of a great help in making them save time when they read (word recognition) for more demanding tasks (comprehension). This helps the students avoid time pressure and confusion that lead to less successful performances; that is exactly the case of the control group students since they have not been taught how to deal with longer passages in smaller amounts of time.

### **7.8 Comparison of the groups' means and the students' performances**

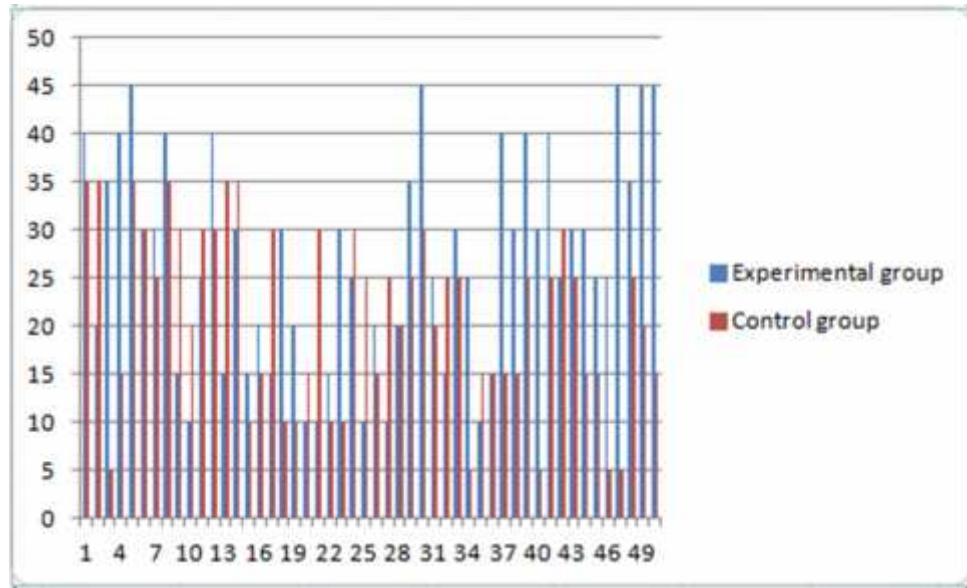
After receiving a five-week treatment, it is important to measure the growth of the students' reading comprehension abilities. To this end, the groups' means in the pretest and the posttest are reported and compared in the following table.

	Pretest scores' means	Posttest scores' means
Experimental group	19.80	24.05
Control group	20.40	21.00

**Table 7.12: Means of the experimental and control groups (pretest and posttest)**

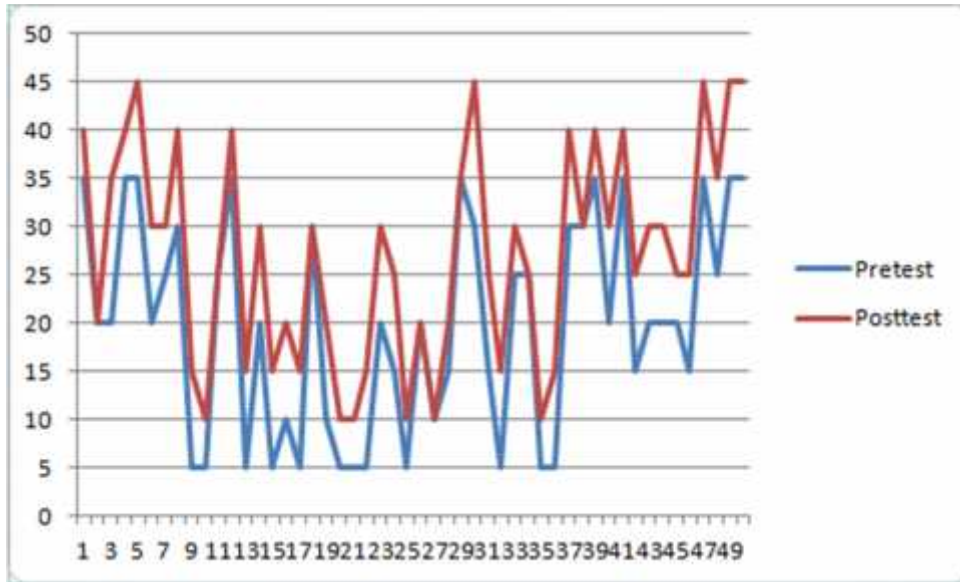
Using table 7.12, it is possible to compare both groups' means in the pretest and the posttest. The groups' means in the pretest are quite similar; this means that the groups' levels of reading comprehension are almost the same (similarly including students with different

comprehension abilities). In both groups, the students' marks in the pretest range between 05.00 and 35.00. Nevertheless, the posttest groups' means show a significant difference between students' achievements in both tests. The results show that the students in the experimental group have performed better than those in the control group. The following graph better highlights this difference.



**Figure 7.2: The experimental and control group students' marks (posttest)**

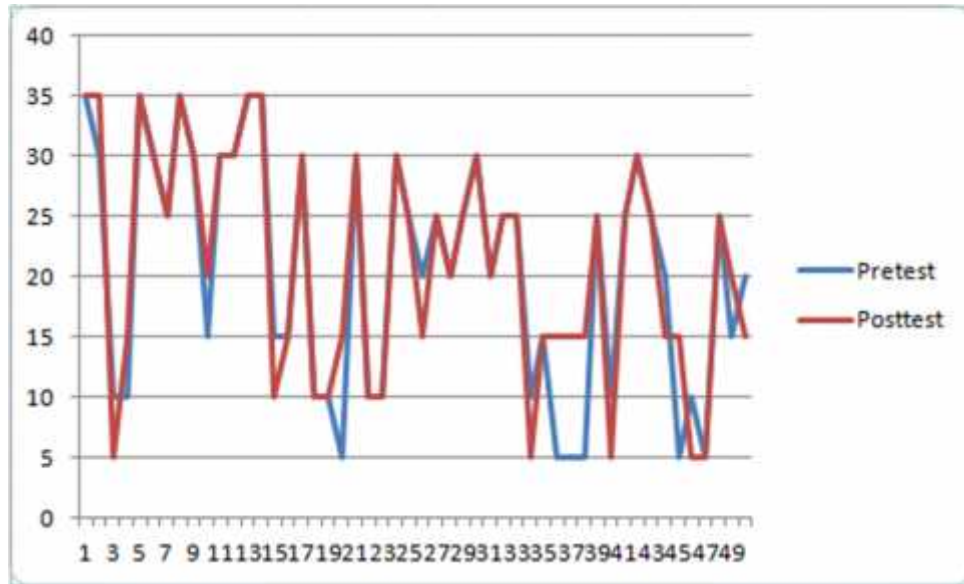
The participants' scores in the experimental group (group 01) range between 10.00 and 40.00; compared to the groups marks in the pretest, a noticeable difference between the group's best and worst marks is remarked. In the control group, the students' marks range between 05.00 and 35.00; no changes are remarked in consideration to the groups' best and worst marks. Nevertheless, it is worth mentioning that, in both groups, some students have obtained better marks in the posttest while some others have performed better in the pretest. The following 2-D line graphs show the students' growth in reading comprehension in each group separately.



**Figure 7.3: Experimental group students' performance on both tests**

The blue line refers to the participants' performance in the pretest and the red line represents their performance in the posttest; the two lines are separated in most of the graph points (indicating a difference in performance). The posttest line takes a superior position in comparison to the pretest line. This indicates that the students' have outperformed themselves in the posttest. The difference between the two performances (pretest and posttest) is reflected in the increase of the experimental group's mean from 19.80 to 20.04 (as reported in table 7.12).





**Figure 7.4: Control group students' performance on both tests**

The blue and the red line in this graph show to be overlapping in most of the graph points; they are separated in very few points. This indicates that there are very few cases of students' who have outperformed themselves in the posttest; for the other students, either they have obtained a very similar score or they have underperformed themselves in the posttest. This group's mean has increased slightly from 20.40 to 21.00 (see table 7.12). It is plain to see that the difference between the two means is insignificant.

Such differences between the groups' means in the pretest and the posttest show that the experimental group's reading comprehension has improved contrarily the control group's processing capacities. At this level, the results can be said to be encouraging. Nevertheless, they represent a preliminary conclusion that needs further statistical analyses to confirm how reading automaticity correlates with reading comprehension and to what extent the manipulated variable (automaticity) contributes in the growth of the dependent variable. Therefore, the statistical analyses that are reported in the following section help in drawing stronger conclusions.

## 7.9 Correlation coefficient 'r' analysis

This correlational study has been carried out in line with the study's hypothesis since it examines the nature of the relationship between automatic information processing and reading comprehension. To this end, the correlation coefficient 'r' is required. This aims at proving, as hypothesised earlier in this thesis, that increases in the magnitude of automatic information processing lead to increases in the magnitude of reading comprehension. Since the relationship between reading automaticity and reading comprehension, in this study, is linear, then the Pearson Product-Moment Correlation (PPMC) is the most relevant to this study. The equation of the PPMC is:

$$r(x, y) = \frac{\sum xy}{(N)(S_x)(S_y)}$$

In this study, 'x' symbols represent automatic information processing scores, and 'y' symbols relate to reading comprehension marks. These symbols have been defined earlier in this thesis (see Chapter Five, Section 5.8). To calculate the research's coefficient 'r', the following real values of the equation symbols are used (See Appendix IX).

$$\sum xy = 9495.41$$

$$N = 100$$

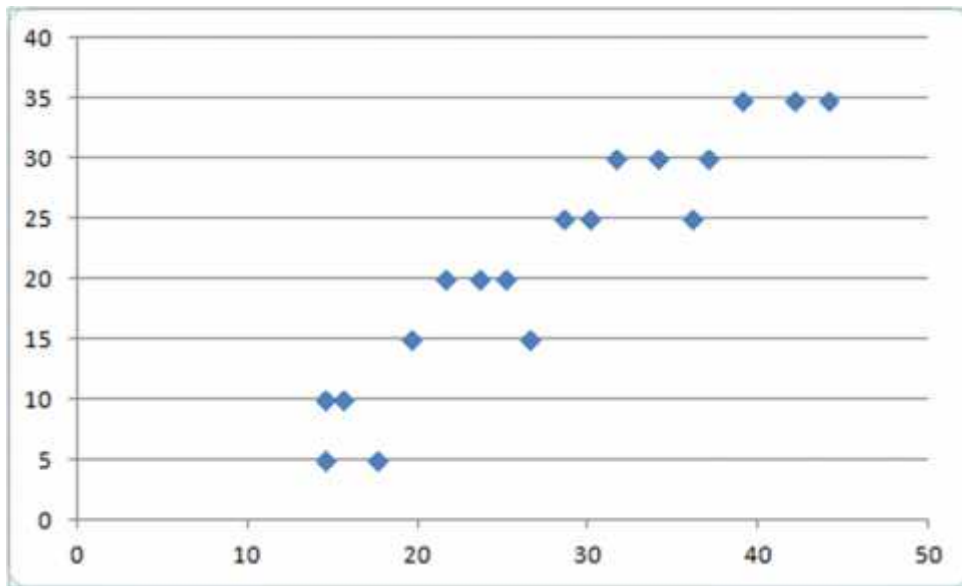
$$SD_x = 09.66$$

$$SD_y = 10.367$$

$$r(x, y) = \mathbf{0.94}$$

It is worth mentioning that the 'r' values range from '-1' to indicate a perfect negative correlation to '+1' to indicate a perfect positive correlation.

With this one-tailed test, a positive correlation is predicted between automatic information processing and reading comprehension, at 0.05 level of significance and with 98 degrees of freedom. After the calculation of the correlation coefficient 'r' between both variables, the value of the obtained 'r' is 0.49. Since the tabulated value of 'r' is 0.165, the results are very significant and are well in the direction of the study's hypothesis. The following scatter graph represents the correlation between automatic information processing and reading comprehension.



**Figure 7.5: Correlation between automatic information processing and reading comprehension**

The scattered points in this graph represent the crossing points of the participants' scores; some crossing points overlap with each other because of the similarity between students' scores. The automatic information processing scores are represented by the horizontal axis while the reading comprehension marks are represented by the vertical one. The points' distribution indicates the positive correlation that exists between reading automaticity and reading comprehension. That is, because the crossing points are distributed in a main direction from lower left corner to upper right corner, most participants occupy the same (or almost) position in the

ranking of students' scores in both tests. To put it differently, most of the students who have a developed reading automaticity are good comprehenders and the students who have poor reading automaticity are poor comprehenders. Therefore, these results, in addition to the previous ones, strengthen the truth about the positive correlation that exists between automatic information processing and reading comprehension. To build a stronger conclusion, it is preferable to consider another statistical analysis that will, hopefully, confirm the preliminary conclusions that have been drawn so far.

### 7.10 T-test analysis

To determine the significance of the experiment's findings and to confirm those of the correlation analysis, a t-test is used. In this experimental study, it attempts to establish the relationship between automatic information processing and reading comprehension. To this end, it compares the means of the two groups in the pretest and the posttest to prove that any difference between these means is not a product of chance; it is the outcome of the experiment's treatment efficiency.

To compute the value of the obtained 't', the following formula is used.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

The detailed explanation of what the formula's components stand for is available in Chapter Six (Section 6.9). To obtain the computed 't', all the components of the formula have to be substituted with their real values. They are summarised as follows.

$$\bar{X}_1=27$$

$$\bar{X}_2=21$$

$$S_1^2=339$$

$$S_2^2=87$$

$$N_1=50$$

$$N_2=50$$

At 0.05 level of significance and with 98 degrees of freedom, the value of the calculated 't' is 2.06. To check the significance of this result, it is important to consider the critical value of 't'. Since the tabulated value of 't' is 1.66 (2.06 > 1.66), the results are statistically very significant. This backs up the previous preliminary conclusions and confirms that automatic information processing contributes interestingly to the growth of the students' reading comprehension. The results are, then, well in the direction of the study's hypothesis.

### **7.11 Discussion of the results**

The current study has investigated the role of the students' automatic information processing in their reading comprehension. Two methods have been used to establish the nature of the relationship between the previously mentioned study variables- a correlation and an experiment. In the context of this research, the study's hypothesis is tested by means of different tools; it involved using a reading comprehension test and an automaticity word list (in the correlation part), and reading comprehension pretest and posttest (experiment part). In addition to that, some materials have been processed in the treatment phase to teach the students how to read more automatically; they include highlighted texts and automaticity word lists.

It is important to examine the values of 'r' and 't' and to compare the groups' means. In the correlational part of the study, the computed value of 'r' ( $r= 0.49$ ) is greater than its critical value ( $r=0.165$ ). Such findings make the first step towards confirming the study's hypothesis. Furthermore, the mean ( $M=24.05$ ) and the standard deviation ( $SD=339$ ) of the experimental group

are larger than the mean ( $M=21.00$ ) and the standard deviation ( $SD=87$ ) of the control group. These comparisons seem to be in the same direction of the correlation findings. As a third step to validate the study's findings, the value of ' $t$ ' has to be examined. Actually, the calculated value of ' $t$ ' ( $t=2.06$ ) is superior to its tabulated value ( $t=1.66$ ). Since the correlation and experiment results are well in the direction of the study's hypothesis, it is possible to confirm that automatic information processing strongly correlates with and contributes to reading comprehension abilities. Therefore, the study's findings can be summarised as follows.

1-The students in the experimental group (group 01) have shown an improvement in reading comprehension and automatic information processing.

2-A few students in the control group have made gains in reading comprehension; they are really minimal in comparison to those shown in the experimental group.

3-All the students in the experimental group have shown an increase in their word recognition speed; for some, the change is remarkable, and for some others it is less interesting. This is noticed from their progress charts.

4-Some students have shown good capacities of reading the text following the highlighted parts; they have even learnt how to divide the text conceptually into meaningful units. Unfortunately, some others still have some weaknesses in trying to see the different pieces of information.

5-The highlighted text reading has shown to be interesting for the students. They have shown a great involvement in reading highlighted parts and highlighting unformatted text.

From this study's data analysis, the students' reading comprehension and automaticity increase over the treatment period has been examined. Expectedly, most of the control group students have shown practically no improvement in their reading comprehension (some have even underperformed themselves in the posttest); for the very rare positive changes, they are described

to be negligible. Nevertheless, the growth of the students' reading comprehension in the experimental group has been statistically demonstrated from the pretest to the posttest. Such changes are not a product of chance. They are strongly believed to be the outcome of the use of the structured repeated reading method that has been used in the treatment period in the experimental group reading classes. These results clearly support the core of evidence as presented earlier in the review of literature which describes how important automaticity is in reading comprehension (Berninger, Abbott, Vermeulen and Fulton, 2006; Breznitz, 1987; Fuchs and Fuchs, 1992; Hasbrouk and Tindal, 1992; Mastropieri, Leinart and Scruggs, 1999; Moats, 2001; and Rasisnski, 1990).

The word-level automaticity of this study's participants has been tested and the results have revealed that the students possess different automatic information processing capacities. Their scores range from 14.50 to 44.00/50.00; there are students with high automaticity levels and others with lower automaticity levels. To check how such abilities correlate with reading comprehension, the correlation coefficient 'r' has been calculated ( $r=0.49$ ). The results have confirmed that students who are able to get the words off the page rapidly and with no efforts are more likely to understand a text. What explains such results is that automatic readers are able to decode the written message effortlessly. This helps them free some cognitive resources to understand what is being processed. These are individuals who are said to possess better short-term memory capacities than less automatic ones (Swanson, and Saez, 2003). Contrarily to this category of readers, there are individuals who possess limited cognitive resources for processing cognitive tasks; when they spend such resources on lower-level processes (decoding), they will be left with less than required resources for higher-order processes (comprehension). Thus, it is important for readers to economise on such resources at lower-order skills for a better use with the higher-order

skills. Parallely, readers' with processing speed difficulties suffer from subsequent short-term memory deficits.

In the experimental phase of this study, the researcher has aimed at introducing the participants with a more structured version of the repeated reading method. This would enhance the students' automatic information processing and, thus, build up their reading comprehension. In the context of this study, it is noticed from the different classroom practices that the students' automatic reading has been improved to different degrees (depending on the participant). More than half of the participants have proven their understanding and practice of the instructed reading method to think more conceptually about the text and use less cognitive resources at the level of word recognition. This means that they have developed a useful way that helps them process information without taxing their cognitive resources; they are able to use less executive attention at the word recognition level to allow better text comprehension.

It is worth mentioning that the results of the treatment phase practices have come to confirm what has been supported in the literature review (Chapter Four, Section 4.5). The practices that have been used in the classroom aim at exposing the participants to the language (academic/high frequency words) for many times. As a result, the students' automaticity has started to develop at different points in the experiment phase. That is to say, some students have shown some progress at earlier points in time. Therefore, they have confirmed Logan's (1988) instance theory of automaticity which supports the belief that automaticity can be improved by 2 trials or even a single exposition to the material (academic words) (See Chapter Four, Section 4.5.2). For some other students, it has taken a longer time to notice a progress in their recognition speed. This has come in the direction of LaBerge and Samuel's (1974) theory of automaticity which holds that various



expositions to the material are necessary to develop individual reading automaticity(Chapter Four, Section 4.5.1).

In addition to the structured repeated reading technique, word previewing technique has been used to measure the students' word recognition abilities and to provide them with practice to become more automatic at identifying words. In this research, it has proven to be, as described by Fuchs, Fuchs, Hosp and Jenkins (2001, p.239), a "direct measure of [...] rapid word recognition." Using this method has proven, like in other research works (Gough, 1996; and Schwanenflugel, Hamilton, Kuhn, Wisenbaker, and Stahl, 2004), that reading automaticity correlates significantly with reading comprehension. Many of the study's low reading performers have confirmed LaBerge and Samuel's (1974) assumption that being slow or unable to recognise words blocks the channel to the individual's automaticity; this results in an interference with print understanding. Equally important, using decontextualised words has shown, in the context of this study, to improve and assess the students' word recognition. Hence, the recognition of decontextualised words prevents the reader from using his comprehension influences that would help him identify the target word. Such a conception has been supported by the Verbal-Efficiency theory (Perfetti, 1985; and Perfetti and Hart, 2001) that has been documented earlier in this thesis (Chapter One, Section 1.5.2).

It is worth mentioning that the progress charts that record the students' automaticity development have shown some one-directional improvements in the automatic information processing of some students. That is to say, such students have been improving their automaticity with every practice text or exercise. Nonetheless, some other cases have expressed less even developmental directions. It is noticed that in the case of these participants, automaticity increases in some sessions and decreases in some others; that could be noticed from one session to the other or even from one exercise to the other. This could be due to the level of difficulty of the material

(which is noticed by the participant, not the researcher) or to the students changing states of mind. Such factors, which are out of the researcher's control, may make it difficult or even impossible for a student to keep a strong mental attachment to the text or the exercise in question.

In this research, as in many others, there is always room for some exceptions. It was expected, earlier in this paper, that the reading comprehension of all the experimental group students will improve after receiving the treatment and that the text processing capacities of control group students would stagnate since they are not programmed to receive any treatment. Surprisingly, some unexpected changes have taken place in both groups. As far as the experimental group is concerned, a few students have shown a minimal development at the level of their automaticity. For such students, it could be that they have not felt interested or involved into the treatment practices. For some other cases, there is a noticeable improvement in their reading automaticity but not in their reading comprehension. These participants belong to the category of the participants who look forward to improving their reading speed at the expense of their reading comprehension. This is a misconception that the researcher has talked about in many reading sessions; the participants have been clearly told that such an experiment aims at helping them become faster comprehenders, not speed readers at the detriment of their understanding.

Exceptions are also present in the control group. All the students of this group have been expected not to show any growth in reading comprehension since they are not intended to receive any treatment. Unexpectedly, some changes have occurred. 7 students have performed slightly better in their reading comprehension posttest. The first reason that comes to mind is that these students have found the posttest to be easier than the pretest; this is still possible even though the tests have already been piloted. Furthermore, such gains may be contributed to the use of several texts (10) in the treatment period. These students have not been instructed on how to break a text

into meaningful units to read and understand it faster as a part of the repeated reading strategy; word-automaticity exercises have not been used either. Therefore, one possible explanation is that the students have felt more comfortable while reading thanks to practice; this has made them feel more acquainted with the skill and perform better. Another reason that may explain the students' reading comprehension growth is the fact of encountering similar academic words, even once, may enhance, even to a very limited extent, the students' reading automaticity which has positively contributed in the growth of the comprehension. This possibility is supported by Logan's (1988) instance theory which holds that a single exposure to an object, word, event...etc. may be enough to leave a trace in the reader's working memory; this helps him recognise, rapidly, the item once encountered. Nevertheless, the gains that these students have made remain minimal and do not influence the significance of the study's results (neither greatly nor negligibly).

The importance of automaticity in reading comprehension is recognised in cognitive psychology and it is highlighted, once again, in this study. The findings of this study support the idea that a significant attention is needed to thoroughly understand a print. When the reader is not automatic in identifying words, he will have to engage a lot of cognitive resources to simply recognise the words. Consequently, when an individual becomes more automatic in reading, greater amounts of attention will be saved for his comprehension. To this end, the learners have to practise reading to improve their automaticity.

## **Conclusion**

The current research has investigated the nature of the relationship between the students' automatic information processing and reading comprehension. Relevant literature supports that practicing automaticity using direct instruction helps the students become faster readers and more successful comprehenders. That is why this research work has incorporated a more structured

repeated reading strategy using specific highlighted texts and context-free word previewing in the treatment phase as an attempt to increase the students' word-reading automaticity.

Examining the data obtained from the correlational and the experimental parts of the study has helped the researcher have better insights into the nature of the relationship between automatic information processing and reading comprehension. The study of the correlation between both variables has revealed significant results; the students' ability to recognise words rapidly has proven to correlate strongly with their text processing abilities. To certify such a conclusion, the experimental study has been carried out. In the experiment, the participants who have received the treatment have made gains in reading comprehension, as indicated by the result of the comparison between the group's means in reading comprehension tests (pretest and posttest). Such positive changes have been confirmed by the calculation and analysis of the t-test. Consequently, it is possible to tell with confidence that the students' automatic information processing has contributed in the growth of their reading comprehension capacities.

That being said, reading teachers should bring about reading methods and practices to help the learners, especially the ones who struggle to make the texts they approach comprehensible, increase their reading automaticity. Hopefully, ample practices of automaticity, which is an essential component of fluency, help the readers focus less on the real reading of the words to, then, achieve the ultimate goal of reading which is making meaning from the text. That is true because reading automaticity helps the students economise on their efforts in the decoding phase to allow for higher-order processes of comprehension to take place.

## **Chapter Eight**

# **Pedagogical Implications, Limitations of the Study, and Suggestions for Future Research**

Introduction

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## **Introduction**

This study has investigated the role of working memory, anticipation of meaning and automatic information processing in young adults' reading comprehension. The aim of this chapter is threefold: it proposes some pedagogical implications that may help language teachers in their reading classrooms, describes the study's limitations that may help novice reading researchers avoid or undertake specific steps toward their hypothesis testing and presents some recommendations for future reading research works.

### **8.1 Pedagogical Implications**

This study attempts to make a contribution to the field of education. To this end, it raises practical implications that are drawn from the study's findings. Such implications need to be considered by the practitioners who are looking forward to embedding some practical interventions in their reading classes. Based on the results obtained in this study, the implications that can be gleaned from this research relate to the three capacities that have shown to be strong regulators of the university students' reading comprehension- working memory capacity, anticipation of meaning and automatic information processing.

#### **8.1.1 The implication of working memory in reading comprehension**

In this study, it is proposed that working memory is crucial to simultaneously store and manipulate information while reading. The aim of this section is, therefore, to help the teachers work with the students to find ways to overcome their working memory difficulties to maximise their reading achievements. In reading classrooms, the students are required to keep information in an active, retrievable structure while they engage in more demanding comprehension activities. Unfortunately, not all the students are able to store the encountered information and manipulate more complex tasks simultaneously; such an overload leads low spans to be distracted and loose

the information that is held in their working memory. Therefore, the teachers must help the students with working memory difficulties to become better readers. This study's implications for classroom practice that are advanced in this section are based on two types of interventions- those that concentrate on accelerating comprehension for the students by adapting the reading materials and activities and those which train directly the learners' working memory.

Before describing classroom-based interventions, it is crucial for the teacher to recognise the warning signs of the students' working memory failures. In the context of reading, the teacher can identify working memory problems that may manifest themselves, like many cases in this study, in some of the following ways:

-The students are not able to recall the information they read in a text; they forget even information that relates to short sentences or word sequences.

-The learners may find it difficult to follow their teacher's instructions even though this latter repeats the same instruction a couple of times. In some cases, they may remember one part of the instruction and forget about the other parts; they often have recourse to their classmates to remind them of what they are asked to do.

-Some struggling students may find it impossible to read a whole text; if ever they manage reading it, they cannot answer all the comprehension questions or even participate in an oral classroom discussion about the topic. Such students, as some of the low spans who have participated in this study, may abandon the task of reading at different levels (during reading or while answering comprehension questions) because of the huge task demands. Those readers cannot manage processing and storing the encountered information, manipulating demanding comprehension tasks and retrieving the stored knowledge which is supposed to be kept in a retrievable structure.

When the teachers identify such working memory problems, they can start by tracking the students' working memory when processing demanding tasks like reading. To be able to do so, Gathercole and Alloway (2007) suggest that the teacher needs to evaluate the demands of the learning activities, including reading. These activities are said to impose loads of storage demands that require the students to retain information and process material at the same time. As in reading classes, the teacher may give lengthy instructions prior to reading; this makes the students struggle while remembering what they are supposed to do with the to-be-read text. In addition to such loads, the students are required to read the text and to retain the encountered information to understand the following parts of the essay. In some reading sessions, the teacher may interrupt the students' course of reading to ask another question, explain a point or even correct a spelling mistake in the text. This may cause some problems for low spans to simultaneously listen to the teacher and understand what he says while keeping the text's processed information active.

To avoid the previously mentioned failures, it is important to decrease the working memory loads in reading tasks that involve the students in the simultaneous storing and processing of the information. That could be accomplished as follows.

-It is possible to reduce the amount of the to-be-processed material using shorter texts or shorter sentences that are put in simple structures.

-It is important to discuss the topic of the material to make it easier for the students to retain and manipulate the encountered information.

-The teacher may replace multi-tasking with single-tasking. That is to say, the reading activity can be divided into different smaller, less demanding tasks. That is to say, the students can be asked to read the text, and then to answer some questions about the text. In fact, when the questions are



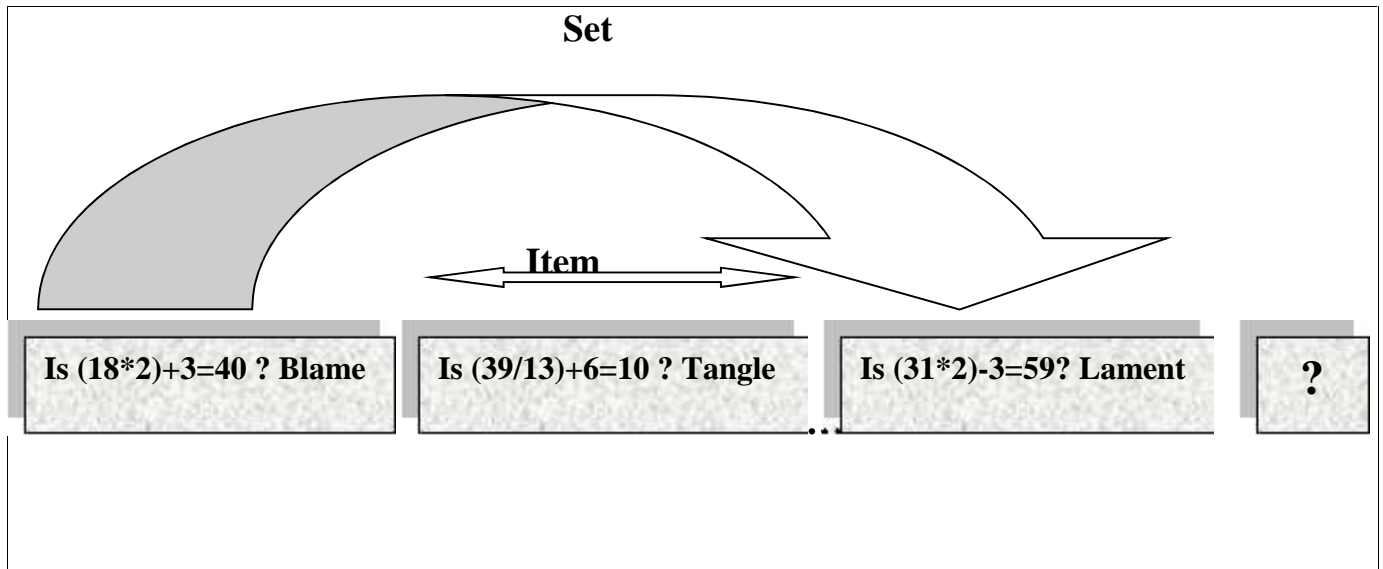
given after reading, the low spans will not have to manipulate reading, storing, recalling and thinking about how to answer questions.

These classroom-based interventions have proven, in earlier research works, to help the students overcome their cognitive weaknesses and boost their learning achievements (Gathercole and Alloway, 2008). In the same context, the teachers who have already implemented such interventions have noticed how the students' learning has improved; they felt enthusiastic about how their classroom practices have been bettered with such workable interventions. Indeed, they have enabled the teachers to understand that even with limited working memory capacities, the learners can achieve more considerable success rates when these methods are taken into consideration by the teachers (Elliott, Gathercole, Alloway, Holmes, and Kirkwood, as cited in Holmes, 2012). The classroom-based approach is advantageous of the low-span learners to cope with their working memory capacities to achieve better. Still, some other practices may target the individuals' working memory directly.

Now, scientific research suggests some brain-training activities or mental workouts that are designed to improve the individual's working memory capacities. Such activities are supported by the working-memory-training approach. They train the individuals' brains to augment their capacities of simultaneously storing and processing information (The Next Wave, 2009). One workable exercise that has been designed for memory fitness is the CASL Working Memory Workout. It has been designed by a group of researchers in the University of Maryland Center for Advanced Study of Language (CASL). According to The Next Wave (2009), this brain-training program aims at developing individual's span (how much information an individual can hold in immediate memory using attention). The CASL researchers suggest that "the attentional processes that make multi-tasking possible may be critical for first and foreign language text analysis and

reading comprehension” (The Next Wave, 2009, p.08). Therefore, the main cognitive functioning that is targeted by this memory-enhancement program is the one required for language analysis and text comprehension.

This program consists of attention- and memory-based exercises that are based on the traditional measures of working memory. These tasks have already been used in the current study (Chapter Five) to measure the participants’ working memory capacities. These complex span tasks, as described earlier, require the students’ to perform two different tasks concurrently by combining a to-be-remembered item with a cognitively demanding task processing (memory requirement and attention-control requirement). The commonest of the working memory spans that are used as a basis for the memory program exercises is the OST (operation span task) (See Appendix III.2). The following figure represents a graphical depiction of one set in the span task.



**Figure 8.1: Depiction of an n-item set in the operation span memory exercise**

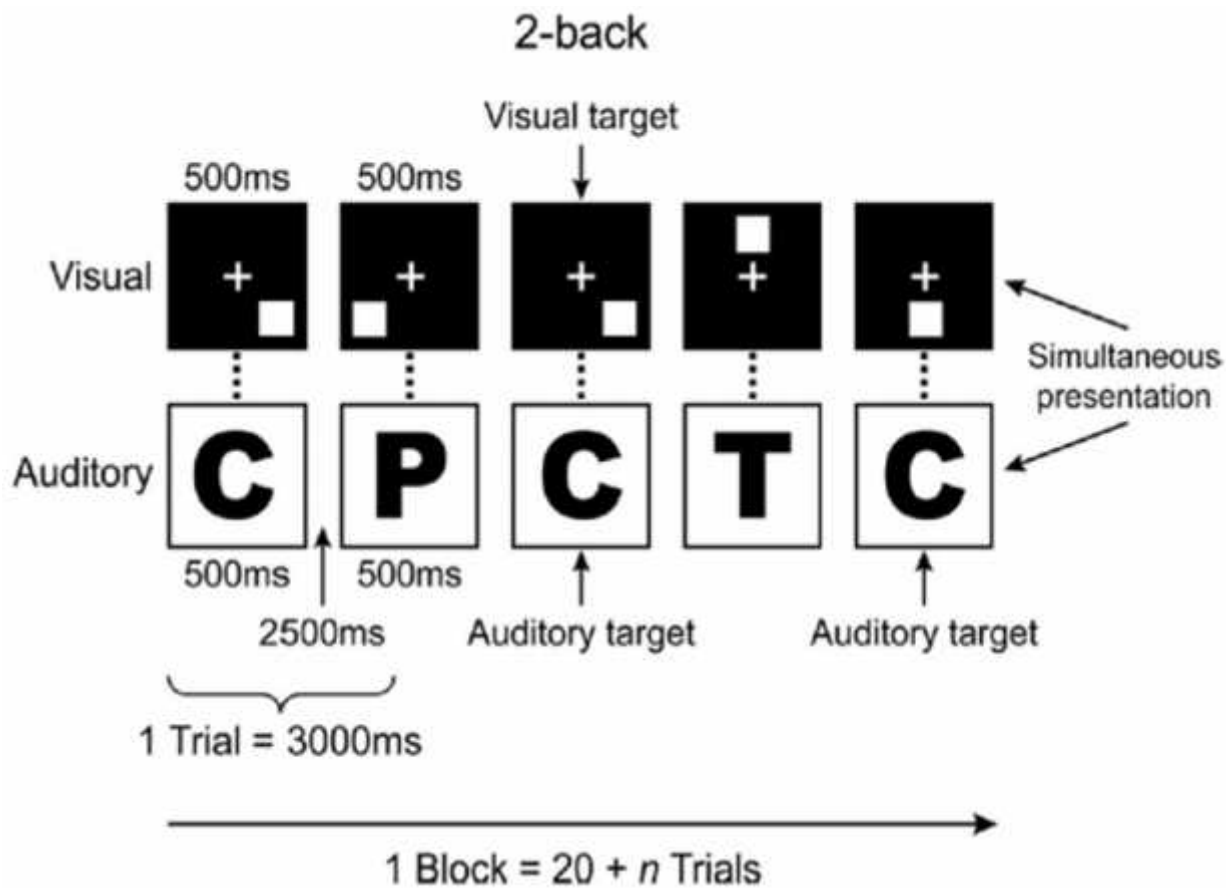
As figure 8.1 illustrates it, each item in the set includes a mathematical equation (two arithmetic operations) and a to-be-remembered item (one- or two-syllable word). In the automated version of operation span exercises, each student reads the equation aloud and says whether the

equation's suggested solution is correct or incorrect. Then, he proceeds by reading the to-be-remembered word aloud. Here, the practitioner moves to the second item and the whole same procedure is repeated. At the end of each set (the number of items per set ranges between 2 and 6 items), the participant is invited to recall all the to-be-remembered words that have been displayed in this set (from 2 to 6 words).

To make a better training exercise out of this assessment tool, a modification needs to be brought to the OST. The OSTs that have been used in this study to assess the participants' working memory capacities do not progress in difficulty. That is to say, the sets have not been ordered from the least to the most challenging set since the task is used to assess, not to train, the students' multi-tasking ability. When using working-memory workouts, The Next Wave (2009) suggests that OSTs have to progress in difficulty, from the least challenging to the most challenging sets (following the increasing number of items a set consists of). As the learners' span increases, they will systematically adapt their capacities to the increasing level of difficulty of the exercise. Using these exercises at regular intervals is shown to improve to individuals' working memory capacities and, hopefully, it helps the readers make some gains in reading comprehension.

Many other studies have encouraged the use of brain training that has proved, according to Chein and Morrison (2010), to improve the individuals' working memory capacities and its benefits have extended to higher-order cognitive skills like language comprehension. The N-back task is another working-memory workout. It is a continuous performance task that presents the participants with a sequence of items, such as letters, asks them to indicate whether or not the current item matches the stimulus that has been displayed N steps earlier in the stream (Jaeggi *et al.*, 2003). This exercise, similarly to the OST, targets attentional processing, updating and multitasking. Dual N-back training is a variation and a more developed version of the N-back

exercise. It consists of presenting the participants simultaneously with two independent streams, instead of one; each stream uses a different modality of stimuli such as the visual and the auditory ones. What makes this variation of the task even more challenging is that it targets item updating in the phonological loop and the visuo-spatial sketchpad working memory buffers. Figure 8.2 reports the Dual N-back task since it is a more comprehensive task.



**Figure 8.2: The dual N-back task. Adapted from *A review of working memory training* (p.11), by M.A. Smith, 2013, retrieved from <http://markashtonsmith.info/working-memory-training-review/>**

Similarly to the OST exercise items, the N-back and dual N-back items have to be organised following a progressive order of difficulty; this is mainly expressed in the number of N-

back intervals. As the participants process more items, they start to adapt to the increasing difficulty of the task without getting their processing to become automatised.

Previous research works that have adopted the N-back tasks have reported many cognitive benefits on the participants cognitive functioning (Smith, 2013). The ones that are summarised in the following lists are the most relevant ones to the context of this study.

- The participants' ability to select, with a *controlled attention*, between 2 input sets that represent different task modalities (Multi-tasking).
- Controlling the task distracters that inhibit the attending of 'new relevant' information using controlled attention.
- The participants' episodic memory
- The students' reading comprehension.

Despite the many research works that have been investigating how working memory capacities facilitate or hinder linguistic information processing, very little is said about the different methods that improve the individuals' working memory capacities, either by means of curricular subject matters, such as reading, or brain-training exercises that target directly working memory capacities. The methods and exercises that are suggested in this study are pretty workable in the reading classroom setting; language practitioners can use them in their classrooms even when they are not experts in the field of cognitive psychology. Encouraging such practices helps the students achieve better in reading, as one of the complex tasks, which puts lot of demands on the readers' working memory and attentional control systems.

### **8.1.2 The implication of anticipation skills in reading comprehension**

In this thesis, anticipation skills have proved to contribute to the growth of the students' reading comprehension. That is why this section sheds light on the pedagogical implications that

may guide reading teachers or other educators who rely on text reading in their classroom activities. The literature review of this thesis (see Chapter Three, Section 3.3) is based on the constructivist learning theory which is related to the practice of instruction in the current chapter. A consideration of applying the principles of the constructivist learning theory into reading classes results in important educational implications that relate to reading as an interactive activity which requires the readers to actively connect the new information they encounter with their background knowledge and past experiences.

#### **8.1.2.1 Activating the learners' background knowledge**

To tap the participants' background knowledge, two pre-reading strategies have been used and, most importantly, proved to be effective tools- anticipation guides and text previewing strategy.

##### ***Anticipation guide strategy***

The current study's participants have proven that it is essential for the reader to use his anticipation skills to understand what he reads. In this research work, the anticipation of meaning has been achieved through the use of anticipation guides. Therefore, it is important for language teachers, in general, and reading instructors, in particular, to explore how to aid the use of this pre-reading (background-knowledge activation) strategy. This would result in more interesting classroom environments that engage the students in more meaningful and authentic lessons.

It has been well documented, in this study's experiment and previous research works, that the use of anticipation guides helps the students anticipate what is to come next in the text by activating their background knowledge. That is why it is important to devote the required time to the pre-reading phase in the reading classroom. Language teachers should allow their students to anticipate what will come next in a text by using prediction guides, as they are called by Smith

(1978), to prepare them before they engage in full reading. By discussing the different anticipation statements, the teacher helps the students feel motivated to read the whole text and relate background knowledge to the newly encountered one to better their understanding.

In order for an anticipation guide to be a good way to stimulate the readers' curiosity about the to-be-read text, the teacher has to follow many steps to construct successful anticipatory statements. Such guidelines have been summarised by Bean, Readence and Baldwin (2007) and followed in creating the anticipatory statements that have been used in this research work. They can be summarised as follows.

**a)-The to-be-learned concepts have to be identified.** The teacher has to read and analyse the passage to determine the *implicit and explicit* major concepts. Based on the teacher's choice, these concepts have to raise the students' curiosity about the text and agitate their reflection on their own beliefs.

**b)-The major concepts have to be phrased in a way that supports or challenges the readers' thoughts.** The teacher must take into consideration the students' age, level of maturity and prior knowledge and create statements that, according to him, challenge the students' beliefs about the text's topic. The number of anticipatory statements depends on the passage's length and the number of major thoughts it consists of. To elicit the students to anticipate what the text will be about, the teacher should write short, declarative sentences that target the major concepts and provoke the students' prior knowledge and past experiences.

**c)-The teacher has to decide upon a logical order of presenting the anticipatory statements.** In this study, the test maker has arranged the anticipatory statements following the order in which the targeted concepts have been encountered in the text. Teachers may also think about ordering the statements from the least to the most important ones, from the most to the least familiar one,

or even from the general to the specific ones. Furthermore, they can be presented on a to-be-handed worksheet (similarly to the guides used in this study), on the board or using overhead transparency.

**d)-The teacher should think about how to present the anticipatory statements to the students.**

In this study, the anticipatory statements have been read orally by the teacher/researcher. This enables the students to follow along with their teacher and respond to each of the statements. Yet, slower students may need to go through the statements another time (or many) to be able to respond to the statements and to feel ready to defend their beliefs. To provide extra motivation, the participants might be invited to respond twice to each statement; one response that represents their own belief and another response that represents that of the author. Moreover, the teacher may think about creating a more cooperative learning atmosphere by making the students respond to the anticipatory statements in pairs or small groups; this has proven in the current study to be more motivating for the students than the participants' individual work.

**e)-The teacher should discuss the statements briefly and encourage the students to exchange ideas through subgroup discussions.**

In this study, the students have been asked to respond to the different statements by raising their hands and expressing their agreement or disagreement with each statement; in some activities, they have discussed them in smaller groups before sharing them with the teacher. Then, the teacher tallies the participants' responses to show how similar or dissimilar they are. During the course of this whole-group discussion, the students consider each other's responses to evaluate their own thoughts; such an awareness about their beliefs motivates them to read to see how their opinions are supported or refuted by the author of the to-be-read text.

**f)-The students should be encouraged to read the text and react to the anticipatory statements once again.** While they are reading, the students are expected to be cognisant of their thoughts and those of their classmates (as they have been discussed orally) and to see the



relationship between what they read and what has been discussed prior to reading. At the end of the reading phase, the teacher may create a culminating activity by encouraging the students revisit the guide to respond to the same anticipatory statements and compare their before- and after-reading responses. By using this follow-up activity, the teacher may lead another discussion that helps the students share what they have learned from the text and how the author's ideas have changed the students' previous thoughts. In addition to that, the teacher may evaluate how the new information has been correctly assimilated.

Anticipation guide strategy is used in the three reading stages. It can serve as a pre-reading strategy that helps the students anticipate what the text is about by tapping their background knowledge; it activates the readers' previous thoughts and past experiences. Besides, it can be used during reading to help the readers link what they already know with the encountered information for a better comprehension. Plus, it works as a post-reading strategy that makes the students react to the very same statements to evaluate the gains they have made in the reading activity.

### ***Text previewing THIEVES strategy***

The second strategy which has been followed in this study and that has shown to be effective in activating the students' background knowledge is text previewing strategy (THIEVES). This strategy has helped the participants set their purpose for reading by *stealing* information from previewing the title, the introduction, the topic sentences and vocabulary. By so doing, the students have identified the major text concepts and, thus, predicted what information might be encountered in the text. That is why reading teachers are encouraged, in this chapter, to teach their students text previewing strategies to set their mind for the reading activity.

In the reading classroom, the teachers can help the students preview a text by asking them some questions that target the main concepts of the text. That is to say, the teachers' questions draw the students' attention, especially when the students are not familiar with the previewing strategy, to the different places in the text where major concepts can be identified. That being said, teachers should select texts that are well designed and that have a variety of cues that can guide the learner locate the targeted information; these features may take the form of titles, preface, headings, graphs, tables, and italicised or bold words...etc. Consequently, becoming familiar with the text guarantees a successful text-viewing phase that is more likely to result in efficient reading.

To guarantee a successful use of the previewing strategy, it is of a paramount importance to consider to what extent the students are cognisant about the different text structures and features. That is a good reason to teach the students the different lexical, graphic and syntactic signals the text consists of (Hare and Bingham, 1986). Similarly, students need to be taught how different types of texts require different ways of identifying information. Actually, authors use different methods of development such as narration, description, comparison/contrast, exemplification, and cause/effect.

For instance, narrative texts, differently from informative ones, do not use cues like tables, graphs and charts; the possible signals that can be found in such texts can be pictures signal words that refer to the chronological organization of events. Being aware about texts' structural differences influences positively the identification of passage's main thoughts and the retention of new information. That is to say, when the reader is aware about the text structure, his use of the previewing strategy enables him to construct a mental representation (map) of the text that he uses as processes the text; building meaningful mental links helps the readers follow the stream of ideas and recognise the relations between the different pieces of thought (Learning Assistance and

Resource Center, 2007). It is noteworthy that some students may be familiar with such information; however, they do not take them into account when they approach a text. Therefore, the role of the teacher is to help them use this knowledge about text features to form ideas about what they will read and, thus, comprehend the material better.

Anticipation guides and THIEVES previewing strategies can be used in combination, as in this study, if the teacher wants to create variety and make reading a more enjoyable learning experience. Apart from being efficient in preparing the participants for the reading task, these strategies have other common features that guarantee their success in tapping the readers' background knowledge and bettering text comprehension. Indeed, they facilitate the students' active engagement in the reading task, enhance the readers' comprehension by provoking their prediction about the text content, and guide the students' reading by setting a purpose for the task and helping them verify their previous predictions.

Unfortunately, these knowledge activation strategies do not always support comprehension. In this study, many students in the experimental group have not made gains in their reading comprehension even though some pre-reading activities have been used prior to processing many texts in the reading classroom. One of the explanations that have been related to such an unexpected result is that some of the concepts that are targeted in the pre-reading activities are incompatible (either conflicting or incorrect) with the students' existing knowledge. For some other students, it could be that they do have enough background knowledge to be tapped. Therefore, to prevent such problems from undermining the students' comprehension of a text, it is important not to take background information building for granted.

### 8.1.2.2 Assessing and building the students' prior knowledge

#### *Assessing prior knowledge*

It is obvious that prior knowledge activation tools will not have the greatest effect unless the students possess in their LTM the required to-be-activated information. In this research experiment, some students have not performed expectedly after the treatment's reception that is supposed to bring about some positive changes to the students' reading comprehension. These students are thought of to have insufficient or incorrect prior knowledge. That is why teachers have to determine their students' levels of prior knowledge before taping it using pre-reading activities. In this study, the researcher has used the anticipatory statements as a tool to assess *informally*, activate and build the students' prior knowledge about the text. When the students discuss the topic with the teacher or in smaller groups, they exchange ideas, listen to each other, learn new information (that could be correct or incorrect), and even correct some of their misconceptions. This helps the students who know less about the topic to learn new concepts and keep them in active state to read the text and confirm or disconfirm what they have learned.

It is possible for the teacher to use more formal methods to assess the students' levels of background knowledge. This could be achieved through assigning tasks (whole tests or simple exercises) that gauge the students' knowledge about the specific topic of the reading class. The results of this assessment give the teacher a better insight into the learners' weaknesses and degree of preparedness. Furthermore, the teacher may ask the students to respond to some questionnaires/inventories that aim at reflecting their past experiences and knowledge. The following question can be used in a questionnaire that assesses the students' knowledge about the term 't-test'.

-Do you know what the term 't-test' stands for?

**a-**I have never heard of this term.

**b-**I have heard of this term but I do not know what it means.

**c-**I am not really sure about its meaning.

**d-**I know what it is but I do not know how to use it.

**e-**I know what it is and how to use it.

It is true that such self-assessment tools may be less reliable than the background knowledge tests a teacher may administer to target directly the participants' prior knowledge, but they remain more practical and less time-consuming tools to be created by teachers who know less about designing prior knowledge tests.

### ***Building prior knowledge***

After assessing the students' background knowledge and before taping it, the teachers should help the learners acquire the relevant and correct knowledge they need to comprehend specific texts. Because of time constraints, it was impossible, in the current research, to use a lot of activities that aim at building the learners' knowledge about the target topics. The teacher has relied on whole-class or small-group discussions prior to reading to help the students analyse each other's thoughts about the topic in question. This way, many students could learn new ideas and correct some of their misconceptions before reading. Consequently, background activation activities have shown to be more effective for these students' reading comprehension. Nevertheless, teachers should devote more time to build the students' knowledge to guarantee the pre-reading activities' success in taping relevant knowledge.

Language teachers should understand how important it is not to rely on reading on its own to help the students build their knowledge; the learners' knowledge can get significantly richer when they are engaged in activities that present them with intensive opportunities for reading,

talking and writing. First, the teacher needs to select texts that represent significant resources for knowledge enhancement. In this study, the focus was mainly on informative texts. Nevertheless, many other types of texts can do a good job in enriching the students' prior knowledge. To make this successful, the teacher can use meaningful texts that include some similar ideas since repetition can help the students retain information better; the more they encounter the same information, the less they forget it. That is to say, teachers can select the texts that have similar themes to make sure the students are learning effectively and deeply through repetition.

Second, teachers have to be aware about the importance of oral discussion in constructing the learners' knowledge. This technique, as used in this study, is supported by many researchers in the field of learning. Rivard and Straw (2000) put that peer discussions enhance the learners' knowledge about a specific topic because they offer them the opportunity to exchange information and negotiate their thoughts which contributes to more coherent comprehension. Furthermore, when teachers discuss the students' responses to a text, he helps them correct some misunderstandings and acquire some missed information; that creates more formal/useful discussions that are based on text content. In the same context, Hartman (1995) has emphasised on the importance of discussing the students' responses to 'why' and 'how' questions since they help the students have better insights into their real understanding and leverage this to improve their existing knowledge. To make these oral discussions more effective, Coleman and Pimenthal (2012) suggest the use of 'close reading' which requires the students to use evidence from the print as a 'primary source' for understanding. By leading a close reading activity, teachers ask questions that help the students answer critical questions that target text information which contribute in building, refuting or elaborating their knowledge. Similarly, Taboada and Guthrie (2006) suggest that teaching the students how to ask themselves such questions can be even more beneficial for

activating and building their knowledge during reading. Equally important, it facilitates the students' long-term knowledge construction process.

Third, teachers have to include writing activities to improve their learners' existing knowledge. Recording evidence in writing helps the students' interact actively with the received information and may help them recall this particular knowledge better. Moreover, teachers can have better insights into individual received knowledge amounts, differently from oral discussions. That is to say, the teacher cannot check what every student has learnt from a text when it is discussed orally. However, when the students express what they learn in writing, the teacher can realise to what extent each student has learnt from the text. Another advantage of recording the received knowledge is to be able to access it whenever the student needs to; this may be for rehearsal, revision, or other reasons.

In a nutshell, the use of pre-reading strategies has helped the researcher assess/build, to some extent, and activate the students' background knowledge. The students attitudes towards using pre-reading activities to get them engaged in the reading activity are positive. They have expressed a will and an excitement to show and share what they know about a topic prior to reading the text. Unfortunately, some few students felt intimidated by talking to a teacher or in front of their classmates. It is believed that with more practice of such activities, they would be able to express their knowledge more openly.

### **8.1.3 The implication of automatic information processing in reading**

This study has concerned itself with the relationship between automatic information processing and reading comprehension. It has revealed that reading automaticity is of a paramount importance for the students to comprehend what they read. That is to say, when the students are able to read with ease by focusing less on word identification, they will understand better since

their cognitive resources are oriented towards comprehension. To this end, the learners require a lot of practice to become more automatic readers. Hence, teachers have to think about incorporating automaticity training exercises in their reading classes. Therefore, this chapter summarises the different strategies that teachers should implement to help increase the students' reading automaticity.

In this study's experiment, two strategies have been used to increase the students' automaticity in reading. Word previewing exercises have been used to train the students' rapid word recognition. To this end, the teacher has used word-previewing techniques to improve the students' academic-word recognition. The practitioners are encouraged to use lists that contain high-frequency words, at earlier levels of the training, and low-frequency words, as the students become more automatic at identifying common words. By so doing, the two fundamental theories of automaticity are being put into practice. When the teachers believe that a single exposition to the word is enough to make the students recognise it later, they are actually referring to Logan's (1988) Instance Theory (See Chapter Four, Section 4.5.2). When the students cannot identify a word after one trial, the teachers are required to use intensive reading activities by selecting texts or exercises that display the target words through successive exposures; this is LaBerge and Samuel's (1974) theory put into practice (See Chapter, Section 4.5.1).

Another strategy, which is also used in this research, has proven to be efficient in helping the participants read faster without doing it at the expense of their comprehension. Structured repeated reading using text chunking is another method that language practitioners are encouraged to use in their reading classrooms. They can use ready-formatted texts or highlight them by separating the small pieces of information using different colors or different characters. In better conditions, such a method can be implemented with the use of a chunking machine or a



tachitoscope (Hook and Jones, 2002). This machine is used by the teacher who gives instructions about the different pieces of information he wants to highlight. Then, the tachitoscope divides the to-be-read text, following the teachers' instructions, into small packages to help the student read one chunk of information at a time. As the students get used to this highlighting method, they will start creating mental chunks instantly when they read. This means that the students have started to think about a text conceptually.

Additionally to the strategies that have been used in this study, many other techniques provide the students with ample opportunities to develop their word-recognition speed while reading. Hulstijn (2001) asserts that the students should be exposed to new materials that contain old elements to make the task less boring for the students relying on both- reading and listening. This provides the readers with the chance of understanding a text effortlessly even though they read a text in L2 for the first time. The magic is that the old elements that have been recognised have helped the students read effortlessly and, thus, save their energy for text comprehension. This, according to Hulstijn (2001), makes automaticity workouts more interesting. Some of the exercises that are suggested following this method can be reported as follows.

**a-Tell the difference.** This exercise requires the learners to simultaneously listen to a text and follow the script that is handed to them. Nevertheless, the oral and the written versions of the material are not 100% identical; there exist some printed deviations from the oral product. Such changes can take the form of word deletion, addition or substitution. It is noteworthy that both texts are grammatical and do not contain unknown words. This activity forces the students to spot the difference between the written and the oral input quickly- in the limits of the delivery of speech.

**b-Silent reading.** Learners are given 5 minutes to read a 200-word text silently. Then, the teacher leads a whole-class discussion about the content of the text for 5 minutes; this talk focuses on the

learners' opinions, not the text's vocabulary. At the end of the discussion, the students are encouraged to read the text silently for a second time in 2 minutes.

**c-Fun reading.** This extended reading assignment requires the teacher to select texts (not too long) that are at the linguistic level of the students. The learners can choose the texts that interest them the most. The students' reward would depend on the number of texts read. This is quite the same as the 'extensive reading strategy' that many theorists consider as one of the most helpful tasks that enhance the learners' speed in recognising words. Actually, it provides the students with an extensive practice that results in automatic word recognition (Bell, 1998).

**d-Bimodal input.** The teacher presents the students with a TV program that is spoken and subtitled in the target language. Repetition in this strategy is highly recommended. This activity forces the students to listen and read at the same speed.

**e-Reversed subtitling.** This activity is quite similar to the previous one in that it makes the students watch a spoken TV program that is subtitled; this time, the TV program is spoken in the students' L1 while the subtitles are in L2. Similarly to the 'bimodal input', this method forces the students to read the subtitles at the same speed of the oral input.

It is important in this thesis to empower the learners who struggle with their reading by implementing some autonomous tasks that encourage the students' to improve their own reading automaticity. The practitioner should introduce and teach such strategies initially to enable the students to use them later, after understanding them, by themselves. One recognized strategy is the DISSECT strategy of Deschler (as cited in Warrington, 2006). When this strategy is used, the learners combine many strategies to analyse the encountered words by relying on word context and word element clues (analysis of the word morphology). The mnemonic DISSECT stands for

the 6 strategies that the readers use to enrich their vocabulary and automatise their word recognition.

**D**iscover the word's context.  
**I**solate the prefix.  
**S**eparate the suffix.  
**S**ay the stem or root of the word.  
**E**xamine the stem or root word.  
**C**heck with someone.  
**T**ry the dictionary.

The readers may need to use some or all of these strategies depending on the reading situation. Regardless of the number of the combined strategies, the readers get empowered to manage their automaticity crises (Warrington, 2006). Each step that they take helps them learn to know the word before coming to the last step that imposes the use of a dictionary. Nevertheless, in some classroom settings, it is possible for the learners to ask their teacher instead of or before/after checking the dictionary.

That being said, facilitating struggling readers in becoming more automatic readers is not an easy task; yet, it is possible. In fact, language teachers should use tasks that help their students become more confident in their reading capacities. Moreover, they should empower their learners with combined learner strategies that help in producing more autonomous readers. That is why the to-be-implemented teachers' tasks and the learners' autonomous strategies that have been iterated (and many others) in this section are expected to help the readers conquer the task of recognising words rapidly and understanding what is being read successfully.

It is noteworthy that before implementing any of the strategies that have been reported in this chapter, the teachers should know about and consider their students' needs. Equally important, they should encourage the students to become more diligent in their learning, in general, and their reading, in particular. It is also worth mentioning that teacher-student successful communication helps practitioners and learners meet their teaching/learning expectations.

## **8.2 Limitations of the study**

Examining the role of working memory, anticipation of meaning and automatic information processing in the students' reading comprehension has presented the researcher with many challenges. In spite of the encouraging results that have shown consistency with the previous research findings, the extent to which this investigation supports the previous studies remains limited. Therefore, this chapter considers the different study limitations that could be at the origin of some unexpected findings.

**-Sample size.** A sample of 100 students is not a small sample since it represents somehow more than the 1/5 of the population. Nevertheless, the results that are presented in this study remain relative to the study participants and may change when the study sample is larger. In fact, the larger a sample is, the stronger the predictive power is.

**-Assessment tools/materials reliability.** Even though the study tools and materials have been piloted prior to administering them in the full-scale study, the researcher has interpreted the study's results with caution. The truth of the matter is that there may be some misinterpretations that are caused by text properties, question types, instruction structures that may be more influential on the study's results more than the independent variables. This needs to be taken into consideration especially that some modifications have been brought to make the used tests more workable for non-native speakers. Moreover, the working memory span tasks that are used in this study are still

criticized since they are not really comprehensive and do not tap the ‘phonological loop’ component as suggested by Baddeley (2000) (See Chapter Two, Section 2.5.1). The reason is that students have not taken the test by reading *aloud* the different elements of the test strings; this could have been helpful for students to maintain the to-be-remembered information in an active state and the participants could have performed better. Unfortunately, the sample size does not allow any individual out loud reading.

**-Test administering conditions.** Taking into consideration the study’s sample size, a better version of the working memory span tasks is the automated one. Administering the test to smaller groups of 10 participants is more time-consuming and tiring than the automated tasks. This implies that the test maker may feel exhausted by the end of the day and, thus, may lose focus on some aspects while administering the test. Therefore, greater potentials of error are undeniable.

**-Participants’ level of proficiency.** Although the study participants are students who are enrolled in the same undergraduate course (3<sup>rd</sup> year), their levels of proficiency in English are somehow different. Therefore, such linguistic differences may influence the students’ performances in the study’s tests more than the independent variables in question. If the researcher could have the index of the proficiency level of each participant, the statistical analysis and the study’s results would have been more reliable.

**-Scoring criteria.** Some modifications have been brought to the original scoring methods of the working memory span task. The simplified method of scoring, also used in previous studies, may influence the results obtained. Nevertheless, the reliability of scoring methods that have been used in earlier working memory span tasks has been criticised.

**-Students’ motivation.** Unfortunately, the nuisance variables in any research work cannot be fully controlled. It is true that some students have expressed a greater level of motivation than other

students. Given that students do not read regularly, reading activities may not be of a great interest to them. In addition to that, the length or the number of some texts may discourage the students from reading them. Therefore, the motivational factors may influence to a great extent the performance of students; it is obvious that the performance of less motivated participants will not reflect their real capacities. Luckily, the number of participants who lacked motivation in this study was very limited.

**-Research time considerations.** Both experiments have been conducted in five weeks for each. This does not reflect an underestimation of the project's required time. Unfortunately, the researcher has been limited by the academic year time. It is necessary to carry out the two experimental studies before the end of the academic year or else it will be difficult for the teacher to have the participants take the tests and receive the treatment when some of them leave university, repeat the year (grade retention) or move to another group.

**-Treatment mistakes.** As reported earlier in this thesis, the control group participants of this study, as in any experimental design, have not received any treatment that would enhance their reading automaticity. Nevertheless, giving them some materials to process, even though they are not taught how to approach the texts strategically, has helped the learners, according to the researcher, become more acquainted with some repeated words and developed their word-level automaticity. Unexpectedly, they have made very limited gains in reading comprehension. Fortunately, such changes have not influenced greatly the significance of the results. That being said, it would have been better not to give students many texts to read to lessen any opportunities that would help them, even to a small extent, improve their automaticity.

**-Missing assessments.** In this research work, reading comprehension abilities of few experimental students have not been enhanced in spite of the treatment they have received. This is expected to

be due to a lack of relevant background knowledge. Therefore, the researcher should have assessed the students' background knowledge (using formal testing, not mere classroom discussion) to make better decisions- either to use pre-reading strategies that tap the existing knowledge of the students or to build their background knowledge to fit the pre-reading strategies. Such measures could not be possible in the limits of time allotted to this research.

**-Experiment group division.** It would have been better to make the experimental group and control group exchange their roles in the experiment phase. That is to say, the experiment would contain two parts. In the first part, group 01 is the experimental group and group 02 is the control one. In the second part, group 01 would become the control group and group 02 would be the experimental group. Exchanging group roles and comparing results in both parts of the experiment would give more strength and reliability to the study's results.

Overall, conducting a new research work that engages different students with different needs that are assessed by different tools logically leads to obtaining different results. Nevertheless, when the results differ from previous research works' slightly in the degree of significance, it is not a major issue. On the contrary, such differences might be inspiring and empowering for future research projects.

### **8.3 Suggestions for future research**

Considering the current study's conditions, findings and limitations, it is possible to generate some recommendations that can be taken into consideration for future research projects. One general suggestion for future a future study would be to study individual and developmental differences in reading comprehension abilities across the learners' life span. Such a project would be similar to the current study in that it considers the impact of working memory capacities, anticipation skills and automatic information processing on the reader's comprehension capacities.

This project, differently from the present study, considers age-related changes in the learners' reading comprehension since it tracks the changes that occur on the students' text processing abilities across their life span. That is to say, such a longitudinal study would give more reliable results about how these independent variables can regulate, through time, the dependent variable.

In another study, a researcher may think about using the background activation or automaticity strategies that are used in the current research differently- that is to say separately. The aim of such a project would be to compare two strategies to find out which one can be more efficient in improving the students reading comprehension. Here, the students would be divided into groups and each one receives a treatment that is based on a specific strategy. Then the researcher measures the gains students make in reading comprehension in both groups. The noticed changes would reflect the degree of efficiency of the used reading strategy.

Many studies, including the current one, consider the difficulties poor readers encounter when they approach a text and provide great amounts of information that help design tasks/activities that improve the struggling readers' reading abilities. Unfortunately, a little is said about the learners who are not struggling with their reading processes. Given that learners' needs have to be considered to help the students become better readers, it is important to consider good readers needs to make them perform even better. It is worth mentioning, in this context, that using activities that are not compatible with the students' needs and abilities are less likely to be efficient. Therefore, research has to shed light on the different problems good readers face when they read to help them excel, even more, in their reading classes. Therefore, all the readers', good or poor, needs will be met.



## **Conclusion**

In this study, working memory, meaning anticipation and processing speed have shown to be effective regulators of healthy young adults' reading comprehension. In the light of what has been obtained, implications have been presented to help EFL teachers consider the students differences in cognitive abilities to help them become more successful comprehenders of texts written in English as a foreign language. Moreover, this chapter has shed light on some of the weaknesses of this study that would help them conduct future research works more successfully. Furthermore, some points have been referred to by the end of the chapter to draw researchers' attention to some issues that may be of interest for them in future research projects.

## **General Conclusion**

The premise of this study was to speak to the contribution of working memory, anticipation, and automatic information processing to reading comprehension. In an attempt to address it successfully, several research methods have been adopted to cast light on the significance of these regulators in text processing abilities of third year English language students at the university of Frères Mentouri, Constantine, Algeria. A correlational study has been conducted to establish the nature of the relationship between working memory and reading comprehension. Further to this, an experimental research is carried out to check how anticipation can contribute to the growth of the students' reading comprehension. Additionally, a correlation and an experiment have been conducted to find out how automatic information processing correlates with and enhances the participants' text processing abilities.

At the beginning of this study, a correlational study has concerned itself with the relationship between the students' working memory capacities and their text processing abilities. The Pearson Product-Moment Correlation coefficient 'r' that is computed in this study ( $r=.81$ ) shows that there is a strong positive correlation between the students' abilities to simultaneously store and retrieve information and process complex cognitive tasks. Beside the general concept correlation, component correlations have revealed significant results. The students' ability to comprehend a sentence while storing a word correlates significantly with their ability to comprehend texts ( $r=.80$ ). Similarly, the participants mathematical ability to verify equations while storing and retrieving a word correlates strongly with reading comprehension abilities ( $r=.75$ ). That being said, it is possible to conclude that the prediction that was stated earlier in this study about the importance of working memory in reading comprehension is confirmed.

It is by means of an experiment that the contribution of anticipation abilities to reading comprehension has been analysed. Given that the number of participants is to some extent huge (100), the t-test was necessary to compare the students' performances on the pretest and the posttest. The calculated value of 't' (1.94) indicates that the experiment results are significant. That is to say, the treatment was beneficial for the students' reading comprehension. To put it differently, the experimental group students have learned how to think about a text before reading it (prior knowledge activation) to make its processing a less challenging task. Therefore, the hypothesis that supports the contribution of anticipation strategies to reading comprehension is confirmed.

The last hypothesis that was put to test in this study holds that automatic information processing correlates with and enhances the readers' comprehension of the print. To address this premise, a correlational study and an experimental design were conducted. The correlational analysis has shown that automatic information processing correlates strongly with reading comprehension ( $r=.49$ ). Similarly, in the experimental study, the t-test calculation has revealed encouraging results ( $t=2.06$ ). It is clear that each of the obtained results confirms the reliability of the other result. Both results indicate that students who can recognise words rapidly are those who show a better understanding of what they read. Therefore, the accuracy of the prediction that is based on the importance of reading automaticity in reading comprehension is proved.

On the basis of the current study's findings, it is possible to state that extending the importance of research on automatic information processing beyond elementary grades has helped slow adult readers who struggle with comprehension make gains in reading automaticity. In this study, some readers were less efficient in word recognition and required more working memory

resources to process the text. That is to say, word recognition, which is not automatized enough, has shown to be more attentionally demanding for these participants than for some faster readers. Even though such findings differ from one reader to another, they still show that, even at more advanced levels, readers use their working memory resources and word-recognition abilities to comprehend what they read. The extent to which such abilities are exploited or alternatively used depends on the level of difficulty of the reading task and the students' ability to monitor their comprehension. It is noteworthy that when students are not able to manage their cognitive resources to comprehend what they read, teachers can guide them through the reading task by having recourse to some beneficial reading strategies.

In this study, the researcher has arrived at the conclusion that reading comprehension can be attained through successful interaction between the reader and the text. Here, the readers' prior knowledge is of a primary importance for readers' comprehension. Therefore, pre-reading (schema-based) activities are required to set the mind of the students for the reading task by anticipating the text's content. In the context of this study, anticipation guides and text previewing (THIEVES) strategies have shown to be intriguing ways to activate the students' existing knowledge and encourage them to use it in anticipating the content of the to-be-read material. Such practices are supported by the constructivist learning models which are looking forward to encouraging the readers to become the creators rather than the collectors of meaning from the text.

In a nutshell, this study was expected to lay bare the importance of the university students' working memory, anticipation abilities and automatic information processing in their reading comprehension of a text written in English as a foreign language. This premise has been addressed successfully since there was a commitment of the participants in the experiments which took place in a healthy atmosphere of teaching/learning.

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## **Appendixes**

### **Appendix I: Self-evaluation Questionnaires**

### **Appendix II: Reading Comprehension Tests**

#### **II.1 Reading Comprehension Test 01**

#### **II.2 Reading Comprehension Pretest 01**

#### **II.3 Reading Comprehension Posttest 01**

#### **II.4 Reading Comprehension Test 02**

#### **II.5 Reading Comprehension Pretest 02**

#### **II.6 Reading Comprehension Posttest 02**

### **Appendix III: Working Memory Span Tasks**

#### **III.1 Reading Span Task**

#### **III.2 Operation Span Task: Part One**

#### **III.3 Operation Span Task: Part Two**

### **Appendix IV: Automaticity Test**

### **Appendix V: Anticipation Guides**

#### **V.1 Anticipation Guide 01**

#### **V.2 Anticipation Guide 02**

#### **V.3 Anticipation Guide 03**

#### **V.4 Anticipation Guide 04**

#### **V.5 Anticipation Guide 05**

### **Appendix VI: Automaticity Exercises**

### **Appendix VII: Automaticity Highlighted Texts**

### **Appendix IIX: Progress Chart**

### **Appendix IX: Data Required for the Computation of ‘r’ and ‘t’**

## Appendix I

### Self-evaluation Questionnaires

#### I.1 Self-evaluation Questionnaire 01

Please tick ( ) the appropriate box.

1. Test items are, in general, ...

Very easy      Easy      Medium level of difficulty      Difficult      Very difficult

2. I understood the short passages easily

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

3. I read and understood the text easily.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

4. I can remember text easily.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

5. I followed the text easily

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

6. The text requires a lot of efforts.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

7. The text is too long

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

8. The options are confusing

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

9. The vocabulary is familiar and easy.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

10. The ideas of the text flow logically.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

11. Some ideas in the text seem to be awkward.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

12. All the information needed to understand the text is found there.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

13. Text ideas are well organized.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

14. The time allocated to take the test is enough for me to read and answer all the questions

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

15. Do you have any further suggestions?

.....  
.....  
.....  
.....  
.....  
.....

***Thank you for your cooperation***

## I.2 Self-evaluation Questionnaire 02

Please tick ( ) the appropriate box.

1. The level of difficulty of both tests can be expressed as follows:

a-Test 01 (pretest) is more difficult than test 02 (posttest).

b-Test 02 (posttest) is more difficult than test 01 (pretest).

c-Tests 01 and 02 have the same level of difficulty.

2. I did not answer some test questions because...

a-I did not read the whole text for it is boring

b-I did not have enough time

c-I did not understand the question

d-I did not know how to justify my answer

e-The options were confusing

3. The texts are...

a-Very difficult

b-Difficult

c-Of average difficulty

d-Easy

e-Very easy

4. The texts that I enjoyed reading are...

1 2 3 4 5 6 7 8 9 10

5. The texts that discuss topics that I am knowledgeable about the most are....

1 2 3 4 5 6 7 8 9 10

### I.3 Self-evaluation Questionnaire 03 (Chapter 07)

Please tick ( ) the appropriate box.

01. I read and understood the text easily.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

-Please, justify your answer.

.....  
.....  
.....

02. The text is too long

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

03. The options are confusing

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

04. The vocabulary is familiar and easy.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

05. Some ideas in the text seem to be awkward.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

06. All the information needed to understand the text is found there.

Strongly disagree      Disagree      Neutral      Agree      Strongly agree

07. The time allocated to take the test is enough for me to read both texts and answer all the questions.

Strongly disagree

Disagree

Neutral

Agree

Strongly agree

08. The level of difficulty of both tests can be expressed as follows:

a-Test 01 (pretest) is more difficult than test 02 (posttest).

b-Test 02 (posttest) is more difficult than test 01 (pretest).

c-Tests 01 and 02 have the same level of difficulty.

09. Do you have any further suggestions?

.....

.....

.....

.....

.....

.....

*Thank you for your cooperation*

## APPENDIX II

### Reading Comprehension Tests

#### II.1 Reading Comprehension Test 01

According to the presented information, select the correct answer.

##### Section 01

1. All water molecules form six-sided structures as they freeze and become snow crystals. The shape of a snow crystal is determined by temperature, vapor, and wind conditions in the upper atmosphere. A snow crystal is always symmetrical because these conditions affect all six of its sides simultaneously.

-The purpose of the passage is to present

- A. a personal observation
- B. a solution to a problem
- C. factual information
- D. opposing scientific theories

2. When cartoonist Charles M. Schulz was a boy in elementary school, other boys teased him for being small and not very good at sports, and his art teacher told him he had no talent for drawing. He had few friends and was too shy to talk to a red-haired girl he admired. Later in life, Schulz used his childhood experiences in his comic strip Peanuts: the strip's main character, the sad and lonely Charlie Brown, represents Schulz as a little boy. Peanuts was unique at the time because it contained no adult characters. Readers fell in love with Charlie Brown, and Peanuts eventually became one of the most popular comic strips of all time.

-What is the main idea of the passage?

- A. Peanuts was the world's most widely read comic strip.

B. Schulz was a very famous cartoonist.

C. Schulz turned the pain of his youth into success as an adult.

D. The comic strip Peanuts featured children as its only characters.

3. Dr. Ellen Ochoa is an inventor and is also the first female Hispanic astronaut. Her inventions include technology to help robots inspect equipment in space to maintain safety and quality control on spacecraft. Before retiring, she logged more than 1,000 hours in space across several space missions.

-According to the passage, Dr. Ochoa is the first

A. Hispanic person to travel into space

B. inventor to travel into space

C. woman to travel into space

D. Hispanic woman to travel into space

4. Money has been used for thousands of years in nearly every culture as a means of exchange. However, today, the use of cash is becoming less and less common in modern societies all over the world. Every year, a higher percentage of purchases are made online, and even in stores customers are now using credit cards more often than cash. Many people today do all of their banking on the Internet rather than going to the bank in person.

-The author of the passage probably assumes that

A. cash will become virtually obsolete in the near future

B. using cash will become popular again

C. paying with credit cards all the time is dangerous

D. societies that do business online will struggle



5. With varying success, many women around the world today struggle for equal rights. Historically, women have achieved greater equality with men during periods of social adversity. The following factors initiated the greatest number of improvements for women: violent revolution, world war, and the rigors of pioneering in an undeveloped land. In all three cases, the essential element that improved the status of women was a shortage of men, which required women to perform many of society's vital tasks.

-We can conclude from the information in this passage that

- A. women today are highly successful in winning equal rights
- B. only pioneer women have been considered equal to men
- C. historically, women have only achieved equality through force
- D. historically, the principle of equality alone has not been enough to secure women equal rights

6. Paul is very **macho**: he loves contact sports, fast cars, and war movies. In contrast, his twin bother, Saul, enjoys chess, hiking, and astronomy.

- A. having an exaggerated sense of masculinity
- B. being competitive with one's brother or sister
- C. insecure; lacking confidence
- D. having a cheerful nature

Feedback: Contrast clue and example clues. Examples of macho activities (contact sports, fast cars, and war movies) contrast with neutral ones (chess, hiking, and astronomy).

7. The French ambassador is extremely **suave**, by which I mean that he has ability to handle any social situation graciously.

- A. able to speak more than one language
- B. handsomely stylish

- C. energetic
- D. agreeably smooth and courteous

Feedback: Definition clue. Clues: by which I mean, and the definition has ability to handle any social situation graciously.

8. Exhausted from her transatlantic flight, Judy could not stay up past 9 p.m.

-What did Judy do at 9 p.m.?

- A. Leave work
- B. Come home from the airport
- C. Get on an airplane
- D. Go to bed

9. Samuel Morse, best known today as the inventor of Morse Code and one of the inventors of the telegraph, was originally a prominent painter. While he was always interested in technology and studied electrical engineering in college, Morse went to Paris to learn from famous artists of his day and later painted many pictures that now hang in museums, including a portrait of former President John Adams. In 1825, Morse was in Washington, D.C., painting a portrait of the Marquis de Lafayette when a messenger arrived on horseback to tell him that his wife was gravely ill back at his home in Connecticut. The message had taken several days to reach him because of the distance. Morse rushed to his home as fast as he could, but his wife had already passed away by the time he arrived. Grief-stricken, he gave up painting and devoted the rest of his life to finding ways to transmit messages over long distances faster.

- Morse left the art world and helped to invent the telegraph because he

- A. was tired of painting
- B. wanted to communicate with people far away

C. experienced a personal tragedy in his life

D. was fascinated by science

10. Knowledge of another language fosters greater awareness of cultural diversity among the peoples of the world.

Individuals who have foreign language skills can appreciate more readily other peoples' values and ways of life.

How are the two sentences related?

A. They contradict each other.

B. They present problems and solutions.

C. They establish a contrast.

D. They repeat the same idea.

11. Read the sentences below and then chose the best answer to the question from the list of lettered choices that follows.

-When we write a check that we know is going to 'bounce,' we are infact performing a criminal act.

-It is a crime to knowingly write a 'hot' check, one we know we don't have sufficient funds to cover.

-What does the second statement do?

A. It provides supporting evidence for the first statement.

B. It restates the central idea of the first sentence.

C. It draws a conclusion from the first sentence.

D. It provides a contradictory point of view.

12. While most people think of dogs as pets, some dogs are bred and trained specifically for certain types of work.

The bloodhound's acute sense of smell and willing personality make it ideal for tracking lost objects or people.

What does the second sentence do?

- A. It makes a contrast.
- B. It restates an idea found in the first.
- C. It states an effect.
- D. It gives an example.

13. According to the American Sleep Disorders Association, the average teenager needs around 9.5 hours of sleep per night, possibly because critical growth hormones are released during sleep. The average adult requires between six and eight hours of sleep per night for optimal health and productivity.

How do the two sentences relate?

- A. They establish a contrast.
- B. They contradict each other.
- C. They reinforce each other.
- D. They provide a problem and solution

14. Read the passage below and then choose the best answer to the question. Answer the question on the basis of what is stated or implied in this passage.

Experienced truck drivers often travel in a convoy--a group of trucks that are traveling to the same part of the country. Convoys can help truckers to stay alert.

.....

The author implies that professional long-distance truck drivers may avoid traveling alone because:

- .....
- A. They might drive too fast.
  - B. They want to arrive before anyone else.
  - C. Accidents happen more frequently to lone truck drivers than to car drivers who travel alone.
  - D. Long-distance travel can cause drowsiness.

15. Answer the question on the basis of what is stated or implied in these passages.

French physicist Charles Fabry found ozone gas in the atmosphere in 1913. At room temperature, ozone is a colorless gas; it condenses to a dark blue liquid at -170 F. At temperatures above the boiling point of water, 212 F, it decomposes.

Ozone is all around us. After a thunderstorm, or around electrical equipment, ozone is often detected as a sharp odor. Ozone is used as a strong oxidizing agent, a bleaching agent, and to sterilize drinking water. This gas is also highly reactive. For example, rubber insulation around a car's spark plug wires will need to be replaced eventually, due to the small amounts of ozone produced when electricity flows from the engine to the plug.

-These passages imply that:

- A. Ozone is the result of pollution.
  - B. High ozone levels in the atmosphere will cause large numbers of people to buy new car batteries.
  - C. Ozone has no practical uses.
  - D. Ozone is a natural part of the Earth's atmosphere
- .....

## **Section 02**

In 1892, the Sierra Club was formed. In 1908, an area of coastal redwood trees north of San Francisco was established as Muir Woods National Monument. In the Sierra Nevada Mountains, a walking trail from Yosemite Valley to Mount Whitney was dedicated in 1938. It is called the John Muir Trail.

John Muir was born in 1838 in Scotland. His family name means "moor," which is a meadow full of flowers and animals. John loved nature from the time he was small. He also liked to climb rocky cliffs and walls.

When John was 11 years old, his family moved to the United States and settled in Wisconsin. John was good with tools and soon became an inventor. He first invented a model of a sawmill. Later, he invented an alarm clock that would cause the sleeping person to be tipped out of bed when the timer sounded.

Muir left home at an early age. He took a 1,000-mile walk south to the Gulf of Mexico in 1867 and 1868. Then he sailed for San Francisco. The city was too noisy and crowded for Muir, so he headed inland for the Sierra Nevadas.

When Muir discovered the Yosemite Valley in the Sierra Nevadas, it was as if he had come home. He loved the mountains, the wildlife, and the trees. He climbed the mountains and even climbed trees during thunderstorms in order to get closer to the wind. He put forth the theory in the late 1860s that the Yosemite Valley had been formed through the action of glaciers. People ridiculed him. Not until 1930 was Muir's theory proven correct.

Muir began to write articles about the Yosemite Valley to tell readers about its beauty. His writing also warned people that Yosemite was in danger from timber mining and sheep

ranching interests. In 1901, Theodore Roosevelt became president of the United States. He was interested in conservation. Muir took the president through Yosemite, and Roosevelt helped get legislation passed to create Yosemite National Park in 1906.

Although Muir won many conservation battles, he lost a major one. He fought to save the Hetch Hetchy Valley, which people wanted to dam in order to provide water for San Francisco. In late 1913, a bill was signed to dam the valley. Muir died in 1914. Some people say losing the fight to protect the valley killed Muir.

**16. What happened first?**

- A. The Muir family moved to the United States.
- B. Muir Woods was created.
- C. John Muir learned to climb rocky cliffs.
- D. John Muir walked to the Gulf of Mexico.
- E. John Muir visited along the east coast.

**17. When did Muir invent a unique form of alarm clock?**

- A. While the family still lived in Scotland.
- B. After he sailed to San Francisco.
- C. After he traveled in Yosemite.
- D. While the Muir family lived in Wisconsin.
- E. After he took the long walk.

**18. What did John Muir do soon after he arrived in San Francisco?**

- A. He ran outside during an earthquake.
- B. He put forth a theory about how Yosemite was formed.
- C. He headed inland for the Sierra Nevadas.

- D. He began to write articles about the Sierra Nevadas.
- E. He wrote short stories for the local newspaper.

**19. When did John Muir meet Theodore Roosevelt?**

- A. Between 1901 and 1906
- B. Between 1838 and 1868
- C. Between 1906 and 1914
- D. Between 1868 and 1901
- E. Between 1906 and 1907

**20. What happened last?**

- A. John Muir died.
- B. John Muir Trail was dedicated.
- C. Muir's glacial theory was proven.
- D. The Sierra Club was formed.
- E. John's family visited him.

*Thank you for your cooperation*



## II.2 Reading Comprehension Pretest 01

Owls, often associated with Athena, Goddess of wisdom and war, can be regarded as totems of. It is said that the feather of an owl can repel illness and negative influences. In some countries, a dead owl nailed to a stable door is believed to ward off predatory attacks by eagles on young animals. The silent passage of the owl through the forest night can be seen as a metaphor for the observation of ourselves by the gods, who make no comments but note all that we do (or do not do) in our passage through life. An unnerving metaphor, perhaps, but also possibly a comforting one.

I am not the only one to believe this. The Zuni, a native American tribe of the Pueblo peoples, believe that placing an owl feather in a baby's crib guards the baby from evil spirits. Essentially, the hooting of an owl signified the coming of death upon an individual. But leaving an owl feather in the crib was an attempt to confuse the owl so that death would not be invoked upon the infant. For me, it is unclear if this means that the owl was actually a true, positive, benevolent force. Regardless, this simply meant at the very least, that it was benign.

I remember coming home after school to my Nonnas' house and seeing a large owl tailored from twine hanging on the frame of the front door. I am not really the superstitious type. I do not believe that a rabbit's foot is lucky or that adorning my car with a trinket of Saint Christopher will preclude me from an accident. Yet, when I used to walk under her door, I felt all of my troubles melt away like snow. I felt invincible, protected, safe. Perhaps, this was just really from the comforts that Nonna had to offer me: a warm afternoon snack, afternoon cartoons, and her little quips and anecdotes about her life in bucolic Tuscany. "Owls are good luck nipote. They keep the wolves away from the sheep. Just look at the eyes. Like daggers into dark spirit's soul. No malicious force would dare cross an owl." Nonna would "hoot" at the owl any time she

felt as though she was being watched. That strange, yet familiar feeling of discomfort like there was a presence in the room faded with each “hoot.”

She passed away 30 years ago and since then, I have kept my own version of her owl hanging wherever I lived, from my childhood bedroom, my dorm room, and then eventually to its current resting place, my own home. Sometimes I “hoot” at the owl, remembering her. You may smile in a derisory, patronizing fashion at this, but it has worked so far.

-According to the information given in the text, select the correct answer.

**Reading comprehension questions**

1-According to this passage, owls are depicted as

- (A) native crafts
- (B) traditional artifacts
- (C) serendipitous charms
- (D) despised totems
- (E) cultural symbols

Please, justify your choice.

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2-In the first paragraph, the owl is depicted as

- (A) a foreboding symbol that signals famine
- (B) a supernatural being that judges all
- (C) an animal that foreshadows future events
- (D) a creative creature that is also pragmatic
- (E) a magical entity that heralds good fortune

Please, justify your choice.

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3-In the second paragraph (“Because of....children”), the author supplies which of the following?

- (A) Various societal perspectives on the existence of sorcery and dark ideas
- (B) Several cultural viewpoints indicative of the symbolic nature of an animal
- (C) Different historical accounts of a particular phenomenon
- (D) A variety of sociocultural beliefs on a very controversial topic
- (E) Mystical thinking as support of a single definition of the owls powers

Please, justify your choice.

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4-The author uses “myths” twice in the last sentence of the second paragraph in what ways?

- (A) The first is given a new definition and the second is used in a clichéd manner.
- (B) The first is associated with cultural views and the second with fear.
- (C) The first is related to certain societal beliefs and the second to untrue stories.
- (D) The first implies duplicity while the second suggests truth.
- (E) The first suggests scientific facts while the second suggests unsubstantiated claims.

Please, justify your choice.

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5-In the third paragraph (“But, it....creature”), the author implies that

- (A) a common fear underlies the truth in cultural perceptions
- (B) cultural superstitions are essentially meaningless
- (C) folk legends only apply to indigenous
- (D) tradition reveals fallacies in mystical thinking
- (E) acceptance of a time honored tradition brings people together

Please, justify your choice.

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6-In the last paragraph (“Like those....judgment”), the author makes use of

- (A) historical facts
- (B) scholarly analyses
- (C) citations
- (D) analogies
- (E) personal anecdotes

Please, justify your choice.

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***Thank you for your cooperation***

## II.3 Reading Comprehension Posttest 01

Becoming an athlete requires a tremendous amount of sacrifice. You have to trade the time you could have spent doing schoolwork, playing or simply relaxing to practice and improve your skills. Some say that only the affluent will become our greatest competitors. But claiming that only children from wealthy households can become successful athletes is like saying any bird that is not exceedingly early will never be able to catch any worms!

Talent is not something that can be bought, no matter how much money you have; the same goes for love and passion. Rather, the athletic ability that can be seen in every famous athlete is intrinsic. This does not mean that they could have gotten where they are today without practice, of course, but not any person could achieve so much with routine practice alone.

With so many children clambering to improve, it's impossible for the coaches and trainers to turn them all into champions. Some children just don't have either the talent or the motivation to cross the hurdles that will block their way in becoming a professional athlete. It's natural for the coaches to focus their attention on those who show that they are capable of going through the hardships of defeat and injury in the future and are still able to pick themselves up and work even harder.

Stating that money makes a successful athlete is both insulting and inaccurate. There have been hundreds of athletes who have come from humble beginnings and made their own way to the top. Olympic gymnastics gold-medalist Gabby Douglas admitted that among the hurdles she had to clear included being homeless at one point. Gabby was raised by a single mother, who struggled through financial issues for years and provided Gabby with the best training she could. Her story of gain after loss is one among many that shows us money doesn't define ability.

While money does factor into the education of an athlete, it is more a testament to how much you're willing to sacrifice to follow your dream than a lever towards success. No matter how much money you pour into hunting down the best coaches, the best environment, and the best equipment, if you don't have skills or passion for the sport, your efforts will never bear fruit. As master of Tae Kwon Do Kerry Roy puts it, "if you really want something bad enough, you'll find a way to get it." Money is just another hurdle that every athlete has to overcome, not a barrier that prevents them from even crossing the finish line.

-According to the information given in the text, select the correct answer.

**Reading comprehension questions**

1-The author agrees that wealth

- (A) a direct result of inherent talent
- (B) integral to the success of an athlete
- (C) a boon for those with athletic talents
- (D) the cause of talents in most athletes
- (E) a deterrent in the life of athletes

Please, justify your choice.

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02-The tone of the sentence "But claiming...worms" in the first paragraph can best be described as

- (A) prudent
- (B) jovial
- (C) enervated
- (D) emphatic

(E) acerbic

Please, justify your choice.

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03-According to the second paragraph, the author claims that

(A) wealth directly correlates with ability

(B) great athleticism comes from training

(C) training will impede athletes with raw talent

(D) enthusiasm is more important than talent

(E) the athletic ability is primarily inherent

Please, justify your choice.

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04-According to the third paragraph, an athlete's failure can be LEAST attributable to

(A) little desire to work

(B) no inherent talent

(C) lack of financial funding

(D) inability to endure hardships

(E) too much competition

Please, justify your choice.

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05-The author, in the concluding paragraph, considers "money" to be

(A) a catalyst to finding inherent talent

- (B) as important as training for success
- (C) the most important element of success
- (D) secondary to innate skill
- (E) instrumental in becoming a trainer

Please, justify your choice.

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06-The author's tone in this passage is

- (A) critical
- (B) optimistic
- (C) absolute
- (D) didactic
- (E) elitist

Please, justify your choice.

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*Thank you for your cooperation*



## II.4 Reading Comprehension Test 02

I have always believed that the human conscience does not just self-extinguish at the point of death. It is a question that has interested scientists, theologians, occultists, and philosophers through ages.

Aristotle made clear links between the “existence” and the “essence” in his *Metaphysics*. These ideas had a profound influence not only on the Greeks but subsequent civilizations: the Romans, Arabs and Medieval Europeans. The concept of “the existence” has remained largely unchanged in the various interpretations over time: that is to say that “existence” is the state of physical being- flesh and blood. The idea of the “essence,” however, is not so straightforward.

Philosophers and, indeed, some psychologists might regard the “essence” as a product of the subconscious or the unconscious mind. Often, the characteristics shown by the “essence” differ greatly from those exhibited by the conscious person. In Layman’s terms, our “essence” sometimes forces us to act against our better judgment.

A theologian, on the other hand, might regard the “essence” of man as his immortal soul. Some would suggest that at death, our souls are either elevated into the dizzying heights of paradise or to the inferno of Hell. The idea that the way in which one conducts oneself in life determines one’s ultimate destiny is one which popular culture is well acquainted with.

In some Eastern cultures, the “ultimate” destiny is not so clearly defined. For instance, one’s “essence” could be reincarnated into one of many forms, and the birth-death-rebirth cycle could be repeated indefinitely. The idea of the “Seven Heavens” also suggests that life after death could indeed be more illustrious than life itself; one would continue to strive to reach the highest level by achieving ever greater degrees of virtue.

In contrast to the spiritual views above, occultists' views are usually considered heretical by mainstream faiths. I suspect this is mainly caused by the fear of the paranormal and mystical. This fear is perhaps due to the tendency of these sects to revere the less celebrated side of the after-life. In reality, many occultists seek to harmonise and manipulate the "essence" in order to benefit the "existence."

How, then, do scientists make sense of all these different beliefs? As a scientist, one is obliged to seek an explanation for prevailing conceptions. Early scientific views include the ability of the human body to project its consciousness in the form of electrical impulses that linger on in inanimate objects. These impulses can be then transferred in a finite quantity, subject to the laws of conservation of energy. A less skeptical interpretation of this would point to an explanation for the existence of ghosts or supernatural entities. There is no doubt that our bodies are constantly emitting radiation over a wide range of frequencies. Most of this is in the form of non-visible photons or infrared (heat). On very rare occasions, the radiation can overlap into the visible sightings of the human aura, a luminous glow around a person. Arguably, these apparitions have yet to be credibly proven or perhaps can be seen only by individuals with peculiar sight disorders. After all, vampire bats are known to hunt their prey by seeking out infrared wavelength traces and many nocturnal animals are able to track their prey by "seeing" the ultraviolet emissions of excrement.

A recent series of experiments at the university of Hertfordshire in the U.K. suggests the existence of low frequency sound waves or infrasound which can cause phenomena that people typically associate with ghosts. This includes feelings of nervousness and discomfort as well as a sense of "presence" in the room. The sound waves may also cause vibration in the human eye,

causing people to see things that are not there. Usually, these waves are too low-pitched for people to actually perceive so rather than noticing the sound itself, people notice its effects.

Regardless of whether the supernatural exists, many people find it fascinating. This fascination has a number of likely causes, from curiosity about what happens to people after death to the comforting idea that deceased loved ones are still nearby. After all, I refuse to accept the premise that I will eventually just cease to exist!

- According to the information given in the text, select the correct answer.

### **Reading comprehension questions**

1-the primary purpose of the passage as a whole is to

- (A) investigate the contention between science and mythology
- (B) present a scholarly and passionate discussion of popular beliefs
- (C) bring an arcane belief system back into the public eye
- (D) debunk scientific hypotheses using supernatural evidence
- (E) connect ideas about the afterlife to cultural bias

2-In context of the entire passage, the purpose of the second paragraph is to

- (A) foreshadow the author's conclusion
- (B) introduce an important distinction
- (C) deconstruct popular convention
- (D) give context to an archaic notion
- (E) develop two conflicting ideas

3-The author uses the phrase "In reality" in paragraph 06 in order to

- (A) rectify a misconception
- (B) transition to a new topic

- (C) propose a theory
- (D) mock an idea
- (E) define a mysterious concept

4-The scientists relationship to “these different beliefs” in 07 paragraph is most analogous to which of the following?

- (A) an apprentice chef recreates a dish that he temporarily forgot the recipe to.
- (B) an architect draws up schematics that don’t fit the needs of a client
- (C) a young student tries to answer a math question from his older brother’s homework
- (D) a magician amazes a crowded auditorium by making her assistant disappear
- (E) a therapist attempts to account for the source of a patient’s deathly fear of snakes

5-The question in paragraph 07 signals a shift in topic from

- (A) popular perception to religious devotion
- (B) regular misconception to academic parody
- (C) well-known fables to technical understanding
- (D) spiritual exploration to scientific inquiry
- (E) non-traditional views to conventional wisdom

6-The discussion of the vampire bats in paragraph 07 (“After all...excrement”) serves to

- (A) provide a natural evidence of a seemingly unnatural phenomenon
- (B) discredit a scientific approach to a non-scientific issue
- (C) supplement the evidence presented with a common superstition
- (D) qualify a previously stated fact with a piece of evidence
- (E) call attention to a specific contradiction to the argument

7-The theory presented by the University of Hertfordshire in paragraph 08 differs from the other explanations offered in that

- (A) it deals with the supernatural, while the others discuss a natural phenomenon
- (B) is based solely on sound waves, while the other theories are based on sight
- (C) is concerned only with sounds, while the others take into account all the five senses
- (D) deals with natural evidence, while the others are concerned with hypothetical situations
- (E) involves physical scenarios, while the others consider intangible experiences

8-Which best describes the author's tone in the final sentence of the passage?

- (A) dismissive
- (B) empathetic
- (C) vehement
- (D) capricious
- (E) pensive

*Thank you for your cooperation*

## **II.5 Reading Comprehension pretest 02**

### **Passage 01**

The sad truth is that most people can say that they have experienced some form of bullying. I know I have. It can range from mean comments to hallway shoving to threatening text messages, and everything in between. With the emergence of social networking sites, we now not only face bullying in person, but also cyber bullying. These social networking sites are places where a vast majority of the social activities of teen life is both echoed and amplified for better or for worse.

It's no secret that getting bullied is hurtful. But when a student, or any individual, gets bullied in person, there's only so much damage a bully can do before the possibility of someone stepping in and stopping them. In cyberspace, bullying takes on a whole new meaning. Now perpetrators can gain momentum with others chiming in as well. And the others who do decide to join in on the bullying don't need to leave the ease and the comfort of their chairs; they simply press a few buttons on the keyboard and they're done. But the impact of those who are bullied is lasting.

Bullying is just as much of a public health problem as it is the victim's or the individual's problem, as it causes major concerns for the overall school environment. High schools with a high rate of bullying scored much lower on standardized tests than those with lower rates of bullying. These lower test scores affect the school's capacity to meet federal requirements as well as the educational achievement of many students who do not pass the exams. This is a problem for the schools because of the No Child Left Behind Act, in which students must receive a passing score on the standardized tests to graduate. Under this act, schools are now under pressure to do something about the bullying.

To stop bullying, we need to work together to educate everyone and get everyone involved: administrators, parents, and the students. President Barack Obama recently started a campaign against bullying and Lady Gaga has her own foundation called Born This Way to help spread the message. But these are just some outlets, and unless society as a whole does what is needed to combat this problem, the consequences of bullying will only get worse. We do not permit harassment and the abuse of adults in the workplace, why shouldn't similar protections be afforded to children in school?

### **Passage 02**

After schools specials are not as popular now as they were in the 80's, but those who watched them can recall at least one of those specials being on bullying. Today, high profile cases like that of Tyler Clementi have brought bullying to the forefront of America's collective social mind. But what some seem to be forgetting is that bullying has been around long before the media put it in the hot seat. Bullying has not gotten worse over the years, according to studies in the field, but rather the media attention that it has received, due to the devastating results of bullying, has highlighted the major problem.

According to a popular website that tracks bullying, "Bullying is unwanted, aggressive behavior...that involves a real perceived power imbalance. The behavior is repeated, or has the potential to be repeated, over time. Bullying includes actions such as making threats, spreading rumors, hitting someone physically or verbally, and excluding someone from a group on purpose." The argument that these instances are simply children being children is no longer a viable excuse. In an age of interconnectedness, bullying has reached a new plateau. The

perpetrators don't just have to pose a physical threat; they now have the internet at their disposal and can do their damage without leaving the comfort of their own homes.

The act of bullying doesn't only have an effect on the victim. For the perpetrators, bullying can be the beginning of a trajectory of trouble. This often includes conduct disorder, skipping school, substance abuse, and eventually, even adult criminal behavior. For the victims, being bullied leads to not simply immediate physical and emotional pain, but many times the impact can extend into later life. The scars don't go away; they stay with the victims into adulthood. The ripple effect doesn't stop at the bully and bullied, those who are simple witnesses and are not directly involved in bullying are more likely to skip school or abuse alcohol. A climate of fear affects everyone.

Unfortunately, the old way of doing things such as suspension and expulsion doesn't stop bullying. Punishment-based strategies don't give students the tools they need to make lasting behavioral changes. Those who have a tendency to victimize others, usually have weak social skills and no emotional regulation, which can definitely be contributors to bullying behaviors. Therefore, the best strategy to combat bullying is a comprehensive approach. This includes getting the bullies involved. It may sound counterintuitive, but the bullies need help too, maybe the most help. If we can get through to them, we can come close to eliminating the problem altogether.

-According to the information presented in the two passages, select the correct answer.

### **Reading comprehension questions**

1-Paragraph 01 (passage01) suggests that 'social networking sites' are places that should be considered

(A) specifically for teens



- (B) both beneficial and deleterious
- (C) ripe with social activities
- (D) loud and raucous
- (E) prone to bullying

Please, justify your choice.

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2-According to the second paragraph of passage , the author implies that cyberspace bullying is

- (A) worse than in-person bullying because it is less likely that someone will stop it
- (B) less hurtful than in-person bullying because other people in cyberspace chime in to help the victim
- (C) indicative of the fact that lazy people bully more than active people do
- (D) proof that bullying online has a longer lasting impact than physical bullying
- (E) less damaging than being bullied in person because it cannot get physical

Please, justify your choice.

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3-In passage 01, the third paragraph highlights that

- (A) harsher consequences are needed for the perpetrators
- (B) social networking sites should be shut down
- (C) programs to treat the bullies themselves should be started
- (D) bullies respond better to positive reinforcement
- (E) bullying is detrimental to academic performance

Please, justify your choice.

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4-Which best describes the function of the qualification in the 4<sup>th</sup> paragraph of passage 01 (“But these....worse”)?

- (A) Deride the use of famous people to highlight a significant social problem.
- (B) Subtly hint that certain campaigns or foundations are futile in their efforts.
- (C) State that some stars do more to promote bullying than to stop it.
- (D) Make a claim that all segments of society must participate in solving this problem.
- (E) Extol the president’s work in trying to combat this heart-wrenching problem.

Please, justify your choice.

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5-The first paragraph of passage 02 (“Today, high....problem”) suggests that greater media attention is due to

- (A) the fact that bullying has been going on for years
- (B) a lack of television programs that deter bullying
- (C) a rising number of high profile cases
- (D) the consequences of bullying becoming more severe
- (E) an increase in the number of studies devoted to bullying

Please, justify your choice.

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6-The “perpetrators” (second paragraph of passage 02) and “victims” (third paragraph of passage 02) are described as

- (A) similar in their experience of physical pain
- (B) similar in their obvious emotional affliction
- (C) similar in that they both suffer in the long term
- (D) different in the responsibility they bear toward their predicament
- (E) equally embarrassed by social interaction

Please, justify your choice.

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7-In the last paragraph of passage 02 (“Punishment-base...behaviors”), the author implies that

- (A) punishment is not the answer to the problem of bullying
- (B) teaching a young child manners will benefit the society
- (C) most high school students lack social intelligence
- (D) bullies are predisposed to having negative emotions
- (E) nobody has tried alternative solutions in treating bullying

Please, justify your choice.

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8-In their opening paragraphs, the two passages differ in that

- (A) Passage 01 addresses the cause of bullying, whereas Passage 02 proposes a solution to the problem
- (B) Passage 01 offers a personal anecdote, whereas Passage 02 uses statistical data

(C) Passage 01 discusses the changing nature of bullying, whereas Passage 02 underscores the media attention it has received

(D) Passage 01 paints a bleak picture, whereas Passage 02 takes a more optimistic view

(E) Passage 01 focuses on cyber bullying, whereas Passage 02 only mentions in school bullying

Please, justify your choice.

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9-The solutions presented in the last paragraph of each passage differ in that

(A) Passage 01 advocates stronger punishment for bullies, whereas Passage 02 advocates more leniency

(B) Passage 01 calls for an increase in funds to solve the problem, whereas Passage 02 suggests a more efficient use of existing funds

(C) Passage 01 advocates more education for the victim, whereas Passage 02 places emphasis on educating the bully

(D) Passage 01 advocates collaboration between authority figures and teens whereas Passage 02 advocates focusing on the bully.

(E) Passage 01 advocates passing new anti-bullying laws, whereas Passage 02 proposes more enforcement of existing laws

Please, justify your choice.

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10-The author of passage 02 would respond to the excerpt “Bullying is...environment” (paragraph 03 of passage 01) by

(A) Agreeing and explaining that schools with a high rate of bullying score much lower on standardized tests

(B) Agreeing and citing examples of mental disorders and substance abuse increasing due to bullying

(C) Disagreeing and explaining that the problem is primarily that of the bully, not the victim

(D) Staying neutral and saying that it all depends on if the bullying is done in person or on cyberspace

(E) Equivocating and wavering about the causes and the solutions for a so-called social problem

Please, justify your choice.

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*Thank you for your cooperation*

## II.6 Reading Comprehension Posttest 02

### Passage 01

Life today is littered with exams. From the day we were born, our progress is measured at nearly regular intervals, moments when we find ourselves trapped in a chilly hall, our bodies tense with nerves, mouths rigidly tight, hearts beating fast. We sit at a desk, a closed booklet before us, a pen gripped in one hand. The other hand fiddles with the lucky charm we brought with us. Scribble, scribble, scribble: our future expends on this exam! For many of us, an exam is a torture far worse than anything invented by the Spanish Inquisition.

The author Michael Mopurgo once said, “one of the great failings of our education system is that we tend to focus on those who are succeeding in exams, and there are plenty of them. But who we should be looking at- are those who fail.” He puts his finger accurately on the limitation of any examination system. If you pass an exam, you are eligible for the next step in life: if you fail, then hard luck! You’re finished. Thank you so much for your effort, but your future is terminated.

Of course, that is a sweeping statement. We all know and admire people who have been successful in life, despite their failures in the exam hall. For example, many of our best actors left school without any success in the exam stakes. A famous actress once said, “you don’t take exams for acting: you take courage.” She was right. One of the ironies in life today is that many of the great actors, ad businessmen, and authors, and pop-singers, who never made it to university because they failed exams, are offered honorary degrees by universities in recognition of their success. Am I alone thinking that this is a rather patronizing gesture?

For, intended or not, there is often an elitism implied in the system of exams that we enforce at every step of people’s lives. To some people, letters before or after one’s name suggest that one has arrived at a level which somehow implies that one is better intellectually,

economically, socially, and perhaps even morally, than those who have not made the grade. Common sense should tell us that it isn't necessarily so. We are individuals and each one of use approaches life in a different way. We should not feel bullied and dragooned by a system that insists we conform to a set pattern or to be dismissed.

## **Passage 02**

With the “No Child Left Behind Act,” recent concerns have arisen amongst educators about the role that exams play in determining a school’s federal funding. With this act, teachers must adjust their lessons plans to prepare their students for standardized exams. Consequently, some question whether this act is merely a superficial quick fix since its aim is to secure a school’s pecuniary stability and not necessarily improve its educational approach. This act forces educators to focus on their school’s Adequate Yearly Progress, or AYP. Since AYP has become a “hot button” issue, factious quarrels have pervaded even the most common of educators’ conversations.

However, meeting or exceeding AYP objectives is a significant step toward educational reform. AYP sets reasonable goals for each school and is a steadfast method for keeping educators accountable. And these goals are actually quire reasonable because each AYP plan is specified to an individual school’s target areas. Experienced educators, commissioned via the “No Child Left Behind Act,” compile data based on the median student of his or her state. The AYP’s criteria is then utilized to set the troubled school’s progress plan for the next year. Ultimately, those critical of the standardized examination tend to forget that the word “adequate,” within the acronym AYP, is not tantamount to nuclear fission or organic chemistry. “Adequate” simply means satisfactory. No one is proposing that the school becomes an

International Baccalaureate overnight. Such hyperbole is often used, however, to refute the necessity of examination.

Because public schools rely on federal funding to operate, it is imperative that they provide the necessary proof (in particular, sufficient AYP results) to secure that money. However, some disagree. “This type of education only works to gloss over the crux of a systematic problem detailed by the almighty dollar,” said Anna Thompson, a high school teacher for more than twenty years. She believes that there are possible correlations between a school’s socioeconomic background and AYP results. Ergo she asks, “how can a school acquire the much needed funding to succeed the AYP objectives, if it relies on that same funding to reform its teaching staff? It’s a Catch-22 in which teachers who are needed in failing districts are instead hired in more affluent towns because these districts can offer higher salaries. “bubbling up” the answer key, taking the cash, and cashing the check- this is not education.”

Yet, Anna and her supporters tend to forget a very important detail. Schools in need of AYP are below standards that are set in place by their respective states. Thus, while some teachers may feel the pressure to confirm their lessons plans toward a standardized test, the concepts that they are preparing their students for are not abstract, collegiate, erudite theories. Rather, they are basic practices and applications that any school should be able to sustain. Otherwise, what can we reasonably expect from our students if our educational system doesn’t look out for them?

- According to the information presented in both passages, select the correct answer.

### **Reading comprehension questions**

01-The passage 01 author’s statement “Of course...statement” (paragraph 03) serves to



- (A) assert that a claim is entirely correct
- (B) admit to a personal bias against an idea
- (C) acknowledge that a view might seem unreasonable
- (D) recognize that an opposing argument is convincing
- (E) digress into an unrelated topic not previously mentioned

Please, justify your choice.

.....

.....

02-According to the third paragraph of passage 01, the author believes that offering “honorary degrees” to the great actors, and businessmen, and authors, and pop singers” is

- (A) condescending
- (B) commendable
- (C) understandable
- (D) inappropriate
- (E) uninteresting

Please, justify your choice.

.....

.....

03-According to the information presented in the last paragraph of passage 01, the author most likely considers the system of test-taking to be

- (A) a necessary evil
- (B) a logical requirement
- (C) a celebrated tradition
- (D) a monotonous procedure
- (E) an oppressive practice

Please, justify your choice.

.....  
.....

04-The phrase “fractious quarrels have pervaded” in passage 02 (second paragraph) suggests that

- (A) students are embracing AYP standards
- (B) contention over the AYP debate is widespread
- (C) educators are in general agreement over AYP
- (D) public schools take issue with AYP while private schools do not
- (E) disagreement is inevitable between students and teachers

Please, justify your choice.

.....  
.....

5-In the second paragraph of passage 02, the author believes that “AYP” is

- (A) an exaggerated and impossible goal to reach
- (B) the cause of problems in troubled schools
- (C) a dangerously strict standard for high schools
- (D) a means to improve long term educational goals
- (E) a clever money-making tool for failing schools

Please, justify your choice.

.....

.....

6-The “type of education” discussed in the third paragraph of passage 02 refers to education that

- (A) incorporates a rigorous physics and chemistry curriculum
- (B) inspires creative solutions to problems in the education system
- (C) is ultimately dictated by the federal funding school gets
- (D) directs educators to schools that are in need of quality teachers
- (E) challenges the notion that educators must teach to a test

Please, justify your choice.

.....

.....

7-The tone of “Bubbling up...education” in the third paragraph of passage 02 can be best described as

- (A) regretful
- (B) inspirational
- (C) skeptical
- (D) derisive
- (E) amused

Please, justify your choice.

.....  
.....

8-Unlike the author of passage 01, the author of passage 02 explicitly expresses a view about the

- (A) bureaucracy behind standardized testing
- (B) controversy surrounding elitism in education
- (C) impact on the individual student
- (D) importance of a college degree
- (E) author’s experiences as a test taker

Please, justify your choice.

.....  
.....

9-How would “Anna Thompson” (third paragraph of passage 02) respond to the statement “To some...grade” in the last paragraph of passage 01?

(A) Life achievement is not based on the grades that a student will obtain throughout years of standardized testing.

(B) The letters before or after one’s name are indicative of how hard an individual is willing to work to achieve goals

(C) The system of test taking is engineered to appeal to students who learn based on their own set of individual standards.

(D) student grades rarely have an impact on the Adequate Yearly Progress of the average high school.

(E) There may be a connection between an institution’s socioeconomic background and the students’ academic performance.

Please, justify your choice.

.....  
.....

10-The concluding sentence of each passage makes its point by

(A) citing scholarly analysis

(B) detailing personal experiences

(C) inciting collective interest

(D) questioning accepted opinions

(E) quoting an authority

Please, justify your choice.

.....

.....

***Thank you for your cooperation***

## Appendix III

### Working Memory Span tasks

#### III.1 Reading Span Task

Please tick ( ) the appropriate box and rewrite the recalled words at the end of each set.

##### Practice set

1. Driving in the rain is dangerous because of reduced adhesion to the road.

Correct      Incorrect

2. After out of the jumping, the relieved paratrooper parachute was when his finally opened plane.

Correct      Incorrect

3. The teens took a hike with their picnic basket all the way to Shyer Falls.

Correct      Incorrect

Recalled words: 1.....2.....3.....

##### Set 01

1. In a flash of fatigue and fantasy, he saw a fat Indian sitting beside a campfire.

Correct      Incorrect

2. The sat lieutenant beside man the walkie-talkie with the and stared at muddy the ground.

Correct      Incorrect

Recalled words: 1.....2.....

##### Set 02

3. I will not shock my readers with a description of the cold-blooded butchery like that one.

Correct      Incorrect

4. The courses are designed as much for professional engineers as for amateur learners.

Correct      Incorrect

Recalled words: 1.....2.....

**Set 03**

5. The taxi up turned Avenue Michigan, they where had a view clear of the lake.

Correct      Incorrect

6. The words of love human have used been by the to describe saints their of vision God.

Correct      Incorrect

Recalled words: 1.....2.....

**Set 01**

7. It was shortly after this that an unusual pressure of business called me out of town.

Correct      Incorrect

8. He pursued this theme by pretending to seek for information to quiet his own doubts.

Correct      Incorrect

9. I was so surprised at this unaccountable apparition, that I was speechless for a while.

Correct      Incorrect

Recalled words: 1.....2.....3.....

**Set 02**

10. When last at his opened eyes, there was of no anger triumph, shade no of gleam.



Correct      Incorrect

11. Wooden forebodings Filled dreary with these fearfully, opened I the heavy door.

Correct      Incorrect

12. I'm not certain what went wrong but I think it was my cruel and bad temper.

Correct      Incorrect

Recalled words: 1.....2.....3.....

**Set 03**

13. I imagine that you have a shrewd suspicion of the visit of my early object.

Correct      Incorrect

14. I my turned memories at over random like a photograph in pictures album.

Correct      Incorrect

15. I get tired of trying to convince him that I don't love him for his money.

Correct      Incorrect

Recalled words: 1.....2.....3.....

**Set 01**

16. The woman hesitated for a husband to taste the onions because her moment hated the smell.

Correct      Incorrect

17. Was It your significance about the my going of me suffering that kept thought.

Correct      Incorrect

18. In fact, there were so many people that I could not find a seat.

Correct      Incorrect

19. With shocked amazement and appalled fascination, Marion looked at the pictures.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....

**Set 02**

20. When there are days I live the city where in morning the wakes with a strange look.

Correct      Incorrect

21. We wanted boys to them warn, but we backed when it down the came to pinch.

Correct      Incorrect

22. He stood there at the edge of the crowd while they were singing, and he looked glum.

Correct      Incorrect

23. What after come this would day would be different inconceivably, would real be life.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....

**Set 03**

24. Annoyed John became with Karen's habits her bad of chewing nails and biting gum.

Correct      Incorrect

25. Without paying attention, she leaned over the candle and her hair caught on fire.

Correct      Incorrect

26. Is it life, of course, that possible not arise did on the at all earth.

Correct      Incorrect

27. The poor lady was thoroughly persuaded that she was not long to survive this vision.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....

**Set 01**

28. Unfortunately, the hunting knife was so sharp that it cut his right hand.

Correct      Incorrect

29. The resound of announcement it would penetrate throughout the world, remotest to the land.

Correct      Incorrect

30. To do in so directions that are for adaptive mankind would be a realistic objective.

Correct      Incorrect

31. Slicing out it carefully with his knife, he creasing folded it without the face.

Correct      Incorrect

32. He laughed sarcastically and looked as if he could have poisoned me for my errors.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....5.....

**Set 02**

33. She soon realized that the man forgot to leave the room key.

Correct      Incorrect

34. May the reader suppose that other motives I had, besides the escape to desire the law.

Correct      Incorrect

35. On the letters where she wrote her desk was a objects of clutter in coated dust.

Correct      Incorrect

36. He stuffed his denim pants into his jacket and the stiff fastened, new securely snaps.

Correct      Incorrect

37. He had an odd elongated skull which sat on his shoulders like a pear on a dish.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....5.....

**Set 03**

38. There was absolutely nothing left to do except leave and turn the page.

Correct      Incorrect

39. The basic heroes of the characteristic in the preceding stories is their sensitivity love.

Correct      Incorrect

40. He listened carefully because he had the weird impression that he knew the voice.

Correct      Incorrect

41. Had she patronized him when was he a teased schoolboy and when him he was a man.

Correct      Incorrect

42. The rain and howling wind kept beating against the rattling window panes.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....5.....

**Set 01**

43. His heart he covered it both with hands to keep hearing from anyone the made noise.

Correct      Incorrect

44. The all stories deal with a protagonist middle-aged who withdraw to the attempts from world.

Correct      Incorrect

45. Without balance there could no be either tension in or in nature mechanical shape.

Correct      Incorrect

46. I wish there existed someone to whom I could say that I felt a huge hatred.

Correct      Incorrect

47. Popular foods people cannot live without in the summer are water melon and sweet corn.

Correct      Incorrect

48. The intervals of progressively silence grew longer; the drove delays him out of his mind.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....5.....6.....

**Set 02**

49. Two or three substantial pieces of wood smoldered on the hearth, for the night was cold.

Correct      Incorrect

50. I imagined that he had been thinking things over while the secretary was with her friends.

Correct      Incorrect

51. There was more than breakfast still before an hour, and the house was in complete silence.

Correct      Incorrect

52. He leant on the bridge of the parapet and the two policemen watched him from distance.

Correct      Incorrect

53. These splendid melancholy eyes were turned upon me from the mirror with a haughty stare.

Correct      Incorrect

54. He sometimes considered suicide but the thought was too oppressive to remain in his head.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....5.....6.....

**Set 03**

55. The digital products of electronics will play your role in an important future.

Correct      Incorrect

56. One problem with this explanation is that there appears to be no defense against cheating.

Correct      Incorrect

57. Sometimes the scapegoat is an outsider who has been taken into a different group.

Correct      Incorrect

58. The train of an approaching sound woke him, and he started to his feet.

Correct      Incorrect

59. The boisterous laughter of the children was disturbing the aged in the neighboring building.

Correct      Incorrect

60. In comparison to his earlier works, the musician had developed a unique and enthralling style.

Correct      Incorrect

Recalled words: 1.....2.....3.....4.....5.....6.....

*Thank you for your cooperation*

### III.2 Operation Span Task: Part One

Please tick ( ) the appropriate box and rewrite the recalled words at the end of each set.

#### Practice exercise

-Is  $(3/1) - 1 = ? 1$  (FALSE) Snow

TRUE                      FALSE

-Is  $(7*3) - 3 = ? 19$  (FALSE) Blade

TRUE                      FALSE

Recalled words: 1.....2.....

#### Set 01

01-Is  $(25*3) + 4 = ? 89$  (FALSE) Status

TRUE                      FALSE

02-Is  $(8*2) - 8 = ? 24$  (FALSE) Paper

TRUE                      FALSE

03-Is  $(27/3) + 1 = ? 10$  (TRUE) King

TRUE                      FALSE

Recalled words: 1.....2.....3.....

#### Set 02

04-Is  $(12*5) + 5 = ? 60$  (FALSE) Spring

TRUE                      FALSE

05-Is  $(4*2) + 6 = ? 14$  (TRUE) Wood

TRUE                      FALSE

06-Is  $(4/4) + 7 = ? 11$  (FALSE) Sport



TRUE FALSE

Recalled words: 1.....2.....3.....

**Set 03**

07-Is  $(46/2) + 2 = ? 26$  (FALSE) Maze

TRUE FALSE

08-Is  $(3*9) - 9 = ? 18$  (TRUE) Star

TRUE FALSE

09-Is  $(26/13) - 2 = ? 0$  (TRUE) Control

TRUE FALSE

10-Is  $(8/2) + 9 = ? 14$  (FALSE) Winter

TRUE FALSE

Recalled words: 1.....2.....3.....4.....

**Set 04**

11-Is  $(3/3) - 0 = ? 0$  (FALSE) Belief

TRUE FALSE

12-Is  $(18*2) - 30 = ? 8$  (FALSE) Blur

TRUE FALSE

13-Is  $(18/9) - 1 = ? 1$  (TRUE) Proof

TRUE FALSE

14-Is  $(22*3) - 6 = ? 60$  (TRUE) Play

TRUE FALSE

15-Is  $(5/5) + 8 = ? 9$  (TRUE) Cream

TRUE FALSE

Recalled words: 1.....2.....3.....4.....5.....

**Set 05**

16-Is  $(4*3) + 4 = ? 16$  (TRUE) burst

TRUE FALSE

17-Is  $(24/3) + 2 = ? 12$  (FALSE) school

TRUE FALSE

Recalled words: 1.....2.....

**Set 06**

18-Is  $(30*2) - 15 = ? 15$  (FALSE) Bloomer

TRUE FALSE

19-Is  $(15*3) - 12 = ? 33$  (TRUE) Week

TRUE FALSE

20-Is  $(4*5) - 5 = ? 16$  (FALSE) Campus

TRUE FALSE

Recalled words: 1.....2.....3.....

**Set 07**

21-Is  $(2*6) - 4 = ? 6$  (FALSE) Trip

TRUE FALSE

22-Is  $(11*9) - 8 = ? 91$  (TRUE) Lunch

TRUE FALSE

Recalled words: 1.....2.....

**Set 08**

23-Is  $(39/13) + 3 = ? 3$  (TRUE) Glass

TRUE FALSE

24-Is  $(16*2) - 3 = ? 30$  (FALSE) Image

TRUE FALSE

25-Is  $(3*8) - 1 = ? 23$  (TRUE) Hole

TRUE FALSE

26-Is  $(35/7) + 5 = ? 10$  (TRUE) Exam

TRUE FALSE

Recalled words: 1.....2.....3.....4.....

**Set 09**

27-Is  $(44/11) + 4 = ? 8$  (TRUE) Bumper

TRUE FALSE

28-Is  $(6/3) + 1 = ? 3$  (TRUE) Glove

TRUE FALSE

29-Is  $(7/7) + 6 = ? 7$  (TRUE) Monday

TRUE FALSE

30-Is  $(19*2) - 17 = ? 22$  (FALSE) Holder

TRUE FALSE

Recalled words: 1.....2.....3.....4.....

**Set 10**

31-Is  $(25*4) - 30 = ? 70$  (TRUE) Boost

TRUE                      FALSE

32-Is  $(7/7) + 3 = ? 3$  (FALSE) Disdain

TRUE                      FALSE

33-Is  $(16/8) + 6 = ? 10$  (FALSE) Bullet

TRUE                      FALSE

34-Is  $(17*2) + 5 = ? 40$  (FALSE) Sheet

TRUE                      FALSE

35-Is  $(3*3) - 7 = ? 2$  (TRUE) Ball

TRUE                      FALSE

Recalled words: 1.....2.....3.....4.....5.....

**Set 11**

36-Is  $(13*2) - 5 = ? 20$  (FALSE) Crown

TRUE                      FALSE

37-Is  $(6*5) + 6 = ? 17$  (TRUE) Grudge

TRUE                      FALSE

38-Is  $(33*3) - 9 = ? 90$  (TRUE) Smile

TRUE                      FALSE

39-Is  $(6/3) + 6 = ? 9$  (FALSE) Phone

TRUE

FALSE

40-Is  $(3*1) - 2 = ? 1$  (TRUE) Chain

TRUE

FALSE

Recalled words: 1.....2.....3.....4.....5.....

*Thank you for your cooperation*

### III.3 Operational Span Task: Part Two

In this test, you will try to memorise letters you see while you also solve simple math problems.

First, you will have some practice to get you familiar with how the task works.

We will begin by practicing the letter part of the experiment.

For this practice set, 4 letters will appear one at a time.

Try to remember each letter in the order presented.

After all the letters have been shown, you will see a list of 12 possible letters. Your job is to select each letter in the order presented by writing a number next to the appropriate letter.

Remember, it is very important to get the letters in the same order as you see them.

#### Practice exercise

D

H

R

N

R                    S                    H (2)

O                    B                    L

D (1)                R (3)                T

M                    J                    N (4)

1-

F

P

T

Q

Select the letters in the order presented using numbers.

F	H	J
K	L	N
P	Q	R
S	T	Y

2-

H

K

T

J

F	H	J
---	---	---

K	L	N
---	---	---

P	Q	R
---	---	---

S	T	Y
---	---	---

3-

S

N

R

P

F	H	J
---	---	---

K	L	N
---	---	---

P	Q	R
---	---	---

S	T	Y
---	---	---

-Now you will do the math part of the experiment.

A math problem will appear. You have to compute the correct answer mentally (no papers, pens or calculators are allowed)

Consider the suggested solution and put a check mark in the appropriate box.

**Practice exercise**

$(2*2) + 1 = ? 6$  (FALSE) / the correct answer is '5'

$(2*1) + 1 = ? 3$  (TRUE)

-For example, if you see the problem and number 5, check the TRUE box because the answer is correct.

If you see the problem  $(2*2) + 1 = ?$  and number 6, check the FALSE box because the answer is 5, not 6.

It is very important to get the math problems correct. It is also important that you try and solve the problem as quickly as you can.

$(2*1) + 1 = ? 3$  (TRUE)

In the above problem, the answer '3' is correct.

4-

$(1*2) + 1 = ? 3$  (TRUE)

TRUE      FALSE

5-

$(3/1) - 1 = ? 1$  (FALSE)

6-

$(7*3) - 3 = ? 18$  (TRUE)

7-

$(4*3) + 4 = ? 16$  (TRUE)

8-

$(12*3) + 6 = ? 40$  (FALSE)

9-

$(12*5) - 4 = ? 55$  (FALSE)

10-



$(13*3)-8=?$  31 (TRUE)

11-

$(15*3)-5=?$  35 (FALSE)

12-

$(18*2)+6=?$  42 (TRUE)

13-

$(86/2)+7=?$  52 (FALSE)

14-

$(27*2)-8=?$  45 (FALSE)

15-

$(36/3)+9=?$  20 (FALSE)

16-

$(54/6)+9=?$  19 (FALSE)

17-

$(14*3)-2=?$  40 (TRUE)

18-

$(6/3)+1=?$  3 (TRUE)

-Now you will do both parts of the experiment at the same time (letter and math). In the next set, you will be given a letter that you will try to remember. After that, one of the math problems will appear; you need make a mental calculation without writing. After that, another letter will appear; you need to remember it later. Then, another math problem will appear to be solved. Once you are done, you will be presented with a list of letters; try your best to remember the letters find them in the list and write next to each one the number that represents the order of its appearance.

**Practice**

B

$(9*2)+5=?$  24 (FALSE)

F

$(32/4)-4=?$  4 (TRUE)

-Try to recall the letters in their display order

D	P	N
B (1)	L	K
M	S	Q
H	F (2)	R

19-

R

$(49/7)+6=?$  13

TRUE

FALSE

K

$(81/3)-2=?$  24 (FALSE)

F	H	J
K	L	N
P	Q	R
S	T	Y

20-

M

$(52/2)-6=?$  21

TRUE

FALSE

N

$(7/7)+3=?4$  (TRUE)

F            H            J

K            L            N

P            Q            R

S            M            Y

21-

S

$(94/2)-1=? 46$

1

TRUE FALSE

L

$(26*2)+2=?52$  (FALSE)

F            H            J

K            L            N

P            Q            R

S            M            Y

22-

P

$(63/7)+8=? 17$

TRUE

FALSE

S

$(18*3)-7=? 47$  (TRUE)

F                    H                    J

K                    L                    N

P

Q

R

S

T

Y

*Thank you for your cooperation*

## Appendix IV

### Automaticity Word-previewing Test

#### Word List #01

1.acquisition	Acquisition	adaptation	aggregate	allocation	alternative
2.formula	Financial	flexibility	formula	founded	functional
3.analysis	accurate	analysis	arbitrary	attached	attitudes
4.indicate	indicate	inherent	instance	institute	integrity
5.financial	financial	flexibility	formula	founded	functional
6.maximum	marginal	maximum	mediation	migration	minimum
7.policy	posed	primary	pursue	policy	passive
8.technology	transmission	techniques	technology	termination	technical
9.concept	complex	collapse	constant	concept	contact
10.region	reveal	section	region	release	retain
11.license	likewise	lecture	liberal	license	federal
12.security	specific	stability	statistics	survive	security
13.final	factor	final	finite	focus	funds
14.identified	identified	illustrated	investment	innovation	integration
15.appropriate	adjustment	ambiguous	anticipated	appropriate	assessment
16.variables	variables	widespread	violation	virtually	voluntary
17.label	labor	label	layer	legal	logic
18.welfare	unique	volume	welfare	vehicle	version
19.discretion	distribution	demonstrate	dimensions	diminished	discretion
20.sustainable	subordinate	subsequent	substitution	successive	sustainable
21.create	civil	credit	create	chart	cited
22.annual	access	affect	albeit	annual	assume
23.conclusion	concentrate	conclusion	considerate	constitution	construction
24.assume	accurate	achieve	aspects	assure	assume
25.consumer	chemical	comprise	computer	corporate	consumer

## Word List #02

1.factors	federal	formula	functions	factors	features
2.source	solely	sought	source	sphere	status
3.environment	enforcement	exploitation	established	environment	encountered
4.area	access	adult	area	alter	aid
5.immigration	immigration	implications	intelligence	intervention	innovation
6.reaction	reaction	research	resident	retained	revenue
7.physical	parallel	physical	potential	prospect	protocol
8.involved	inferred	internal	invoked	involved	isolated
9.principle	paragraph	perceived	persistent	predicted	principle
10.marginal	marginal	negative	nuclear	military	minimal
11.specific	security	statistics	survive	specific	stability
12.process	positive	primary	purchase	process	passive
13.potential	positive	potential	primary	priority	process
14.labor	hence	tense	labor	trace	trend
15.major	mature	media	norms	notion	major
16.retained	retained	revealed	required	rejected	removed
17.research	reaction	research	resident	retained	revenue
18.purchase	process	passive	positive	primary	purchase
19.investment	identified	illustrated	investment	innovation	integration
20.obtained	objective	obtained	ongoing	outcomes	overseas
21.constitutional	consequences	considerable	constitutional	construction	consultation
22.export	ethical	exhibit	expert	extract	export
23.whereas	version	volume	welfare	whereby	whereas
24.consultation	consideration	consulation	constitutional	construction	contribution
25.section	section	sector	select	similar	solely

### Word List #03

1.core	chart	civil	code	core	cycle
2.cultural	complex	contract	contrary	contrast	cultural
3.scheme	Scheme	section	similar	specific	structure
4.distribution	distribution	demonstrate	dimensions	diminished	discretion
5.affect	access	adults	affect	author	aware
6.region	reveal	section	retain	region	release
7.estimate	equation	estimate	evidence	exposure	external
8.computer	complex	computer	collapse	constant	comprise
9.impact	image	impact	income	initial	injury
10.mental	manual	mature	mental	method	mutual
11.area	access	adult	aid	alter	area
12.perceived	published	purchased	perceived	predicted	promoted
13.role	deny	role	bias	code	data
14.theory	target	thesis	topics	trendy	theory
15.technical	technical	temporary	thereby	transfer	transport
16.chapter	chapter	chemical	clarity	clauses	capable
17.evaluation	economic	equipment	equivalent	evaluation	expansion
18.structure	simulation	summary	structure	statistics	strategy
19.journal	granted	journal	parallel	potential	project
20.conflict	contact	context	concept	conduct	conflict
21.institute	indicate	inherent	instance	institute	integrity
22.resolution	resolution	resources	responses	restraints	revolution
23.analysis	accurate	arbitrary	analysis	attached	attitudes
24.sector	section	select	similar	solely	sector
25.equation	evolution	expansion	exposure	equation	evidence

## Word List #04

1.adequate	academic	adequate	analogous	arbitrary	assistance
2.final	factor	final	finite	focus	funds
3.enforcement	enforcement	exploitation	established	environment	encountered
4.legislation	interaction	intervention	investment	justification	legislation
5.features	factors	features	federal	founded	functions
6.text	tapes	task	team	text	trace
7.focus	format	founded	function	funds	focus
8.administration	approximated	acknowledged	administration	approximated	automatically
9.evidence	enhance	equation	evidence	excluded	exposure
10.notion	normal	mature	notion	media	norms
11.response	relevant	required	research	response	retained
12.input	index	initial	injury	input	insert
13.constitutional	consequences	considerable	constitutional	construction	consultation
14.bond	data	deny	bond	brief	bulk
15.regulations	regulations	reinforced	resources	restraints	revolution
16.function	formats	formula	founded	finalizes	function
17.orientation	objective	obtained	ongoing	orientation	outcomes
18.strategies	strategies	statistics	simulation	summary	structures
19.volume	unique	volume	welfare	vehicle	version
20.context	context	contact	concept	conduct	conflict
21.stability	security	statistics	survive	specific	stability
22.issue	image	impact	injury	insert	issue
23.medical	medical	medium	method	military	network
24.authority	arbitrary	assembly	assigned	authority	available
25.subsequent	subordinate	subsequent	substitution	successive	suspended



## Word List #05

1.formula	financial	flexibility	formula	founded	functional
2.appropriate	adjustment	ambiguous	anticipated	appropriate	assessment
3.circumstances	circumstances	compensation	consequences	constitutional	contemporary
4.assessment	assessment	alternative	ambiguous	amendment	analogous
5.maintenance	manipulation	monitoring	nevertheless	maintenance	nonetheless
6.participation	participation	phenomenon	practitioners	presumption	professional
7.principle	paragraph	principle	perceived	persistent	predicted
8.dimensions	distribution	demonstrate	dimensions	diminished	discretion
9.interpretation	infrastructure	interpretation	investigation	integration	interaction
10.concept	complex	collapse	constant	contact	concept
11.aspects	abstract	access	adults	assume	aspects
12.generation	guidelines	hypothesis	legislation	generation	illustrated
13.export	ethical	exhibit	expert	export	extract
14.transition	techniques	traditional	transition	transport	temporary
15.potential	positive	potential	primary	priority	process
16.impact	image	income	impact	initial	injury
17.trend	tapes	target	trend	topic	trace
18.issue	insert	impact	injury	image	issue
19.location	allocation	lecture	license	likewise	location
20.objective	objective	obtained	ongoing	outcomes	overseas
21.occur	offset	option	output	access	occur
22.capacity	capacity	channel	complex	confined	currency
23.purchase	process	purchase	passive	positive	primary
24.create	civil	cited	credit	create	chart
25.perspective	parameters	perspective	philosophy	preliminary	professional

## Word List #06

1.data	Bias	code	data	deny	draft
2.constraints	challenges	concurrent	confirmed	consistent	constraints
3.labor	hence	tense	labor	trace	trend
4.communication	comprehensive	concentration	consequences	communication	contemporary
5.indicate	indicate	inherent	instance	institute	integrity
6.consequences	consequences	considerable	constitutional	construction	consultation
7.promote	passive	positive	primary	process	promote
8.evolution	equation	evolution	expansion	exposure	evidence
9.styles	sought	sphere	status	styles	stress
10.available	arbitrary	assembly	assigned	available	authority
11.intelligence	immigration	implications	intelligence	intervention	innovation
12.fees	bias	fees	files	focus	funds
13.journal	journal	granted	parallel	potential	project
14.normal	mutual	neutral	normal	notion	nuclear
15.flexibility	facilitate	financial	foundation	flexibility	framework
16.source	solely	sought	source	sphere	status
17.elements	elements	enhanced	economic	empirical	enormous
18.clause	clarity	clause	couple	criteria	crucial
19.period	primary	pursue	parallel	period	passive
20.enhanced	elements	enhanced	economic	empirical	enormous
21.revenue	reaction	research	resident	retained	revenue
22.income	implicit	income	indicate	induced	integral
23.recovery	recovery	relevant	reluctant	removed	response
24.injury	image	impact	income	initial	injury
25.expansion	economic	equipment	equivalent	evaluation	expansion

## Word List #07

1.constitutional	Consequences	considerable	constitutional	construction	consultation
2.financial	Financial	flexibility	formula	founded	functional
3.method	Medical	medium	method	military	network
4.definition	Definition	deduction	distortion	distinction	document
5.illustrated	Innovation	investment	identified	individual	illustrated
6.obtained	Objective	obtained	ongoing	outcomes	overseas
7.individual	Innovation	investment	identified	illustrated	individual
8.resources	Resolution	resources	responses	restraints	revolution
9.required	Retained	revealed	required	rejected	removed
10.community	Commodity	conference	conference	community	controversy
11.contract	Context	concept	contrast	contact	contract
12.text	Tapes	task	team	text	trace
13.sufficient	Strategies	submitted	subsidiary	sufficient	suspended
14.interval	Inferred	inherent	integral	internal	interval
15.specific	Security	statistics	survive	specific	stability
16.estimate	Estimate	equation	evidence	exposure	external
17.traditional	Techniques	traditional	transition	transport	temporary
18.perceived	Published	purchase	perceived	predicted	promoted
19.percent	Percent	parallel	passive	primary	priority
20.institute	Indicate	inherent	instance	institute	integrity
21.commitment	Components	commenced	commission	constitution	commitment
22.assume	Assume	accurate	achieve	aspects	assure
23.minimum	Marginal	minimize	minimum	military	minimal
24.sector	Section	sector	select	similar	solely
25.previous	Potential	previous	promote	prospect	protocol

## Word List #08

1.communication	Comprehensive	concentration	consequences	communication	contemporary
2.evaluation	Economic	equipment	evaluation	equivalent	expansion
3.environment	Enforcement	exploitation	established	environment	encountered
4.analysis	Arbitrary	attached	attitudes	accurate	analysis
5.process	Process	passive	positive	primary	purchase
6.section	Sector	select	section	similar	solely
7.cultural	Complex	contract	contrary	contrast	cultural
8.published	Perceived	predicted	promoted	published	purchased
9.identified	Identified	illustrated	investment	innovation	integration
10.similar	Status	similar	survive	sustain	symbol
11.investment	Identified	illustrated	investment	innovation	integration
12.regulations	Status	similar	survive	sustain	symbol
13.final	Factor	final	finite	focus	funds
14.definition	Definition	deduction	distortion	distinction	document
15.major	Mature	media	norms	notion	major
16.export	Ethical	exhibit	expert	export	extract
17.aspects	Abstract	access	aspects	adults	assume
18.benefit	Behalf	benefit	debate	denote	detect
19.distinction	Depression	discretion	distinction	distortion	document
20.principle	Principle	paragraph	perceived	persistent	predicted
21.impact	Image	initial	injury	impact	income
22.consumer	Chemical	comprise	computer	corporate	consumer
23.potential	Positive	potential	primary	priority	process
24.area	Access	adult	aid	alter	area
25.variables	Widespread	variables	violation	virtually	voluntary

## **Appendix V**

### **Anticipation Guides**

#### **V.1 Anticipation Guide 01**

##### **Celebrating Love**

So many of us around the world celebrate Valentine's Day, but most of us don't think to question where the holiday originated. Why do we give flowers and gifts to our loved ones? And why is the heart so closely associated with Valentine's Day? We all know it's a day of romance and love, but not many of us know why. Overall, the history of St. Valentine, along with the story of its patron saint, is surrounded in mystery. But there are some things we do know.

The Catholic church recognizes at least two different saints that were both named Valentine, or Valentinus, and who were both martyred. One story goes that Valentine was a priest who served in third century Rome. During this time, the emperor Claudius II decreed that single men amounted to better soldiers in comparison to married men and those with families. For this reason, he outlawed marriage for young men in hopes for building a stronger army. Valentine saw the injustice of this decision and went against Claudius. He continued to marry young lovers in clandestine ceremonies. Unfortunately, he was discovered, and Claudius ordered Valentine to be put to death.

The second origin story of Valentine's Day is about the saint named Valentine who helped Christians escape horrific and inhumane Roman prisons. He was imprisoned, and while there, he allegedly helped heal the blind daughter of his jailer, Julia. Before he was executed, he sent her a note, signed "From Your Valentine," signifying that might be the first Valentine ever to be sent. Additionally, to "remind them of God's love and to encourage them to remain faithful

Christians,” legend has it that Valentine cut out parchment hearts and gave them to persecuted Christians and soldiers. This may explain why we still use the heart today.

Valentine’s Day is also said to originate from a pagan festival that took place on February 15. The celebration of Lupercalia was fertility festival dedicated to Faunus, the Roman god of agriculture. During this festival, the Luperci, an order of Roman priests, would collect in a sacred cave where the infants Romulus and Remus, the founders of Rome, were supposed to have been cared for by a she-wolf, or *lupa*. The priests would sacrifice a goat, for fertility, and a dog, for purification. Afterwards, they would strip the goat’s hide and dip it into the sacrificial blood. They would then take this hide to the streets, gently slapping both women and crop fields with it. Women welcomed the touch of the hide because it was said to make them more fertile in the upcoming year. According to legend, at the end of the day, all the young women in the city would place their names in a big urn. The unmarried men would then choose a name and become paired with the woman they chose for the year. These matches generally ended in marriage.

Whichever you prefer, the stoic priest who believed in marriage, the healer and savior of the persecuted or the luperci who granted fertility at festivals, Valentine’s Day still holds a special place in our hearts today. Whether we are single or betrothed, it warms our hearts with love and fills our bellies with chocolate- a 21<sup>st</sup> century answer to a pagan love feast!

Check “Agree” or “Disagree” beside each statement below *before* you read the text. After that, compare your answer with that of your classmate. After reading, revisit the statements and check again “Agree” or “Disagree”. See how your answers compare (before/after).

<b>Before</b>		<b>Statements</b>	<b>After</b>	
<b>Agree</b>	<b>Disagree</b>		<b>Agree</b>	<b>Disagree</b>
		1.Valentine’s Day is an enigmatic/ mysterious holiday.		
		2.Only one saint is recognized as Valentine and he was martyred.		
		3.Valentine used to marry young couples in clandestine ceremonies.		
		4.The ‘heart’, synonymous with Valentine’s Day, most likely came from the note St. Valentine sent to Julia just before his execution.		
		5.Valentine’s day originates from a celebration centered on mirth and productivity		

## V.2 Anticipation Guide 02

### An Introduction to Relativity

Albert Einstein, in his work of The Meaning of Relativity, explained that what we individually experience is arranged in a series of events. In this series, the single moments that we remember are arranged as happening either “earlier” or “later,” which we cannot break down further because these words do not have concrete, universal definitions. Therefore, we, as individuals, experience an “I-time,” or subjective time- what is considered earlier to me might be different from what is considered earlier to you. Einstein suggests trying to associate numbers with the events, so that a greater number is associated with a later event than with an earlier one (e.g. the 27<sup>th</sup> event in my day was dinner, while the 3<sup>rd</sup> event was breakfast) but ultimately concludes that the “nature of this association may be quite meaningless,” because, again, these would be different for different people (dinner might be the 34<sup>th</sup> thing you do in a day, or, if you are less inclined to be active, the 7<sup>th</sup> thing).

So we have these experiences. Through talking to each other we can, to a certain extent, compare them. We come to understand that some of our “sense perceptions,” as Einstein calls them (which are what we feel and what we experience), can correspond with others’ perceptions. But some don't match up quite so well. We tend to believe in shared experiences more easily, as though a common feeling is more real than feelings. This makes them feel more impersonal, more scientific. Einstein suggests that we think of our experience like a clock: we can all experience and relate to seconds turning to minutes, minutes turning to hours, and hours turning to days (science). But how we actually feel time passing us by is completely unique experience (not science).



The clock then to Einstein represents the “epitome of our experience.” It can describe our shared experience, but go no further. He states that he is “convinced that the philosophers have had a harmful effect upon the progress of scientific thinking in removing certain fundamental concepts from the domain of empiricism, where they are under our control, where we can observe and determine them.” Granted, by philosophizing, we lose what’s real and in front of our faces; but without that philosophical thought, what good is science? We want to rationalize what we find, apply it to our lives. Understandably, we want our experiences to be made not only into rigid structures, but also into seemingly irrational bank of feelings. We are humans, after all.

Check “Agree” or “Disagree” beside each statement below *before* you read the text. After that, compare your answer with that of your classmate. After reading, revisit the statements and check again “Agree” or “Disagree”. See how your answers compare (before/after).

<b>Before</b>		<b>Statements</b>	<b>After</b>	
<b>Agree</b>	<b>Disagree</b>		<b>Agree</b>	<b>Disagree</b>
		<b>1.</b> Philosophy is not necessary to science.		
		<b>2.</b> Philosophers often hinder science.		
		<b>3.</b> Subjective time is influenced by personal experiences and opinions.		
		<b>4.</b> Experiences can feel more scientific and less personal.		
		<b>5.</b> Experiences have to be made only into rigid structures.		

## V.3 Anticipation Guide 03

### The Usefulness of Selfishness

Of course seeing selfishness as evil is nothing new. Avarice, after all, is one of the seven deadly sins. And an entire circle of Hell is dedicated to the horrific punishment of the greedy in Dante's *Inferno*. But I am going to go a step further and say that there is no such thing as true altruism, the belief in or practice of selfless concern for the well-being of others. We don't exhibit behavior that purely benefits another at our own expense. But is that so bad? And further, can selfishness ever be a good thing?

There is no avoiding the fact: humans are both the most detestable of animals and the noblest. Our ability to exhibit both good and evil has plagued philosophers from Plato to Nietzsche. So far here is what the consensus seems to be: the key to virtue is altruism. But anyone can do what is righteous given the right incentive. What sets apart genuinely good deeds is that they are selfless in nature. Bees and ants exhibit a remarkable level of self-sacrifice, but these insects are so closely related to one another that helping others is synonymous with being selfish, in evolutionary terms anyway. Relatedness can also provide an explanation as to why some other animals, like many birds, will help raise each other's offspring. Then what about humans?

We do at times appear to be selfless. In the 1980s, behavioral economists used a game called the "ultimatum game" to access altruistic tendencies. One player, Player X, is given some money and advised to split it with a second player, Player Y. If Y accepts the division, both keep their share of money. If not, neither gets any money. Since it's free money, it would be logical for Y to accept any amount of money, no matter how small, and for X to split the smallest amount as possible. But what happened instead was that in universities all around the world, the

offer that was most often given was 50%. It would appear, at least in laboratory setting, that humans are very generous, albeit not very smart.

This raises the question, why be nice? One of the most groundbreaking insights of current evolutionary theory is that while our brains are hardwired by self-serving genes, these same inclinations have resulted in behavior that is often altruistic. But those who consider humans to be the worst of creatures will argue that we behave well only if we are being watched, showing that there is no such thing as true altruism. On the contrary, altruistic behaviours do happen, and these behaviours have evolved through natural selection. Furthermore, evolutionary biologists have compiled a list of explanations for human niceness.

Check “Agree” or “Disagree” beside each statement below *before* you read the text. After that, compare your answer with that of your classmate. After reading, revisit the statements and check again “Agree” or “Disagree”. See how your answers compare (before/after).

<b>Before</b>		<b>Statements</b>	<b>After</b>	
<b>Agree</b>	<b>Disagree</b>		<b>Agree</b>	<b>Disagree</b>
		1.Altruism is always good.		
		2.“Self-sacrifice” always refers to “real altruism”.		
		3.Being watched leads people to be generous/altruistic.		
		4.The main reason of people’s niceness is public image.		
		5.Free riders, those selfish who benefit from the altruism of others, must be seriously punished.		

## V.4 Anticipation Guide 04

### The Changing Technology

When I was a very young boy, in our house, in the hall, at the bottom of the stairs, by the front door, stood a small round table on which sat the telephone. It had a large black base on which was a dial of numbers and letters (ABC 0, DEF1 and so on), which supported the receiver, one end for listening, the other for talking. It was made of black Bakelite. If one picked up the receiver, one could hear the buzzing sound that meant it was connected and after one had dialed the number, one heard the intermittent ringing tone and then the voice of whomever one had dialed. Should one not know the number of the person to whom one wished to speak, one dialed 0, and spoke directly to the lady in charge of inquiries. She would be able to find the telephone number one needed, even if the person to whom one was telephoning was lived at long distance. She could explain how to ring someone abroad or how to reverse the charges. She was always polite and patient and friendly and always seemed concerned to help- just like a neighbor, really.

Naturally, in those days, one did not ring on a whim; one respected the privacy of the others. For example, one avoided using the telephone at meal times. Too early in the morning the person to whom the person was telephoning might be still in bed or having breakfast: late at night, he may have already gone to bed. Certainly, one never used the telephone after 10 P.M. unless there was an emergency. Indeed, if the phone rang in the middle of the night, one felt quite nervous because one knew that something awful must have happened. There was a definite etiquette about how and when the telephone was used. Certainly, the telephone was not regarded as a substitute for writing a letter. Even, at Christmas, when I was allowed to telephone my Grandma and Grandpa, to wish them a Merry Christmas and thank them for the ten dollar bill that had been tacked inside the Christmas card they had sent me, I was still expected to write a

letter of thanks and post it later in the week. Moreover, I had to write the letter and post it in the mailbox immediately, for the Post Office could be depended upon to deliver it within a day- or two days at the most- unless it was Sunday.

Well, times have changed, that' for sure! Nowadays, it's all "texting" on mobile phones, not to mention, iPod and iPad, and Facebook and Twitter. You walk down any street and weave between an army marching steadfastly and blindly towards you. One hand holds styrofoam Starbucks cartons, the other clutches a device, from which processor's eyes do not rise. With dexterous thumbs, they flick their way through messages posted and then proceed to text replies. Others stare fixedly ahead, earphones clamped to their heads, apparently chanting madly to themselves- until you realize they are talking to their mobile connection. No matter what time of day it is, it seems, instant thought needs to be transmitted into instant contact. Mealtime used to be a time when the family or friends gathered around a table and chatted intimately to one another. Now, the meal is accompanied by the sound of musical "apps," a muttered "Bear with, bear with," and a long muttered conversational aside into the mobile in a language incomprehensible to the other diners. Apparently, we live in an instant world, with instant and constant communication. We spend our entire day and night in touch with one another, at work, at home, in the shops, in bed, on the bus, on the train, on the plane, and, one can only assume, on the toilet. Accessibility rules in today's society. We are all, apparently, "friends."

However, friendship is more than accessibility. Even when in a relationship, we need to heed our privacy as much as our need to share. "My true love hath my heart and I have his" wrote the poet. That is true. However, my true love does not need me to be constantly in contact to tell him that I am on the train or to pass on to him every wild thought that passes through my head every second of the day. Nor does he need me to send him photos of the ice cream I am

eating, nor the details of the consequent effects it may have on my sensibilities. We need moments to be introspective and alone with our thoughts, to respect the boundaries that exist between the individual and the world.

Oh, how often do I long to be back in our house, in the hall, at the bottom of the stairs, by the front door, where stands the small round table on which sits the telephone!



Check “Agree” or “Disagree” beside each statement below *before* you read the text. After that, compare your answer with that of your classmate. After reading, revisit the statements and check again “Agree” or “Disagree”. See how your answers compare (before/after).

<b>Before</b>		<b>Statements</b>	<b>After</b>	
<b>Agree</b>	<b>Disagree</b>		<b>Agree</b>	<b>Disagree</b>
		<b>1.</b> The telephone was first used as a substitute for writing letters.		
		<b>2.</b> Telephone use should be ruled by a definite etiquette.		
		<b>3.</b> Phones, as used in the past, protected their users’ privacy.		
		<b>4.</b> Instant and constant communication between people allows them to connect intimately with acquaintances.		
		<b>5.</b> Friend relations become weaker because of a lull in communication.		

## V.5 Anticipation Guide 05

### Detective Novels

When it comes to finding a literary genre which will prove to be relatively relaxing and not too taxing to the little grey cells, there is nothing that fits the bill so well as the crime novels. Foul weather outside? Light the log fire, pop the kettle on for tea and curl up on the sofa with a paperback murder mystery. It is the best way to relax. One can always be confident that, eventually, the detective will solve the crime, despite the fact that it takes two or three corpses before the denouement reveals all.

However, it is probably fair to say that not every detective in this category gives total satisfaction. American detectives are often far too energetic in their pursuit of the killer., forever racing along those mean streets at high speeds, firing off guns erratically and, in periods of less physical exertion, confronting their emotional neuroses. Swedish detectives, at the moment, are extremely fashionable, but unbearably gloomy- not their fault of course: it is highly difficult to be cheerful and positive when one spends half a year waist deep in snow and darkness. French detectives are, also, subject to moodiness and introspection possibly because they are so often dealing with corrupt politicians and pressure from their superiors. On the other hand, Italian detectives review corruption with a shrug of the shoulders; but then, apparently, they spend most of their time eyeing up attractive young women and being fed large meals by their mothers.

In truth, the English are the only writers who are masters of this kind of fiction. They ought to be. Despite the claim by the French that they were the first nation to produce a novel that had its hero a detective with the name of Arsene Lupin, the first detectives to appear in literature were actually English. And with the appearance of Sherlock Holmes, in “A Study in Scralett” in 1887, the English to the lead in the development of this kind of writing. In the early

part of the 20<sup>th</sup> century, English authors dominated the genre, beginning with Dorothy L. Sayers and her rather pretentious amateur detective, Lord Peter Wimsey. It is perhaps surprising that the best writers of the English detective novel have been, for the most part, women. It is perhaps much more surprising then whichever sex was the novelist, virtually every detective they created was male.

Of course, the arrival of career women in England was a long time coming and for many decades the idea that women might be quite good at working out “who dunnit” was not something that occurred to “the good and the wise”-men, naturally- who were responsible for running the country. So, in detective novels, we had male inspectors heading the various divisions of the police force who were sometimes helped by intelligence such as that possessed by the great male detectives, such as Sherlock Holmes and Hercule Poirot.

Poirot was the creation of Agatha Christie, probably the most famous and successful of all crime writers after Conan Doyle. But another of Christie’s detectives, Miss Marple, was the coup de grace against male domination in the solution of crime. She appears in only nine novels and a few short stories, but her impact was- and is- enormous. She is not in the least what you might expect a detective to be. She is a modest, elderly spinster living in the small and typically English village of St. Mary Mead where she knits and gardens and precisely observes human nature. She travels not by Aston Martin but by Inch’s taxi and British rail when it was still powered by steam. She understands how people act, react and think, and, gently but relentlessly, she always solves the crime which has baffled England’s elite crime bureau, Scotland Yard. She embodies the quiet and forceful intelligence of women.

Check “Agree” or “Disagree” beside each statement below *before* you read the text. After that, compare your answer with that of your classmate. After reading, revisit the statements and check again “Agree” or “Disagree”. See how your answers compare (before/after).

<b>Before</b>		<b>Statements</b>	<b>After</b>	
<b>Agree</b>	<b>Disagree</b>		<b>Agree</b>	<b>Disagree</b>
		<b>1.</b> Crime novels have a trying effect on the brain.		
		<b>2.</b> Reading murder mysteries generally makes the reader feel satisfied.		
		<b>3.</b> Americans are the best writers of murder fiction.		
		<b>4.</b> All the writers of murder novels are men.		
		<b>5.</b> Male-only detective has to be supported because men are more intelligent than women.		

## Appendix VII

### Automaticity Training Exercises

#### Exercise #01

1.formula	Financial	formula	flexibility	founded	functional
2.structure	Structure	summary	stability	statistics	strategy
3.available	Arbitrary	assembly	assigned	authority	available
4.established	Enforcement	established	exploitation	environment	encountered
5.percent	passive	primary	priority	percent	parallel
6.elements	elements	enhanced	economic	empirical	enormous
7.implications	immigration	implications	intelligence	intervention	innovation
8.mehod	medical	medium	method	military	network
9.administration	accommodation	acknowledged	administration	approximated	automatically
10.overall	obvious	ongoing	output	overall	overlap
11.concept	complex	collapse	constant	concept	contact
12.attributed	adequate	aggregate	allocation	analogous	attributed
13.considerable	concentration	considerate	considerable	constitution	construction
14.issue	image	impact	injury	insert	issue
15.site	seek	site	bias	deny	task
16.imposed	imposed	induced	inferred	invoked	involved
17.injury	image	impact	income	initial	injury
18.transfer	transfer	technical	temporary	thereby	transport
19.text	tapes	task	team	text	trace
20.emphasis	eliminate	emerged	emphasis	empirical	enormous
21.contract	context	concept	contrast	contract	contact
22.occur	offset	option	output	access	occur
23.complex	complex	coincide	collapse	constant	comprise
24.create	civil	credit	create	chart	cited
25.labor	hence	labor	tense	trace	legal

## Exercise #02

1.approach	advocate	allocation	appendix	approach	arbitrary
2.evidence	enhance	equation	evidence	excluded	exposure
3.affect	access	adult	affect	author	aware
4.computer	complex	computer	collapse	constant	comprise
5.corporate	corporate	chemical	comprise	computer	consumer
6.context	contact	context	concept	conduct	conflict
7.factor	federal	formula	functions	factors	features
8.commission	components	commenced	commission	commitment	constitution
9.proportion	portion	preceding	procedure	published	proportion
10.statistics	significant	somewhat	sequences	similarities	statistics
11.similar	status	similar	survive	sustain	symbol
12.despite	debate	decline	despite	display	domain
13.maintenance	manipulation	monitoring	nevertheless	maintenance	nonetheless
14.modified	modified	marginal	mediation	monitored	motivation
15.exposure	equation	evolution	expansion	exposure	evidence
16.significant	significant	somewhat	sequences	similarities	statistics
17.focus	fees	funds	focus	format	founded
18.specific	security	specific	stability	statistics	survive
19.achieve	abstract	achieve	aspects	attained	accurate
20.exceed	enable	energy	erosion	exceed	exhibit
21.restricted	restricted	reinforced	resolution	registered	revealed
22.construction	concentration	conclusion	considerate	constitution	construction
23.cycle	cycle	credit	code	create	confirm
24.benefit	behalf	denote	detect	debate	benefit
25.primary	passive	period	parallel	pursue	primary

### Exercise #03

1.period	passive	period	parallel	primary	pursue
2.assistance	appropriate	assessment	assurance	anticipated	assistance
3.procedure	procedure	preceding	predicted	prospect	protocol
4.convention	convention	conclusion	considerate	constitution	construction
5.implementation	infrastructure	interpretation	investigation	implementation	interaction
6.distribution	demonstrate	dimensions	diminished	discretion	distribution
7.economic	economic	eliminate	enhanced	evolution	financial
8.interpretation	infrastructure	interpretation	investigation	integration	interaction
9.policy	posed	primary	pursue	policy	passive
10.authority	arbitrary	assembly	assigned	authority	available
11.indicate	indicate	inherent	instance	institute	integrity
12.range	radical	range	refine	rigid	route
13.hypothesis	guidelines	hypothesis	legislation	generation	illustrated
14.version	validity	vehicle	version	visible	volume
15.source	solely	sought	source	sphere	status
16.investment	identified	illustrated	investment	innovation	integration
17.sought	sought	source	section	sphere	survive
18.legal	labor	license	layer	legal	lecture
19.select	section	sector	select	similar	solely
20.equation	evolution	expansion	exposure	equation	evidence
21.previous	potential	previous	promote	prospect	protocol
22.survey	status	survive	sustain	symbol	survey
23.design	debate	denote	design	device	display
24.domain	debate	decline	despite	display	domain
25.reaction	research	resident	retained	revenue	reaction

## Exercise #04

1.principle	principle	paragraph	perceived	persistent	predicted
2.process	process	passive	positive	primary	purchase
3.data	deny	draft	bias	code	data
4.enforcement	exploitation	established	enforcement	environment	encountered
5.traditional	techniques	traditional	transition	transport	temporary
6.approach	advocate	allocation	appendix	approach	arbitrary
7.acquisition	acquisition	adaptation	aggregate	allocation	alternative
8.features	actors	features	federal	founded	functions
9.contribution	conclusion	consultation	contribution	constitution	construction
10.prime	panel	phase	policy	posed	prime
11.individual	innovation	investment	individual	identified	illustrated
12.conclusion	concentrate	conclusion	considerate	constitution	construction
13.emerged	eliminate	emerged	emphasis	empirical	enormous
14.required	retained	revealed	rejected	removed	required
15.pursue	period	portion	precise	pursue	project
16.institute	indicate	inherent	instance	institute	integrity
17.injury	image	impact	income	initial	injury
18.rejected	retained	revealed	rejected	removed	required
19.retained	revealed	retained	rejected	removed	required
20.ensure	estate	export	extract	ensure	entity
21.regulations	regulations	reinforced	resources	restraints	revolution
22.credit	create	chart	cited	civil	credit
23.relevant	retained	revealed	relevant	removed	required
24.benefit	behalf	denote	detect	benefit	debate
25.incentive	incentive	incidence	inevitably	inhibition	interaction



## Exercise #05

1.constitutional	consequences	constitutional	considerable	construction	consultation
2.philosophy	parameters	perspectives	philosophy	preliminary	professional
3.stress	sought	sphere	status	styles	stress
4.debate	debate	denote	design	despite	display
5.involved	inferred	internal	invoked	involved	isolated
6.factors	federal	formula	functions	factors	features
7.predicted	procedure	preceding	predicted	prospect	protocol
8.security	security	specific	stability	statistics	survive
9.available	arbitrary	assembly	assigned	authority	available
10.rational	random	rational	reaction	rejected	relaxed
11.transfer	technical	temporary	thereby	transfer	transport
12.function	formats	formula	founded	function	finalizes
13.reaction	research	resident	retained	revenue	reaction
14.participation	participation	phenomenon	practitioners	presumption	professional
15.resources	resolution	resources	responses	restraints	revolutions
16.design	debate	denote	design	device	display
17.primary	passive	period	parallel	primary	pursue
18.distinction	depression	distinction	discretion	distortion	document
19.excluded	enhance	excluded	equation	evidence	exposure
20.injury	image	impact	income	initial	injury
21.target	target	theory	thesis	topics	trendy
22.create	civil	credit	create	chart	cited
23.capable	chapter	chemical	clarity	clauses	capable
24.definition	definition	deduction	distortion	distinction	document
25.initial	impact	income	initial	injury	image

## Exercise #06

1.equation	Evolution	expansion	exposure	equation	evidence
2.assume	accurate	achieve	aspects	assume	assure
3.consequences	compensation	comprehensive	consequences	constitutional	contemporary
4.procedure	procedure	preceding	predicted	prospect	protocol
5.consistent	challenge	concurrent	confirmed	consistent	constraint
6.framework	fluctuations	forthcoming	framework	fundamental	furthermore
7.analysis	accurate	analysis	arbitrary	attached	attitudes
8.sector	section	sector	select	similar	solely
9.items	levy	links	items	bias	jobs
10.computer	complex	computer	collapse	constant	comprise
11.final	factor	finite	focus	funds	final
12.section	sector	select	similar	solely	section
13.context	contact	context	concept	conduct	conflict
14.positive	positive	potential	primary	priority	process
15.significant	significant	somewhat	sequences	similarities	statistics
16.issue	image	impact	injury	insert	issue
17.function	formats	formula	founded	function	finalizes
18.conduct	complex	coincide	conduct	constant	comprise
19.variables	variables	widespread	violation	virtually	voluntary
20.identified	identified	illustrated	investment	innovation	integration
21.construction	concentration	conclusion	considerate	constitution	construction
22.outcomes	objective	obtained	ongoing	outcomes	overseas
23.estimate	equation	estimate	evidence	exposure	external
24.granted	journal	parallel	granted	potential	project
25. role	deny	bias	code	data	role

## Exercise #07

1.role	deny	role	bias	code	data
2.response	relevant	required	research	response	retained
3.income	implicit	income	indicate	induced	integral
4.theory	target	theory	thesis	topics	trendy
5.select	section	sector	select	series	solely
6.categories	categories	challenge	coherence	colleagues	comments
7.corresponding	concentrating	differentiating	contemporary	corresponding	discriminating
8.policy	posed	primary	pursue	policy	passive
9.involved	inferred	internal	invoked	isolated	involved
10.assessment	scheme	section	similar	specific	structure
11.accurate	collapse	constant	comprise	coincide	complex
12.link	implications	instructions	intelligence	intervention	investigation
13.assistance	retained	revealed	relevant	removed	required
14.conference	financial	flexibility	formula	founded	functional
15.enforcement	enforcement	exploitation	established	environment	encountered
16.concept	complex	collapse	constant	contact	concept
17.sturcture	scheme	section	similar	specific	structure
18.complex	collapse	constant	comprise	coincide	complex
19.instructions	implications	instructions	intelligence	intervention	investigation
20.relevant	retained	revealed	relevant	removed	required
21.financial	financial	flexibility	formula	founded	functional
22.chapter	chapter	chemical	clarity	clauses	capable
23.normal	mutual	neutral	normal	notion	nuclear
24.factors	federal	formula	functions	features	factors
25.source	solely	sought	source	sphere	status

## Exercise #08

1.prior	Panel	phase	posed	prime	prior
2.formula	Financial	flexibility	formula	founded	functional
3.marginal	Modified	marginal	mediation	modified	monitored
4.authority	Arbitrary	assembly	assigned	authority	available
5.survey	Statues	survive	sustain	symbol	survey
6.environment	Enforcement	exploitation	established	environment	encountered
7.region	Reveal	section	region	release	retain
8.legislation	Interaction	legislation	intervention	investment	justification
9.community	Commodity	conference	conferencing	community	controversy
10.similar	Similar	status	survive	sustain	symbol
11.investment	Interaction	legislation	intervention	investment	justification
12.percent	Parallel	passive	primary	priority	percent
13.restricted	Reinforced	resolution	restricted	registered	revealed
14.process	Process	passive	positive	primary	purchase
15.conclusion	Concentrate	conclusion	considerable	constitution	construction
16.ethnic	Entities	ethical	ethnic	exhibit	explicit
17.economic	Economic	eliminate	enhanced	evolution	financial
18.hence	Hence	tense	thesis	trace	trend
19.equivalent	Economic	equipment	equivalent	evaluation	expansion
20.contract	Context	concept	contrast	contact	contract
21.potential	Positive	potential	primary	priority	process
22.features	Factors	features	federal	founded	functions
23.major	Major	mature	media	norms	notion
24.evaluation	Economic	equipment	evaluation	expansion	equivalent
25.reliance	Rejected	relaxed	relevant	reliance	require

## Exercise #09

1.network	Medical	medium	method	military	network
2.justification	Justification	interaction	legislation	intervention	investment
3.amendment	Assessment	alternative	ambiguous	amendment	analogous
4.psychology	Philosophy	partnership	perspective	philosophy	psychology
5.labor	Hence	tense	labor	trace	trend
6.affect	access	adults	affect	author	aware
7.distribution	distribution	demonstrate	dimensions	diminished	discretion
8.area	access	adult	aid	alter	area
9.index	image	index	injury	insert	issues
10.elements	elements	enhanced	economic	empirical	enormous
11.underlying	ultimately	underlying	undertaken	widespread	variables
12.allocation	acquisition	adaptation	aggregate	allocation	alternative
13.consistent	challenge	concurrent	confirmed	consistent	constraint
14.significant	significant	somewhat	sequences	similarities	statistics
15.coordination	consultation	contribution	coordination	controversy	cooperative
16.period	parallel	passive	primary	pursue	period
17.obvious	ongoing	obvious	output	overall	overlap
18.academic	adequate	academic	analogous	arbitrary	assistance
19.shift	shift	site	sought	sphere	stress
20.definition	distinction	document	definition	deduction	distortion
21.appropriate	adjustment	ambiguous	anticipated	appropriate	assessment
22.resources	resolution	resources	responses	restraints	revolution
23.funds	factor	final	finite	focus	funds
24.transfer	technical	temporary	thereby	transfer	transport
25.distortion	definition	deduction	distortion	distinction	document

## Exercise #10

1.range	Radical	range	refine	rigid	route
2.data	Deny	draft	bias	code	data
3.project	Pursue	granted	period	parallel	project
4.survey	Status	survey	survive	sustain	symbol
5.procedure	Procedure	preceding	predicted	prospect	protocol
6.sex	Job	odd	sex	sum	via
7.sector	Section	sector	select	similar	solely
8.undertaken	Ultimately	underlying	undertaken	widespread	variables
9.analysis	Accurate	analysis	arbitrary	attached	attitudes
10.constant	Complex	coincide	collapse	constant	comprise
11.strategies	Simulation	summary	structures	statistics	strategies
12.principle	Persistent	predicted	principle	paragraph	perceived
13.categories	Categories	challenge	coherence	colleagues	comments
14.goals	Focus	goals	grade	funds	hence
15.research	Reaction	resident	retained	revenue	research
16.institute	Indicate	inherent	instance	institute	integrity
17.ignored	Ignored	implicit	implies	indicate	induced
18.positive	Positive	potential	primary	priority	process
19.complex	Coincide	collapse	constant	comprise	complex
20.obtained	Objective	ongoing	obtained	outcome	overseas
21.security	Security	specific	stability	statistics	survive
22.involved	Inferred	internal	invoked	involved	isolated
23.relevant	Retained	revealed	relevant	removed	required
24.contract	Context	concept	contrast	contract	contact
25.techniques	Traditional	transition	transport	techniques	temporary

## Exercise #11

1.interpretation	Infrastructure	interpretation	investigation	integration	interaction
2.assume	Accurate	achieve	aspects	assume	assure
3.maintenance	Manipulation	monitoring	nevertheless	maintenance	nonetheless
4.evidence	Evidence	enhance	equation	excluded	exposure
5.conduct	Complex	coincide	conduct	constant	comprise
6.administration	Accomodation	acknowledged	administration	approximated	automatically
7.items	Bias	jobs	levy	links	items
8.commission	Components	commenced	commission	commitment	constitution
9.site	Seek	site	bias	deny	task
10.occur	Offset	option	output	access	occur
11.document	Dominant	discretion	distinction	distortion	document
12.cultural	Complex	contract	contrary	contrast	cultural
13.chapter	Chapter	chemical	clarity	clauses	capable
14.variables	Variables	widespread	violation	virtually	voluntary
15.sum	Job	odd	sex	sum	via
16.parallel	Journal	granted	journal	parallel	project
17.specific	Security	statistics	survive	specific	stability
18.journal	Granted	journal	parallel	potential	project
19.previous	Potential	previous	promote	prospect	protocol
20.aspects	Abstract	access	adults	assume	aspects
21.indicate	Indicate	inherent	instance	institute	integrity
22.economic	Economic	eliminate	enhanced	evolution	financial
23.structure	Simulation	summary	structure	statistics	strategy
24.context	Contact	context	concept	conduct	conflict
25.output	Offset	option	output	access	occur

## Exercise #12

1.legislation	Interaction	legislation	intervention	investment	justification
2.instance	Indicate	inherent	instance	institute	integrity
3.identified	Identified	illustrated	investment	innovation	integration
4.acquisition	Acquisition	adaptation	aggregate	allocation	alternative
5.approach	Advocate	allocation	appendix	approach	arbitrary
6.enforcement	Exploitation	enforcement	established	environment	encountered
7.concentration	Conclusion	considerate	constitution	construction	concentration
8.consumer	Chemical	comprise	computer	corporate	consumer
9.expansion	Expansion	economic	equipment	equivalent	evaluation
10.evidence	Enhance	equation	evidence	excluded	exposure
11.negative	Marginal	negative	nuclear	military	minimal
12.task	Tapes	task	team	text	trace
13.abstract	Abstract	achieve	adjacent	arbitrary	attitudes
14.summary	Security	strategy	specify	summary	stability
15.assistance	Appropriate	assessment	assistance	assurance	anticipated
16.region	Release	retain	reveal	region	section
17.individual	Innovation	investment	identified	illustrated	individual
18.layer	Label	labor	layer	legal	logic
19.furthermore	Fluctuations	forthcoming	framework	fundamental	furthermore
20.sequence	Significant	somewhat	sequence	specific	statistics
21.gender	Gender	global	grade	granted	journal
22.affect	Access	adults	author	affect	aware
23.credit	Create	chart	cited	civil	credit
24.regime	Refine	regime	region	restore	reverse
25.major	Norms	notion	mature	major	media



### Exercise #13

1.export	Ethical	exhibit	expert	export	extract
2.evaluation	Economic	equipment	equivalent	evaluation	expansion
3.income	Implicit	income	indicate	induced	integral
4.consequences	Compensation	comprehensive	consequences	constitutional	contemporary
5.assessment	Assessment	alternative	ambiguous	amendment	analogous
6.reaction	Research	resident	reaction	retained	revenue
7.theory	Target	thesis	topics	trendy	theory
8.text	Tapes	task	team	text	trace
9.research	Reaction	research	resident	retained	revenue
10.site	Seek	site	bias	deny	task
11.achieve	Accurate	aspects	assume	assure	achieve
12.significant	Significant	somewhat	sequences	similarities	statistics
13.impact	Impact	income	initial	injury	image
14.rational	Random	rational	reaction	rejected	relaxed
15.registered	Reinforced	resolution	restricted	registered	revealed
16.trace	Tapes	task	team	text	trace
17.computer	Complex	collapse	constant	comprise	computer
18.tapes	Tapes	task	team	text	trace
19.specified	Sequence	somewhat	specific	specified	symbolic
20.normal	Mutual	neutral	normal	notion	nuclear
21.job	Job	odd	sex	sum	via
22.required	Retained	revealed	required	rejected	removed
23.enhanced	Elements	economic	empirical	enormous	enhanced
24.obtained	Objective	obtained	ongoing	outcomes	overseas
25.restricted	Reinforced	resolution	restricted	registered	revealed

## Exercise #14

1.maintenance	Manipulation	monitoring	nevertheless	maintenance	nonetheless
2.purchase	Process	passive	positive	primary	purchase
3.data	Deny	data	draft	bias	code
4.sought	Sought	source	section	sphere	survive
5.resources	Resolution	resources	responses	restraints	revolution
6.issue	Image	impact	injury	insert	issue
7.equation	Evolution	expansion	equation	exposure	evidence
8.minorities	Mediation	migration	minimum	minorities	monitoring
9.section	Sector	section	select	similar	solely
10.primary	Passive	period	parallel	pursue	primary
11.traditional	Techniques	traditional	transition	transport	temporary
12.adjustment	Adjustment	ambiguous	anticipated	appropriate	assessment
13.economic	Economic	eliminate	enhanced	evolution	financial
14.symbolic	Sequence	somewhat	specific	specified	symbolic
15.chapter	Chapter	chemical	clarity	clauses	capable
16.benefit	Behalf	benefit	debate	denote	detect
17.period	Period	parallel	passive	primary	pursue
18.aspects	Abstract	access	aspects	adults	assume
19.labor	Hence	tense	labor	trace	trend
20.involved	Inferred	internal	invoked	involved	isolated
21.complex	Coincide	collapse	complex	constant	comprise
22.aspects	Abstract	access	adults	aspects	assume
23.occur	Offset	option	output	access	occur
24.fundamental	Fluctuations	forthcoming	framework	fundamental	furthermore
25.conduct	Complex	coincide	conduct	constant	comprise

## Exercise #15

1.distribution	Distribution	demonstrate	dimensions	diminished	discretion
2.procedure	Procedure	preceding	predicted	prospect	protocol
3.response	Relevant	required	research	response	retained
4.consistent	Challenge	concurrent	confirmed	consistent	constraint
5.investigation	Infrastructure	interpretation	investigation	integration	interaction
6.function	Formats	formula	function	founded	finalizes
7.design	Debate	denote	design	device	display
8.interpretation	Infrastructure	interpretation	investigation	integration	interaction
9.substitution	Subordinate	subsequent	substitution	successive	suspended
10.percent	Percent	parallel	passive	primary	priority
11.availabe	Arbitrary	assembly	assigned	authority	available
12.structure	Structure	simulation	summary	statistics	strategy
13.elements	Elements	enhanced	economic	empirical	enormous
14.individual	Innovation	investment	identified	illustrated	individual
15.perceived	Published	purchased	perceived	predicted	promoted
16.contrast	Context	concept	contrast	contract	contact
17.construction	Concentration	conclusion	considerate	constitution	construction
18.distinction	Depression	discretion	distinction	distortion	document
19.logic	Label	labor	layer	legal	logic
20.draft	Deny	draft	bias	code	data
21.similar	Status	similar	survive	sustain	symbol
22.phase	Panel	phase	policy	posed	prime
23.demonstrate	Distribution	demonstrate	dimensions	diminished	discretion
24.monitoring	Manipulation	nevertheless	maintenance	nonetheless	monitoring
25.community	Commodity	conference	conference	community	controversy

## Appendix VII

### Repeated Reading Highlighted Texts

#### Text 01: Pride and Prejudice

It is a truth universally acknowledged, that a single man in possession of a good fortune, must be in want of a wife.

However little known the feelings or views of such a man may be on his first entering a neighbourhood, this truth is so well fixed in the minds of the surrounding families, that he is considered the rightful property of someone or other of their daughters.

"My dear Mr. Bennet," said his lady to him one day, "have you heard that Netherfield Park is let at last?"

Mr. Bennet replied that he had not.

"But it is," returned she; "for Mrs. Long has just been here, and she told me all about it."

Mr. Bennet made no answer.

"Do you not want to know who has taken it?" cried his wife impatiently.

"You want to tell me, and I have no objection to hearing it."

This was invitation enough.

"Why, my dear, you must know, Mrs. Long says that Netherfield is taken by a young man of large fortune from the north of England; that he came down on Monday in a chaise and four to see the place, and was so much delighted with it, that he agreed with Mr. Morris immediately; that he is to take possession before Michaelmas, and some of his servants are to be in the house by the end of next week."

"What is his name?"

"Bingley."

"Is he married or single?"

"Oh! Single, my dear, to be sure! A single man of large fortune; four or five thousand a year. What a fine thing for our girls!"

"How so? How can it affect them?"

"My dear Mr. Bennet," replied his wife, "how can you be so tiresome! You must know that I am thinking of his marrying one of them."

"Is that his design in settling here?"

"Design! Nonsense, how can you talk so! But it is very likely that he may fall in love with one of them, and therefore you must visit him as soon as he comes."

"I see no occasion for that. You and the girls may go, or you may send them by themselves, which perhaps will be still better, for as you are as handsome as any of them, Mr. Bingley may like you the best of the party."

"My dear, you flatter me. I certainly have had my share of beauty, but I do not pretend to be anything extraordinary now. When a woman has five grown-up daughters, she ought to give over thinking of her own beauty."

"In such cases, a woman has not often much beauty to think of."

"But, my dear, you must indeed go and see Mr. Bingley when he comes into the neighbourhood."

"It is more than I engage for, I assure you."

"But consider your daughters. Only think what an establishment it would be for one of them. Sir William and Lady Lucas are determined to go, merely on that account, for in general, you know, they visit no newcomers. Indeed you must go, for it will be impossible for us to visit him if you do not."

"You are over-scrupulous, surely. I dare say Mr. Bingley will be very glad to see you; and I will send a few lines by you to assure him of my hearty consent to his marrying whichever he chooses of the girls; though I must throw in a good word for my little Lizzy."

"I desire you will do no such thing. Lizzy is not a bit better than the others; and I am sure she is not half so handsome as Jane, nor half so good-humoured as Lydia. But you are always giving her the preference."

"They have none of them much to recommend them," replied he; "they are all silly and ignorant like other girls; but Lizzy has something more of quickness than her sisters."

"Mr. Bennet, how can you abuse your own children in such a way? You take delight in vexing me. You have no compassion for my poor nerves."

"You mistake me, my dear. I have a high respect for your nerves. They are my old friends. I have heard you mention them with consideration these last twenty years at least."

"Ah, you do not know what I suffer."

"But I hope you will get over it, and live to see many young men of four thousand a year come into the neighbourhood."

"It will be no use to us, if twenty such should come, since you will not visit them."

"Depend upon it, my dear, that when there are twenty, I will visit them all."

Mr. Bennet was so odd a mixture of quick parts, sarcastic humour, reserve, and caprice, that the experience of three-and-twenty years had been insufficient to make his wife understand his character. Her mind was less difficult to develop. She was a woman of mean understanding, little information, and uncertain temper. When she was discontented, she fancied herself nervous. The business of her life was to get her daughters married; its solace was visiting and news.

Mr. Bennet was among the earliest of those who waited on Mr. Bingley. He had always intended to visit him, though to the last always assuring his wife that he should not go; and till the evening after the visit was paid she had no knowledge of it. It was then disclosed in the following manner. Observing his second daughter employed in trimming a hat, he suddenly addressed her with:

"I hope Mr. Bingley will like it, Lizzy."

"We are not in a way to know what Mr. Bingley likes," said her mother resentfully, "since we are not to visit."

"But you forget, mamma," said Elizabeth, "that we shall meet him at the assemblies, and that Mrs. Long promised to introduce him."

"I do not believe Mrs. Long will do any such thing. She has two nieces of her own. She is a selfish, hypocritical woman, and I have no opinion of her."

"No more have I," said Mr. Bennet; "and I am glad to find that you do not depend on her serving you."

Mrs. Bennet deigned not to make any reply, but, unable to contain herself, began scolding one of her daughters.

"Don't keep coughing so, Kitty, for Heaven's sake! Have a little compassion..."

## Text 02: The Wizard of Oz

Dorothy lived in the midst of the great Kansas prairies, with Uncle Henry, who was a farmer, and Aunt Em, who was the farmer's wife. Their house was small, for the lumber to build it had to be carried by wagon many miles. There were four walls, a floor and a roof, which made one room; and this room contained a rusty looking cookstove, a cupboard for the dishes, a table, three or four chairs, and the beds. Uncle Henry and Aunt Em had a big bed in one corner, and Dorothy a little bed in another corner. There was no garret at all, and no cellar—except a small hole dug in the ground, called a cyclone cellar, where the family could go in case one of those great whirlwinds arose, mighty enough to crush any building in its path. It was reached by a trap door in the middle of the floor, from which a ladder led down into the small, dark hole.

When Dorothy stood in the doorway and looked around, she could see nothing but the great gray prairie on every side. Not a tree nor a house broke the broad sweep of flat country that reached to the edge of the sky in all directions. The sun had baked the plowed land into a gray mass, with little cracks running through it. Even the grass was not green, for the sun had burned the tops of the long blades until they were the same gray color to be seen everywhere. Once the house had been painted, but the sun blistered the paint and the rains washed it away, and now the house was as dull and gray as everything else.

When Aunt Em came there to live she was a young, pretty wife. The sun and wind had changed her, too. They had taken the sparkle from her eyes and left them a sober gray; they had taken the red from her cheeks and lips, and they were gray also. She was thin and gaunt, and never smiled now. When Dorothy, who was an orphan, first came to her, Aunt Em had been so startled by the child's laughter that she would scream and press her hand upon her heart whenever Dorothy's merry voice reached her ears; and she still looked at the little girl with wonder that she could find anything to laugh at.

Uncle Henry never laughed. He worked hard from morning till night and did not know what joy was. He was gray also, from his long beard to his rough boots, and he looked stern and solemn, and rarely spoke. It was Toto that made Dorothy laugh, and saved her from growing as gray as her other surroundings. Toto was not gray; he was a little black dog, with long silky hair and small black eyes that twinkled merrily on either side of his funny, wee nose. Toto played all day long, and Dorothy played with him, and loved him dearly.

Today, however, they were not playing. Uncle Henry sat upon the doorstep and looked anxiously at the sky, which was even grayer than usual. Dorothy stood in the door with Toto in her arms, and looked at the sky too. Aunt Em was washing the dishes.

From the far north they heard a low wail of the wind, and Uncle Henry and Dorothy could see where the long grass bowed in waves before the coming storm. There now came a sharp whistling in the air from the south, and as they turned their eyes that way they saw ripples in the grass coming from that direction also.

Suddenly Uncle Henry stood up. "There's a cyclone coming, Em," he called to his wife. "I'll go look after the stock." Then he ran toward the sheds where the cows and horses were kept.

Aunt Em dropped her work and came to the door. One glance told her of the danger close at hand.

"Quick, Dorothy!" she screamed. "Run for the cellar!"

Toto jumped out of Dorothy's arms and hid under the bed, and the girl started to get him. Aunt Em, badly frightened, threw open the trap door in the floor and climbed down the ladder into the small, dark hole. Dorothy caught Toto at last and started to follow her aunt. When she was halfway across the room there came a great shriek from the wind, and the house shook so hard that she lost her footing and sat down suddenly upon the floor.

Then a strange thing happened.

The house whirled around two or three times and rose slowly through the air. Dorothy felt as if she were going up in a balloon.

The north and south winds met where the house stood, and made it the exact center of the cyclone. In the middle of a cyclone the air is generally still, but the great pressure of the wind on every side of the house raised it up higher and higher, until it was at the very top of the cyclone; and there it remained and was carried miles and miles away as easily as you could carry a feather.

It was very dark, and the wind howled horribly around her, but Dorothy found she was riding quite easily. After the first few whirls around, and one other time when the house tipped badly, she felt as if she were being rocked gently, like a baby in a cradle.

Toto did not like it. He ran about the room, now here, now there, barking loudly; but Dorothy sat quite still on the floor and waited to see what would happen.

Once Toto got too near the open trap door, and fell in; and at first the little girl thought she had lost him. But soon she saw one of his ears sticking up through the hole, for the strong pressure of the air was keeping him up so that he could not fall. She crept to the hole, caught Toto by the ear, and dragged him into the room again, afterward closing the trap door so that no more accidents could happen.

Hour after hour passed away, and slowly Dorothy got over her fright; but she felt quite lonely, and the wind shrieked so loudly all about her that she nearly became deaf. At first she had wondered if she would be...



### **Text 03: The Adventures of Tom Sawyer**

‘TOM!’ No answer. ‘TOM!’ No answer. ‘What’s gone with that boy, I wonder? You TOM!’ No answer.

The old lady pulled her spectacles down and looked over them about the room; then she put them up and looked out under them. She seldom or never looked THROUGH them for so small a thing as a boy; they were her state pair, the pride of her heart, and were built for ‘style,’ not service — she could have seen through a pair of stove-lids just as well. She looked perplexed for a moment, and then said, not fiercely, but still loud enough for the furniture to hear:

‘Well, I lay if I get hold of you I’ll —

‘She did not finish, for by this time she was bending down and punching under the bed with the broom, and so she needed breath to punctuate the punches with. She resurrected nothing but the cat.

‘I never did see the beat of that boy!’

She went to the open door and stood in it and looked out among the tomato vines and ‘jimson’ weeds that constituted the garden. No Tom. So she lifted up her voice at an angle calculated for distance and shouted:

‘Y-o-u-u TOM!’

There was a slight noise behind her and she turned just in time to seize a small boy by the slack of his roundabout and arrest his flight.

‘There! I might ‘a’ thought of that closet. What you been doing in there?’

‘Nothing.’

‘Nothing! Look at your hands. And look at your mouth. What IS that truck?’

‘I don’t know, aunt.’

‘Well, I know. It’s jam — that’s what it is. Forty times I’ve said if you didn’t let that jam alone I’d skin you. Hand me that switch.’ The switch hovered in the air — the peril was desperate —

‘My! Look behind you, aunt!’

The old lady whirled round, and snatched her skirts out of danger. The lad fled on the instant, scrambled up the high board-fence, and disappeared over it.

His aunt Polly stood surprised a moment, and then broke into a gentle laugh.

‘Hang the boy, can’t I never learn anything? Ain’t he played me tricks enough like that for me to be looking out for him by this time? But old fools is the biggest fools there is. Can’t learn an old dog new tricks, as the saying is. But my goodness, he never plays them alike, two days, and how is a body to know what’s coming? He ‘pears to know just how long he can torment me before I get my dander up, and he knows if he can make out to put me off for a minute or make me laugh, it’s all down again and I can’t hit him a lick. I ain’t doing my duty by that boy, and that’s the Lord’s truth, goodness knows. Spare the rod and spile the child, as the Good Book says. I’m a laying up sin and suffering for us both, I know. He’s full of the Old Scratch, but laws-a-me! he’s my own dead sister’s boy, poor thing, and I ain’t got the heart to lash him, somehow. Every time I let him off, my conscience does hurt me so, and every time I hit him my old heart most breaks. Well-a-well, man that is born of woman is of few days and full of trouble, as the Scripture says, and I reckon it’s so. He’ll play hookey this evening, and I’ll just be obleeged to make him work, to-morrow, to punish him. It’s mighty hard to make him work Saturdays, when all the boys is having holiday, but he hates work more than he hates anything else, and I’ve GOT to do some of my duty by him, or I’ll be the ruination of the child.’

Tom did play hookey, and he had a very good time. He got back home barely in season to help Jim, the small colored boy, saw next-day’s wood and split the kindlings before supper — at least he was there in time to tell his adventures to Jim while Jim did three-fourths of the work. Tom’s younger brother (or rather half-brother) Sid was already through with his part of the work (picking up chips), for he was a quiet boy, and had no adventurous, troublesome ways.

While Tom was eating his supper, and stealing sugar as opportunity offered, Aunt Polly asked him questions that were full of guile, and very deep — for she wanted to trap him into damaging revealments. Like many other simple-hearted souls, it was her pet vanity to believe she was endowed with a talent for dark and mysterious diplomacy, and she loved to contemplate her most transparent devices as marvels of low cunning. Said she:

‘Tom, it was middling warm in school, wasn’t it?’

‘Yes’m.’ ‘Powerful warm, wasn’t it?’

‘Yes’m.’

‘Didn’t you want to go in a-swimming, Tom?’

A bit of a scare shot through Tom — a touch of uncomfortable suspicion. He searched Aunt Polly’s face, but it told him nothing. So he said:

‘No’m — well, not very much.’

The old lady reached out her hand and felt Tom’s shirt, and said:

‘But you ain’t too warm now, though.’ And it flattered her to reflect that she had discovered that the shirt was dry without anybody knowing that that was what she had in her mind. But in spite of her, Tom knew where the wind lay, now. So he forestalled what might be the next move:

‘Some of us pumped on our heads — mine’s damp yet. See?’ Aunt Polly was vexed to think she had overlooked that bit of circumstantial evidence, and missed a trick. Then she had a new inspiration:

‘Tom, you didn’t have to undo your shirt collar where I sewed it, to pump on your head, did you? Unbutton your jacket!’ The trouble vanished out of Tom’s face. He opened his jacket. His shirt collar was securely sewed.

‘Bother! Well, go ‘long with you. I’d made sure you’d played hookey and been a-swimming. But I forgive ye, Tom. I reckon you’re a kind of a singed cat, as the saying is — better’n you look. THIS time.’

She was half sorry her sagacity had miscarried, and half glad that Tom had stumbled into obedient conduct for once. But Sidney said: ‘Well, now...

## Text 04: The Voyages of Dr. Dolittle

MY name was Tommy Stubbins, son of Jacob Stubbins, the cobbler of Puddleby-on-the-Marsh; and I was nine and a half years old. At that time Puddleby was only quite a small town. A river ran through the middle of it; and over this river there was a very old stone bridge, called Kingsbridge, which led you from the market-place on one side to the churchyard on the other.

Sailing-ships came up this river from the sea and anchored near the bridge. I used to go down and watch the sailors unloading the ships upon the river-wall. The sailors sang strange songs as they pulled upon the ropes; and I learned these songs by heart. And I would sit on the river-wall with my feet dangling over the water and sing with the men, pretending to myself that I too was a sailor.

For I longed always to sail away with those brave ships when they turned their backs on Puddleby Church and went creeping down the river again, across the wide lonely marshes to the sea. I longed to go with them out into the world to seek my fortune in foreign lands--Africa, India, China and Peru! When they got round the bend in the river and the water was hidden from view, you could still see their huge brown sails towering over the roofs of the town, moving onward slowly--like some gentle giants that walked among the houses without noise. What strange things would they have seen, I wondered, when next they came back to anchor at Kingsbridge! And, dreaming of the lands I had never seen, I'd sit on there, watching till they were out of sight.

Three great friends I had in Puddleby in those days. One was Joe, the mussel-man, who lived in a tiny hut by the edge of the water under the bridge. This old man was simply marvelous at making things. I never saw a man so clever with his hands. He used to mend my toy ships for me which I sailed upon the river; he built windmills out of packing-cases and barrel-staves; and he could make the most wonderful kites from old umbrellas.

Joe would sometimes take me in his mussel-boat, and when the tide was running out we would paddle down the river as far as the edge of the sea to get mussels and lobsters to sell. And out there on the cold lonely marshes we would see wild geese flying, and curlews and redshanks and many other kinds of seabirds that live among the samphire and the long grass of the great salt fen. And as we crept up the river in the evening, when the tide had turned, we would see the lights on Kingsbridge twinkle in the dusk, reminding us of tea-time and warm fires.

Another friend I had was Matthew Mugg, the cat's-meat-man. He was a funny old person with a bad squint. He looked rather awful but he was really quite nice to talk to. He knew everybody in Puddleby; and he knew all the dogs and all the cats. In those times being a cat's-meat-man was a regular business. And you could see one nearly any day going through the streets with a wooden tray full of pieces of meat stuck on skewers crying, "Meat! M-E-A-T!" People paid him to give this meat to their cats and dogs instead of feeding them on dog-biscuits or the scraps from the table.

I enjoyed going round with old Matthew and seeing the cats and dogs come running to the garden-gates whenever they heard his call. Sometimes he let me give the meat to the animals myself; and I thought this was great fun. He knew a lot about dogs and he would tell me the names of the different kinds as we went through the town. He had several dogs of his own; one, a whippet, was a very fast runner, and Matthew used to win prizes with her at the Saturday coursing races; another, a terrier, was a fine ratter. The cat's-meat-man used to make a business of rat-catching for the millers and farmers as well as his other trade of selling cat's-meat.

My third great friend was Luke the Hermit. But of him I will tell you more later on.

I did not go to school; because my father was not rich enough to send me. But I was extremely fond of animals. So I used to spend my time collecting birds' eggs and butterflies, fishing in the river, rambling through the countryside after blackberries and mushrooms and helping the mussel-man mend his nets.

Yes, it was a very pleasant life I lived in those days long ago-- though of course I did not think so then. I was nine and a half years old; and, like all boys, I wanted to grow up--not knowing how well off I was with no cares and nothing to worry me. Always I longed for the time when I should be allowed to leave my

father's house, to take passage in one of those brave ships, to sail down the river through the misty marshes to the sea-- out into the world to seek my fortune.

ONE early morning in the Springtime, when I was wandering among the hills at the back of the town, I happened to come upon a hawk with a squirrel in its claws. It was standing on a rock and the squirrel was fighting very hard for its life. The hawk was so frightened when I came upon it suddenly like this, that it dropped the poor creature and flew away. I picked the squirrel up and found that two of its legs were badly hurt. So I carried it in my arms back to the town.

When I came to the bridge I went into the musselman's hut and asked him if he could do anything for it. Joe put on his spectacles and examined it carefully. Then he shook his head.

"Yon crittur's got a broken leg," he said--"and another badly cut an' all. I can mend you your boats, Tom, but I haven't the tools nor the learning to make a broken squirrel seaworthy. This is a job for a surgeon--and for a right smart one an' all. There be only...

## **Text 05: The Life and Adventures of Robinson Crusoe**

I was born in the year 1632, in the city of York, of a good family, though not of that country, my father being a foreigner of Bremen, who settled first at Hull. He got a good estate by merchandise, and leaving off his trade, lived afterwards at York, from whence he had married my mother, whose relations were named Robinson, a very good family in that country, and from whom I was called Robinson Kreutznaer; but, by the usual corruption of words in England, we are now called—nay we call ourselves and write our name—Crusoe; and so my companions always called me.

I had two elder brothers, one of whom was lieutenant-colonel to an English regiment of foot in Flanders, formerly commanded by the famous Colonel Lockhart, and was killed at the battle near Dunkirk against the Spaniards. What became of my second brother I never knew, any more than my father or mother did know what was become of me.

Being the third son of the family and not bred to any trade, my head began to be filled very early with rambling thoughts. My father, who was very ancient, had given me a competent share of learning, as far as house education and a country free school generally go, and designed me for the law; but I would be satisfied with nothing but going to sea; and my inclination to this led me so strongly against the will, nay, the commands of my father, and against all the entreaties and persuasions of my mother and other friends, that there seemed to be something fatal in that propensity of nature, tending directly to the life of misery which was to befall me.

My father, a wise and grave man, gave me serious and excellent counsel against what he foresaw was my design. He called me one morning into his chamber, where he was confined by the gout, and expostulated very warmly with me upon this subject. He asked me what reasons, more than a mere wandering inclination, I had for leaving my father's house and my native country, where I might be well introduced, and had a prospect of raising my fortune by application and industry, with a life of ease and pleasure. He told me it was men of desperate fortunes on one hand, or of aspiring, superior fortunes on the other, who went abroad upon adventures, to rise by enterprise, and make themselves famous in undertakings of a nature out of the common road; that these things were all either too far above me or too far below me; that mine was the middle state, or what might be called the upper station of low life, which he had found, by long experience, was the best state in the world, the most suited to human happiness, not exposed to the miseries and hardships, the labour and sufferings of the mechanic part of mankind, and not embarrassed with the pride, luxury, ambition, and envy of the upper part of mankind. He told me I might judge of the happiness of this state by this one thing—viz. that this was the state of life which all other people envied; that kings have frequently lamented the miserable consequence of being born to great things, and wished they had been placed in the middle of the two extremes, between the mean and the great; that the wise man gave his testimony to this, as the standard of felicity, when he prayed to have neither poverty nor riches.

He bid me observe it, and I should always find that the calamities of life were shared among the upper and lower part of mankind; but that the middle station had the fewest disasters, and was not exposed to so many vicissitudes as the higher or lower part of mankind; nay, they were not subjected to so many distempers and uneasinesses, either of body or mind, as those were who, by vicious living, luxury, and extravagances on the one hand, or by hard labour, want of necessaries, and mean or insufficient diet on the other hand, bring distemper upon themselves by the natural consequences of their way of living; that the middle station of life was calculated for all kind of virtues and all kind of enjoyments; that peace and plenty were the handmaids of a middle fortune; that temperance, moderation, quietness, health, society, all agreeable diversions, and all desirable pleasures, were the blessings attending the middle station of life; that this way men went silently and smoothly through the world, and comfortably out of it, not embarrassed with the labours of the hands or of the head, not sold to a life of slavery for daily bread, nor harassed with perplexed circumstances, which rob the soul of peace and the body of rest, nor enraged with the passion of envy, or the secret burning lust of ambition for great things; but, in easy circumstances, sliding gently through the world, and sensibly tasting the sweets of living, without the bitter; feeling that they are happy, and learning by every day's experience to know it more sensibly.

After this he pressed me earnestly, and in the most affectionate manner, not to play the young man, nor to precipitate myself into miseries which nature, and the station of life I was born in, seemed to have provided against; that I was under no necessity of seeking my bread; that he would do well for me, and endeavour to enter me fairly into the station of life which he had just been recommending to me; and that if I was not very easy and happy in the world, it must be my mere fate or fault that must hinder it; and that he should have nothing to answer for, having thus discharged his duty in warning me against measures which he knew would be to my hurt; in a word, that as he would do very kind things for me if...

## Text 06: Gulliver's Travels

My father had a small estate in Nottinghamshire: I was the third of five sons. He sent me to Emanuel College in Cambridge at fourteen years old, where I resided three years, and applied myself close to my studies; but the charge of maintaining me, although I had a very scanty allowance, being too great for a narrow fortune, I was bound apprentice to Mr. James Bates, an eminent surgeon in London, with whom I continued four years. My father now and then sending me small sums of money, I laid them out in learning navigation, and other parts of the mathematics, useful to those who intend to travel, as I always believed it would be, some time or other, my fortune to do. When I left Mr. Bates, I went down to my father: where, by the assistance of him and my uncle John, and some other relations, I got forty pounds, and a promise of thirty pounds a year to maintain me at Leyden: there I studied physic two years and seven months, knowing it would be useful in long voyages.

Soon after my return from Leyden, I was recommended by my good master, Mr. Bates, to be surgeon to the *Swallow*, Captain Abraham Pannel, commander; with whom I continued three years and a half, making a voyage or two into the Levant, and some other parts. When I came back I resolved to settle in London; to which Mr. Bates, my master, encouraged me, and by him I was recommended to several patients. I took part of a small house in the Old Jewry; and being advised to alter my condition, I married Mrs. Mary Burton, second daughter to Mr. Edmund Burton, hosier, in Newgate street, with whom I received four hundred pounds for a portion.

But my good master Bates dying in two years after, and I having few friends, my business began to fail; for my conscience would not suffer me to imitate the bad practice of too many among my brethren. Having therefore consulted with my wife, and some of my acquaintance, I determined to go again to sea. I was surgeon successively in two ships, and made several voyages, for six years, to the East and West Indies, by which I got some addition to my fortune. My hours of leisure I spent in reading the best authors, ancient and modern, being always provided with a good number of books; and when I was ashore, in observing the manners and dispositions of the people, as well as learning their language; wherein I had a great facility, by the strength of my memory.

The last of these voyages not proving very fortunate, I grew weary of the sea, and intended to stay at home with my wife and family. I removed from the Old Jewry to Fetter Lane, and from thence to Wapping, hoping to get business among the sailors; but it would not turn to account. After three years expectation that things would mend, I accepted an advantageous offer from Captain William Prichard, master of the *Antelope*, who was making a voyage to the South Sea. We set sail from Bristol, May 4, 1699, and our voyage was at first very prosperous.

It would not be proper, for some reasons, to trouble the reader with the particulars of our adventures in those seas; let it suffice to inform him, that in our passage from thence to the East Indies, we were driven by a violent storm to the north-west of Van Diemen's Land. By an



observation, we found ourselves in the latitude of 30 degrees 2 minutes south. Twelve of our crew were dead by immoderate labour and ill food; the rest were in a very weak condition.

On the 5th of November, which was the beginning of summer in those parts, the weather being very hazy, the seamen spied a rock within half a cable's length of the ship; but the wind was so strong, that we were driven directly upon it, and immediately split. Six of the crew, of whom I was one, having let down the boat into the sea, made a shift to get clear of the ship and the rock. We rowed, by my computation, about three leagues, till we were able to work no longer, being already spent with labour while we were in the ship.

We therefore trusted ourselves to the mercy of the waves, and in about half an hour the boat was overset by a sudden flurry from the north. What became of my companions in the boat, as well as of those who escaped on the rock, or were left in the vessel, I cannot tell; but conclude they were all lost.

For my own part, I swam as fortune directed me, and was pushed forward by wind and tide. I often let my legs drop, and could feel no bottom; but when I was almost gone, and able to struggle no longer, I found myself within my depth; and by this time the storm was much abated. The declivity was so small, that I walked near a mile before I got to the shore, which I conjectured was about eight o'clock in the evening.

I then advanced forward near half a mile, but could not discover any sign of houses or inhabitants; at least I was in so weak a condition, that I did not observe them. I was extremely tired, and with that, and the heat of the weather, and about half a pint of brandy that I drank as I left the ship, I found myself much inclined to sleep. I lay down on the grass, which was very short and soft, where I slept sounder than ever I remembered to have done in my life, and, as I reckoned, about nine hours; for when I awaked, it was just day-light. I attempted to rise, but was not able to stir: for, as I happened to lie on my back, I found my arms and legs were strongly fastened on each side to the ground; and my hair, which was long and thick, tied down in the same manner. I likewise felt several slender ligatures across my body, from my arm-pits to my thighs...

## Text 07: The Three Musketeers

On the first Monday of the month of April, 1625, the market town of Meung, in which the author of ROMANCE OF THE ROSE was born, appeared to be as perfect a state of revolution as if the Huguenots had just made a second La Rochelle of it. Many citizens, seeing the women flying toward the High Street, leaving their children crying at the open doors, hastened to don the cuirass, and supporting their somewhat uncertain courage with a musket or a partisan, directed their steps toward the hostelry of the Jolly Miller, before which was gathered, increasing every minute, a compact group, vociferous and full of curiosity.

In those times panics were common, and few days passed without some city or other registering in its archives an event of this kind. There were nobles, who made war against each other; there was the king, who made war against the cardinal; there was Spain, which made war against the king. Then, in addition to these concealed or public, secret or open wars, there were robbers, mendicants, Huguenots, wolves, and scoundrels, who made war upon everybody. The citizens always took up arms readily against thieves, wolves or scoundrels, often against nobles or Huguenots, sometimes against the king, but never against cardinal or Spain. It resulted, then, from this habit that on the said first Monday of April, 1625, the citizens, on hearing the clamor, and seeing neither the red-and-yellow standard nor the livery of the Duc de Richelieu, rushed toward the hostel of the Jolly Miller. When arrived there, the cause of the hubbub was apparent to all.

A young man--we can sketch his portrait at a dash. Imagine to yourself a Don Quixote of eighteen; a Don Quixote without his corselet, without his coat of mail, without his cuisses; a Don Quixote clothed in a woolen doublet, the blue color of which had faded into a nameless shade between lees of wine and a heavenly azure; face long and brown; high cheek bones, a sign of sagacity; the maxillary muscles enormously developed, an infallible sign by which a Gascon may always be detected, even without his cap--and our young man wore a cap set off with a sort of feather; the eye open and intelligent; the nose hooked, but finely chiseled. Too big for a youth, too small for a grown man, an experienced eye might have taken him for a farmer's son upon a journey had it not been for the long sword which, dangling from a leather baldric, hit against the calves of its owner as he walked, and against the rough side of his steed when he was on horseback.

For our young man had a steed which was the observed of all observers. It was a Bearn pony, from twelve to fourteen years old, yellow in his hide, without a hair in his tail, but not without windgalls on his legs, which, though going with his head lower than his knees, rendering a martingale quite unnecessary, contrived nevertheless to perform his eight leagues a day. Unfortunately, the qualities of this horse were so well concealed under his strange-colored hide and his unaccountable gait, that at a time when everybody was a connoisseur in horseflesh, the appearance of the aforesaid pony at Meung--which place he had entered about a quarter of an hour before, by the gate of Beaugency--produced an unfavorable feeling, which extended to his rider.

And this feeling had been more painfully perceived by young d'Artagnan-- for so was the Don Quixote of this second Rosinante named--from his not being able to conceal from himself the

ridiculous appearance that such a steed gave him, good horseman as he was. He had sighed deeply, therefore, when accepting the gift of the pony from M. d'Artagnan the elder. He was not ignorant that such a beast was worth at least twenty livres; and the words which had accompanied the present were above all price.

"My son," said the old Gascon gentleman, in that pure Bearn PATOIS of which Henry IV could never rid himself, "this horse was born in the house of your father about thirteen years ago, and has remained in it ever since, which ought to make you love it. Never sell it; allow it to die tranquilly and honorably of old age, and if you make a campaign with it, take as much care of it as you would of an old servant. At court, provided you have ever the honor to go there," continued M. d'Artagnan the elder, "--an honor to which, remember, your ancient nobility gives you the right--sustain worthily your name of gentleman, which has been worthily borne by your ancestors for five hundred years, both for your own sake and the sake of those who belong to you. By the latter I mean your relatives and friends. Endure nothing from anyone except Monsieur the Cardinal and the king. It is by his courage, please observe, by his courage alone, that a gentleman can make his way nowadays. Whoever hesitates for a second perhaps allows the bait to escape which during that exact second fortune held out to him. You are young. You ought to be brave for two reasons: the first is that you are a Gascon, and the second is that you are my son. Never fear quarrels, but seek adventures. I have taught you how to handle a sword; you have thews of iron, a wrist of steel. Fight on all occasions. Fight the more for duels being forbidden, since consequently there is twice as much courage in fighting. I have nothing to give you, my son, but fifteen crowns, my horse, and the counsels you have just heard. Your mother will add to them a recipe for a certain balsam, which she had from a Bohemian and which has the miraculous virtue of curing all wounds...

## Text 08: Moby Dick

Call me Ishmahel. Some years ago—never mind how long precisely—having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen, and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off—then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it, almost all men in their degree, some time or other, cherish very nearly the same feelings towards the ocean with me.

There now is your insular city of the Manhattoes, belted round by wharves as Indian isles by coral reefs—commerce surrounds it with her surf. Right and left, the streets take you waterward. Its extreme downtown is the battery, where that noble mole is washed by waves, and cooled by breezes, which a few hours previous were out of sight of land. Look at the crowds of water-gazers there.

Circumambulate the city of a dreamy Sabbath afternoon. Gofrom Corlears Hook to Coenties Slip, and from thence, by Whitehall, northward. What do you see?—Posted like silent sentinels all around the town, stand thousands upon thousands of mortal men fixed in ocean reveries. Some leaning against the spiles; some seated upon the pier-heads; some looking over the bulwarks of ships from China; some high aloft in the rigging, as if striving to get a still better seaward peep. But these are all landsmen; of week days pent up in lath and plaster—tied to counters, nailed to benches, clinched to desks. How then is this? Are the green fields gone? What do they here?

But look! Here come more crowds, pacing straight for the water, and seemingly bound for a dive. Strange! Nothing will content them but the extremest limit of the land; loitering under the shady lee of yonder warehouses will not suffice. No. They must get just as nigh the water as they possibly can without falling in. And there they stand—miles of them—leagues. Inlanders all, they come from lanes and alleys, streets and avenues—north, east, south, and west. Yet here they all unite. Tell me, does the magnetic virtue of the needles of the compasses of all those ships attract them thither?

Once more. Say you are in the country; in some high land of lakes. Take almost any path you please, and ten to one it carries you down in a dale, and leaves you there by a pool in the stream. There is magic in it. Let the most absent-minded of men be plunged in his deepest reveries—stand that man on his legs, set his feet a-going, and he will infallibly lead you to water, if water there be in all that region. Should you ever be athirst in the great American desert, try this experiment, if your caravan happen to be supplied with a metaphysical professor. Yes, as everyone knows, meditation and water are wedded forever.

But here is an artist. He desires to paint you the dreamiest, shadiest, quietest, most enchanting bit of romantic landscape in all the valley of the Saco. What is the chief element he employs? There stand his trees, each with a hollow trunk, as if a hermit and a crucifix were within; and here sleeps his meadow, and there sleep his cattle; and up from yonder cottage goes a sleepy smoke. Deep into distant woodlands winds a mazy way, reaching to overlapping spurs of mountains bathed in their hill-side blue. But though the picture lies thus tranced, and though this pine-tree shakes down its sighs like leaves upon this shepherd's head, yet all were vain, unless the shepherd's eye were fixed upon the magic stream before him. Go visit the Prairies in June, when for scores on scores of miles you wade knee-deep among Tiger-lilies—what is the one charm wanting?—Water—there is not a drop of water there! Were Niagara but a cataract of sand, would you travel your thousand miles to see it? Why did the poor poet of Tennessee, upon suddenly receiving two handfuls of silver, deliberate whether to buy him a coat, which he sadly needed, or invest his money in a pedestrian trip to Rockaway Beach? Why is almost every robust healthy boy with a robust healthy soul in him, at some time or other crazy to go to sea? Why upon your first voyage as a passenger, did you yourself feel such a mystical vibration, when first told that you and your ship were now out of sight of land? Why did the old Persians hold the sea holy? Why did the Greeks give it a separate deity, and own brother of Jove? Surely all this is not without meaning. And still deeper the meaning of that story of Narcissus, who because he could not grasp the tormenting, mild image he saw in the fountain, plunged into it and was drowned. But that same image, we ourselves see in all rivers and oceans. It is the image of the ungraspable phantom of life; and this is the key to it all.

Now, when I say that I am in the habit of going to sea whenever I begin to grow hazy about the eyes, and begin to be over conscious of my lungs, I do not mean to have it inferred that I...

## Text 09: Little Women

‘Christmas won’t be Christmas without any presents,’ grumbled Jo, lying on the rug.

‘It’s so dreadful to be poor!’ sighed Meg, looking down at her old dress.

‘I don’t think it’s fair for some girls to have plenty of pretty things, and other girls nothing at all,’ added little Amy, with an injured sniff.

‘We’ve got Father and Mother, and each other,’ said Beth contentedly from her corner.

The four young faces on which the firelight shone brightened at the cheerful words, but darkened again as Jo said sadly, ‘We haven’t got Father, and shall not have him for a long time.’ She didn’t say ‘perhaps never,’ but each silently added it, thinking of Father far away, where the fighting was.

Nobody spoke for a minute; then Meg said in an altered tone, ‘You know the reason Mother proposed not having any presents this Christmas was because it is going to be a hard winter for everyone; and she thinks we ought not to spend money for pleasure, when our men are suffering so in the army. We can’t do much, but we can make our little sacrifices, and ought to do it gladly. But I am afraid I don’t.’ And Meg shook her head, as she thought regretfully of all the pretty things she wanted.

‘But I don’t think the little we should spend would do any good. We’ve each got a dollar, and the army wouldn’t be much helped by our giving that. I agree not to expect anything from Mother or you, but I do want to buy *UNDINE AND SINTRAM* for myself. I’ve wanted it so long,’ said Jo, who was a bookworm.

‘I planned to spend mine in new music,’ said Beth, with a little sigh, which no one heard but the hearth brush and kettle holder.

‘I shall get a nice box of Faber’s drawing pencils. I really need them,’ said Amy decidedly.

‘Mother didn’t say anything about our money, and she won’t wish us to give up everything. Let’s each buy what we want, and have a little fun. I’m sure we work hard enough to earn it,’ cried Jo, examining the heels of her shoes in a gentlemanly manner.

‘I know I do—teaching those tiresome children nearly all day, when I’m longing to enjoy myself at home,’ began Meg, in the complaining tone again.

‘You don’t have half such a hard time as I do,’ said Jo. ‘How would you like to be shut up for hours with a nervous, fussy old lady, who keeps you trotting, is never satisfied, and worries you till you you’re ready to fly out the window or cry?’

‘It’s naughty to fret, but I do think washing dishes and keeping things tidy is the worst work in the world. It makes me cross, and my hands get so stiff, I can’t practice well at all.’ And Beth looked at her rough hands with a sigh that any one could hear that time.

'I don't believe any of you suffer as I do,' cried Amy, 'for you don't have to go to school with impertinent girls, who plague you if you don't know your lessons, and laugh at your dresses, and label your father if he isn't rich, and insult you when your nose isn't nice.'

'If you mean libel, I'd say so, and not talk about labels, as if Papa was a pickle bottle,' advised Jo, laughing.

'I know what I mean, and you needn't be statirical about it. It's proper to use good words, and improve your vocabilary,' returned Amy, with dignity.

'Don't peck at one another, children. Don't you wish we had the money Papa lost when we were little, Jo? Dear me! How happy and good we'd be, if we had no worries!' said Meg, who could remember better times.

'You said the other day you thought we were a deal happier than the King children, for they were fighting and fretting all the time, in spite of their money.'

'So I did, Beth. Well, I think we are. For though we do have to work, we make fun of ourselves, and are a pretty jolly set, as Jo would say.'

'Jo does use such slang words!' observed Amy, with a reproving look at the long figure stretched on the rug. Jo immediately sat up, put her hands in her pockets, and began to whistle.

'Don't, Jo. It's so boyish!'

'That's why I do it.'

'I detest rude, unladylike girls!'

'I hate affected, niminy-piminy chits!'

'Birds in their little nests agree,' sang Beth, the peacemaker, with such a funny face that both sharp voices softened to a laugh, and the 'pecking' ended for that time.

'Really, girls, you are both to be blamed,' said Meg, beginning to lecture in her elder-sisterly fashion. 'You are old enough to leave off boyish tricks, and to behave better, Josephine. It didn't matter so much when you were a little girl, but now you are so tall, and turn up your hair, you should remember that you are a young lady.'

'I'm not! And if turning up my hair makes me one, I'll wear it in two tails till I'm twenty,' cried Jo, pulling off her net, and shaking down a chestnut mane. 'I hate to think I've got to grow up, and be Miss March, and wear long gowns, and look as prim as a China Aster! It's bad enough to be a girl, anyway, when I like boy's games and work and manners! I can't get over my disappointment in not being a boy. And it's worse than ever now, for I'm dying to go and fight with Papa. And I can only stay home and knit, like a poky old woman!'

And Jo shook the blue army sock till the needles rattled like castanets, and her ball bounded across the room.

'Poor Jo! It's too bad, but it can't be helped. So you must try to be contented with making your name boyish, and playing brother to us girls,' said Beth, stroking the rough head with a hand that all the dish washing and dusting in the world could not make ungentle in its touch.

'As for you, Amy,' continued Meg, 'you are altogether too particular and prim. Your airs are funny now, but you'll grow...'



## Text 10: Anna Karenina

Happy families are all alike; every unhappy family is unhappy in its own way.

Everything was in confusion in the Oblonskys' house. The wife had discovered that the husband was carrying on an intrigue with a French girl, who had been a governess in their family, and she had announced to her husband that she could not go on living in the same house with him. This position of affairs had now lasted three days, and not only the husband and wife themselves, but all the members of their family and household, were painfully conscious of it. Every person in the house felt that there was so sense in their living together, and that the stray people brought together by chance in any inn had more in common with one another than they, the members of the family and household of the Oblonskys. The wife did not leave her own room, the husband had not been at home for three days. The children ran wild all over the house; the English governess quarreled with the housekeeper, and wrote to a friend asking her to look out for a new situation for her; the man-cook had walked off the day before just at dinner time; the kitchen-maid, and the coachman had given warning.

Three days after the quarrel, Prince Stepan Arkadyevitch Oblonsky—Stiva, as he was called in the fashionable world—woke up at his usual hour, that is, at eight o'clock in the morning, not in his wife's bedroom, but on the leather-covered sofa in his study. He turned over his stout, well-cared-for person on the springy sofa, as though he would sink into a long sleep again; he vigorously embraced the pillow on the other side and buried his face in it; but all at once he jumped up, sat up on the sofa, and opened his eyes.

'Yes, yes, how was it now?' he thought, going over his dream. 'Now, how was it? To be sure! Alabin was giving a dinner at Darmstadt; no, not Darmstadt, but something American. Yes, but then, Darmstadt was in America. Yes, Alabin was giving a dinner on glass tables, and the tables sang, *Il mio tesoro*—not *Il mio tesoro* though, but something better, and there were some sort of little decanters on the table, and they were women, too,' he remembered.

Stepan Arkadyevitch's eyes twinkled gaily, and he pondered with a smile. 'Yes, it was nice, very nice. There was a great deal more that was delightful, only there's no putting it into words, or even expressing it in one's thoughts awake.' And noticing a gleam of light peeping in beside one of the serge curtains, he cheerfully dropped his feet over the edge of the sofa, and felt about with them for his slippers, a present on his last birthday, worked for him by his wife on gold-colored morocco. And, as he had done every day for the last nine years, he stretched out his hand, without getting up, towards the place where his dressing-gown always hung in his bedroom. And thereupon he suddenly remembered that he was not sleeping in his wife's room, but in his study, and why: the smile vanished from his face, he knitted his brows.

'Ah, ah, ah! Oo!...' he muttered, recalling everything that had happened. And again every detail of his quarrel with his wife was present to his imagination, all the hopelessness of his position, and worst of all, his own fault.

'Yes, she won't forgive me, and she can't forgive me. And the most awful thing about it is that it's all my fault—all my fault, though I'm not to blame. That's the point of the whole situation,'

he reflected. 'Oh, oh, oh!' he kept repeating in despair, as he remembered the acutely painful sensations caused him by this quarrel.

Most unpleasant of all was the first minute when, on coming, happy and good-humored, from the theater, with a huge pear in his hand for his wife, he had not found his wife in the drawing-room, to his surprise had not found her in the study either, and saw her at last in her bedroom with the unlucky letter that revealed everything in her hand.

She, his Dolly, forever fussing and worrying over household details, and limited in her ideas, as he considered, was sitting perfectly still with the letter in her hand, looking at him with an expression of horror, despair, and indignation.

'What's this? this?' she asked, pointing to the letter. And at this recollection, Stepan Arkadyevitch, as is so often the case, was not so much annoyed at the fact itself as at the way in which he had met his wife's words.

There happened to him at that instant what does happen to people when they are unexpectedly caught in something very disgraceful. He did not succeed in adapting his face to the position in which he was placed towards his wife by the discovery of his fault. Instead of being hurt, denying, defending himself, begging forgiveness, instead of remaining indifferent even—anything would have been better than what he did do—his face utterly involuntarily (reflex spinal action, reflected Stepan Arkadyevitch, who was fond of physiology)—utterly involuntarily assumed its habitual, good-humored, and therefore idiotic smile.

This idiotic smile he could not forgive himself. Catching sight of that smile, Dolly shuddered as though at physical pain, broke out with her characteristic heat into a flood of cruel words, and rushed out of the room. Since then she had refused to see her husband.

'It's that idiotic smile that's to blame for it all,' thought Stepan Arkadyevitch.

'But what's to be done? What's to be done?' he said to himself in despair, and found no answer. Stepan Arkadyevitch was a truthful man in his relations with himself. He was incapable of deceiving himself and...



## Appendix IX

### Data Required for the Computation of 'r' and 't'

Data required to compute the t-test for the relationship between meaning anticipation and reading comprehension (experimental group)

Participants	X <sub>1</sub>	X <sub>1</sub> <sup>2</sup>	X <sub>2</sub>	X <sub>2</sub> <sup>2</sup>
2	42,5	1806,25	47,5	2256,25
3	22,5	506,25	27,5	756,25
4	22,5	506,25	27,5	756,25
6	42,5	1806,25	45	2025
8	42,5	1806,25	45	2025
9	22,5	506,25	35	1225
12	30	900	35	1225
13	40	1600	40	1600
15	10	100	17,5	306,25
16	10	100	15	225
17	30	900	37,5	1406,25
19	37,5	1406,25	40	1600
20	10	100	20	400
26	22,5	506,25	30	900
27	10	100	15	225
29	10	100	12,5	156,25
32	10	100	15	225
36	40	1600	45	2025
37	10	100	15	225
39	10	100	12,5	156,25
40	10	100	15	225
41	10	100	12,5	156,25
43	20	400	25	625
44	12,5	156,25	15	225
46	10	100	12,5	156,25
48	20	400	25	625
49	10	100	12,5	156,25
51	12,5	156,25	12,5	225
54	37,5	1406,25	40	1600
59	40	1600	45	2025
61	12,5	156,25	15	225
62	10	100	12,5	156,25

63	30	900	37,5	1406,25
67	30	900	37,5	1406,25
69	10	100	12,5	156,25
74	10	100	17,5	306,25
75	40	1600	47	2209
76	40	1600	42,5	1806,25
77	42,5	1806,25	45	2025
79	22,5	506,25	30	900
80	42,5	1806,25	45	2025
82	12,5	156,25	15	225
86	20	400	22,5	506,25
91	20	400	25	625
92	20	400	27,5	756,25
93	12,5	156,25	17,5	306,25
94	37,5	1406,25	45	2025
95	30	900	25	625
98	37,5	1406,25	47,5	2256,25
99	37,5	1406,25	45	2025
<b>Sum</b>	1175	35375	1404,5	47709
<b>Mean</b>	23,5	707,5	28,09	954,18

Data required to compute the t-test for the relationship between meaning anticipation and reading comprehension (control group)

Participants	X <sub>1</sub>	X <sub>1</sub> <sup>2</sup>	X <sub>2</sub>	X <sub>2</sub> <sup>2</sup>
1	32,5	1056,25	32,5	1056,25
5	25	625	25	625
7	15	225	15	225
10	25	625	25	625
11	17,5	306,25	15	225
14	27,5	756,25	27,5	756,25
18	32,5	1056,25	35	1225
21	17,5	306,25	20	400
22	27,5	756,25	27,5	756,25
23	25	625	25	625
24	10	100	10	100
25	15	225	15	225
28	10	100	12,5	100
30	10	100	12,5	156,25
31	10	100	12,5	156,25
33	25	625	25	625
34	10	100	10	100
34	25	625	25	625
35	35	1225	37,5	1406,25
38	27,5	756,25	27,5	756,25
42	15	225	15	225
4547	10	100	12,5	156,25
50	10	100	10	100
52	10	100	12,5	156,25
53	27,5	756,25	27,5	756,25
55	17,5	306,25	20	400
56	15	225	15	225
57	45	2025	45	2025
58	32,5	1056,25	32,5	1056,25
60	10	100	10	100
64	10	100	10	100
65	45	2025	45	2025
66	35	1225	37,5	1406,25
68	27,5	756,25	27,5	756,25
70	45	2025	45	2025
71	35	1225	37,5	1406,25

72	17,5	306,25	20	400
73	32,5	1056,25	32,5	1056,25
78	35	1225	37,5	1406,25
81	45	2025	45	2025
83	10	100	10	100
84	15	225	15	225
85	32,5	1056,25	32,5	1056,25
87	10	100	10	100
88	10	100	10	100
89	10	100	12,5	156,25
90	35	1225	37,5	1406,25
96	10	100	10	100
97	10	100	10	100
100	45	2025	45	2025
<b>Sum</b>	1130	32387,5	1167,5	33856,25
<b>Mean</b>	22,6	647,75	23,35	677,125

Data required to compute the t-test for the relationship between processing speed and reading comprehension (experimental group)

Participants	$X_1$	$X_1^2$	$X_2$	$X_2^2$
2	35	1225	40	1600
3	20	400	20	400
4	20	400	35	1225
6	35	1225	40	1600
8	35	1225	45	2025
9	20	400	30	900
12	25	625	30	900
13	30	900	40	1600
15	5	25	15	225
16	5	25	10	100
17	25	625	25	625
19	35	1225	40	1600
20	5	25	15	225
26	20	400	30	900
27	5	25	15	225
29	10	100	20	400
32	5	25	15	225
36	30	900	30	900
37	10	100	20	400
39	5	25	10	100
40	5	25	10	100
41	5	25	15	225
43	20	400	30	900
44	15	225	25	625
46	5	25	10	100
48	20	400	20	400
49	10	100	10	100
51	15	225	20	400
54	35	1225	35	2025
59	30	900	45	2025
61	15	225	25	625
62	5	25	15	225
63	25	625	30	900
67	25	625	25	625
69	5	25	10	100
74	5	25	15	225



75	30	900	40	1600
76	30	900	30	900
77	35	1225	40	1600
79	20	400	30	900
80	35	1225	40	1600
82	15	225	25	625
86	20	400	30	900
91	20	400	30	900
92	20	400	25	625
93	15	225	25	625
94	35	1225	45	2025
95	25	625	35	1225
98	35	1225	45	2025
99	35	1225	45	2025
<b>Sum</b>	990	25600	1350	43350
<b>Mean</b>	19,8	512	27	867

Data required to compute the t-test for the relationship between processing speed and reading comprehension (control group)

Participants	$X_1$	$X_1^2$	$X_2$	$X_2^2$
1	35	1225	35	1225
5	30	900	35	1225
7	10	100	5	25
10	10	100	15	225
11	35	1225	30	900
14	30	900	30	900
18	25	625	25	625
21	35	1225	35	1225
22	30	900	30	900
23	15	225	20	400
24	30	900	30	900
25	30	900	30	900
28	35	1225	35	1225
30	35	1225	30	900
31	15	225	10	100
33	15	225	15	225
34	30	900	30	900
35	10	100	10	100
38	10	100	10	100
42	5	25	15	225
45	30	900	30	900
47	10	100	10	100
50	10	100	10	100
52	30	900	30	900
53	25	625	25	625
55	20	400	15	225
56	25	625	25	625
57	20	400	30	900
58	25	625	25	625
60	30	900	30	900
64	20	400	20	400
65	25	625	25	625
66	25	625	30	900
68	10	100	5	25
70	15	225	15	225
71	5	25	15	225

72	5	25	15	225
73	5	25	15	225
78	25	625	25	625
81	10	100	5	25
83	25	625	25	625
84	30	900	30	900
85	25	625	30	900
87	20	400	15	225
88	5	25	15	225
89	10	100	5	25
90	5	25	5	25
96	25	625	30	900
97	15	225	20	400
100	20	400	15	225
<b>Sum</b>	1020	25550	1050	26400
<b>Mean</b>	20,4	511	21	528

Data required to compute the correlation coefficient 'r' for the relationship between processing speed and reading comprehension

Participants	X	Y	x	y	X <sup>2</sup>	Y <sup>2</sup>	xy
1	42	35	15,55	14,9	241,802	222,01	231,695
2	44	35	17,55	14,9	308,002	222,01	261,495
3	25	20	-1,45	-0,1	2,102	0,01	0,145
4	23,5	20	-2,95	-0,1	8,702	0,01	0,295
5	34	30	7,55	9,9	57,002	98,01	74,745
6	44	35	17,55	14,9	308,002	222,01	261,495
7	14,5	10	-11,95	-10,1	142,802	102,01	120,695
8	44	35	17,55	14,9	308,002	222,01	261,495
9	23,5	20	-2,95	-0,1	8,702	0,01	0,295
10	14,5	10	-11,95	-10,1	142,802	102,01	120,695
11	42	35	15,55	14,9	241,802	222,01	231,695
12	36	25	9,55	4,9	91,202	24,01	46,795
13	37	30	10,55	9,9	111,302	98,01	104,445
14	31,5	30	5,05	9,9	25,502	98,01	49,995
15	17,5	5	-8,95	-15,1	80,102	228,01	135,145
16	17,5	5	-8,95	-15,1	80,102	228,01	135,145
17	28,5	25	2,05	4,9	4,202	24,01	10,045
18	36	25	9,55	4,9	91,202	24,01	46,795
19	39	35	12,55	14,9	157,502	222,01	186,995
20	14,5	5	-11,95	-15,1	142,802	228,01	180,445
21	42	35	15,55	14,9	241,802	222,01	231,695
22	31,5	30	5,05	9,9	25,502	98,01	49,995
23	26,5	15	0,05	-5,1	2,5	26,01	-2,55
24	34	30	7,55	9,9	57,002	98,01	74,745
25	31,5	30	5,05	9,9	25,502	98,01	49,995
26	25	20	-1,45	-0,1	2,102	0,01	0,145
27	14,5	5	-11,95	-15,1	142,802	228,01	180,445
28	42	35	15,55	14,9	241,802	222,01	231,695
29	14,5	10	-11,95	-10,1	142,802	102,01	120,695
30	42	35	15,55	14,9	241,802	222,01	231,695
31	19,5	15	-6,95	-5,1	48,302	26,01	35,445
32	14,5	5	-11,95	-15,1	142,802	228,01	180,445
33	26,5	15	0,05	-5,1	2,5	26,01	-0,255
34	34	30	7,55	9,9	57,002	98,01	74,745
35	15,5	10	-10,95	-10,1	119,902	102,01	110,595
36	37	30	10,55	9,9	111,302	98,01	104,445

37	14,5	10	-11,95	-10,1	142,802	102,01	120,695
38	14,5	10	-11,95	-10,1	142,802	102,01	120,695
39	14,5	5	-11,95	-15,1	142,802	228,01	180,445
40	14,5	5	-11,95	-15,1	142,802	228,01	180,445
41	14,5	5	-11,95	-15,1	142,802	228,01	180,445
42	14,5	5	-11,95	-15,1	142,802	228,01	180,445
43	25	20	-1,45	-0,1	2,102	0,01	0,145
44	19,5	15	-6,95	-5,1	48,302	26,01	35,445
45	31,5	30	5,05	9,9	25,502	98,01	49,995
46	17,5	5	-8,95	-15,1	80,102	228,01	135,145
47	15,5	10	-10,95	-10,1	119,902	102,01	110,595
48	25	20	-1,45	-0,1	2,102	0,01	0,145
49	14,5	10	-11,95	-10,1	142,802	102,01	120,695
50	15,5	10	-10,95	-10,1	119,902	102,01	110,595
51	26,5	15	0,05	-5,1	2,5	26,01	-0,255
52	34	30	7,55	9,9	57,002	98,01	74,745
53	36	25	9,55	4,9	91,202	24,01	46,795
54	39	35	12,55	14,9	157,502	222,01	186,995
55	21,5	20	-4,95	-0,1	24,502	0,01	0,495
56	36	25	9,55	4,9	91,202	24,01	46,795
57	21,5	20	-4,95	-0,1	25,502	0,01	49,5
58	30	25	3,55	4,9	12,602	24,01	17,395
59	37	30	10,55	9,9	111,302	98,01	104,445
60	34	30	7,55	9,9	57,002	98,01	5,445
61	19,5	15	-6,95	-5,1	48,302	26,01	35,445
62	14,5	5	-11,95	-15,1	142,802	228,01	180,445
63	36	25	9,55	4,9	91,202	24,01	46,795
64	21,5	20	-4,95	-0,1	24,502	0,01	0,495
65	28,5	25	2,05	4,9	4,202	24,01	10,045
66	30	25	3,55	4,9	12,602	24,01	17,395
67	30	25	3,55	4,9	12,602	24,01	17,395
68	15,5	10	-10,95	-10,1	119,902	102,01	110,595
69	17,5	5	-8,95	-15,1	80,102	228,01	135,145
70	26,5	15	0,05	-5,1	2,5	26,01	-0,255
71	14,5	5	-11,95	-15,1	142,802	228,01	180,445
72	14,5	5	-11,95	-15,1	142,802	228,01	180,445
73	14,5	5	-11,95	-15,1	142,802	228,01	180,445
74	17,5	5	-8,95	-15,1	80,102	228,01	135,145
75	37	30	10,55	9,9	111,302	98,01	104,445
76	37	30	10,55	9,9	111,302	98,01	104,445
77	44	35	17,55	14,9	308,002	222,01	261,495

78	28,5	25	2,05	4,9	4,202	24,01	10,045
79	25	20	-1,45	-0,1	2,102	0,01	0,145
80	44	35	17,55	14,9	308,002	222,01	261,495
81	14,5	10	-11,95	-10,1	142,802	102,01	120,695
82	19,5	15	-6,95	-5,1	48,302	26,01	35,445
83	30	25	3,55	4,9	12,602	24,01	17,395
84	31,5	30	5,05	9,9	25,502	98,01	49,995
85	30	25	3,55	4,9	12,602	24,01	17,395
86	23,5	20	-2,95	-0,1	8,702	0,01	0,295
87	21,5	20	-4,95	-0,1	24,502	0,01	0,495
88	14,5	5	-11,95	-15,1	142,802	228,01	180,445
89	15,5	10	-10,95	-10,1	119,902	102,01	110,595
90	14,5	5	-11,95	-15,1	142,802	228,01	180,445
91	23,5	20	-2,95	-0,1	8,702	0,01	0,295
92	23,5	20	-2,95	-0,1	8,702	0,01	0,295
93	19,5	15	-6,95	-5,1	48,302	26,01	35,445
94	39	35	12,55	14,9	157,502	222,01	186,995
95	28,5	25	2,05	4,9	4,202	24,01	10,045
96	28,5	25	2,05	4,9	4,202	24,01	10,045
97	26,5	15	0,05	-5,1	2,5	26,01	-0,255
98	39	35	12,55	14,9	157,502	222,01	186,995
99	39	35	12,55	14,9	157,502	222,01	186,995
100	21,5	20	-4,95	-0,1	24,502	0,01	0,495
<b>Sum</b>	2645	2010	0	0	9333,19	10749	9495,41

## Résumé

Ce travail de recherche vise à étudier l'importance de la mémoire de travail, les capacités d'anticipation et le traitement automatique de l'information dans la compréhension écrite des étudiants universitaires. Cependant, le but de cette étude est triple. En premier lieu, elle cherche à déterminer s'il existe une forte corrélation entre la mémoire de travail des élèves et leurs aptitudes à la compréhension écrite en effectuant une étude corrélationnelle. Deuxièmement, elle a pour but de mesurer la contribution des capacités d'anticipation dans la croissance des capacités de traitement des textes étudiés en réalisant une étude expérimentale. Troisièmement, elle examine la nature de la relation entre l'automatisme de la lecture des participants et la compréhension de la lecture en utilisant à la fois une étude corrélationnelle et une étude expérimentale. Les participants sont 100 étudiants de troisième année d'Anglais à l'Université des Frères Mentouri, Constantine, Algérie. Les capacités cognitives ciblées sont mesurées à l'aide de différents outils de mesure. La compréhension écrite des participants est mesurée à l'aide d'exercices à choix multiples. De plus, 2 mesures de mémoire de travail ont été utilisées pour mesurer leur compréhension de la lecture. En outre, l'automatisation des mots des participants est évaluée à l'aide d'exercices de visualisation de listes de mots. Les analyses statistiques, utilisant le coefficient de corrélation 'r' et le test t, révèlent que la capacité de la mémoire de travail est significativement corrélée avec leurs capacités de compréhension écrite. De plus, les capacités d'anticipation ont montré qu'elles contribuent au traitement du discours écrit. Et en fin, le traitement automatique de l'information est révélé comme un régulateur important du traitement des textes écrits en Anglais.

تبحث هذه الدراسة الدور الحاسم لسعة الذاكرة العاملة قدرات الترقب ومعالجة المعلومات التلقائي في الاستيعاب القرائي طلاب الجامعة. ولذلك، فإن الهدف من هذه الدراسة ثلاثي . أولاً، فإنه يسعى لفحص ما إذا كانت هناك علاقة قوية بين الذاكرة العاملة وقدرات الطلاب والقراءة والفهم من خلال إجراء دراسة ارتباطية. ثانياً، أنه يقيس مساهمة قدرات ترقب في نمو قدرات تجهيز النصوص الطلاب عن طريق تنفيذ دراسة تجريبية. ثالثاً، فإنه يفحص طبيعة العلاقة بين تلقائية القراءة للمشاركين والفهم الكتابي باستخدام الدراسة الارتباطية والدراسة التجريبية. والمشاركون هم 100 طالب السنة الثالثة في اللغة الإنجليزية في جامعة الإخوة منتوري ، قسنطينة ، الجزائر. يتم قياس القدرات المعرفية المستهدفة من هؤلاء الطلاب باستخدام أود مختلفة. يتم قياس الفهم القراء المشاركين باستخدام تمارين ذات متعددة الاختيارات.

اختبارين لقياس قدرات التخزين. إلى جانب ذلك، يتم تقييم قدرات المشاركين على المعالجة تلقائية باستخدام تمارين المشاهدة قائمة كلمات. التحليلات الإحصائية، وذلك باستخدام معلمي الارتباط واختبار ، تكشف عن أن العمل سعة الذاكرة يرتبط بشكل كبير مع قدرات القراءة والفهم. وبالإضافة إلى ذلك، أظهرت أن قدرات توقع محتوى النص يساهم في فهم النص المكتوب. أكثر من ذلك، تبين أن معالجة المعلومات التلقائية كمنظم مهم لم .