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A DESCRIPTIVE STUDY OF READING COMPREHENSION DIFFICULTIES AND STRATEGIES OF FOURTH YEAR MICROBIOLOGY STUDENTS OF FERHAT ABBAS UNIVERSITY AT SETIF

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DEDICATION

This work would not have been possible without the loving support of so many people. I find myself overwhelmed in offering them all my thanks in dedicating this work to them. The following is not a hierarchy since each person made his/her own unique contribution and none could stand above the others in that regard.

To my mother and father, source of my happiness and success in life. May Allah bless them.

To my husband for his unconditional support and encouragements to pursue my interests.

To my family and the many friends, who have been so supportive and encouraged the fulfilment of this work.

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ABSTRACT

This study presents a qualitative and quantitative investigation designed to provide a concrete picture of the reading comprehension difficulties, processes and strategies used by the graduates in their academic reading by adopting a triangulated approach which uses three research instruments, namely a test, a questionnaire and a think-aloud procedure. The main concern of the test is to depict the comprehension level of the students; then elicit their comprehension difficulties. The aim of the questionnaire is to develop knowledge of the learners' strategic repertoire and general strategy use free from context. Think-aloud procedure, on the other hand, aims at developing knowledge of the learners' actual strategy use in a specific reading situation and of the actual execution of online strategies during reading.

In terms of the research hypotheses raised in this study, the four hypotheses have been confirmed statistically. The first hypothesis confirmed that subjects with higher reading ability (high-achievers) are more purposeful and efficient than subjects with lower reading ability (low-achievers) in the sense that they read in a way that allows them to understand the writer's message without spending too much time in the process by using effective strategies. The results of hypothesis two are also congruent with other studies (Carrell 1989, Devine1987) that strategy monitoring is significantly related to reading performance. High-achievers favoured global processes, i.e., those having to do with background knowledge, inferences, and predictions; whereas, less-proficient readers employed more localized processes, i.e., those having to do with word meaning, and text details. Furthermore, much of low-achiever's attention resources are spent on decoding words in print which disrupted their comprehension (hypothesis three). The readers' less developed word recognition skills and strategies also caused them to read less effectively than high-achievers and to read the text in isolated units rather than as meaningful sentences. Henceforth, the construction of the text's meaning was not executed effectively (hypothesis four).

LIST OF ABBREVIATIONS

CALLA : Cognitive Academic Language Learning Approach

DTLS : Descriptive Test of Language Skills

EAP: English for Academic Purposes

EFL: English as a Foreign Language

ESL: English as a Second Language

ESP: English for Specific Purposes

ETR: Experience-Text Relaltionship

FL: Foreign Language

K-W-L: What do I **K**now? What I **W**ant to learn? What did I **L**earn?

L1: First Language

L2: Second Language

MBE: Microbiologie Langue Etrangère

MBN: Microbiologie Langue Nationale

MC: Multiple Choice

N: Number

R: Researcher

S: Student

TSI: Transactional Strategy Instruction

RTA: Reciprocal Teaching Approach

SAQ: Short Answer Questions

SEM: Structural Equation Modeling

TALO: Text as a Linguistic Object

TAVI: Text as a vehicle for Information

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INTRODUCTION

1. Statement of the Problem

Courses whose specific objective is the reading of scientific and technical texts are becoming more and more common in universities and technical colleges throughout the world, and Algeria is no exception.

At Ferhat Abbas University of Sétif, English for scientific and technical purposes has become an obligatory course in different institutes. Its importance lies in the international status it has acquired, basically as a means that enables students to gain access to the latest and up-to-date scientific and technical findings, thus becoming essentially a "library language". The students are expected at the end of the course to understand specialised books, and journals for their studies and research.

In the Biology Institute, the course is taught for two academic years –the third and fourth years– by teachers that have never received any adequate pedagogical training for the teaching of English for specific purposes, a complete absence of official programmes, lack of coordination between the different teachers of English, and no prior analysis of the students' needs.

The Biology institute at Ferhat Abbas University, like the other institutes, receives students that have been trained in Arabic and have a low competence in the English language. This linguistic handicap in English has brought with it some problems of reading comprehension in the students' own speciality. In addition, many teachers use reading passages as a means either for teaching grammar and vocabulary or for translation. The course then does not aim to teach reading as such and cultivate the students' strategies for comprehension. The latter do not constitute one of the important objectives to be achieved. It even seems that enough is not still known about the nature of the reading process and the way

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to improve reading performance through the use of adequate strategies. In other words, the problem that has been scrutinised is that fourth year students cannot read successfully in English, although they have spent two years studying English (at the tertiary level). This is partly related to the absence of a serious undertaking in the teaching of English which is taught without clearly assigned objectives and methodology.

Given this situation, the present work has as a main objective the scrutiny of the reading difficulties, and the reading strategies used by the Biology students with special emphasis on the last year. The choice of fourth year students was not a random one; it was motivated by the fact that students in this year prepare a dissertation about a topic in their field of speciality and have to read extensively, and that most of the documentation is written in English.

2. Aims of the Study

The present study aims at identifying the major factors that have a bearing on the the reading achievement of the students, and how they process new information and the kinds of strategies they employ in retrieving information as well as understanding it. It also attempts to depict the students' awareness about strategy use. By strategy awareness, we mean the students' knowledge of whether comprehension is taking place, and the conscious application of one or more strategies to correct comprehension, because students with such a consciousness will, not only improve their reading comprehension, but also have flexibility in performing all reading related tasks in their environment. Without a conscious approach to strategy use, these students will lack opportunity to review their progress, accomplishments and future directions.

Decision to investigate reading from this aspect stemmed from our view on the nature of reading as being a highly cognitive process and an active skill that requires the combination a number of strategies as scanning, skimming, guessing and predicting with internal and external clues such as the students' background knowledge to derive meaning from texts. It also stemmed from the specific characteristics of the students whose immediate need in English is reading efficiently and rapidly texts and articles that are relevant to their specialist area. Students are highly motivated and aware to learn English, given its paramount importance as a vehicle for Science and Technology.

3. Hypotheses and Research Questions

The present study is an attempt at answering a few questions that pertain to university students' performance on reading comprehension in Engish for Specific Purposes context. The objectives of the investigation can be expressed in the following research questions:

(i) What is the relationship between the reading level and the type, quantity and quality of strategy use?

(ii) What is the relationship between the students' reading level and their vocabulary level?

(iii) What is the relationship between vocabulary level and word treatment strategy use?

All these questions can be expressed in terms of the following research hypotheses. For each hypothesis, its negative counterpart will represent the null hypothesis.

Hypothesis One

Students' difficulties in reading in English may result from the inadequate use of reading strategies; for successful reading requires a wide variety of strategies and the students' handling of texts is weak because they cannot manipulate them successfully. Adequate strategy use refers to effective versus less-effective strategies use. We then hypothesize that

the two sub-groups differ with respect to effective versus less-effective strategies use with high-achievers using more effective strategies than low-achievers.

Null Hypothesis

There is no difference between the two sub-groups with respect to effective versus less-effective strategies use

Hypothesis Two

Students' reading problems in English may be due to the fact that they mainly engage in bottom-up strategies or data-driven processing by passively decoding the text rather than in top-down or reader-driven processing by actively participating in the act of reading. In addition to decoding meaning from print with bottom-up skills, successful readers implement top-down skills to activate their prior knowledge of content and use textual cues to help them cope with new information. Hence, we hypothesize that high-achievers use top-down strategies to greater rate than low-achievers.

Null Hypothesis

There is no difference between the two sub-groups with respect to bottom-up versus top-down strategies use.

Hypothesis Three

Vocabulary knowledge and successful reading performance are tightly connected. Students' reading problems may be rooted in their poor vocabulary in English. We hypothesize that low-achievers are confronted to lack of vocabulary knowledge more than high-achievers.

Null Hypothesis

There is no difference between the two sub-groups with respect to vocabulary knowledge

Hypothesis Four

A strategic approach to word recognition fosters efficiency in reading. Students' reading problems may be related to lack of strategic approach to handle unfamiliar words. We hypothesize that low-achievers differ both in the type and amount of word treatment strategies and adopt a less strategic approach than high-achievers in handling unfamiliar words.

Null Hypothesis

There is no difference between the two sub-groups with respect to word treatment strategies.

4. Means of Research

In order to report on the students' ability to understand, their perception of strategies and their strategy use when attending texts in English and in their field of speciality, a combination of research methods has been used in this research. These methods involve a reading comprehension test, a students' questionnaire and a think-aloud procedure.

The test aims at a quantitative measurement of the product of reading i.e. comprehension, and at diagnosing how much the students can grasp from text. The Think aloud reports – an introspective technique– aims at gathering on-line strategy use and investigating the way in which learners process texts. This research method is used because it is especially well suited to the task of providing the most direct access we have to mental processes and strategies involved in reading while it is going on. Finally, the students' questionnaire –a retrospective

method– provides information about the students' beliefs, attitudes and perception about strategies use. The students' questionnaire is not specifically directed to a specific reading task, but rather to the students' perception about the reading behaviour and the general reading habits which they have acquired. Thus it involves retrieval of information from long-term memory.

5. Structure of the Thesis

This thesis involves a theoretical and a practical part. The theoretical part includes chapters one, two, and three. Chapter one reviews first and second language reading process models. It also deals with the relationship between first and second language reading and the causes for second language reading problems.

Chapter two sheds light on issues regarding reading skills and strategies, particularly with their definitions, classifications, their relationship with each other, and above all their contribution to successful reading. The chapter also discusses the role of metacognitive awareness in reading comprehension and the importance of comprehension monitoring for successful reading.

Chapter three provides some theoretical issues particularly pertaining to second language qualitative and quantitaive assessment of reading. It sheds light on the three data collection instruments –traditional test, questionnaire and think-aloud procedure.

The practical part comprises chapters four, five, six and seven. The first part of chapter four discusses the experimental design of the present study by providing a description of the test in terms of selecting the reading passage, skills and strategies to be

tested, the activities and tasks involved as well as the administration and sampling procedures. The second part of the chapter describes the second data elicitation procedure; i.e., the questionnaire and offers the reader a description of the latter, its piloting and its administration.   Finally, part three tackles the think-aloud procedure and provides information about the participants, the selection of the reading material, the training sessions as well as the collection, identification and categorization of strategies.

Chapter five provides the statistical analysis of the reading comprehension test, the questionnaire items and the think-aloud data in order to depict the students' level in reading and diagnose their reading comprehension processes and difficulties. Chapter six deals with the statistical analysis and interpretation of the results obtained from the three above assessment methods in terms of answers to the set hypotheses.

Finally, chapter seven tackles the research implications by suggesting some operational guidelines in the form of recommendations which will contribute to enhance the learners' reading performance and assist them in developing their reading abilities, and discussing the research limitations and suggestions for further research.

CHAPTER   ONE

FIRST   AND   SECOND   LANGUAGE   READING   PROCESSES

Introduction

Reading is largely an unobservable mental activity and a multi-faceted skill which involves lower and higher skills. In spite of the overwhelming number of different theories of reading, no one has won general acceptance. The controversy over definitions of reading stems from the purpose(s) each scholar sets for his theory. In this respect, a wide array of questions about reading may be asked: What is reading? What is the difference between reading process and reading product? What is reading in a second language? and What is the relation between First and Second language reading?

The present chapter seeks to answer the above questions by offering a definition of the reading skill from two perspectives: process and product. It also sheds light on models of First and Second language reading, reading in a second language, and relation between First and Second language reading.

1.1. Nature of Reading

1.1.1. Definition of Reading

It would appear superfluous to ask the question of what reading actually is, had it not been for the fact that to date nobody has been able to define reading exhaustively. As Urquhart and Weir (1998: 13) said,

We all know what reading is. And many of us have suffered, at some time or the other, from the type of bore who stops any argument or discussion with 'Ah, it depends on what you mean by...'. So it is with some reluctance that we begin this part with an attempt to define reading, to say what we mean by the term. Our excuse is that people do use the term in different ways, and that while this may be permissible when everybody is consciuos of the differences, on occasions it can cause real confusion and difficulty.

Definitions of reading can generally be placed across a continuum of two opposing views, one focusing on the process of reading and the other focusing on the result of that process, the product.

According to the first view, reading is primarily a decoding process involving, to cite Taylor and Taylor (1983), four signposts of letter and word recognition, sentence reading, story reading and reading for its own sake. On the other hand, according to Spink (1989), the reading process involves the perception of words, the comprehension of text, a reaction to what is read and a fusion of old and new ideas.

From the 'product' point of view, reading is the process of constructing meaning from written texts, that is comprehending which requires the coordination of a number of interrelated sources of information and the dynamic interaction among:

(i) the reader's existing knowledge;

(ii) the information suggested by the text being read; and

(iii) the context of the reading situation (Anderson et al., 1985; Wixson, Peters, Weber, & Roeber, 1987).

Deriving meaning from print is a complex system which requires the following skills and abilities:

(i) to understand how phonemes, or speech sounds, are connected to print;

(ii) to decode unfamiliar words;

(iii) to read fluently;

(iv) sufficient background information and vocabulary to foster reading comprehension;

(v) the development of appropriate active strategies to construct meaning from print, and

(vi) the development and maintenance of a motivation to read.

Comprehension, then, is an active mental process. It is not something that a reader has; rather, it is something that a reader does. This process involves the author's ideas being seeded in the reader's background and the latter attempting to explore his or her own ideas, to modify them, to fit new ideas into the organization of his or her thinking, and to construct still new ideas, the reader is involved in a constant process of concept development (Farr and Roser, 1977).

We can notice that there is a big overlap between the above definitons, the reason being the difficulty to dissociate process and product even theoretically. Henceforth, and restricting ourselves to the two above views, and for the purpose of the study, we can conclude with a working definition of reading as follows: Reading is an interactive process between a reader and a text leading to the creation of meaning.

1.1.2. The Process of Reading

By process of reading, we mean the cognitive activity operating in real time. It is the interaction between a reader and a text. Many operations happen during the process of reading; they include looking at print, deciphering the marks on the page, recognizing

words, deciding what they mean and how they relate to each other. This process is likely to be dynamic, variable and different, not only for the same reader on different texts at different times and different purposes, but also for different readers on different texts at different times and different purposes (Alderson, 2000).

Another approach, equally interested in the reading process, is the componential model. This model merely describes what components are thought to be involved in the reading process. It restricts itself to descriptive behaviour and does not in any way attempt to speculate on how the components tend to correlate and interact, or how the reading process actually develops in time. In other words, it breaks the construct of reading into various components varying from a description of a fixation, or the amount of seconds an eye pauses on a group of words. The components may also encompass "skills" or "strategies" which are themselves made up of numerous components such as skimming and scanning. The dominant current models of the reading process are detailed below (Section 1.2.).

1.1.3. The Product of Reading

The product of reading is comprehension, in other words, the understanding the reader has constructed. This approach to reading is based on the view that "although readers may engage in different reading processes, the understanding they end up with is the same…. What matters, then, is not how you reach that understanding, but the fact that you reach it" (Alderson, 2000: 04). A focus on what one understands, the advocates of this approach argue, reduces the problem of potentially infinite variations in the process of interpreting texts. In recent years, the Product Approach to reading has become unfashionable as researchers have concentrated their efforts on understanding the process.

Theories of reading commonly distinguish between a literal understanding of the text, understanding meanings that are not explicitly stated in the text, and understanding the main implications of the text. These three levels of reading are commonly referred to as comprehending, inferencing and interpreting or to use Gray's (1960, cited in Alderson, 2000) distinction between reading "the lines", reading "between the lines" and reading "beyond the lines" respectively. This distinction which relates to the product of reading makes it possible to describe the observed differences in understanding among readers.

The first level, comprehending –reading "the lines"– refers to linguistic comprehension and involves the conventional meanings of lexical and syntactic forms. For example, in English, the lexical item *apple* has a different meaning from *prince*, while the structure *Are you happy?* has a different meaning from *You are happy*.

As for inferencing –reading "between the lines"– it may be text-based inferencing or pragmatic inferencing. Text-based inferencing is understanding language in its contextual function. Thus a sentence such as *The path was very steep* has one meaning at the linguistic level, but possibly two functions in two different contexts. On the other hand, in pragmatic inferencing, readers may also draw on knowledge of the world to help them construct the meaning.

Finally, interpreting reading –"beyond the lines"– refers to the reader's personal understanding of the communicative intent of the author of the text. A reader may react to a text along the lines of *The writer has tried to write an amusing story*, or *The writer wants me to buy…*, or *The writer wants to tell me about…* . Other responses to reading may

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include evaluative judgements on the content or style of the text or critical judgements such as on the logic, argument or even ideological assumptions expressed in the text.

These levels of understanding are frequently ordered hierarchically in terms of difficulty and value and in terms of acquisition. Regarding the first hierarchy, the assumption is that the literal level is considered 'lower' and less difficult to reach than critical understanding. As for the second hierarchy, the assumption is that we first learn how to understand texts literally, then to infer meanings and only at a later stage do we learn to approach texts critically (Alderson, 2000). Vacca and Vacca (1996) offer the following pictorial representation of the levels of comprehension (See figure 01).

Figure 01: Vacca's Levels of Comprehension

	Levels of Comprehension	Reading the lines
Getting information explicitly from the text	Literal	
Putting together information, perceiving relationships, and making inferences	Interpretive	Reading between the lines
Using information to express opinions and form new ideas	Applied	Reading beyond the lines
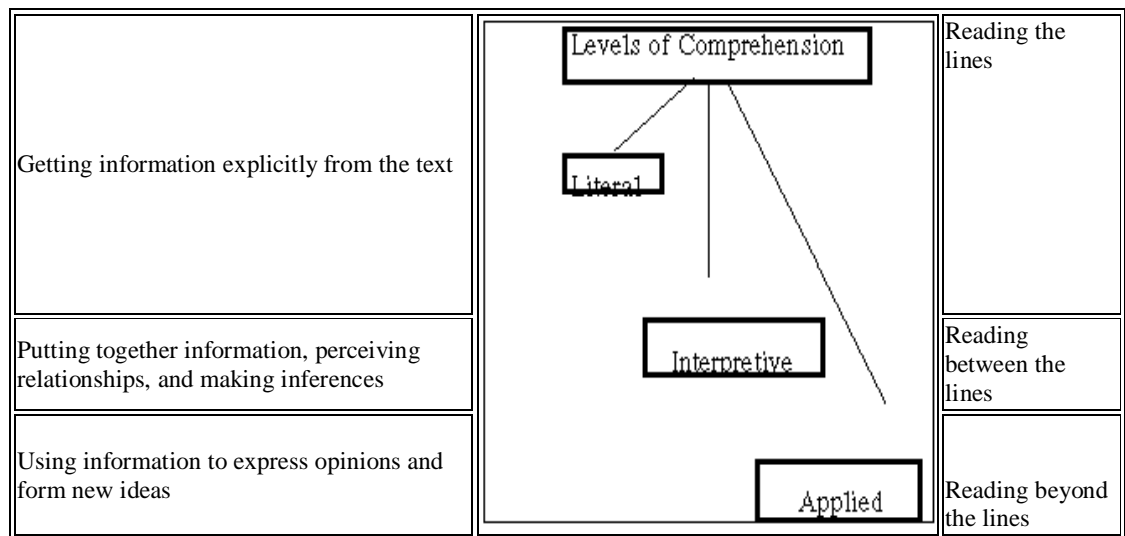
1. 2. Models of First Language Reading Process

There is a long history of attempts which have to answer the question: "What goes on in the reader's visual system and mind during the process of reading?" These attempts conceptualize knowledge about reading in the form of explicit models of the reading process which describe the whole process from the moment the eye meets print until the

reader reaches comprehension. So the term 'model' "refers to a formalised, visually represented theory of what goes on in the eyes and the mind of the readers when they are comprehending (or miscomprehending) text" (Davies, 1995: 57). Such models played a crucial role in the shaping of educational policies and teaching methods. Two factors contributed to the burst in model-building. The first is related to the changes that occurred in language research and the psychological study of mental process and the second is associated to the advent of the psycholinguistic perspective (Goodman 1976; Smith, 1971) which gave an impetus to the field to consider underlying assumption about basic process in reading.

1.2.1. Some Problems in Model Evaluation

When attempting to describe the reading process, one must be aware of two major problems that lead to misunderstanding among model builders. The first has to do with the limited knowledge base that the model builder has to draw upon which is often "influenced by the scientific philosophies and studies dominant within the historical context in which the model was developed" (Samuel and Kamil, 1988: 25). For example, a contrast drawn between the models developed during the pre- 1960 period of behaviourism and those of the post- 1960 period of cognitive psychology clearly indicates conceptualizations and components in newer models that are not found in earlier ones. The former attempt to describe how mental processes such as memory and attention play a role in reading; whereas, the latter show how stimuli like printed words and word recognition responses are connected. Even during the period of cognitive psychology, one can notice differences between the models: the earlier models were linear information processing models; whereas, the later models were interactive. The second problem is that any model that describes the reading process is influenced by information that the researcher has gathered

during experiments. This information is influenced by four interactive factors: the age and the skill of the experimental subjects, the task that the subjects are asked to perform, the materials which are used, and the context (classroom, laboratory, type of school, etc.) which surround the study (Samuel and Kamil, 1988). Thus, any change in any one of these variables would affect the results of the study and the researcher's view of the process.

1.2.2. Types of Reading Models

Views on the nature of reading vary across a scale which has as endpoints the two models that have been labelled bottom-up and top-down models. However, most current research adheres to what has been termed the interactive model or the more recent reading/ writing and bottom-up/interactive models. The above models vary in the emphasis each places on text-based variables like vocabulary, syntax and rhetorical structure and reader-based variables like background knowledge of the world and texts, cognitive development, interest and purpose in reading and strategy use.

1.2.2.1 Bottom-up Models

In this type of model, the reader begins with the written text (the bottom) and constructs meaning from letters, words, phrases, clauses and sentences, sequentially processing the text in a series of discrete stages in a linear fashion. The model is based on the assumption that reading is "a process in which small chunks of text are absorbed, analyzed and gradually added to the next chunks until they become meaningful" (Barnett, 1989: 13) and that the reading task is composed of a series of stages which proceed in a fixed order from sensory input to comprehension. Clearly, bottom-up models are text-driven models of comprehension which are based

on issues of rapid processing of text and word identification and on the reader's ability to recognize words in isolation by mapping the input directly on some independent representational form in the mental lexicon. This mapping is seen to be independent of context.　　　　　(Hudson, 1998: 47)

The most prototypic model of bottom-up model is that proposed by Gough (1972). The model provides a detailed description of how the reader processes text from the moment s/he looks at the printed words until the time when s/he derives meaning from words. This model is based on evidence drawn from laboratory studies of adult readers engaged in letter and word recognition tasks. Gough's model of reading holds that the reader takes in data from the page in sequence. In brief, the model suggests that the reader starts with letters, which are recognised by a SCANNER. The gained information is then passed to the DECODER, which converts the strings of letters into a string of systematic phonemes. This string is then passed to the LIBRARIAN, where it is recognised as a word with the help of the LEXICON, culminating in the transfer of the input from Primary Memory to a magical device labelled MERLIN which applies syntactic and semantic knowledge to assign meaning to the sentence. This sentence then goes to TPWSGWTAU (The Place Where Sentences Go when They Are Understood). We should point out that Gough's model uses two sets of entities: *text units* which are arranged in order of size, letters, words, then sentences and *processing components* namely scanner, decoder, librarian, the Merlin. The crucial feature of this model is that it is unidirectional, and that higher level processes concerned with the construction of meaning do not affect the lower level processes.

The second model which can be described as bottom-up model is the one proposed by La Berge and Samuels (1974). The latter emphasize the role of attention in processing information and the importance of automaticity in the reading process. This model is based on the assumption "that readers can attend to only one thing at a time while reading but that they may be able to process many things at once as long as only one requires attention. A skill or sub – skill is automatic when it can complete its processing while attention is directed elsewhere" (Barnett, 1989: 16). Like Gough, La Berge and Samuels assume that understanding is text-based and that the reader performs two tasks when reading: decoding and comprehending. In the decoding phase, the reader goes from the printed words to some articulatory or phonological representation of the printed stimulus. In the comprehending phase, s/he derives meaning from the decoded material. In the later versions of La Berge and Samuels' model (1977), feedback loops have been added that allow later stages of processing to influence earlier ones, thus making the model fall into the interactive category.

The third model which falls into the bottom-up category is Carver's (1977). Carver presents what he calls a theory of reading comprehension and rauding. The term rauding links reading and listening comprehension (auding). During rauding, the readers successively check words –which they say to themselves in order to determine whether a complete thought is being formulated. In this model, "the sentence is the unitary expression of a thought and the primary purpose of most reading and auding is to comprehend the thoughts of writer or speaker" (Barnett, 1989: 18).

In sum, according to the bottom-up models of reading, the information flow is processed in a series of discrete stages, in which every stage transforms the input and then

passes the recorded information on to the next higher stage for additional transformation and recoding. The reading process can be represented as:

i) Eye looks.

ii) Words recognized.

iii) Words allocated to grammatical class and sentence structure.

iv) Sentences give meaning.

v) Meaning leads to thinking.   (Davies, 1995: 58)

A major drawback of these models, however, is lack of feedback, that is they provide no mechanism to allow later processing stages in the system to influence earlier ones (Samuels and Kamil, 1988). In addition, because the model emphasizes the priority of text as input, textual information tends to be seen as the sole factor which influences reading. Thus, various readers, accepting the author as authority, are expected to come up with identical interpretations of a given text. The reader is simply seen as a passive decoder of sequential graphic-phonic-syntactic and semantic systems in that order.

1.2.2.2. Top-down Models

Top-down models describe reading as a linear process which moves from the top, the higher mental stages, down to the text itself. They view the reading process as one in which higher stages of information processing not only interact with earlier stages, but also direct the process and do most of the work. They also assume that the reading process is driven by the reader's mind at work on the text. In other words, the reader is not bound by the text. Rather, s/he utilizes her/his general knowledge of the world or of a particular text component to make intelligent guesses about what might come next in the text. The reader proceeds, then, by sampling the text information in order to verify these guesses. Reading

is, thus, conceptually driven by the higher-order stages rather than by low-level stimulus analysis and the reader's expectations play a crucial role (Barnett, 1989).

Goodman (1968, 1976) and Smith (1971) are most closely associated with top-down theories of the reading process, though Goodman himself denies the association. Goodman's model, often dubbed "reading as a psycholinguistic guessing game", argues that in order to minimize their dependence on visual decoding and grapho-phonemic knowledge (association of sounds with graphemes), readers rely on their knowledge of syntax and semantics. The reading process is made up of a series of four primary cycles: optical, perceptual, syntactic and semantic with the latter in the controlling role. If the readers are to be productive, Goodman argues, they have to focus on meaning, so with every cycle melting into the next, they get to meaning. Unlike Gough's model which was based on fluent adult readers, Goodman's model was based on the study of beginning first language (L1) readers; however, just as Gough extrapolates from studies of adult readers to beginners, Goodman extrapolates from beginning readers to fluent adults. The model's most distinctive characteristic is its procedural preference. It proposes four processes in reading:

 (i) predicting (that is making predictions about the grammar structure in a text),

 (ii) sampling (that is sampling the text to confirm predictions),

(iii) confirming guesses, and

(iv) correcting guesses.

Thus, prediction precedes confirmation which precedes correction. Another distinction in Goodman's model is his use of the term decoding which he uses to describe how either a graphemic input or phonemic input are translated into a meaning code,

whereas, others use it to describe the translation of graphemic input into phonemic input. Goodman refers to the latter view as recoding. Thus, decoding can be either direct (grapheme to phoneme) or mediated (grapheme to phoneme to meaning). A last characteristic of Goodman's model is its great impact on conceptions about reading instruction, particularly early instruction. Using what they call miscue analysis, Goodman and his colleagues accumulated an impressive amount of data about reading comprehension. Miscue analysis consists in having children read moderately difficult stories. The children then retell what they remember of the story. Their misreading and miscues are analyzed in order to provide an indication of how much they comprehend.

Smith (1971) also focuses on the top-down nature of reading. For him, non-visual information transcends the text, and the reader's background knowledge, experience with the reading process, knowledge of the structure and pattern of the text and of specific text types are of an extreme importance in the construction of meaning during the processing of any type of information, including print. Smith shares a number of points with Goodman like the emphasis he places on the role of meaning and the reader's need to make predictions when reading, the distinction he makes between mediated (through recoding to sound) and immediate meaning identification (print to meaning) and finally his account of the procedural preference of reading, i.e. his reliance on language factors instead of graphic information. Smith cites four characteristics of reading:

(i) Reading is purposeful: people read for specific reasons and with specific goals.

(ii) Reading is selective: readers attend only to what is necessary to their purpose.

(iii) Reading is based on comprehension: the reader brings certain prior knowledge to the text and adds to it the information and ideas gathered from the reading.

(iv) Reading is anticipatory: the interaction of prior knowledge, the expectations of comprehending and the purpose in reading lead readers to anticipate text content.

In sum, one way to differentiate between top-down and bottom-up models is that in the former, the readers start with making hypotheses and predictions and attempt to verify them by working down the printed stimuli; whereas, in the latter, the readers start with the printed stimuli and work their way up to the higher-level stages. Unlike the bottom-up approach, the top-down approach sees the reader as active, planning, decision-making individual who brings to the task of reading a wide array of information and ideas, attitude and beliefs and who coordinates a number of skills and strategies to facilitate comprehension. The top-down model is illustrated as:

i) Eyes look.

ii) Thinking-prediction about meaning.

iii) Sample sentence as a whole to check meaning.

iv) To check further, look at words.

v) If still uncertain, study letters.

vi) Back to meaning prediction.   (Davies, 1995: 58)

Problems of the top-down model emerge, however, when the reader has little knowledge of the text topic and fails to generate predictions. Even when a skilled reader can generate prediction, it may be that the amount of time required for the generation of predictions is greater than the amount of time required to simply recognize the words. In other words, it is sometimes more demanding and laborious for a skilled reader to make predictions than to recognize words in a text. Thus, "while the top-down models may be able to explain beginning reading, with slow rates of word recognition, they do not

accurately describe skilled reading behaviour". (Samuel and Kamil, 1988: 32). Top-down model are rare, having quickly given way to interactive models.

1.2.2.3. Interactive Models

As their name suggests, interactive models theorize an interaction between the reader and the written text. They emphasize on the bidirectional nature of reading which involves the application of higher-order mental processes, background knowledge and text processing. Like top-down models, interactive models are reader-driven. They conceive of the reading process as cyclical rather than linear in nature. That is the readers' mental activities which involve the processing of graphic, syntactic, lexical, semantic and pragmatic information together with textual information operate simultaneously and with equal importance in text comprehension. Like in top-down models, the reader relies on previous understanding and his/her expectations in order to generate guesses about the text, and like in bottom-up models, the reader still depends on what is in the text. "Text sampling and higher-level decoding and recording operate simultaneously." (Barnett, 1989: 13).

Differences between the various interactive models depend on whether they focus on the process of reading where the key element is the interaction between componential cognitive processes, or whether they focus on the product of the reader's interaction with the information in the text and his/her background knowledge in the process of comprehension. (Grabe, 1991). Rumelhart's model is one of the most influential models in underpinning both first (L1) and second language (L2) reading and one of the first to argue against the linear process presumed by bottom-up models. The model aims at proposing an alternative to linear, bottom-up models and the possibility of parallel processing which

consists of the simultaneous processing of information from more than one source. Rumelhart (1977: 573) suggests that reading is at once a "perceptual" and "cognitive" process" that begins with a flutter of patterns on the retina and ends with a definite idea about some author's intended message. The model is based on laboratory research on fluent skilled readers. Based on an information processing perspective, Rumelhart's model proposes various types and directions of processing which are themselves dependent on text context and available information sources. These types of processing include the identification of letters which is dependent on the surrounding letters or the word in which it appears, the identification of the word which is determined by the semantic and the syntactic environment in which it appears, and the interpretation of the text which is determined by the schematic framework within which it is presented. The figure below illustrates the model.

Figure 02: The Interactive Reading Process (Rumelhart, 1977, p.588)
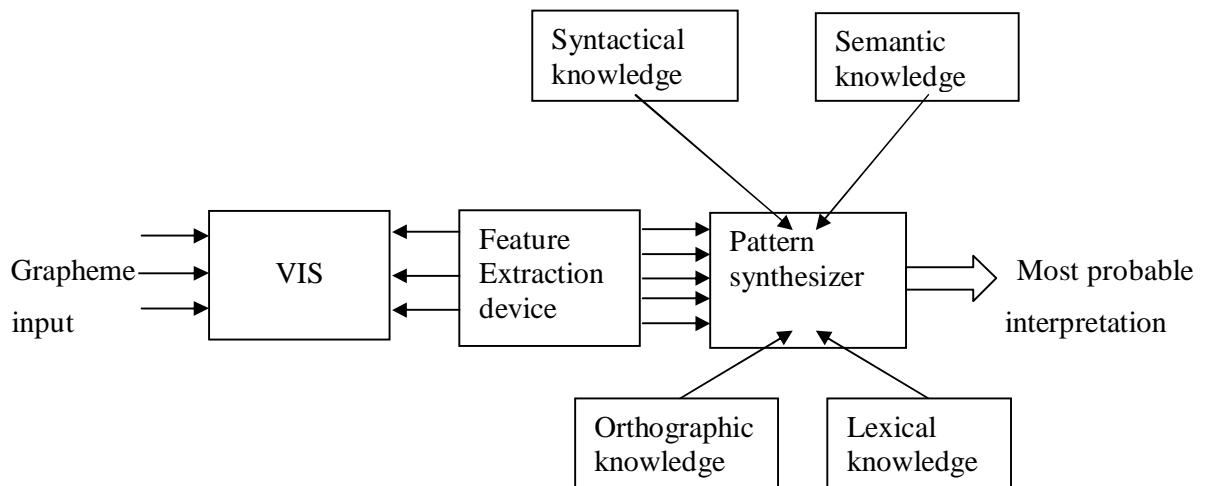
The reading process proceeds as follows: first the graphemic input is registered in a Visual Information Store (VIS), and then it is operated on by a feature extraction device. After that, the features pass to a pattern synthesizer which simultaneously receives input from orthographic, syntactic, lexical and semantic knowledge, all potentially operating at

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the same point. Thus "all sources of knowledge come together to one place and the reading process is the product of the simultaneous joint application of all knowledge sources" (Davies, 1995: 64-65). What the model does not show, however, is how the interaction between these information sources takes place.

Stanovich (1980) adds a new feature to Rumellhart's interactive model by suggesting that a deficit in any knowledge source may cause a compensatory reliance on other knowledge sources, regardless of their level in the processing hierarchy. In other words, any deficiency at an early print analysis stage is quickly compensated by higher-order knowledge. Thus, "for the poor reader who may be both inaccurate and slow at word recognition but who has knowledge of the text topic, top-down processing may allow for this compensation" (Samuel and Kamil, 1988: 32). On the other hand, for the reader who is skilled at word recognition but who is unfamiliar with the text topic, "it may be easier to recognize the words on the page and rely on bottom-up processes" (Samuel and Kamil, ibid: 32). The Stanovich model, then, can be fairly described as interactive compensatory. It is interactive because regardless of its place in the system, any stage may communicate with any other stage, and it is compensatory because when particular and commonly used knowledge sources are temporally weak, the reader may rely on better developed knowledge sources.

So, an interactive model is based on four principles.

(i) Selective Use of Information Sources: Unlike the bottom-up and top-down models, the interactive model does not predict any pre-determined sequence of processing. Rather, it considers the reader to be able to draw upon a range of sources of information: visual,

orthographic, lexical, semantic, syntactic and schematic simultaneously but selectively. The model also places a great emphasis on the visual information.

(ii) Account for Different Kinds of Reading Behaviour: As demonstrated above by the Stanovich model, if the readers are inexperienced in any area of knowledge, say syntactic knowledge, they may place more reliance on another source which they are good at, for example lexical or orthographic knowledge. So, the model will make it possible to provide "a basis for investigations of the performance, and indeed the processing strategies of different groups of readers under different conditions, L1 or L2" (Davies, 1995: 65).

(iii) Account for both L1 and L2 Reading: Not only does the interactive model give importance to beginning L1 reading by suggesting that readers have recourse to different sources of information instead of relying on only one source, but there is also potential of applying this principle for second language pedagogy. As Eskey (1988) puts it, an interactive model 'can, for example, accommodate the problems of developing less fluent readers who seem to need as much help in "holding in the bottom" (that is simple decoding) as they do in performing higher-level interpretations of text'.

(iv) 'Schema-Theoretic' Account of the Comprehension Process: In his more recent studies Rumelhart (1984) further extended his 1977 model by allowing the semantic level of processing to play a greater role and this by suggesting a 'schema-theoretic' account of the comprehension process. More emphasis is now placed on the higher-levels of processing but not at the expense of lower-level which still have their place in the process. In this new development of the interactive model, Rumelhart proposed the basic construct of schema, a unit of knowledge whose function is providing "frameworks for interpreting

the world, including in reading, the world of the text" (Davies, 1995: 66). The new belief now is that visual information and words are interpreted only when the reader relates them to his/her prior background knowledge and experience which are 'seen to be packaged' into an infinite number of both general and specific units or schemata' (ibid.). These schemata are fluid and constantly capable of adapting to new information.

1.2.2.4. The Reading / Writing Models

These models are a recent innovation in L1 reading models which result from the renewed interest in writing. They hypothesize a close relationship between reading and writing and describe reading as a composing process.

The composing model of Pearson and Tierney (1984) is a good example of such models. According to Pearson and Tierney, both reader and author negotiate and create meaning through the medium of a text. The model views comprehension as the act of composing a new version of a text for an inner thoughtful reader who holds four interactive roles of planner, composer, editor and monitor. As planner, the reader creates goals, mobilizes knowledge or prior experience appropriate to the text. In other words, the reader decides the extent to which s/he will align him/ herself with the text. As composer, the reader searches for coherence, often needing to fill in the gaps in a text. The editor stands back from the planners and composer's activities and examines their developing interpretations. Good editing behaviours include rereading, annotating the text page with reactions and questioning which particular version of the text is the most desired one. The monitor decides which one of the above roles should dominate the process at any particular moment (Hudson, 1998: 52). The model assumes a great deal of collaboration between the

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reader and the author, collaboration with the text, and collaboration among the four internal reader roles.

1.2.2.5. The Bottom-up Interactive Model

A relatively more recent model proposed by Pollatsek and Rayner (1989) described as a bottom-up interactive model seeks to give a detailed account for all sources of information. As suggested by its name, the model puts a combined emphasis on both bottom-up, visual processing of information and interactive features of this process which allow both top-down and bottom-up processes to interact. Pollatsek and Rayner's model which is based upon laboratory studies of fluent adult readers and data from extensive and sophisticated studies of eye movements aims at demonstrating the relationship between eye movements and cognitive processing. Rayner and Pollatsek observe from their experimental data that the eye fixation is limited to a universal perceptual span, which extends only to about fifteen characters.

According to this model, the reading process consists of two stages: automatic identification of words, and interaction of information sources. In the first stage, the reader identifies words and their meanings through two mediums: directly, from graphic input (grapheme to meaning), or indirectly through the grapho-phonic rules (grapheme to phoneme to meaning). In the second stage, it is the automatic recognition of words which allows for the interaction with higher sources of information. The thematic processor, in which lexical, semantic and background knowledge interact, seems to be the controlling mechanism; it influences the automatic identification of words only partially.

1.2.3. Implications for Second Language Pedagogy

In general, the impact of bottom-up models on L2 theory had such an impact that in the late 1960s and early 1970s, L2 or foreign language (FL) reading was viewed principally as a decoding process. The reader's role consisted in attempting "to reconstruct the author's intended meaning by recognizing the letters and words as meaningful units". (Barnett, 1989: 18-19)

However, the bottom-up view of reading fell into disfavour with the coming of the top-down models which view reading as a psycholinguistic process. "Goodman's predicting reader and Smith's anticipatory reader seem a fitting model into which to place the intelligent and cognitively skilled adult second or foreign language reader" (Barnett, 1989: 22). Nevertheless, the most serious criticism of this model is its representation of the behaviour of efficient fluent readers on the basis of data from L1 beginners. In addition, a purely top-down view of reading proved to be ineffective for a reader whose comprehension may be impeded by a text which contains a large amount of unfamiliar vocabulary. As Eskey (1988) observes, the application of top-down models to L2 learning has resulted in many useful insights, but lack of attention to decoding problems has produced a somewhat distorted picture of the true range of problems L2 readers face.

Thus, recent research tends to emphasize the important contribution of bottom-up or data-driven processing to fluent reading, particularly with the studies of eye movements. Studies of the latter demonstrated the importance of rapid and automatic processing of words: it is estimated that fluent readers process some 80% of content words and 40% of function words (in English). The top-down, psycholinguistic model, on the other hand, demonstrates the degree to which beginning L1 readers contribute to the process of reading

by downplaying the importance of printed words and relying on syntactic semantic and schematic knowledge.

In recent years, however, the interactive reader-driven models on L2 reading theory which view the reader as an active participant whose background knowledge and past experience play a major role in reading comprehension have gained ground. The debate now has ceased about whether reading is language-based (bottom-up) or knowledge-based (top-down). Most people now maintain that successful reading entails a balanced interaction between bottom-up and top-down processing skills. Moreover, the assumption now is that readers actively control the hidden reading process and "that this control directly affects their ability to understand and to learn from text" (Block, 1992: 319).

The Rumelhart and Stanovich interactive-compensatory model contributes most to our understanding of skilled readers' behaviour in L1 context and of the differences between good and poor readers. The view now is that every reader is potentially different, with different strengths and weaknesses and that two readers may arrive at the same level of performance by using different strengths. The other contribution of the model is its potential application to L2 pedagogy.

As for Pearson and Tierney writing/ reading model, the implication of the research is that the two skills can act as scaffolding for each other and that for reading instruction we need to integrate the skills areas. Carson (1993, cited in Hudson, 1998) has pointed out how activities such as writing a synthesis or summary inherently involve the two skill areas. Such tasks help the learner to attend to text structure and distinguish critically between essential and non-essential information.

Finally, the contribution of Rayner and Pollatsek's bottom-up interactive model in the context of L2 adult English for Academic Purposes (EAP) and English for Specific Purposes (ESP) contexts is that by drawing attention to the importance of different L2 visual, lexical and syntactic features from those of L1, it indicates the need to give students time to acquire automatic processing of such features. This process allows the possibility for students to have a choice between relying upon well-established schematic knowledge, or processing bottom-up information, depending on affective factors. For example, in an EAP/ESP context, a strong motivation to learn may compensate for difficulties (Davies, 1995).

Given the different situations, motivations and perspectives of L2 readers, L1 theory may not completely apply to L2 reading process. The following section sheds light on existing L2 reading theories and examines basic differences between L1 and L2 reading.

1.3. Reading in a Second Language

There is no single generally accepted theory for L2 reading. The latter often takes the direction of L1 research by selecting and borrowing aspects of L1 theory. Most generally, L2 reading process is considered as analogous to L1 models of interactive processing, with the reader occupying a central role in this process. In other words, the reader's cognitive skills, language proficiency, strategies, background knowledge and purpose and schemata contribute more to comprehension than do the graphic, syntactic and semantic symbols of the text (Carrell, 1988; Bernhardt, 1986). Yet, some L2 reading specialists who consider the text as an essential entity also study the impact of text variables such as typology, structure, organization, linguistic feature and authenticity on

comprehension. The following section is a review of these two views on L2 reading, i.e. the reader-based view and the text-based view.

1.3.1. Reader-based View: Reader Variables

As its name suggests, reader-based view focuses on the reader and how s/he may affect the reading process and product. Aspects of the reader include two broad variables: the reader's knowledge (formal and content schemata), and his/her psycholinguistic perspective (language competence, motivation, purpose in reading, and reader skills and strategies.

1.3.1.1. Schemata-Theory Models

The word schemata (singular schema) is an abstract structure representing the reader's knowledge and pre-existing concepts about the world and about the text to be read which are stored in his/her memory. When processing a text, readers integrate new information from the text to their pre-existing schemata. But if the new textual information does no fit into the readers' schemata, they misunderstand the new material, ignore it or revise the schemata to match the facts in the text. Proponents of this theory view reading as "an interactive process in which the author's perspective, point of view, allusions or arguments are all interpreted through the reader's experiences, perspectives, cultural orientation and bases" (Barnett, 1989: 42). There are two kinds of schemata: those which relate to a text topic or content (content or background schemata) and those which relate to text structure or rhetorical organization (formal schemata).

- Content Schemata

A content schemata refers to knowledge about the content of the text which enables readers to understand it. Not only does such knowledge need to be available but also "needs to be activated by the reader or text, if it is to be used in accurate understanding" (Alderson, 2000: 43). Wilson and Anderson (1986) showed that activating schemata before reading improved readers' comprehension and recall.

Content schemata cover three areas of knowledge: knowledge of the subject matter or topic, knowledge of the world, and cultural knowledge. Knowledge of the subject matter or topic is directly linked to text content and topic. It seems evident that it is easier for readers to read texts which fall within their scope of familiarity, (for example those they have already studied), than to read the texts which do not, and readers who are familiar with the content of a text understand and recall more than do readers less familiar with the content. Knowledge of the world, also referred to as background knowledge may or may not fit to the content of a particular text, and which could also be said to have an impact on text processing and to be essential for reading. "The activation of such knowledge is fast and automatic, and without such processes, language comprehension would be slow and laborious, if it could take place at all" (Alderson, 2000: 45). Rumelhart's (1985: 267, cited in Alderson, 2000) example denotes the importance of background knowledge.

The policeman held up his hand and the car stopped.

No normal reader would face any difficulty to understand this sentence provided that s/he activates his/her background knowledge. The reader should first infer that the car has a driver and that the policeman holding his hand up is a signal to the driver to stop the car. None of this meaning is stated explicitly in the sentence, but it constitutes part of the reader's knowledge of how the world works. Cultural knowledge also interferes in the

comprehension of texts and difficulty of processing, and recalling may arise if the text is beyond the reader's cultural setting.

- Formal Schemata

Formal schemata are the reader's knowledge of language and linguistic knowledge, including how pieces of textual information relate to each other, in what order and what the main characteristics of a particular genre are. In fact, the ease or difficulty with which a reader processes a particular text depends on his/her linguistic knowledge.

L2 research on background knowledge is based on the assumption that before learners can read, they must first acquire language knowledge. Emphasis was first placed on the importance of syntactic and lexical knowledge before it has recently turned to rhetorical and metalinguistic knowledge. In the context of ESP, for example, the early approaches (1970s) argued that in order to read texts in their subject disciplines, readers need to know the language of that discipline starting by lexical knowledge before they pass to syntactic and rhetorical features of the text. In order to ensure that readers had the necessary formal linguistic schemata, courses and textbooks aimed at teaching the language of the discipline.

In combination with the effect of linguistic knowledge on text processing and comprehension, Cooper (1984) made a study, based on the contrast between what he called "practiced" readers (those whose medium of education is English, even though their L1 is not English) and "unpractised" readers. The results showed that the latter suffered mainly from poor vocabulary knowledge (especially sub-technical vocabulary) and from weak understanding of semantic relations between words and the meaning of sentence

connectors. The unpractised readers also demonstrated inability in using linguistic cues in order to deduce the meaning of unfamiliar words and understanding lexical relationships and semantic relations between sentences. The practised readers, on the other hand, were favoured by their superior lexical rather than their syntactic competence. It appears then that the lexical knowledge together with content knowledge of the text can largely compensate for lack in linguistic knowledge.

After surveying a number of studies, Bernhardt and Kamil (1995) concluded that although literacy in L1 is a strong predictor (up to 20% of variance) of L2 reading ability, L2 linguistic knowledge appears to be a more powerful predictor (more than 30% of variance). They suggested a reformulation of the L2 reading problem from Either / Or question into a question of interaction between the two knowledge sources. This view also gained support from Carrell (1991) and Bossers (1992) who show that L2 reading ability is both related to L1 reading ability and L2 knowledge, but according to Bossers, L2 knowledge, especially vocabulary knowledge rather than knowledge of grammar, is more related at lower levels of linguistic proficiency. L1 reading ability proved to the sole predictor of L2 reading, but only when readers gain a relatively advanced level of L2 proficiency.

Two conclusions can be drawn from these studies. First, in relation to L2 reading, L2 proficiency is more important than L1 reading ability. Second, threshold L2 proficiency must be achieved before L1 reading ability can transfer to L2 reading. The threshold hypothesis will be further developed below. (See section 1.4.2., p.53). Finally, although schema theory provided valuable information about how new information is integrated with old, it did not explain how completely new information is handled. Furthermore, the

theory lacks explicit definitions or predictions of comprehension process and the considerable research it stimulated was more related to the product of understanding (Alderson, 2000). Not surprisingly, results of a study on the interaction of content and formal schemata demonstrate that when high–intermediate English as a Second Language (ESL) students are familiar with form and content, the reading is relatively easy. On the contrary, when the students are unfamiliar with both form and content, the reading is relatively difficult. (Carrell, 1987)

1.3.1.2. The Psycholinguistic Perspective

Coady's (1979) psycholinguistic model can be considered as an attempt to apply Goodman's and Smith's L1 theories to reading ESL. Coady postulates that reading comprehension is the result of interplay between conceptual strategies, background knowledge and process strategies. He also distinguishes between the processing strategies of the beginning and the proficient L2 readers. Whereas the first starts by acquiring the more concrete processing strategies such as syllable-morpheme information, the second uses the more abstract strategies such as syntax and semantics more frequently, by "sampling" like in Goodman's (1968, 1976) model. (See Section 1.2.2.2, p.21).

In his description of the reading process, Eskey (1976) accounts for three spheres:
(i) a sociolinguistic sphere which relates both reader and text to a particular universe of
    texts and a particular society of readers,
(ii) a linguistic sphere which relates the functions and forms of a given language
(iii) and finally, a psycholinguistic sphere which brings together the reader and text in the
    mind of a single human being.

From this last perspective, we can say that each reader brings to the process a unique set of past experiences, linguistic competence, interest level in topic, purpose in reading and reader skills and strategies. These reader characteristics have received considerable recent scrutiny.

- Language Competence of Reader

It is evident that texts that are linguistically difficult require a higher degree of linguistic proficiency from the reader. This view is supported by many researchers such as Alderson, 1984; Cummins, 1979; Clarke, 1987. These researchers claim that the readers cannot engage meaningfully with the text until they reach a threshold of linguistic level. Below this level, the readers' ability to interact with the text will be restricted. This view will be dealt with more fully below. (See Section 1.4.2, 53).

- Reader Motivation/ Interest

Studies of L1and L2 reading attribute poor reading to lack of motivation. Indeed, motivation is likely to be the effect of poor reading as the cause of it. As for readers with higher interest, Olshavsky (1977) concludes from her research that they engage more actively with text, though the level of reader interest is not independent of the text, and may decrease while reading is in progress, if the text does not meet the expectations of the reader. Reader motivation and interest have also been shown to relate to the quality of reading. Fransson (1984) finds that interest in the text results in more effective "deep-level" processing which are held to be educationally desirable like paying attention to the main ideas rather than to facts and details, to how ideas relate to each other, or how the text relates to other texts, or to what the reader knows about the text topic or the world. Fransson also observes that interest is not necessarily predictable from the readers'

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academic speciality. It seems to depend more on the type of motivation of the reader, i.e. whether it is intrinsic, generated internally by the reader, or whether it is extrinsic, generated by external factors such as reading to answer an assignment.

- Reader Purpose in Reading

Different readers read texts with different purposes, and this may explain the variations between readers. For example, reading a text to get a general idea may require the reader to pay less attention to details than when reading a text to get key information. Thus, we can say that every purpose needs the use of different skills and that the reason for which we are reading a text will influence the way we read it, the skills we use and the ultimate understanding and recall we have of the text.

- Reader Skills and Strategies

The schemata theory models are models about the knowledge readers have. However, readers not only have knowledge, but they have abilities as well: abilities to learn new knowledge and ability to process information. A considerable research was carried out on the idea that readers may have relevant knowledge but that they may not possess, or have learned the ability or skill to process texts, and this may explain the difference between good and poor readers. The next chapter will elaborate more on the notions of skills and strategies.

1.3.2. Text-based View: Text Variables

The text is the other side of the coin in the reader-text interaction. Text aspects such as type organization, structure, lexis, type and genre and many other aspects might either facilitate the process of reading or on the contrary make it more difficult.

Before developing these text aspects, let us first define what a text is. One of the most influential definitions of text is that which Halliday and Hasan (1976: 1-2, cited in Davies, 1995) provided:

> *A text is a unit of language in use... and is not defined by its size... A text is best regarded as a semantic unit: a unit not of form but of meaning. A text has a texture and that is what distinguishes it from something not a text. It derives this texture from the fact that it functions as a unity with respect to its environmen*t

1.3.2.1. Text Organisation

Text organisation refers to the way paragraphs relate to each other, the way the relationships between ideas are signalled or not signalled. (Alderson, 2000). In fact, texts differ from each other in the way they are organised. Researchers in this domain are preoccupied by showing how different text organisations might lead to different reading outcomes and processes. Text organization has received attentions of studies of both L1 and L2 readers. Urquhart (1984), for example, found that readers can recall narrative texts which are organised in a directional sequence more than they do with texts not so sequenced. At the level of inter-sentential text development, Widdowson (1984, cited in Williams and Moran, 1989: 220) proposed that

> *text be viewed as a sequence of responses by the author to a series of anticipated questions from the prospective reader. The reader then participates in the covert interaction, and the extent to which the reader 'follows' the writer will in part depend on how far he or she corresponds to the interlocutor presupposed by the writer.*

Two common aspects of text organisation are cohesion and coherence. Cohesion refers to the way in which ideas and meanings in a text relate to each others. Halliday and Hasan (1976, cited in Barnett, 1989) speak of the following L1 cohesive ties: reference, repetition, substitution, ellipsis and conjunctions. They hold the strong view that cohesion (the semantic functions realized in the surface-level features of the text) creates coherence (the reader's understanding of the text as a coherent entity). Studying the discourse of a text through cohesion and analyzing FL or L2 reader's ability to follow that discourse are valid fields of investigation which flourished in the 1970s and early 1980s. Many books, like the *Focus* series, were designed with the aim of training readers to respond on cohesive devices in texts. Nevertheless, for most teachers and researchers the effect of cohesion on understanding was felt to be weak, probably because readers can make bridging inferences. Freebody and Anderson (1983) argue that lack of connectors does not seriously affect comprehension. However, when the topic is unfamiliar, average readers may use conjunctions to facilitate discourse processing. Thus, cohesion interacts with text topic to create an effect, and in itself it is not a key variable for text readability.

Unlike Halliday and Hasan, Brown and Yule (1983) believe that some of the coherence of a text derives not so much from the presence or absence of surface cohesive features such as conjunctions but from underlying text relationships to which conjunctions are pointers. Nonetheless, the effect of coherence seems to be stronger than that of cohesion. For Beck et al. (1991), texts which present facts with little explanation of relationship between them and force the readers to make many connecting inferences are much more difficult to understand than texts that are coherent. Furthermore, texts which expose the reasoning that connects a cause to an event and an event to a consequence are more easily understood than those which fail to make such causal sequences clear

(Alderson, 2000). McKeown et al (1992, cited in Alderson, 2000: 68), on the other hand, argue that "text coherence best facilitates comprehension when content is moderately unfamiliar but coherent text also enables readers with background knowledge to understand text better".

1.3.2.2. Text Type and Genre

Some L2 reading theorists consider text type to be the determining factor in text readability (the ease of difficulty with which readers understand texts). Swales' (1990) studies on the abstracts of scientific articles gave an impetus to text type study. Certain types of texts seem to be associated with certain topics. For example, descriptions of how things work are more likely to be found in expository rather than narrative text types. The way a text is written, its style and features that keep it distinct from another text, gave rise to a number of different classifications. The different text types proposed by the related literature include the Narrative, Descriptive, Argument, Sequence, Exposition, Persuasive and Enquiry types. The criteria involved to define these types are communicative intent, content, structure and status of information. These labels refer more to the broad social or communicative goals of the author than to the text predicted difficulty (Davies, 1995).

As for the possible differential effect of text types on readers, focusing on advanced ESL students' reading process, Carrell submits the following conclusions:

(i) The tightly organized, comparison and problem/solution types of organization tend to aid recall of text ideas more than does a loosely organized collection of descriptions.

(ii) Readers from different native language groups seem to find certain English discourse types more or less facilitative to recall, possibly because of interference from preferred native rhetorical patterns.

(iii) If ESL readers possess an appropriate formal schema for a particular text and if they organize their recall protocols according to that formal schema, they retrieve more information.

(iv) ESL students' reading comprehension can be facilitated if they are trained in recognizing and analyzing the four expository text types.

1.3.2.3. Linguistic Features of the Text

As far as linguistic difficulties of texts are concerned, research into text difficulty has considered the contribution of both structure and vocabulary and focused on whether certain text elements especially influence comprehension. If poor language proficiency negatively affects reading comprehension, what elements of language knowledge are crucial?

Interest in the connection between vocabulary knowledge and successful reading has a long history in the research of foreign language reading. If we accept comprehension as the goal of reading, vocabulary knowledge is the foundation of reading proficiency and fluent reading (Daneman, 1991; Stanovich, 1991). Some researchers (Nation, 1990; Grabe, 1991) have shown the important role of vocabulary as a predictor of overall reading abiltity. They have also shown that measures of readers' vocabulary knowledge strongly correlate with measures of reading comprehension. Vocabulary difficulty, then, has consistenly been shown to have an impact on comprehension (Freebody and Anderson, 1983, cited in Alderson, 2000). As Alderson (2000) expresses it, 'having to struggle with reading because of unknown words will obviously affect comprehension and take the pleasure out of reading' (p.35).

Research related to readers' word treatment strategies, on the other hand, suggests that the best way to handle the unfamiliar words in the text is to use context. According to Hosenfeld (1984), readiness to guess from context is what distinguishes a good reader from a bad one. However, while most researchers find successful L2 readers can correctly guess the meaning of unknown words while reading (Carrol and Drum, 1982, Liu and Nation, 1985); others question the effectiveness of contextual guessing. If, however, there are insufficient context clues to aid recognition, examining the word affixes, using phonemics, or using the dictionary can lead to the comprehension of the word. However, the three previous strategies can interfere with text comprehension because of the inordinate amount of time it takes to apply them. Henceforth, word importance must take precedence before applying the aforementioned word recognition strategies. As for dictionary use, the related research found no significant correlation between its use and reading comprehension. Its use to increase comprehension, however, seems to be rationally appealing (Aspatore, 1984 ; Besoussan et al. 1985, cited in Levine and Reeves, 1998).

The question of whether vocabulary is a greater problem than structure in an absolute sense would be irrelevant until the relationship between the reader and the text is clearly established. For example, ESP students with the vocabulary of their specialisation are more likely to encounter structural problems; whereas, intermediate-level students reading in unfamiliar content area would probably have more difficulties with vocabulary. Therefore, one should avoid generalising from individual pieces of research (Williams and Moran, 1989). The lexis and syntax of texts without doubt contribute to text difficulty; however, given the interaction among syntactic, lexical, discourse and topic variables, no variable can be shown to be paramount. In fact, the whole activity of reading should be seen in context: the context of the reader and other variables in the text (Alderson, 2000).

1.3.2.4. Text Readability

In order to adjust text difficulty to the intended readership, researchers have been concerned to understand what makes a text difficult and identify what features make it readable, especially in educational contexts. The variables which have emerged as the best predictors of difficulty have been linguistic, particularly related to word difficulty and to complexity of sentence structure. The readability of texts has been traditionally measured through reference to formulae which account of word and sentence length and complexity or through the use of cloze procedures. As a result, many readability formulae appeared (up to 1960, they were over 30). However, due to its various limitations, its validity as the only difficulty predictor was questioned. According to Harrison (1979), combined expert judgements is the best measure of text difficulty, and it is only when this is not available that readability formula is recommended. Davies (1984), on the other hand, suggests that in measuring text difficulty, experts should take account of, over and above linguistic variables, aspects like potential interest and availability of text for its intended readership. Furthermore, "in their own reading, students frequently deliberately choose texts that are challenging for them to read. This suggests either that the acceptance of challenge is a means of learning and/or that other features of text are of greater importance to individual readers." (Davies, 1995: 87). Finally, we need to bear in mind that in classroom context- whether for teaching or testing- readability is an essential criterion for the selection of texts.

1.3.2.5. Simplified and Authentic Texts

The debate of whether to simplify texts if they are found to be difficult for the intended readership or keep them intact dates back to the 1970s. As for text simplification, different methods have been studied for their effect on textual understanding among them

the method of making the text less syntactically complex. But this "may have the effect of distorting the message or increasing difficulties in other text features" (Alderson, 2000: 73). Mountford (1975) showed that the illocutionary force of the scientific articles might change after simplifying them. For Strother and Ulijn (1987), simplifying texts syntax does not make them necessarily more readable, since a thorough syntactic analysis of texts may not be necessary. They further suggest the use for conceptual rather than syntactic strategies for text processing. Conceptual strategies involve processing content words and require lexical and content knowledge. In the context of L2 educational context, Williams and Dallas (1984) suggest a range of different methods for helping readers cope with new words like glossaries, key words section, and vocabulary revision checks. To help L2 readers cope with the vocabulary load of texts from which content knowledge is learnt, they also suggest the use of context in a variety of ways like presentation, definition and illustrations.

The concept of text authenticity, on the other hand, was associated with three interpretations, the most widespread referring to texts that are not specially produced for language learners. Advocates of the use of authentic texts, with the above sense, argue that the latter are more interesting and motivating to learners who are best taught to cope with 'real world 'texts by having experience of them inside the classroom (Grellet, 1981). Grellet also opposes the use of simplified texts because reducing the number of linguistic and extralinguistic cues from them often results in increasing their difficulty. To overcome difficulties, she proposes to grade the exercises rather than simplify texts. This claim had an earlier support from Davies and Widdowson (1974) for whom the use of authentic texts is the best opportunity for learners to experience actual instances of language used as communication. The second interpretation with which the word authentic is used is that

authenticity is not a feature of the text; rather it denotes the interaction of reader and text. In other words, the authenticity of a text is measured by the extent to which the reader corresponds to the intentions of the writer which are signalled by linguistic and rhetorical conventions. The third interpretation may be considered as 'reader-centred' extension of the second interpretation (Williams and Moran, 1989). While the interaction in the previous sense is between reader and writer, the interaction in this sense refers to the reader's response (Breen 1985 and Davies, 1984). According to this view a text is authentic when the reader finds it appropriate to his/her purpose, regardless of whether it is written for language teaching purposes or not and of whether it corresponds or not to the writer's purpose. "This definition is pedagogically useful to the extent that the reader's response is more important than the provenance of the text" Williams and Moran, 1989: 219)

1.3.2.6. Verbal and Non-Verbal Information

Many texts are accompanied by tables, graphs, diagrams and other forms of presentation of data which act as an alternative or complementary support for the processing of the verbal information. In order to achieve a complete understanding of the text, readers of journal article often need to read both tables and text. Sometimes, the graphic data is described partially by the text. Sometimes, however, without the non-verbal support –especially with diagrams and illustrations– the text cannot be understood.

In the context of our study, it is worth noting that the purpose underlying the learning of English is, to use Johns and Davies (1983) distinction, *immediate* (where the language is learned with an immediate need to use it) rather than *deferred* (where the language is learned to be used at some period in the future). An example for an immediate purpose would be the case of a science student who must have access to information in the

specialized English-language journals and periodicals relevant to his/her subject. An example for a deferred purpose would be the case of a student learning English to work in the Ministry of Foreign Affairs after graduation.

The learning situation in this study –falling in the first case– would have a crucial impact on the use of texts. Not only will the learner be working with authentic, unsimplified material, but the texts will also have a real value for him/her. S/he is not simply reading "them as examples of the language system in use, but because they contain ideas and information that he needs at that moment in time" (Johns and Davies, 1983: 02). In addition, familiarity with the subject matter together with the style of presentation of scientific papers will facilitate his/her search for that information and make it possible for him/her to know where to look for the information and when s/he has found it. In this respect, the text is essentially used as a vehicle for information (TAVI: Text as a Vehicle for Information), rather than a linguistic object (TALO: Text as Linguistic object). (Johns and Davies, 1983: 03). In the former, primary attention is given to the content of the text and its value in terms of the extent to which it matches the needs of the reader' specialization. Syntactic and lexical grading is secondary. In the latter, priority is given to the syntactic structure and the new vocabulary at the expense of the subject matter which is given a secondary importance.

1.4. Relation between First and Second Language

Comparisons between L1 and L2 reading are generally centred on two basic issues: the reading process and reading skills. Some researchers questioned whether L1 and L2 reading processes are similar or whether there is a universal reading process. Others,

interested in the individuals' reading skills, questioned whether the latter transfer from L1 to L2.

1.4.1. Comparing First and Second Language Reading Process

Before engaging in the comparison between L1 and L2 reading processes, one must be cautious of the following obstacles:

(i) matching L1 and L2 texts, especially for beginning and intermediate readers, can be complicated;

(ii) defining subjects's first language reading proficiency is another difficulty, given the wide variation in adult reading proficiency;

(iii) comparison of studies can also be problematic because of differences in research methodologies, hypotheses tested, and readers' level of expertise (Barnett, 1989: 49-50).

1.4.1.1. Similarities in the Processes

Many researchers defend the view that the reading process is the same for all languages, with minor variations to accommodate the specific characteristics of the writing system and the grammatical structures for each language. Conclusion on the resemblance in the reading processes among languages is often based on work with advanced L2 readers. In a study carried out in 1984, Connor concluded that native English speakers and advanced ESL students recalled a similar number of high-level ideas from English prose texts. (Cited in Barnett, 1989). Sarig's (1987) ten advanced Hebrew speaking students of English were also equally successful in finding main ideas and synthesizing the overall message in both English and Hebrew texts. Sarig further advances that any differences are due to individual methods of processing reading than to differences between L1 and L2 speakers.

Furthermore, a study by Kern (1988: 51, cited in Barnett, 1989) on students' perception of their main difficulties in reading French texts as opposed to English texts demonstrated that some difficulties are common to both types of reading; "affective variables, concentration and background knowledge figure importantly in both first and foreign language reading. Further support to this view comes from Cummins (1984) who hypothesizes that all written languages share an underlying cognitive academic proficiency. He compares the space of literacy to a balloon with two channels, L1 and L2, to blow into, and since literacy skills are common to all languages, the L2 reader can benefit from proficiency either in L1 or L2 or both. In other words, there is a two-way transfer, from L1 to L2 and vice versa.

1.4.1.2. Differences in the Processes

Proponents of the view that L1 and L2 reading processes differ hold the readers' language proficiency to be a determining factor in reading comprehension. "In general, the reading process of advanced second language learners proves analogous to the first language reading process, whereas that of the beginning second language learner contrasts with both" (Barnett, 1989: 51).

Based on miscue analysis, Cziko's (1980) study shows that advanced English speaking and native French students use an interactive strategy to read French, i.e. they draw on both graphic and contextual information when they read French and that intermediate students tend to rely more on graphic than on contextual information i.e. they are inclined towards bottom-up skills. In sum, the readers' reading strategies vary according to their competence in language.

Similarly, Mc Leod and Mc Laughlin (1986) found out that advanced second language readers differ not only from second language readers but also from native readers. They also noticed that although their advanced ESL readers had syntax and semantic competence, they still decode rather than interact with the text. This fact led them to question the role of automaticity in the reading skill and development. The conclusion they have reached is that advanced learners had still not reached the stage where they automatically restructured text, although they had mastered many of the mechanical aspects of reading and that although concentration on pronunciation might have interfered with the advanced readers' performance, this did not give account for the differences between the beginner and advanced learners.

Bossers' (1992) study on Turkish students who had an intermediate level in Dutch attempted to depict whether L1 reading ability or L2 knowledge had more effect on their reading comprehension. The result of the study showed that both variables contributed significantly, but L2 knowledge was a far more important factor than L1 reading ability.

In conclusion, we can argue that in comparing between L1 and L2 reading processes, one must take into account the following experimental variables: reading proficiency levels, language proficiency levels, the language read as L1and L2, and individual reader's degree of L1 literacy, reading skills and motivation. Furthermore, despite the fact that similarities in the reading processes exist, different languages may well entail different sorts of processing (Barnett, 1989).

1.4.2. Causes of Second Language Reading Problems

The issue of whether reading proficiency in L2 vitally depends on reading proficiency in L1 or whether L1 reading skills transfer to L2 reading has been a major concern in the L2 reading literature. There was not much agreement among theorists on what might be the most important cause(s) of the reader's apparent (in)ability to reach a sufficient level of reading comprehension in L2. Lack of agreement has been stated in different terms:

- Reading in a foreign language: a reading problem or a language problem? (Alderson, 1984)

- Language competence or reading strategies (Cziko, 1980)

- Reading ability or language proficiency? (Carrell, 1991)

- Psycho or linguistic? (Clarke 1979)

One of the theories about the relationship between language proficiency and reading comprehension in L2 is the notion of threshold level of language proficiency (Cummins, 1979), or linguistic ceiling (Clarke, 1978). The main idea underlying these concepts is that readers will not be able to read effectively until they develop some proficiency in the target language, even though the threshold level is liable to vary from task to task and from reader to reader. In other words, whether or not a reader has reached the threshold level may be the deciding factor in success or failure in L2 reading (Lee and Schallert, 1997). The construct of language proficiency is portrayed differently by different researchers and there is no agreement about how to define it. Nevertheless, knowledge of vocabulary and grammatical structure seem to be central components of language proficiency.

Clarke (1979, cited in Bossers, 1997) views L2 knowledge as of a relatively minor importance compared to general, language independent reading behaviour. For him, effective reading behaviour – which is equally manifested in L1 and L2 reading is based on:

(i) concentration on passage-level semantic cues,

(ii) formulation of hypotheses about a text before reading,

(iii) refinement and rejection of those hypotheses, and

(iv) de-emphasis of graphophonic and syntactic accuracy, that is, a tolerance for inexactness, a willingness to take chances and make mistakes.

Attempting to answer the question of whether L2 readers are able to transfer their L1 reading skills to L2, Clarke analyzed 21 low-level ESL students' oral miscues and their answers on a rational deletion cloze test. Clarke argued that if L1 reading behaviour would automatically transfer, the superior reading skills of the good readers would provide them with an equal advantage over poor readers in both languages, given an equivalent L2 reading proficiency. Nevertheless, the results of the study only partly supported the above argument. The good L1 readers appeared to be better L2 readers than the poor L1 readers. This finding led Clarke to the conclusion that the reading process is universal and that a language competence ceiling hampers the good L1 reader's attempt to use good reading strategies in L2. In other words, "limited control over the language 'short-circuits' the good reader's system, causing him / her to revert to poor reader strategies when confronted with a difficult or confusing task in the second language." (Clarke, ibid: 206). Thus, the skilled L1 reader becomes poor L2 reader, showing a reading behaviour similar to that of poor readers.

Similarly, Carrell (1988) suggested that before L2 readers can transfer L1 reading skills and background knowledge to improve comprehension, they must reach a threshold level of language proficiency. In line with the same view, Yorio (1971) argues that L2 reader's difficulties are caused by L1 interference and the reader's lack of second language competence and that "the guessing or predicting ability necessary to pick up the correct cues is hindered by the imperfect knowledge of the language" (Yorio, ibid: 108). For Cummins (1979: 229), the positive effects of balanced bilingualism in cognitive and academic domains were "unlikely to come into effect until the child has attained a certain minimum of a threshold level of competence in a second language".

Another group of researchers (Coady, 1979; Hudson, 1982) argues that L2 reading depends very largely on L1 reading abilities and that inadequacies in lower-level linguistic skills can be compensated by transfer to students with a poor reading ability in L2 of higher-processing skills from L1. Accordingly, students with a poor reading in L2 fail to read either because they do not have good reading skills in L1 or because they fail to transfer them. Reading or learning to read, the argument goes, is accomplished once, and once learners have matured in their ability to read in L1, awareness of the reading process is transferred to L2 and does not need to be relearned. Hence, "we learn to read only once … with language as with music, the rituals of reading are already ingrained in us" (Kellerman, 1981: 44).

Coady's (1979) psycholinguistic perspective views reading as an interactive complex of skills, abilities and knowledge, some of which have a linguistic nature. He argues that a great number of these skills transfer automatically from L1to L2 and that advanced level students read in a similar way as native speakers. However, he says that the

lower level readers who are unable to use such skills as inferences and prediction and who have poor reading habits to transfer from their L1 must be taught reading skills which should have been taught in L1instruction.

Hudson (1982) accepts Clarke's (1980) short circuit hypothesis, but argues that if students are encouraged to call up the relevant schemata, the latter can override language proficiency as a factor in comprehension. In other words, good L1readers with relatively weak L2 skills can understand more of what they read if they activate their predictions about text content. Thus, linguistic ceiling is only one determinant of reading comprehension.

Conclusion

Various conclusions can be drawn from the above literature review about L1 and L2 reading processes. The first one concerns research on the nature of reading which can be described, to use Smith's (1973) words, as incredibly confused and inconclusive. The conclusion that we can draw about the various models of L1 reading process, reviewed in this chapter, is that when we put all of them together, we can notice that they are all based on the same assumption which is that reading starts with a visual stimulus and, if successful, it ends up with meaning. However, these models differ at the relative emphasis each model places on these different sources of information due to the methodology and the data which they are based on. Nonetheless, each one contributes in a different way to our understanding of reading behaviour.

As for L2 reading, we can say that the reader's various characteristics which include not only language proficiency, attitudes, motivation, but also background knowledge

interact with a number of text features, involving type, organisation, topic, linguistic features and so on. Although these aspects are theoretically separable, it is difficult to dissociate them in practice: one is a mirror image of the other. Thus, we cannot disregard any of the above variables in our effort to develop better second and foreign language readers. As concerns the relation between first and second language reading and because of the different nature of the samples and settings in which the studies take place, conclusions drawn from thes studies are only tentative and applicable only to the situation at hand.

After reviewing different reading models of the reading process both in L1 and L2 contexts, the different variables involved in reading which influence the reader/text interaction and the relationship between reading in the mother tongue and reading in a second/ foreign language, we now turn to another aspect which underlies the reading process and which is necessary for the reading comprehension to take place that is the use of skills and strategies. The next chapter will examine this aspect of the reading skill.

CHAPTER   TWO

DEVELOPING   READING   SKILLS   AND   STRAREGIES

Introduction

Acquiring reading skills and strategies is vital in reading comprehension because to become an efficient and independent reader, it is important for a learner to acquire and make use of certain skills and strategies. Theory on the reading process has been characterised by inconsistent use of terminology, especially with terms such as 'skill' and 'strategy'. As expressed by Williams and Moran (1989: 222), "it is paradoxical that those whose business is largely to do with words should operate with such inconsistent metalanguage".

The present chapter attempts to shed light on issues regarding reading skills and strategies, particularly with their definitions, classifications, their relationship with each other, and above all their contribution to successful reading.

2.1. The Reading Skills

The act of reading consists of the deployment of a range of different skills which have been a major area of reading research over the recent years. The latter has long sought to identify these reading skills and sub-skills which underlie or contribute to the reading process. The controversial issues are whether it is possible to identify and label separate component skills of reading, or whether reading is a single, holistic skill. In addition, and admitting the componentiality of the reading skill, the question is to determine what relationship exists between the different skills and how they might be classified (as well as acquired, taught and tested). (Williams and Moran, 1989; Alderson, 2000).

2.1.1. Definition

A reading skill can be defined as "a cognitive ability which a person is able to use when interacting with a text" (Urquhart and Weir, 1998: 88). For Paris et al. (1991: 611)**,** reading "skills refer to information-processing techniques that are automatic, whether at the level of recognizing grapheme-phoneme correspondence or summarizing a story". A third definition is that of Dubin et al. (1986: 193) who argue that

> *interactive models (of the reading process) suggest a need to test the skills at many levels since these are assumed to play a significant role in the reading process. They include everything from rapid identification of vocabulary and syntactic structures, to the interpretation of larger discourse patterns, the making of inferences, etc.*

The first definition takes a broad view about the term skill and does not say anything about what is exactly involved under this ability; whereas the two last ones view it as an all-embracing notion which encompasses all the processes – lower-level and higher-level skills- required for the act of reading to take place. Furthermore, the word skill, according to the two last definitions, seems to relate both to the linguistic features of the text – recognizing grapheme-phoneme correspondence, identification of syntactic structures– and to the levels of understanding that a reader can derive from text-summarizing, making inferences.

2.1.2. Reading as Discrete Skills or One Single Skill

Debate has gone over the years on whether reading is made up of a set of discrete skills that are separately identifiable or whether these skills relate to common underlying abilities, and thus they are indivisible. As a result, two viewpoints emerged; the first views

reading as a single holistic process; whereas the second considers reading to be a multi-divisible skill.

The view that reading is a set of discrete skills is based on the assumption that if reading is a skill, then it must be possible to break it down into underlying components skills for the purpose of teaching and testing. Advocates of this view also hypothesize that students may exhibit differences in levels of proficiency across these skills. William and Moran (1989: 224) give an account on the current consensus among writers on teaching materials as follows: "While material writers might disagree on the emphasis to be devoted to any particular skill, there seems to be substantial agreement on such skills as guessing the meaning of unknown words, identifying anaphoric reference, identifying the main idea and inference'. Likewise, Grabe (1991) may also be seen to represent this view. He emphasizes the importance of automaticity in reading, particularly in word identification, and identifies as components of the reading skill: syntactic knowledge, knowledge of formal discourse structure (formal schemata), content and background knowledge (content schemata), and metacognitive knowledge and skill.

In opposition to the skills approach of reading, many researchers have cast doubt on the multi-divisible nature of reading and argued that it is not possible to differentiate between the reading skill components, either through empirical investigation or through expert judgements. (Alderson, 1990; Alderson and Lukmani, 1989; Rosenshine, 1980; Rost, 1993; Lunzer et al. 1979). Lunzer et al.'s empirical study is often cited as evidence that reading is a single undifferentiated ability. Here we can quote their conclusion: "One must reject the hypothesis that several tasks used in reading tests of reading comprehension call on distinct subskills which can differentially be assessed and taught" (p.59). This conclusion

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gained further support from Alderson (1990) and Alderson and Lukmani (1989) who investigated the question of skill components through expert judgements. In their study, Alderson and Lukmani presented a group of experts –usually students on MA courses– with a long list of posited reading skill components and asked them to identify what items in a pilot version of an EAP reading test were measuring in terms of the list. The experts failed to reach agreement on assigning particular skills to particular test items. In other words, they could not agree on what an item was testing and even whether an item was testing a "higher-level" or "lower-level" skill component. This result could be considered as evidence of the indivisibility of the reading skill. (Weir and Porter, 1994)

However, the results of both hypotheses have been criticised on the following grounds.

(i) Both groups of researchers proceeded by giving their subjects tests on their understanding of passages, yet doing a comprehension test and actually reading are not the same thing. In other words the link between the results of a comprehension test and the process of reading is indirect (Williams and Moran, 1989; Alderson, 1984).

(ii) Advocates of the unitary view of reading conducted their studies on native speakers of English; however it may be that these subjects are free of the specific linguistic problems experienced by the non-native speakers.

(iii) The levels of understanding that the learners have achieved and which advocates of the skills approach are trying to establish do not relate to the process of understanding but to the product. The latter, however, may vary according to readers and readers' purposes and motivation for reading (Alderson, 1984).

Paradoxically, if we consider the implications of the two views, we will find they meet at the same point. The implication of the view of reading as a single, holistic skill would imply that students become good readers by reading and that different types of exercises are unnecessary. All one needs to do is read ("extensive reading" programmes). On the other hand, if the view of reading as made up of discrete skills is adopted, then an appropriate pedagogic response would be to construct reading exercises and activities that attempt to develop those skills (for example, word meaning, literal comprehension, drawing inferences). In the final analysis, however, one might find that the results of both approaches are similar: both approaches require reading, and it is reading itself that is crucial (Williams, 1993).

Finally, despite the inconsistency of the evidence for the discreteness of the skills, the latter figures prominently in EFL reading material. Nuttall's view is representative: "That is possible to promote reading skills and strategies … is stilly largely a matter of faith, but the number of materials produced show that it is a faith widely held" (1985: 199). While sympathetic to the view of reading as a unified process, Brown and Hirst (1983) point out that the discrete skills approach is highly productive in that it provides many ideas for exercises. Furthermore, some specialists propose addressing the skills more directly rather than try to develop them indirectly through exercises. Thus Carrell, Pharis and Liberto (1989) have suggested that students receive explicit strategy training in order to improve their skills.

2.1.3. Classification of the Reading Skills

A large number of skills taxonomies of native speaker readers exists, some based on empirical grounds and others on armchair speculations of researchers. Despite the

variability of the lists – varying in context from three or four skills to the outstanding thirty six drawn by the New York City Board of Education (Alderson, 1984) – there is little consensus in the terminology used to describe the skills, as well as the content of taxonomies. Urquhart and Weir (1998: 90) give a selection of typical taxonomies as follows:

- Davis (1968)

- § Identifying word meaning.
- § Drawing Inferences.
- § Identifying writer's techniques and recognizing the mood of the passage.
- § Finding answers to questions.

- Lunzer et al. (1979)

- § Word meaning.
- § Words in context.
- § Literal comprehension.
- § Drawing inferences from single strings.
- § Drawing inferences from multiple strings.
- § Interpretation of metaphor.
- § Finding salient or main ideas.
- § Forming judgements.

- Munby (1987)

- § Recognizing the script of a language.
- § Deducing the meaning and use of unfamiliar lexical items.
- § Understanding explicitly stated information.

§ Understanding information when not explicitly stated.

§ Understanding conceptual meaning.

§ Understanding the communicative value of sentences.

§ Understanding relations within the sentence.

§ Understanding relations between parts of texts through lexical cohesion devices.

§ Interpreting text by going outside it.

§ Recognizing indicators in discourse.

§ Identifying the main point of information in discourse.

§ Distinguishing the main idea from detail.

§ Extracting salient points to summarize (the text, an idea).

§ Selective extraction of relevant points from text.

§ Basic inference skills.

§ Skimming.

§ Scanning to locate specifically located information.

§ Transcoding information in the diagrammatic display.

- Grabe (1991)

§ Automatic recognition skills.

§ Vocabulary and structural knowledge.

§ Formal discourse structure knowledge.

§ Content/world background knowledge.

§ Synthesis and evaluation.

§ Metacognitive knowledge and skills monitoring.

The pedagogical value of all these lists of skills is that they could offer a means of

devising test tasks and items, and of isolating reading skills to be tested. In addition, they make it possible to diagnose the reader's problems, with the view of identifying remediation (Alderson, 2000: 11).

However, a critical reading of these taxonomies seems essential. A close examination of Davis's taxonomy shows that the skill of 'Finding the answers to questions' seems to include all the others. In Lunzer et al.'s list, however, separating between 'Drawing inferences from single strings.' and 'Drawing inferences from multiple strings' seems to be useless (Urquhart and Weir, 1998). Munby's list, on the other hand, gives the impression that the skills are discrete when in fact they overlap enormously. "The items in Munby-based taxonomies appear to be slightly random and overlapping collection of strategies, skills and (chiefly) knowledge, and represent an impoverished account of the reading process" (Mathews, 1990, cited in Alderson, 2000: 11-12). Mathews further adds that what Munby calls 'skills' are, in fact, aspects of knowledge. Finally, some of the Munby's list (for example 'Understanding information when not explicitly stated', 'Understanding conceptual meaning', 'Understanding the communicative value of sentences' and 'Understanding relations within the sentence') seem to relate more to the product, i.e. they identify what is done rather than to the process i.e., how the reader processes meaning.

2.1.4. Levels of Skills

It is fairly common for reading specialists to make a distinction between "lower" or "higher" order skills, implying both a hierarchy of such skills, and an implicational scale such as that lower skills are held to be necessary before higher ones can be acquired or developed. The lower level is primarily concerned with identifying word meaning, identifying grammatical meaning, and generating propositional meaning within sentences

(i.e. language-related); whereas, the higher level is concerned with generating a representation of larger segments of the text and integrating textual information with prior knowledge (i.e. reason-related).

Lunzer's et al. taxonomy above (see p.64) is arranged hierarchically, with the lowest level skills at the top. Urquhart and Weir (1998: 91-92) propose a set of criteria for ranking skills as follows:

(i) Logical implication: One component in the system can logically be considered to presuppose all the components below it.

(ii) Pragmatic implication: A reader displaying one skill in the system can be assumed to possess all the "lower" skill.

(iii) Developmental: Some skills are acquired earlier than other.

(iv) Discourse level: A skill is ordered with respect to the size or level of discourse level it relates to.

In order to empirically establish the validity of such a hierarchy, Lunzer, Waite and Dolan (1979) devised a reading comprehension test administered to 257 English primary schoolchildren. The test aimed at assessing their abilities at understanding text at different levels of comprehension, through questions intended to tap all the reading skills proposed in Lunzer's list above. The results revealed the authors' failure to find evidence for the separability of such skills and their inability to demonstrate that these skills were arranged in a hierarchy of implicational scale. The validity of the assertion that reading sub-skills relate to each other in such a way that before we can employ higher-order skills, we have to master preceding lower skills could not also be proved by Lunzer et al.'s study. For example, they were unable to identify readers who were able to answer word meaning

questions but not questions further up. On the contrary, subjects proved to be able to answer "higher-level" questions but failed to answer "lower-level" questions correctly.

Consequently, one can draw two conclusions. The first is that "the division of skills into "higher" and "lower" orders, however tempting, does not seem be justified in practice" (Alderson (1990: 478, cited in Alderson, 2000). The second is that the implicational scale is not necessarily consequence of hierarchy (Alderson, 1990). One final remark concerns the question of whether these skills are empirically separable at all or whether we should regard reading as a single integrated aptitude. This last issue was discussed above (see p. 60).

2.2. Reading Strategies

L2 reading research has tended to be favourable to a schema-theoretic view of reading by relating successful reading comprehension with the readers' ability to access adequate content and formal schemata. However, successful reading comprehension also requires their ability of monitoring what they understand and taking appropriate strategic action (Casanave, 1988). Casanave refers to this underlying knowledge about monitoring behaviours as strategy schema. Studies on reading strategies are, thus, based on the assumption that the individual characteristics of readers may have a big influence on reading performance. The same text may be processed in different ways by different readers and this depends on their purposes, attitudes, interests and background knowledge. Readers' reasoning about what has been read and the kinds of inferences drawn from their reasoning may also greatly differ.

This section of the chapter will examine the nature of reading strategies, their characteristics, classifications and the relationship between reading strategies and comprehension.

2.2.1. Definition

The term reading strategy is very ill-defined and there is controversy among researchers concerning the definition of this concept.

Most definitions of strategy see it as a conscious response to local problems in a text. Urquhart and Weir (1998: 95) define strategies as "ways of getting round difficulties encountered while reading". For Carrell (1998), reading strategies include any of a wide array of tactics that readers use to engage and comprehend texts. Another view sees strategies as means to facilitate comprehension. Such a view is held by such writers as Pritchard (1990: 275) who defines a strategy as "a deliberate action that readers take voluntarily to develop an understanding of what they read" and Davies (1995: 50) who refers to strategy as "a physical or mental action used consciously or unconsciously with the intention of facilitating text comprehension and or /learning" . Singhal (2001: 1) combines in her definition the two above views. She refers to reading strategies as "processes used by learners to enhance reading and overcome comprehension failure". Barnett's (1989: 66) definition of the concept strategies seems to encompass almost all the above views. For her,

the word strategy refers to the mental operations involved when readers purposefully approach a text to make sense of what they read. They may be either conscious techniques controlled by the reader or unconscious processes applied automatically. Both 'good' successful and poor (unsuccessful) strategies exist, yet the term strategy as used in pedagogical material often implies those which are successful.

By examining the above definitions, we notice lack of agreement between researchers concerning automaticity of strategies, level of consciousness, and the role they are allowed to play in the process of reading.

With respect to the distinction between "skill" and "strategy", there is a fair amount of confusion and a considerable terminological inconsistency both in the in the reading literature and teaching material. Much of the research frequently fails to distinguish between strategies and skills. For example, "inferencing" is a skill for Davis (1968), but a strategy for Olshavsky (1977); skimming and scanning are referred to as strategies by Sarig (1987), while for Munby (1987), they are skills. On the other hand, some writers (Nuttal 1996; Grabe 2000) use skills/strategies as if the two were interchangeable, whereas for others (Williams and Moran, 1989; Paris, Wasik and Turner, 1991; Uquhart and Weir, 1998), skills are distinguished from strategies on the following points:

(i) Strategies are reader-oriented, skills are text-oriented.

(ii) Strategies represent conscious decisions taken by the reader. They are selected deliberately to achieve particular goals. Skills are regarded as an acquired ability which has been automised and applied to text largely subconsciously. Examples of such automaticity are lexical recognition and syntactic parsing.

(iii) Strategies, unlike skills, are carried out in order solve a problem, e.g. failure to understand a word or the significance of a proposition, failure to find the information one was looking for.

Nevertheless, a reader's behaviour can change from involving a "skill" to a "strategy" and vice versa. In other words, when an emerging skill is used intentionally, it can become a strategy; whereas a strategy can go underground and become a skill. For example, for beginner readers, phonological encoding may be a strategy used in recognizing written words. However, a fluent reader who may possess the skill of rapid automatic word recognition may still resort to the strategy of phonological encoding when faced with an unfamiliar word (Williams and Moran, 1989). Indeed, according to Paris, et al. (1991: 611), strategies are more efficient and developmentally advanced when they are applied automatically as skills. Furthermore, the conscious and deliberate character of strategies makes them open to inspection and evaluation for their utility, effort and appropriateness.

Given the important role of the reading strategies, the present study attempts to investigate how L2 readers perceive and apply them when reading. The term 'reading strategies' in this thesis refers to operations or actions that are deliberately employed by readers to accomplish the reading task and enhance learning. We also adopt the view of Hadwin and Winne (1996: 694, cited in Allen, 2003) that "to be [a strategy], a student must (a) have alternatives from which to choose, (b) deliberate about the advantages and disadvantages of each relative to the task at hand, and (c) select the [strategy] because it is judged to be more effective for meeting goals than its alternative".

2.2.2. Characteristics of Reading Strategies

The word strategy is often used ambiguously in view of conflicting views as to whether it refers to bad, good or neutral strategy. Some writers (Hosenfeld, 1977) refer to strategies as "good" strategies such as skipping, regressing, and rereading; whereas, others reject the notion of "good" or "bad" strategies and rather talk of good or bad use of strategies (Kern,1997). A third group yet uses the term strategy neutrally, in view of the conflicting findings about which strategies are effective (Davies, 1995).

Another point of dispute relates to whether the term strategy refers deliberate and conscious behaviour (Cohen, 1986; Pritchard, 1990) or a non- deliberate and less conscious one. In other words, strategies can be stipulated either within the focal attention of the learners or within their peripheral attention. For Cohen (1986), if the learner cannot identify any strategy associated with it as it is unconscious, then the behaviour would simply be referred to as common process, not a strategy. Kletzein (1991) insists on the conscious character of strategy and defines it as "a deliberate means of constructing meaning from text when comprehension is interrupted". By contrast, for a third group of writers, such as Barnett (1989), the term strategy covers both conscious and unconscious behaviour. For Davies (1995: 50), however, the presence or absence of consciousness as regards strategies depends largely on the type of reading; that is to say, when readers are engaged in normal reading, their use of strategies might be said to be unconscious; but "when they are required to report their thought processes", their strategies "may come… to the surface of consciousness".

Some researchers, such as Farech and Kasper (1983), argue that once learners have developed some strategies to the point that they become automatic, these strategies may be

subconscious. Ellis (1994) argues that if strategies become so automatic that the learners are no longer conscious of employing them and cannot be accessible for description, they lose their significance as strategies.

Other researchers (for example, Oxford, 1990) see strategies as observable, but others (for example, Weinstein and Meyer, 1986; Purpura, 1999) see them as both observable and non-observable. According to Purpura, a lack of observable behaviour in the eye of the researcher does not necessarily imply a lack of mental processing. Strategies will be assumed to be observable, but it is essential for a researcher to allow for the possibility that readers might use a strategy, but fail to report it.

Another problem concerns the scope of strategies: are they global or specific? Here again researchers are divided between those who argue that strategies involve multiple components that must be carefully analysed (Levin, 1986), and those who argue that strategies are general learning plans that are implemented through specific tactics (Derry an Murphy, 1986, in Paris et al., 1991).

2.2.3. Taxonomy of Reading Strategies

While a number of taxonomies of reading strategies is available, there is yet no agreed rationale for categorizing strategies and no conclusive evidence that certain strategies are inherently more facilitating of comprehension than others. Barnett (1989: 66-67) gives a selection of what she considers to be the most complete catalogues of the types of L2 reading strategies. They include Hosenfeld's et al. (1981), Block's (1986) and Sarig's 1987 lists.

Hosenfeld et al. (1981) offer a list of effective strategies in *'Interviewer Guide for Reading Strategies'*. The list is illustrated in the figure below.

Figure 03: INTERVIEWER GUIDE FOR READING STRATEGIES
Hosenfeld et al. 1981

Name ----------------------------

GENERAL READING BEHAVIOR

- Rarely translates;   Translates;
  Guess contextually   Guesses non-contextually

- Translates;   Translates;
  Guesses contextually   Rarely guesses

_____

| OBSERVED STRATEGIES | COMMENTS |

1. Keeps meaning in mind --

2. Skips unknown words (guesses contextually) --

3. Uses context in preceding and succeeding sentences and paragraphs ------------------------

4. Indentifies grammatical category of words --

5. Evaluates guesses --

6. Reads title (makes inferences) ---

7. Continues if successful --

8. Recognizes cognates --

9. Uses knowledge of the world --

10. Analyzes unknown words --

11. Reads as though he or she expects the text to make sense -------------------------------

12. Reads to identify meaning rather than words --

13. Takes chances in order to identify meaning ---

14. Uses illustration ---

15. Uses side-gloss ---

16. Uses glossary as a last resort ---

17. Looks up words correctly --

18. Skips unnecessary words ---

19. Follows through with proposed solutions ---

20. Uses a variety of types of context clues --

Based on the think aloud protocols of six ESL and three native-English speaking university-level students, Block (1986) categorizes their strategies as general (comprehension-gathering and comprehension-monitoring) and local (attempts to understand specific linguistic units).

General Strategies

- Anticipate content.

- Recognize structure.

- Integrate information.

- Question information in the text.

- Interpret the text.

- Use general knowledge and associations.

- Comment on behaviour and processes.

- Monitor comprehension.

- Correct behaviour.

- React to the text.

Local strategies

- Paraphrase.

- Reread.

- Question meaning of clause or sentence.

- Question meaning of word.

- Solve vocabulary problem.

Sarig (1987) classifies her foreign learners' reading moves or strategies which she gathered from their think- aloud protocols into four types (all containing "comprehension promoting moves" and "comprehension deterring moves").

Technical-aid moves are generally useful for decoding at a local level.

- Skimming.

- Scanning.

- Skipping.

- Written key elements in the text.

- Marking parts of text for different purposes.

- Summarizing paragraph in the margin.

- Using glossary.

Clarification and simplification moves show the reader's intention to clarify and/or simplify text utterances.

- Substitutions.

- Paraphrase.

- Circumlocutions.

- Synonyms.

Coherence-detecting moves demonstrate the reader's intention to produce coherence from the text.

- Effective use of content schemata and formal schemata to predict forthcoming text.

- Identification of people in the text and their views or actions.

- Cumulative decoding of text meaning.

- Relying on summaries given in the text.

- Identification of text focus.

Monitoring moves are those displaying active monitoring of these processing, whether metacognitively conscious or not.

- Conscious change of planning and carrying out the tasks.

- Deserting a hopeless utterance ("I don't understand that, so I'll read on").

- Flexibility of reading rate.

- Mistake correction.

- Ongoing self-evaluation.

Another inventory of strategies has been proposed by Olshavsky (1976-1977) who used think aloud protocols for L1readers. She classifies strategies under three levels:

(i) word-related strategies which include use of context to define a word, synonym substitution, and stated failure to understand a word,

(ii) clause-related strategies which include re-reading, inference, addition of information, personal identification, hypothesis, and stated failure to understand a clause,

(iii) and story-related strategy which refers to the use of information about the story.

2.2.4. Previous Research into Reading Strategies

2.2.4.1. First Language Reading Strategy Research

Researchers (Baker, 1979; Garner, 1980; Hare, 1981) on comprehension strategies of native English speakers have concentrated on the description of those strategies that are involved in understanding. They have also compared the performances of "good" and "poor" readers. The findings of these studies suggest that good readers are:

– more able to monitor their comprehension than poor readers,

– are more aware of the strategies they use than poor readers,

– use strategies more flexibly,

– able to adjust their strategies to the type of the text they are reading and the purpose for which they are reading, distinguish between important information and details as they read,

– able to use clues in the text to anticipate information and/ or relate information with information already stated, and

– able to notice inconsistencies in text and employ strategies to make these inconsistencies understandable (Block, 1986: 465-466).

These studies provide a great deal of information about certain types of readers; however, it seems difficult to compare their results because of such variables as age, grade level of participants, the tasks and the reading material together with the categories of strategies which differ from study to study.

Carrell (1998) distinguishes, in L1 reading between proficient and novice readers. Proficient readers use rapid decoding, large vocabularies, phonemic awareness and knowledge about text features and a variety of strategies to aid comprehension and memory. Novice readers, by contrast, often focus on decoding single words, fail to adjust their reading for different texts and purposes, and rarely look ahead or back in the text to monitor or improve comprehension. This failure in using reading strategies effectively leads to what Carrell (ibid: 04) calls non-strategic reading. The latter results from 'limited practice, lack of instruction and motivational reluctance to use unfamiliar effortful strategies'. Strategic reading, on the other hand, is a basic characteristic of expert readers "because it is woven in the very fabric of "reading for meaning" and the development of this cognitive ability' and the use of reading strategies will allow them 'to elaborate, organize and evaluate information derived from text" (Carrell, ibid: 04).

Given the purpose and the context of the present study, not much emphasis is placed on L1 strategies research. Furthermore, because of the different natures of L1 and L2 reading,

findings of the former cannot directly apply to the contexts of the latter; however, they do help in establishing basic grounds for further research in L2 situations.

2.2.4.2. Second Language Reading Strategy Research

L2 reading research began to focus on reading strategies in the late 1970s and early 1980s. Researchers in this domain are divided into two groups. The first group believes that reading ability in L2 largely depends on proficiency in that language (Clarke, 1979; Cziko, 1980); whereas the second group believes that much of what L2 readers do is the same as when they read in their L1 and that strategies that are developed in L1 can be transferred to L2 (Coady, 1979; Cummins, 1980; Goodman, 1973; Hudson, 1982) (See Section 1.4.2., p.53). However, L2 reading could be slower and less successful than L1 due to many reasons such as the readers' L2 proficiency and their L1 literacy. Types of texts, unknown vocabulary and unfamiliar syntax may hinder the reader from using appropriate prior knowledge to comprehend the text (Cohen, 1994; Block, 1986). Several of these studies were exploratory and descriptive in nature, based on the think-aloud reports of a small number of individual learners. They aimed at identifying relationships between certain types of reading strategies and successful and unsuccessful second language reading.

Below, we are going to examine a number of selected studies that have been cited for years. This review is by no means exhaustive, but rather the selected studies serve to illustrate the difficulty involved in comparing results across studies and making generalizations concerning the role of strategies in L2 reading process for the upper levels of instruction. Indeed, the difficulty stems from the wide variety of :

(i) participants –who are of many ages and backgrounds;

(ii) tasks –which may be executed at the sentence level as well as the connected discourse level;

(iii) reading passages –that vary in content or topic familiarity, difficulty level, and text type and genre,

(iv) and research method such as think-aloud verbal reports, interviews, questionnaires, observations, and written recalls.

In one of the earliest works on L2 reading strategies, Hosenfeld's (1977) examined successful and unsuccessful readers in order to find out what types of cognitive operations they used to process written texts. The study was based on the think-aloud reports of ninth grade American students learning French. Before conducting the study, she classified readers on the basis of an L1 reading test, and then selected twenty successful and twenty unsuccessful students. The results of the study indicated that the successful readers, for example, followed such reading strategies as:

(i) keeping the meaning of the passage in mind during reading;

(ii) reading in what Hosenfeld called 'broad phases';

(iii) skipping words as unimportant to the meaning of the sentence;

(iv) using words in context, and

(v) having a positive self-concept as reader. (cf. to the list above, section 2.2.3. p.74)

On the other hand, poor readers used such strategies as:

(i) translating sentences and losing the general meaning of the passage;

(ii) rarely skipping words;

(iii) looking up unknown words in the glossary,

(iv) and having a negative self-concept as reader.

Although these studies clearly described the strategies students used to process the text, they did not link the strategy use to comprehension of specific paragraphs or to the text as a whole. The data only focused on sentence-level comprehension and do not reveal overall comprehension of the entire text.

In 1984, Hosenfeld conducted two case studies with a non-successful non-native readers by using think-aloud protocols. In the first case study, Hosenfeld used an inductive technique in remedial sessions with her subject, a fourteen-year old school girl enrolled in level two French class. The subject was first asked to compare her reading strategies to those of a successful reader and later practised the good ones. The results demonstrated that unsuccessful readers who used to do word translation and turned to the dictionary for the meaning of new words could acquire effective strategies which include translation into broad phases, contextual guesses and use of various information sources in decoding (e.g. illustration, cognates, side gloss).

In the second case study, with a fourteen-year old high school freshman, Hosenfeld used a think aloud protocol introspection to identify his reading strategies. After that she arranged remedial sessions in order to teach him strategies of successful readers. A considerable improvement in the use of successful strategies was noticed after the session. Hosenfeld's findings suggest that good and poor readers adopt different strategies to their reading processes and that it is possible to train unsuccessful learners to use the strategies of the successful ones. Her case studies, however, were limited to word decoding and meaning retention. Moreover, they were more likely to be studies of translation rather than reading in a natural situation. In fact Hosenfeld's work contributes more to the training side than the understanding of reading.

A decade later, Block's (1986) "general comprehension" and "local linguistic" categories echoed Hosenfeld's binary division of strategies. Block used think-aloud protocols to examine the comprehension strategies of non-proficient ESL readers and compared strategies they used with those of non-proficient native English speakers who were all enrolled in a remedial reading course at the university level. Subjects were given two expository passages selected from an introductory psychology course and responded to parts of the text cued by red dots. After reading and retelling each passage, the participants answered twenty multiple-choice comprehension questions. They were allowed to consult the passages while answering the questions.

Block developed a coding scheme that consisted of two types of strategies: general and local (cf. to the list above, section 2.2.3., p.75). Results demonstrated that language background (native speakers of Chinese, Spanish and English) did not account for the use of particular strategies. Of the nine ESL students in the study, the readers with higher comprehension scores on retelling and the multiple choice questions integrated new information in the text to the old information, distinguished main ideas from details, referred to their background, and focused on textual meaning as a whole, all classified as general strategies. On the other hand, readers with low comprehension scores rarely distinguished main ideas from details, rarely referred to their background, infrequently focused on textual meaning, and seldom integrated information. Block also identified two modes of response, reflexive and extensive. In the extensive mode, the readers direct their attention on the information in the text and focus on understanding the author's ideas rather than relating the text to themselves. In the reflexive mode, however, readers relate ideas in the text to themselves, affectively and personally, focusing on their thoughts and feelings

rather than the information in the text. Block associated the extensive mode to the better readers.

Sarig (1987) made a comparative exploration of the contribution of L1 reading strategies and L2 language proficiency to L2 reading with ten female high school readers who were classified under three levels of low, intermediate and high English proficiency. Subjects read academic texts in L1, Hebrew and L2, English and were asked to self report their reading behaviours. She assigned them main idea analysis and overall message analysis. From the study, she classified the data into four general types of behaviuors or responses:

(i) Technical aid moves.

(ii) Classification and simplification moves.

(iii) Coherence moves.

(iv) Monitoring moves (See the full list above, section 2.2.3., p.75).

Sarig's (ibid: 118) results revealed the participants transferred strategies from L1 to L2 and that the same strategy types 'accounted for success and failure in both languages to almost the same extent'. Top-down, global strategies led to both successful and unsuccessful reading. She concluded that the ability to transfer reading skills from L1 to L2 depends on individual characteristics of the reader rather than L2 level of proficiency. Results also indicated that readers were shown to be characterised by their own reading styles. In other words each individual read differently and used different combinations of strategies. In addition, weak and strong readers did not greatly differ in the number of moves they used in order to get round difficulties they encountered. These findings do not seem to agree with Block's (1986) where global strategies led to successful and not

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unsuccessful reading comprehension. Success or failure in reading seems to depend more on a combination of moves used in the processing of the text rather than on occurrence or non-occurrence of certain strategies. Readers may use good strategies but fail to comprehend the text because of few wrong moves. Success in reading then tends to depend more on the quality rather than the quantity of strategy use.

Devine (1987) investigated the reading behaviour of twenty beginning level ESL students enrolled in an intensive ESL programme with the aim of determining the interaction between general language proficiency and second language reading. She collected a sample of the subjects' oral reading at three months intervals of the same academic year and used miscue analysis to examine the changes of their performance. To determine the correlation between reading bahaviour and language proficiency, Devine also administered proficiency tests of grammar, vocabulary, listening, composition and cloze. The results indicated a positive correlation between language proficiency and reading ability. They also indicated a positive correlation between increases in language proficiency and increases in frequency of semantic and syntactic acceptability of oral reading miscues. Results also suggested that the reader's ability to use efficient reading strategy was enhanced with an increase in language proficiency. However, a negative correlation was noticed between increased scores on discrete point grammar and vocabulary tests and increasing reading proficiency; whereas increased scores on holistic tests had a positive correlation with increasing reading proficiency. These findings led Devine to the conclusion that knowledge of grammar and vocabulary alone is not sufficient for proficient reading.

Barnett (1988) examined university level students' real and perceived strategy use and how it affect comprehension, by examining reading strategies used by two groups of students learning French; one group was taught reading strategies and the other not. After they had read an unfamiliar passage in French, the students were asked to write a recall in English, and then they completed a multiple choice comprehension questionnaire. Finally, they answered 17 questions about the types of reading strategies that they used. In her study, Barnett used two coding schemes: "text- level" and "word-level". Text-level strategies refer to the processes used to read the passage as whole, such as using background knowledge, predicting, reading the title, skimming and scanning. Word-level strategies, on the other hand, refer to processes such as using context to guess word meaning, identifying grammatical categories of words and identifying word families. The questionnaire used in the study contained effective and less effective text-level and word level strategies.

Barnett's (op.cit: 156) findings suggest that students who received strategy use training showed greater ability to read through context than those who did not and that "students who think that they use those strategies considered most productive actually do read through context better and understand more than do those who do not think they use such strategies". The results of the study also confirmed a relationship between strategy use and reading comprehension level. For example, students who used context while reading comprehended more than those who did not. Similarly, higher scores were obtained by students who perceived they used productive strategies.

Carrell (1989) compared L1 and L2 metacoginitive awareness of reader strategies and the relationship between this awareness and comprehension. She collected data from

two groups. The first group consisted of university level Spanish speakers of intermediate and high-intermediate level in English as an L2. The second group consisted of native speakers of English learning Spanish as an L2 in first, second and third year courses. After reading two texts, one in L1 and the other in L2, the subjects answered multiple choice comprehension questions about the text followed by a strategy use questionnaire. After correlating strategy use with comprehension, Carrell concluded that the ESL readers of more advanced proficiency levels perceived "global" or top-down strategies as more effective. With Spanish as L2 group, she found that the lower proficiency level subjects used more bottom-up or "local" strategies.

Anderson (1991) investigated individual differences in strategy use of twenty eight Spanish speaking adult students enrolled in university-level English as an L2 courses by using two types of tasks: standardised reading comprehension tests and academic texts. On the first day of the study, two different forms of a standardized test −the Descriptive Test of Language Skills-Reading Comprehension Test (DTLS)− were randomly assigned to participants. The test consisted of fifteen reading passages, each followed by two to four multiple-choice comprehension questions. The questions were categorized according to three types of reading skills: understanding the main ideas, understanding direct statements, and drawing inferences. On a different day, the students completed the second form of the DTLS, accompanied by a think aloud protocol where participants verbalized reading strategies. In the second reading task, students read two passages taken from freshman-level texts, and answered multiple-choice questions for each passage. The findings of Anderson's qualitative and quantitative inquiries revealed that for both the standardised comprehension test and academic text reading participants who used more strategies comprehended better. Results also indicated that there is not a statistically

significant relationship between the number of particular strategies reported and overall comprehension scores on the reading tasks.

Block (1992) examined the comprehension monitoring processes used by L1 and L2 readers in reading expository prose. She collected the think aloud protocols from 25 college freshman consisting of 16 proficient readers (8 native speakers of English, 4 Spanish, and 4 Chinese) and 9 non-proficient readers (3 native speakers of English, 3 Spanish and 3 Chinese). The findings indicated that proficient L2 readers performed similarly to proficient L1 readers and less proficient L2 readers performed similarly to less proficient L1 readers. In addition, L2 readers used similar comprehension monitoring strategies to L1 readers. Both proficient L1 and L2 readers were found to monitor their comprehension actively by identifying the source of the problem, attempting to solve them and usually looking back to check their solutions. On the other hand, both L1 and L2 less proficient readers lacked awareness of the problems and the ability to solve the problems when coming across them. Besides they tended to use a local, word-based processing strategy while the proficient readers seemed to use a more global meaning-based one. Proficient and less proficient readers, thus, were different in their awareness of the source of the problems they encountered as well as in their approaches to solving these problems. Finally, a comparison was drawn between L2 proficient and L2 non proficient readers. When faced with a vocabulary problem, the former used background knowledge, decided on whether the word contributes to the overall meaning of the passage, reread the sentence, and used syntactic clues. These meaning-based strategies are classified as global behaviours. On the other hand, the latter focused on identifying lexical problems and did little to figure out the meaning of words.

Raymond (1993) examined the effect of structure strategy training on the comprehension of expository prose. The subjects were English speaking students learning French as an L2. Raymond compared two groups of participants. The first group was taught five top-level structure strategies, and the second group received no training. The strategies were:

(i) Description.

(ii) Collection.

(iii) Causation.

(iv) Problem solution.

(v) Comparison.

The participants were assigned three tasks: reading a text, completing a questionnaire and writing a recall in English. The findings of the study revealed that the experimental group outperformed the control group by recalling more idea units from the text and that structure strategy use is characteristic of skilled readers.

The above studies are summarised in the following table.

<div align="center">

Table 01
Foreign Language Reading Strategy Research

</div>

Author	Participants	Aim of the Study	Research Method	Coding Scheme	Results
Hosenfeld 1977	Ninth grade students learning French; 20 successful and 20unsuccessful readers	Type of strategy use by successful and unsuccessful readers	Think aloud reports for each sentence they read	Two different codes: Main-meaning line and word-solving strategies	Successful readers kept meaning of passage while assigning meaning to sentences; whereas poor readers focused on solving unknown words or phrases.
Hosenfeld 1984	Two 14 years old high school students (unsuccessful readers)	Relationship between strategies of successful and unsuccessful reading	Think aloud (based on interview technique and remedial session)		(1) Good and poor readers used different strategies. (2) Strategies can be trained.
Block 1986	9 university level ESL and native English students in remedial reading course	Comparison of the reading comprehension strategies used by first and second language readers	Think aloud reports for each sentence they read.	Two different codes: general strategies and local strategies	(1) More successful readers used their general knowledge, focused on overall meaning of text, integrated new information with old, and differentiated main ideas from supporting points. (2) The poor reader rarely did any of the above. (3) Integrator readers responded in extensive modes while non-integrators responded in reflexive mode.
Sarig 1987	10 high school readers (low, intermediate and high proficiency)	Contribution of L1 reading strategies and L2 proficiency to L2 reading	Think aloud reports while reading L1 and L2 texts	4 different codes: (i) technical aid (ii) clarification and simplification (iii)coherence detection (iv) montoring moves	(1)Subjects transferred strategies from L1 to L2. (2) Good and poor readers used similar strategies. (3) Success or failure in reading depends on a combination of moves. (4) Global strategies led to both successful and unsuccessful reading comprehension. (5) Clarification and simplification strategies contributed to unsuccessful reading.
Devine 1987	20 low proficient ESL readers	Interaction between language proficiency and L2 reading	Miscue Analysis		Increase in language proficiency enhanced effective strategy use

Barnett 1988	278 university level students	Real and perceived strategy use among university level students and its effect on comprehension	Strategy use questionnaire	Two different codes: text-level (global or top down strategies); word level (local or bottom-up strategies	(1) Higher comprehension scores were obtained by particip... while reading. (2) Participants who were trained in strategy use understoo...
Carrell 1989	75 native English speakers learning Spanish; 45 native speakers of Spanish in intermediate ESL courses	Metacognitive awareness of L2 reader strategies and its relationship with comprehension	Strategy use questionnaire, multiple choice comprehension questions	Two different codes: Global or top-down strategies; local or bottom-up strategies	(1) Lower proficiency level students leaning Spanish as a fo... bottom-up processing strategies. (2) ESL advanced level students used top-down strategies.
Anderson 1991	26 Spanish speaking adult English as a second language students	Individual differences in strategy use	Reading comprehension test; reading text; think aloud reports	(i) understanding main ideas (ii) understanding direct statements (iii) drawing inferences	(1) Students who used more strategies comprehend better. (2) No significant relationship between the amount of uniqu... comprehension.
Block 1992	16 college freshmen proficient and non proficient readers	Comprehension monitoring process used by first and second language readers of English	Think aloud oral reports at sentence level	Two different codes: meaning-based (global) and word-level (local)	(1) Different monitoring strategies used by proficient and n... former are more aware of the source of the problem and the... (2) Less proficient readers used local strategies. (3) More proficient readers relied on global strategies.
Raymond 1993	43 native English readers of French	Effect of strategy training on comprehension	Written questionnaire and written recall	Top- evel structure strategy	Training in strategy helped increase the amount of idea unit...

The studies reviewed above yield different findings because the researchers used a variety of research methods with diverse populations to investigate the reading strategies of second language learners and because the different tasks that the subjects performed also varied in text type, length, content and difficulty level. However and despite this variability, the common thread is that most studies revealed that L2 readers encountered more difficulties than L1 readers, that L2 less proficient readers tend to face more difficulties and that proficient readers used top-down strategies rather than bottom-up strategies. Besides, each researcher established a different set of criteria to distinguish proficient and non-proficient readers, and some did not provide the criteria for the above categorization.

The table above also shows the methodological trend of combining different research methods with the dominance of think aloud techniques. Furthermore, the studies cover not only the types and frequencies of strategies but also their effectiveness which is related to metacognitive strategies (Devine, 1987; Anderson, 1991; Block, 1992). As for the type of strategy use and its relation with good and poor readers, there seems to be no conclusive answer as to whether the two groups of readers are the same or different. The studies of Hosenfeld (1977, 1984), Block (1986) and Carrell (1989) suggest that the two groups use different strategies while the study of Sarig (1987) shows that they use similar strategies. An important component of the research methods of some of the reviewed studies (Hosenfeld, 1984; Barnett, 1988; Raymond, 1993) was that some students received direct training in some effective strategies. The results in the three studies confirmed the effectiveness of such training in enhancing comprehension.

Finally, some researchers predetermined the students' reading proficiency level and did not examine the successful comprehension of the specific passages in the study; other researchers did not connect the strategy use and type to successful comprehension. Because of

its importance, the relationship between strategies and comprehension attracted the attention of many researchers and this is what is going to be discussed below.

2.2.5. Reading Strategies and Comprehension

2.2.5.1. Relationship between Strategies and Comprehension

According to Carrell (1998), the relationship between strategies and comprehension is not simple and straightforward. That is, using certain types of strategies does not always guarantee successful reading comprehension. Similarly, failure to use strategies does not always result in unsuccessful reading comprehension. This view is backed up by Anderson (1991: 19) who argues that there is no simple one-to-one relationship between particular strategies and successful and unsuccessful reading. According to him, successful L2 reading comprehension is:

> *not simply a matter of knowing what strategy to use, but the reader must*
>
> *also know how to use it successfully and how to orchestrate its use with*
>
> *other strategies. It is not sufficient to know about strategies, but a reader*
>
> *must also be able to apply them strategically.*

Kern (1997) brings further support to the above view by arguing that no strategy in inherently 'good' or 'bad' and that so called 'bad' strategies are used by 'good' readers and vice versa. He rather suggests that there are good and bad users of the same strategy and that the difference between a good and a bad use of the same strategy is in the context in which they are used, how they are used and how they interact with other strategies. In other words, Kern says the difference is how the strategies are 'operationalized'.

So, the question which may be asked in relation to the above views is what does Anderson mean by applying strategies 'strategically' and what does Kern mean by

successfully 'contextualyzing' and 'operationalizing' strategies?. The answer to this question is given by Carrell (1998). According to her, the difference between good and bad use of strategies lies in whether they are used metacognitively or not.

2.2.5.2. Role of Metacognitive Awareness in Reading Comprehension

Metagonition is a relatively new label for a body of theory and research that addresses learners' knowledge and use of their own cognitive resources. The term metacognition is the notion of thinking about thinking, thinking of what a person knows and what a person is currently doing. It is knowledge about ourselves, the task we face, and the strategies we employ (Baker and Brown, 1984). Knowledge about ourselves may include knowledge about how well we perform certain types of tasks or our proficiency level. Knowledge about tasks may include knowledge about task difficulty level. Knowledge about strategies that we employ involves knowledge about strategies that function to monitor or regulate cognitive strategies. They include:

(i) checking the outcome of any attempt to solve a problem,

 (ii) planning one's next move,

 (iii) monitoring the effectiveness of any attempted action, and

 (iv) testing, revising and evaluating one's strategies for learning (Baker and Brown, ibid: 354).

In other words, they involve "learners stepping outside their learning and looking at it from outside. Such strategies include an awareness of one's mental processes and an ability to reflect on how one learns, in other words knowing about knowing" (William and Burden, 1997: 148).

O'Mally et al. (1985: 506) articulated the contrast between metacognition and cognition in that

metacognitive strategies involve thinking about the learning process,

planning for learning, monitoring of comprehension or production

while it is taking place and self-evaluation of learning .... Cognitive

strategies, by contrast, are more directly related to individual learning

tasks and entail direct manipulation or transformation of the learning

materials.

According to O'Malley et al, op. cit: 561), "students without metacognitive approaches are essentially learners without direction or opportunity to review their progress, accomplishments and future directions." Metacognitive awareness involves the awareness of whether or not comprehension is taking place, and the conscious application of one or more strategies to correct comprehension, but "if learners are not aware of when comprehension is breaking down and what they do about it, …. they will not be able to use strategies strategically" (Carrell, 1998: 8). Here comes the role of metacognitive strategy training, a point that we will develop below. Metacognition is often related to effective learning and competent performance in any area of problem-solving. Carrell further adds that expert learners are more consistent than novice learners in their planning, predicting outcomes and monitoring their performance.

In the area of reading, metacognitive abilities relate to self-control mechanisms like planning, monitoring and evaluating the strategies employed during reading to enhance comprehension; whereas, cognitive strategies are the mental processes that enable us to read, ranging from working out the meaning of words in context through skimming a whole text quickly to extract the gist (Urquhart and Weir, 1998). The importance of meatcognition in strategic reading shows up in the tactics readers use to monitor comprehension. Let us illustrate this with some examples. Skimming a text for key information involves using a

cognitive strategy; whereas assessing the effectiveness of skimming for gathering textual information would be a meatcognitive strategy (Devine, 1993). Other metacognitive strategies may involve knowing that familiar topic material is easier to understand than unfamiliar material and that explicit sentences assist us in tasks that require reduction of texts to their gists. Finally, knowing that prediction of article content, based on titles, improves comprehension is another example of metacognitive reading strategy (Singhal, 2001).

Metacognitive awareness, whether in L1 or L2 reading, is more and more recognised as an important aspect of skilled strategic reading. Baker and Brown (1984) argue that "effective readers are aware of and have degree of control over their cognitive activities when they read and that they possess well-developed metacognitive skills." Similarly, for Pressley and Afflerbach (1995), proficient readers are strategic readers who take conscious steps – involving a careful orchestration of cognitive resources– in order to ensure maximum comprehension.

According to Flavell (1978), there are two dimensions of metacognitive ability, namely knowledge of cognition and regulation of cognition. Knowledge of cognition includes three components: declarative, procedural, and conditional. Declarative knowledge is propositional knowledge, referring to "knowing what". A learner may know what a given strategy is, for example, s/he may know what skimming or scanning is. Procedural knowledge, on the other hand, refers to "knowing how" to perform various actions, for example how to skim or scan. Finally, conditional knowledge refer to "knowing why", and includes the learner's understanding of the value or rationale for acquiring and using a strategy and when to use it. Baker and Brown (1984) point out that "knowing that" (declarative knowledge is different from "knowing how" (procedural knowledge), and that knowledge that

a particular strategy is useful (awareness) precedes its routine use, which in turn precedes the ability to describe how it is used.

2.2.5.3. Comprehension Monitoring

Most studies on comprehension monitoring have been conducted with native speakers; however, many researchers (Casanave, 1988; Block, 1992) believe that because L2 readers may "encounter more unfamiliar language and cultural references while reading authentic or unadapted texts than L1 readers" (Block, 1992: 320), comprehension monitoring is of particular importance for L2 readers. Indeed, Casanave (1988) has called comprehension monitoring "a neglected essential" in L2 reading.

Comprehension monitoring is one kind of metacognitive behaviour which involves the use of self-regulatory mechanisms that allow readers to judge whether they have understood what they have read and to decide whether to take compensatory, corrective action when necessary (Casanave, 1988). For Paris and Meyers (1981), comprehension monitoring involves such behaviours as judging one's current level of understanding, and regulating comprehension and fix-up strategies. Much of the good readers' monitoring behaviour is said to be automatic, especially, in reading for gist or pleasure (Casanve, 1988), but when a "triggering event" impedes competent readers from achieving comprehension, the latter take deliberate and planned strategic actions to understand the material (Baker and Brown, 1984), by rereading or moving ahead in the text, seeking to clarify ambiguity, making a mental or physical note of the question in the hope a solution will emerge later or by consulting a dictionary, a knowledgeable person or another text.

Casanave (1988)) argues that in order to monitor comprehension, L1 and L2 competent readers make use of what she labels 'routine' and 'nonroutine' strategies. The

former involve "routine predicting, checking understanding for consistency with other part of the text and with existing knowledge, and checking for general understanding" (Casanave, 1988: 290). On the other hand, nonstrategic behaviours, which are the outcome of successful routine monitoring, occur in reaction to a trigger that points out a problem. Readers employ nonstrategic behaviours in order to assess what the problem is, make decisions about how to resolve it, act on those decisions and check the results. Routine monitoring continues as soon as the problem is resolved. These strategic behaviours are illustrated below.

Figure 04: Strategic Behaviours in the Reading Process (Casanve, 1988, p. 290)

Routine monitoring Strategies	Evaluation and fix-up strategies	Routine monitoring strategies

"Trigger"   Resolution
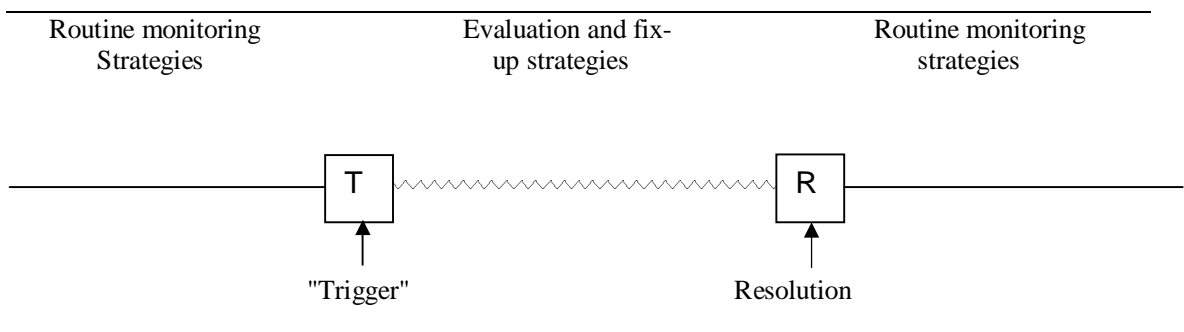
2.2.6. Reading Strategy Training

In L1 and L2 contexts, a growing body of empirical research has supported the pedagogical call for an explicit teaching of specific strategies to improve students' reading comprehension (Bereiter and Bird, 1985; Carrell, 1985; Cotteral, 1990). The results have indicated that non-skilled L1 and L2 readers either don't possess knowledge about strategies or mainly engage in bottom-up strategies and that strategy training can help them overcome their difficulties in learning. They have also indicated the beneficial and positive effect of such training and reported significant improvements in the students' reading comprehension performance after receiving training. Good readers demonstrated more awareness of the process while reading, greater consistency in keeping in mind the purpose of the task, and greater flexibility in reading shown by rereading when necessary, by relating ideas and reviewing content (Salataci and Akyel, 2002; Dhieb-Henia, 2003).

Several methods have been adopted to investigate the effect of using metacognitive strategies in classroom context. They include direct instruction, reciprocal teaching, question-answer, self-questioning or problem solving.

In sum, training in metacognitive strategies, although a relatively recent practice, seems to have a potential value for enhancing reading comprehension both in L1 and L2 contexts.

2.2.7. Some Prototypical Text Processing Strategies

Different reading strategies can be used for different purposes. This section contains some prototypical text-processing strategies which promote comprehension. Conventionally, strategies are taxonomically organized according to whether they are applied before, during or after reading. They are more commonly referred to as pre-reading (planning), while-reading (monitoring) and post-reading (evaluation) strategies. According to Paris et al. (1991: 611), a taxonomy of strategies may have two purposes: it provides a framework to review a wide variety of cognitive strategies that aid comprehension, and it calls attention to the successive choices that readers make as they engage text.

– **Pre-reading Strategies**

Students can use many strategies before they begin reading, like: previewing the material by skimming the text, and making predictions and setting the purpose for reading.

- **Previewing:** Readers can use previewing to make a decision whether to read a book, an article of a text (Urquhart and Weir, 1998). Previewing may involve examining the title and subheadings, looking at pictures, going through the table of contents and the indices quickly, reading the abstract carefully and the preface carefully. According to Hamps-Lyons (1984:304, cited in Urquhart and Weir, 1998), previewing helps

students recognize the difficulty level of text and comparative difficulty with other texts in the same field, judge the relevance/irrelevance of text for a particular topic, and decide which book from a set of possibilities would be more appropriate to read for a specific purpose. In the classroom context, its value might also lie in the amount of time it saves in preventing prolonged reading of something of no value (Nuttal, 1996). In addition, previewing may be very useful, particularly for unsuccessful readers who do not engage in strategies spontaneously. It helps generate a more positive attitude towards the text (Paris et al., 1991). Among the important components of previewing is the activation of prior knowledge and relevant schemata, and this has the role of facilitating the reader-text interaction. Ogle (1986, cited in Paris et al. 1991) advocates the use of "K-W-L" approach to reading in which the student learns to ask "What do I know?, What do I want to learn? And What did I learn?". This self-questioning will help the reader to think about relevant background information and make predictions about the text.

- **Prediction:** After the reader decides to read the text, s/he activates the strategy of prediction which involves his/her ability to foretell or anticipate what is to happen in the upcoming portion of text, form hypotheses which the latter might contain and generate questions about the text before beginning to read. In addition, prediction has the potential of helping the reader in setting a purpose for reading the particular text.

The difficulties one may face with pre-reading strategies, however, are that they:
(i) are difficult to execute spontaneously, either because students do not realize their value or avoid them because they consider them to be unnecessary or time consuming, and
(ii) depend on the readers' knowledge about the text.

Some strategies, like previewing, may be relatively independent of the text content; others, however, are driven by the nature of the reading passage. Semantic mapping, which refers to the graphic descriptions of the relations among the ideas in the text, is an example of such strategies whose execution varies according to the text genre. The readers' knowledge of such expository structures as enumerations, comparison/contrast and hierarchical organization will contribute to the effectiveness of the semantic mapping of a particular text (Paris et al. 1991).

– **While-reading Strategies**

Examples of on-line strategies involve self-questioning, self-monitoring, identifying main ideas, and making inferences.

- **Self-questioning**: This strategy is considered to be a "characteristic of good reading when it promotes cognitive processes such as inferencing, monitoring understanding and attending to structure" (Urquhart and Weir, 1998: 186).

- **Self-monitoring:** This is another feature of skilled reading which consists in the reader's checking of whether comprehension is taking place or not, and in case it is not, repair strategies will be adopted. The readers' self-generated questions are a means of enhancing their own comprehension. This strategy is closely connected with schema theory because when readers ask themselves whether they have understood or not, they are indirectly asking whether the information fits with what they know already. Thus, in the process of learning how to monitor their comprehension, they learn how to understand what they read (Pearson and Fielding, 1991, cited in Urquhart and Weir, 1998).

- **Identifying Main Ideas:** Identifying main ideas may be regarded as the "essence of reading comprehension" (Pearson and Johnston, 1978). In order to find out main ideas readers need to understand what they have read, judge the importance of the information and consolidate information clearly. Bauman (1986) suggests a five-step method to teach students to construct and improve main idea comprehension. The method involves:

  (i) introduction,

  (ii) examples,

  (iii) direct instruction,

  (iv) teacher-directed application and

  (v) practice.

He also posits that text-based factors influence the reader's ability to identify main ideas from text. For example, readers are better at identifying out main ideas when these are stated explicitly than implicitly and when they appear at the beginning of a paragraph rather than when they are embedded in text.

- **Making Inferences:** Inferring is another strategy which has received attention of many current researchers. It "refers to the reader coming to conclusion that are not explicitly stated in the text, but for which the text provides evidence" (Williams and Moran, 1989: 224). The schemata provided by prior knowledge help the reader to make inferences while reading; although, inferential comprehension is assumed to be automatic learnt through practice.

– **Post-reading Strategies:**

Post-reading strategies may involve the repeated use of pre-reading and while-reading strategies "because strategic readers revise their understanding recursively" (Paris et al., 1991: 614); however, there are some strategies which can be applied only after the whole text has been read. These strategies may involve summarising and evaluation and personal response.

Conclusion

Despite the terminological inconsistency commonly associated with the terms strategy and skill, they represent the two sides of the same coin. They both equally contribute in making the act of reading more complete and more successful; it is with this sense that they are taken in the present work. Strategic reading is not only a matter of knowing which strategies to use, but, in addition, the reader must know how to apply strategies successfully to achieve and improve comprehension. Research results demonstrated that skilled readers know when and how to apply reading strategies for a given task better than less skilled ones. Strategy training seems to have gained an important pedagogical support for its potential value in improving reading comprehension.

Because the aim of this study is to tap the reading behaviour of Biology students in terms of the processes as well as the strategies and skills they employ in order to understand texts in their specialist area, and because of the silent and private nature of reading, one needs to use some assessment methods to explore such behaviour. The aim of the following chapter is to provide some theoretical background of the various instruments applied in the domain of FL reading.

CHAPTER   THREE:

ASSESSING   READING

Introduction

An assessment or test can be defined as a measurement to sample behaviour in that a teacher tests a limited sample and then generalizes from the results; however, an assessment of linguistic competence should not be regarded as a precise instrument like a ruler or scale that measures weight or length, because it is very difficult to measure competence accurately (Kilfoil and Van der Walt, 1997).

The issue of methodology with respect to the assessment of FL reader-text interaction is complex due to the inadequacy of existing techniques to investigate a highly unknown process. Experts in native and L2 reading assessment now recommend that reading comprehension be measured in less traditional ways on the basis that these are too limited in scope. There is an emerging concern that the testing of reading be more consistent with strategic view of the reading process (Cohen, 1994). The present chapter describes some instruments of data elicitation aiming at capturing the students' reading behaviour, more particularly the diverse strategies and processes which may ultimately impact their reading achievement.

3.1. Traditional Tests

There are three main kinds of tests: proficiency, diagnostic and achievement tests. A proficiency test measures the level of a skill in language considered as necessary for entry in a particular class or level. A diagnosis test aims at measuring the learners' strengths and weaknesses which will inform the teacher as to whether remedial lessons are needed or not. As for an achievement test, it aims at assessing a specific body of knowledge which is assumed to have been learnt. It reveals weaknesses and tests underlying competence, so its results can lead to remedial work or be used to predict future performance.

The focus in this section is on diagnostic tests because it is the type of test needed within the scope of this study, i.e. assessing the reading comprehension level of the students and relating test results with other results obtained from the other two other assessment methods used in the study, namely think aloud reports and strategy questionnaire.

3.1.1. Objectives: What Skills and What Strategies

The test developer should be as explicit as possible concerning the nature of the ability about which the test is designed to be providing information. The current consensus is that reading is an interactive process that is the product of complex information processing system involving both bottom-up and top-down processes. Within this view, reading can be broken down into underlying skills and strategies such as using context to guess meaning of unfamiliar word, identifying main ideas, locating specific information and understanding relations between parts of the text.

These abilities are subsequently divided into two ways: first along "expeditions" careful reading continuum (for example, deciding whether a particular passage, article or section of a book is relevant to a particular need); secondly, along a global local reading continuum (for example, searching texts for information about a specific date or symbol). The table below illustrates these divides.

Table 02: Matrix of Reading Types

(Adapted from Urquhart and Weir, 1998: 123)

	Global Reading	Local Reading
Expeditious Selective Reading	Skimming. Processing a text quickly and selectively to establish discourse topic and main ideas. Search reading. Processing a text quickly and selectively to locate and understand information relevant to predetermined needs.	Scanning. Processing a text quickly to locate specific information, symbols, figures, dates.
Careful Reading	Understanding a text. Reading carefully to establish accurate comprehension of explicitly stated main ideas and to infer propositional inferencing.	Understanding lexis/deducing meaning of lexical items from morphology and context.

3.1.2. Content of the Test: Types of Texts

The decision on text type is best informed by a needs analysis of the students target situation and by careful examination of texts (and tasks) used in other tests (Urquhart and Weir, 1998). In selecting texts, various factors have to be taken into account to determine their suitability for testing the targeted skills and strategies. These factors involve topic familiarity, language difficulty, channel of presentation and the skills and strategies we want to test.

The familiarity of the text can be established through survey, and texts at the extremes of a familiarity continuum should be avoided (Khalifa, 1997). In general, a text should not be so unfamiliar that it cannot be mapped onto the reader's existing schemata. Rather, it should be "sufficiently familiar to candidates so that candidates of a requisite level of ability have sufficient existing schemata to enable them to deploy appropriate skills and strategies to understand the text" (Khalifa, ibid: 143). Conversely, when the level of topic familiarity is too high, the test-takers will be able to answer some of the items without recourse to the text itself (Roller, 1990). A text should bear a certain degree of unfamiliarity in order to engage the reader's attention and motivate interest. However, it does appear that the contribution of background knowledge to comprehension is more important when the text is more specific, but when the text is less specific, language proficiency plays a more important role in comprehension (Clapham, 1994).

The difficulty level of the text is largely determined by its linguistic, organizational, propositional and discoursal features. It is also determined by such individual variation as background knowledge and purpose of reading (Urquhart and Weir, 1998). Although many readability formulae exist, researchers (Harrison, 1997, and Weaver and Kinsch, 1991) warn against relying completely on them for estimating text difficulty due to their limitations (See Section 1.3.2.4. above). Furthermore, readability formulas, originally intended for native speakers of English, are rarely used in English as a second language (ESL) and English as a foreign language (EFL) teaching or testing contexts because readers from different language backgrounds may not have the same problems. The best guide to the types of texts that might be selected and that could be based on *a priori* needs analysis is perhaps texts that test-takers will have to process in the target situation. Furthermore, the wording of reading test items should not cause test-takers any difficulties of comprehension. It should always be well within

their capabilities and less demanding than the text itself. In the same way, responses should make minimal demands in writing ability (Hughes, 1989).

Concerning the channel of presentation, test developers need to decide on the nature and amount of non-verbal information such as charts, tables and diagrams which most science texts consist of. As for length of texts, this varies according to the skill and strategies being focused on. It may not be possible to test expeditious reading strategies (search reading, skimming and scanning) if texts are too short. According to Hughes (1989), scanning may call for passages up to 2000 words, whereas detailed reading can be tested using passages of just a few sentences. It is only when decisions have been taken in relation to selection of texts and tasks for a test that the issue of format can be settled.

The skills and strategies we want to test will also influence text selection. For example, if we aim at testing reading carefully for main ideas comprehension, problem/solution, causative or comparison texts from journals or textbook would be more appropriate than more descriptive texts with detailed information. On the other hand, in careful reading, the text may not necessarily have explicit main ideas comprehension for selection in which case the reader might have to construct them through propositional inferencing, whereas in skimming and search reading the main ideas should be clearly stated (Urquhart and Weir, 1998).

3.1.3. Form of the Test

Since the focus of this study is not assessment, no detailed explanation will be given for the various kinds of tests. Rather we will provide a brief survey of the kinds of tests which are most commonly used in assessing reading comprehension. It is noteworthy that there is no one "best method" for testing reading. Because of the varied purposes a test might have, no

single method can fulfill all of them. Certain methods are more widely used than others merely for reasons of convenience and efficiency.

The most common technique for assessing reading which dominated textbooks for teaching reading is by far the multiple-choice (MC) questions. However, the 1970s saw the advent, in ESL, of the use of the cloze procedure which not only tests general language proficiency, but also reading. Recent years have seen the increase in the number of different techniques for testing reading, we now see a range of different "objective" techniques and also an increase in "non-objective" methods, like short-answer questions, or even the use of summaries which have to be subjectively evaluated (Alderson, 2000). The view is now accepted that measuring the understanding of text by only one method is inadequate, and that objective methods can be supplemented by more subjective evaluation technique. It is likely to employ in a single reading test a number of different techniques, possibly on the same text.

Comprehension tests can be divided into two different forms: discrete-point and integrative.

3.1.3.1. Discrete-point Tests

Discrete-point items test knowledge or specific points of language usage separately, one point at a time. The language theory that underpins the discrete point format proposes that comprehension consists of separate or discrete skills which need to be mastered separately. Thus, this format tests aspects with little or no contextualization. Its assessment is quantitative and the scoring is objective. The most common discrete-point tests are MC questions and matching items.

- Multiple-Choice Questions

In multiple choice test, students must select the correct answer from a number of possible answers. The incorrect answers are termed distractors. These distractors should embody misconceptions, partly correct answers and common errors of fact or reasoning, i.e. they distract students who are not well prepared for the test from giving the correct answer. MC questions are usually used to test a student's ability to recall information, to interpret data or diagrams and to analyse and evaluate material.The principal strengths of MC tests are:

(i) They test a wide range of issues in a short time.

(ii) Assessment is not affected by a student's ability to write.

(iii) They can be reliably marked as all answers are predetermined.

(iv) They can be quickly marked by computer.

(v) They can be used for quick revision at the start or end of a class and marked by the students.

Despite the above advantages, even for experienced examiners, it is extremely difficult and time consuming to develop a sufficient number of decent items on a passage. In other words, it takes a long time to write plausible distractors - especially in cases where higher order cognitive skills are being tested. In addition, items need to be validated though trialling (pre-testing) and analyzed for difficulty and discrimination, and items that have not performed well would either be rejected or modified.

The validity of MC tests as measures of reading ability has been questioned. These tests which have been criticized "for measuring either more or less than what comprehension may involve, measure behaviour which only indirectly reflects the comprehension process itself" (Cavalcanti, 1987: 230). Below are the various flaws of the test method.

(i) The task of answering MC items is unreal, because in real life one is rarely presented with four alternatives from which to make a choice to signal understanding.

(ii) The distractors may present candidates with possibilities they may not have thought of.

(iii) A MC test is a separate ability different from the reading ability, and students can learn to answer MC questions without recourse to the passage by eliminating improbable distractors, or various forms of logical analysis of the structure of the question.

(iv) In MC tests, we cannot determine whether a candidate's failure is due to lack of comprehension of text or lack comprehension of the question.

-Matching Items

In this format, two sets of stimuli have to be matched against each other as, for example, matching headings for paragraphs to their corresponding paragraph, titles of book against extracts from each book. This technique is subject to the same criticism as MC, in that candidates may be distracted by choices they would not otherwise have considered.

Other techniques for particular purposes include identifying order of events, topics or arguments, identifying referents (for example, what does "it" line 5 refer to?) and guessing the meaning of unfamiliar words from context (for example, find a single word in the passage between lines 3 and 7 which has the same meaning as x).

3.1.3.2. Integrative Tests

Integrative tests are holistic in that they focus on the learners' degree of control of language in real-life situations. The theoretical framework that underlies the integrative format proposes that comprehension is an interactive process which involves simultaneous processing of a variety of factors in the learner, the text and the environment. Integrative questions therefore focus on language use in real-life situations. They test overall

comprehension in contextualized situations. The assessment is qualitative but scoring is usually subjective.

The most common integrative tests are the cloze procedure, selective deletion gap-filling tests, information transfer techniques, and short answer questions.

- The Cloze Procedure

A cloze procedure can be regarded as a completion measure which aims "at tapping reading skills interactively, with respondents using cues from the text in a bottom-up fashion as well as bringing their background knowledge to bear on the task" (Cohen, 1994: 234). In cloze tests, words are deleted from a text after leaving a few sentences intact at the beginning and the end of the text to provide some degree of contextual support. The deletion rate is mechanically set, usually between every 5th and 12th word. The candidates have then to fill the gap by supplying the word they think has been deleted.

Klein-Braley (1981, cited in Cohen, 1994) described the cloze as a measure of L2 as follows.

(i) It is an integrative measure of discourse.

(ii) It is easy to construct.

(iii) Fixed ratio deletion adequately samples the text.

(iv) The actual deletion rate does not affect the results very much.

(v) The starting point can vary.

(vi) The choice of texts is not a key issue.

(vii) It ranks the examinees in a consistent manner.

(viii) It is highly valid and reliable.

Despite the above advantages, what an individual cloze test measures will depend on which individual words are deleted. Once the test constructor chooses the starting point, s/he has no control over the words to delete, and thus it is difficult to predict with confidence what such a test will measure. On the other hand, its validity as a device for testing global comprehension of the immediate local environment may raise some doubts, One of its flaws, as expressed by Urquhart and Weir (1998: 157) "is that it seems to produce more successful test of syntax and lexis at sentence level, comprehension of the immediate local environment than of reading comprehension in general or of inferential or deductive abilities." Furthermore, Alderson (1978:99) found that

> *… cloze is essentially sentence bound …clearly the fact that cloze procedure deletes words rather than phrases or clauses must limit its ability to test comprehension of more than the immediate environment, since individual words do not usually carry textual cohesion and discourse coherence (with the exception of cohesive devices like anaphora, lexical repetition and logical connectors.*

Calvacanti (1987), criticizes the cloze procedure for its inability to test both the readers' short memory capacity and their skill in understanding questions. She further criticizes its dependence on the readers' knowledge structure range relative to the ease or difficulty they encounter in blank filling. In other words, for her, "blanks may be meaningfully filled without reading and /or fully understanding the passage"(p. 230).

- Selective Deletion Gap-Filling Tests

Gap-filling tests are constructed by deleting words on some rational basis from selected texts, but not leaving fewer than five or six words between the gaps. The test-taker is

required to restore the words that have been deleted. This method is almost as simple as that of the cloze procedure, but it is much more under the control of the tester. s/he may, for example, produce two versions of the same text. If s/he aims at testing the understanding of the overall meaning of the text, s/he will delete selected content words, but if s/he aims at testing grammatical sensitivity, s/he will delete function words. However, this method "seems to measure only a limited part of our construct of reading proficiency and since it is word-based, many reading skills may not be assessed by such deletions. Furthermore, the method does not seem to provide any evidence of reading or skimming a text or to read it carefully to understand its main idea. (Urquhart and Weir, 1998). On its own, it is an insufficient indicator of a candidate's reading ability. Additional formats to gap filling might be essential, if the purpose of a test is to sample the range of expeditious strategies for example.

- Information-Transfer Technique

Information-transfer technique is a fairly common testing technique that requires information in the target text to be translated into non-verbal form by labelling a diagram, completing a chart or ordering a sequence of events. A useful variant of short-answer questions, information transfer technique requires candidates to write down answers in spaces provided on the question paper. The advantages of the technique are that the answers are kept brief, writing is reduced to the minimum and a possible contamination from students having to write answers out in full is avoided (Weir, 1993).

Nevertheless, a possibly related problem to this technique may arise when in the original text, verbal and graphic texts were complementary and the reader's full understanding of the verbal text is only possible when the graphic text is kept intact. In such a case the relationship will be disrupted by deletion of information, and the verbal text becomes more difficult – if not impossible – to understand. In addition, the tasks can become more

demanding and " the candidates spend so much time understanding what is required and what should go where in the table that performance may be poor on what is linguistically a straightforward task for the understanding of the task itself" (Alderson, 2000: 248).

- Short-Answer Questions

This test is a semi-objective version of the MC test where candidates are asked a question and required to give a brief response. Unlike the MC test where the correct answer is provided to the candidate, in the short-answer questions (S.A.Q) test, it is the candidate who seeks the answer. The latter is more likely an outcome of his/her comprehension rather than a result of test-taking strategies like guessing and matching. Although, it lends itself to testing all types of reading (search reading, skimming for gist, scanning for specific information and reading carefully to extract the main ideas and important details from a text), the S.A.Q format involves the candidate to write the answer using his/her own word rather than the language of the text and this may lead to a significant increase in the degree of difficulty of the test. It can also have the disadvantage of some questions accepting a wide range of possible acceptable answers, and the variability of responses might lead to marker unreliability. Henceforth, and in order to increase the accuracy of measurement of the reading construct, mechanical feature of language such as grammar, spelling, punctuation are not to have a prominent part in the scoring system. The advantage of SAQ over all other formats, however, is that texts can be selected to match performance conditions appropriate to any level of student, and the format allows the testing of all the operations that might be required in a test of reading (Urquhart and Weir, 1998).

3.1.3.3. Format Familiarity and Question Design

According to Weir (1993), test developers should ensure that candidates are familiar with the task types before sitting a test (for example, a practice test should be given to

familiarize them). In case a pre-test situation is not possible, providing examples at the start of the test paper would be helpful. As stated by Anderson and Armbuster (1984: 695), "performance on the criterion task is function of knowledge of the task".

As for question design, Fillmore and Kay (1983, cited in Urquhart and Weir, 1998: 152) provide useful set guidelines for setting questions.

– Questions should not contain harder vocabulary than the text.

– Questions should have only one unequivocal answer.

– If the candidates understand the text, they should be able to answer the question.

– Rejection of alternatives on grammatical grounds should not be allowed.

– Skills not related to reading, e.g. mathematics should not be tested.

– Incidental insignificant information should not be tested.

– Questions that require stylistic or other ambiguous judgements should be avoided.

3.2. Introspective Assessment

One of the problems the language researchers are confronted with is that a great deal of the work involved in language development and use is invisible, going on in the head of the learner (Nunan, 1992). To remedy such a problem, researchers had recourse to introspection. In this work, we shall use the term introspection as a cover term for all types of verbal reporting to investigate mental processes. We will also use the terms introspective, think aloud and verbal- report data/ methods interchangeably, following the current general practice in the literature.

3.2.1. Definition of Introspection

By introspection we mean the process whereby "we observe and reflect one's thought, feelings, motives, reasoning processes and mental states with the view to determining the way

which these processes and states determine our behavior" (Nunan,1992: 115). Such a method consists in asking students to report on their thought processes either as they work through a task, providing think-aloud data, or after they have completed a task, providing retrospective data. The tradition of using introspective methods has come from Cognitive Psychology. Its use in research is recent; it has aroused a fair amount of controversy as it has become more used. The opponents of such method (for example, Seliger, 1983) questioned the veridicality of introspection and challenged the notion that individuals mediate their mental processes.

The current shift towards the use of informants' introspective methods has been motivated mainly by Ericsson and Simon (1980) who proposed that verbal reports are data, and when elicited and interpreted with care, they are valuable and reliable source of evidence about human mental processes. What makes it possible today to use introspective reports as rigorously as the so-called objectives methods is that the validity of the elicited statements can be assessed in terms of explicit models of information processing, the formulation and testing of which is assisted by computer simulation. The new focus in research on strategies and the collection of learners' reports of their own insights about the strategies they use was mainly the result of the limitations of the observational techniques. Furthermore, the observational studies have actually proved unsuccessful in providing satisfactory data of learners' mental processes including strategic learning. Conventional observation of teacher-centred classroom sessions cannot obtain insights about learners' conscious thought processes i.e., all thoughts that are within the realm of awareness of the learner. Only physical movements of students are recorded by classroom observation, but what students are thinking about, how they are thinking, and how they feel cannot easily be captured by this method. The scope of classroom observation is usually confined to students who speak up and participate actively in verbal classroom interaction. Such observation tells us nothing about those who remain quiet, and not a great deal about those who do not. The outside observer has little chance of guessing

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accurately the likelihood that a certain strategy is being used or the frequency with which it is used. Researchers observe learners' verbal and non-verbal behaviour and infer from overt behaviour cognitive processes (Cohen, 1987, Matsumoto, 1993).

Introspective methods, on the other hand, have the advantage of providing access to reasoning processes underlying sophisticated cognition. They can also provide data on cognitive processes and reader responses that otherwise could be investigated on indirectly and allow for the examination and analysis of important but often neglected characteristics of readers including affect and motivation in addition to (or in relation to) cognitive processes. Moreover, they allow for the examination of the influence of contextual variables such as text, task, setting and reader ability on the act of reading. In addition to their value in providing valuable information about cognition and learning processes, they also provide information on a range of processes related to reading such as instruction and assessment (Afflerbach and Johnston, 1984; Pressley and Afflerbach, 1995).

According to Matsumoto (1993), introspection can have three main objectives:
(i) investigation of learners' cognitive processes and strategies involved in their L2 use in a specific task given by the researcher, for example the think-aloud protocol studies;
(ii) investigation of learners' beliefs, attitudes and perception about language learning which they have acquired based on past experience, for example the questionnaire and intreview;
(iii) exploration of the overall psychological dimension of the L2 learning/ acquisition process, for example L2 diaries.

Among the many classifications of verbal reports is that of Ericsson and Simon (1984) who classify verbal reports into two forms: concurrent and retrospective on the basis of the time of verbalization the relation between heeded and verbalized information. These two

forms involve four techniques: think-aloud, questionnaires, interviews and diary-keeping. Questionnaires, interviews and diary-keeping are usually categorized as "introspective" because they involve informants reporting on themselves, their views, their beliefs and interaction. They are used to tap into the learners' opinions, ideas and experiences, and to elicit factual data and when the sample is big enough, responses can be statistically analysed. The relationship between heeded and verbalized information is direct in concurrent reporting whereas retrospective reporting involves mediating processes between attention to the information and its verbalization, which may modify the stored information.

3.2.2. Concurrent Verbal Reporting: Think-aloud Procedure

3.2.2.1. Definition of Think-aloud Procedure

In the concurrent verbal reporting the verbalization is done during a specific task given; thus the informant provides verbal reports while the information is heeded, or in other words while the information is still in short-term memory. Ericsson and Simon (1980) assume that the heeded information kept in short-term memory is directly accessible for producing verbal reports.

Think-aloud procedures ask subjects to tell the researcher what they are thinking and doing i.e., everything that comes to mind while performing a task. While thinking aloud, the informants are instructed to keep thinking aloud, acting as if they are alone in a room speaking to themselves; they are prompted to talk when a long period of silence occurs, and asked to try not to plan out what they say or try to explain what they are saying. In other words, think-aloud refers to "stream of consciousness disclosure of thought process while information is being attended to" (Cohen, 1983:). Think-aloud verbalizations are tape and/or video recorded and then transcribed. Then they are content-analyzed and in many cases coded for specific categories which have previously been developed by the researcher.

The following is a transcript of think-aloud protocol from a subject mentally multiplying 36 times 24 reported in Ericsson and Simon (1987: 34).

Ok

36 times 24

um

4 times 6 is 24

4

carry the 2

4 times 3 is 12

14

144

0

2 times 6 is 12

2

carry the 1

2 times 3 is 6

7

720

720

144 plus 72

so it would be 4

6

864

The anagram task is another technique related to letters and words rather than numbers. An anagram consists of rearranging the constituent parts of a word or phrase to obtain a 'nonsense' word and then presenting it to subjects who are asked to unscramble it and make it a meaningful word using all the letters. The table below presents transcripts of three think-aloud protocols from subjects solving the anagram NPEPHA.

Table 03: Think-Aloud Protocols from Subjects solving the Anagram 'NPEPHA'

Protocol 1	Protocol 2	Protocol 3
N-P neph, neph	start with P	All right
Probably PH goes together	No, it doesn't	Let's see
Phan	the two P's go together	NEPHA
Phanny	Happen	Let's try what letters go
together		
I get phan-ep		Do you want to tell me
No Nap-		when I miss,
Phep-an, no		Okay
E is at the end		Ph go together
Phag-en		but they're not very likely
People- I think of		so how about APP
Try PH after the other letters		Oh, happen
Naph, no		Got it
I thought of paper again		
E and A sound alike		
Couldn't go together without		
a consonant		
try double p		
happy		
happen		

According to Ericson and Simon (1987: 48), two types of strategies are frequent in protocols.

First subjects select likely combinations of letters (sequences that occur frequently in English) and use these as constraints for generating longer strings as probes to LTM [long-term memory] to evoke words that contain those combinations. .… Second, subjects generate alternative possible solution words.. These can derive from attempts to sound out letter combinations or can be related words evoked from LTM. … These protocols depend heavily upon recognition processes and evocation of information from LTM. A computer model could be programmed to produce qualitatively similar protocols, but it is impossible in the absence of detailed knowledge of how subjects have information stored and indexed in LTM, to predict the sequence of events in any particular subjects' thinking-aloud protocols. In spite of the use of common processes, different subjects arrive at the anagram solution along different routes.

3.2.2.2. Objectives of Think-aloud Protocols

Think-aloud protocols have been widely used in both L1 and L2 reading research both as an exploratory methodology with the aim of obtaining the mental processes of readers in different situations and as a means to test hypotheses about reading. The different studies aimed at:

(i) developing a taxonomy of reading strategies,

(ii) comparing L1and FL reading and finding evidence of strategy transfer from the native language to the FL,

(iii) identifying the reading strategies of "good" and "poor" readers,

(iv) investigating the effects of prior knowledge on reading comprehension,

(v) and describing strategies used in taking reading comprehension tests.

According to Pressley and Afflerbach (1995), the suitability of the method to the different areas of investigation within the wide discipline of reading has provided rich description and understanding of reading. Due to the complex nature of the readers' thoughts and actions, many studies focused on single aspects of reading and on particular reader, process and strategy. Examples of such studies include determining main ideas (Afflerbach, 1990), summarizing texts (Brown and Day, 1983), demonstrating awareness of text cohesion (Bridge and Winograd, 1982) and the monitoring of cognition (Garner and Reis, 1981). Other studies involved such independent variables as readers' prior knowledge or text genre.

From the categorization and sorting of readers' verbalizations across studies came the model of constructively responsive reading (Pressley and Afflerbach, 1995): constructive in the sense that knowledge is constructive, and responsive in the sense that readers respond to the texts which they read in relation to the contexts in which reading takes place. In other words good readers are constantly changing their processing in response to the text they are reading. The portrait of a constructively responsive reader, proposed by Pressley and Afflerbach, describes what accomplished readers do and includes three general categories of strategy and response:

(i) identifying and remembering important information,

(ii) monitoring reading and

(iii) evaluating reading.

Furthermore, constructively responsive reading is said to have four characteristics.

(i) Readers seek to identify the overall meaning of the text by actively searching, reflecting on and responding to text in pursuit of main ideas.

(ii) Readers respond to text with predictions and hypotheses that reflect their prior knowledge.

(iii) Readers are passionate in their response to text.

(iv) Readers' prior knowledge predicts their comprehension and responses to text.

(Afflerbach, 2002: 168)

The majority of protocol analysis studies, however, focus on expert readers. This was based on the assumptions that "better readers are more verbal, make better use of their limited working memory, and may better verbalize the things they do in a think aloud" (Afflerbach, 2002: 168). These readers are also thought to be "more sophisticated, diverse and successful in the application of reading strategies and in responding to what they read' (Afflerbach, ibid: 168). On the other hand, less able readers influenced by the burden of the task of reading and reporting are not only less verbal but also will not provide useful verbal report. These assumptions, however, need careful examination.

The information gathered from the description of expert reading would then serve in strategy and skill instruction of developing readers. As expressed by Pearson and Fielding (1991), the detailed descriptions of readers' strategies, motivations and mindsets provided by protocol analysis may be valuable both for determining the detail and form of reading instruction and for building models of reading. Consequently, protocol analysis has had a considerable impact in the shaping of ideas about what to teach - strategies and responses - and how to teach -explicit modelling of strategy instruction.

3.2.2.3. Methodological Issues in Using Think-alouds

This section provides a methodological review about the think-aloud method and involves such components as informant training, characteristics of informants, the selection of the reading text, language of verbalization, think-aloud instruction, reporting interval, and probing.

-Training for Think-alouds

The think-aloud procedure is usually unfamiliar to most subjects so it can prove advantageous if not necessary to introduce the informants to the thinking-aloud task before they can be expected to perform it. This involves familiarisation with the method itself and the reason for conducting the study. Training is useful for subjects in that it provides them with feedback from the researcher before they start and helps ensure consistency of the thought reports across subjects. There seem to be no restricted rules for how long the training session should take. For most studies using this technique (Olshavsky, 1976-7; Ericsson and Simon, 1993; Afflerbach and Johnston, 1984), the training sessions continued until the subjects were able to talk freely and to verbalize without confounding their verbal reports with explanation or justification. For Rankin (1988: 126), "subjects differ in the amount of practice they need, but it is better to allow extra time than not enough". Generally, four or five trial passages will be enough for subjects to catch on. Furthermore, practice sessions are best followed immediately by the taping session before subjects lose familiarity with the task.

Church and Bereiter (1983, cited in Rankin, 1988) propose a three-step method consisting of explanation, modelling and supervised practice. The researcher should begin with an explanation of the purpose of the study, expressed in general terms in order not to bias the subjects' responses. After explaining the task briefly, the researcher should immediately make a modelling of the think-aloud task by reading the passage and saying out loud every thought that comes to mind. The subjects are told to follow along as the researcher reads, noting the stops at various points to make comments. After finishing the task, the researcher should indicate that the comment reflect his own thoughts while reading and someone else's thinking might be very different, but no better and no worse. In the third step, the subjects are given a passage to try out the technique with the researcher interrupting only when the subjects fail to make enough verbalisation. At the end of the passage, the researcher may have

a retrospective look at the task by questioning subjects about trouble spots noted during the reading. Below is a typical exchange between a researcher (R) and a subject(S).

R: What were you thinking when you stopped here? (Pointing to a word)

S: I was thinking how it looks like a word in Dutch.

R: It does?

S: Yes, I think they mean the same.

R: Good. Now, the next time you do something like that, say so!

S: Oh, even things like that. I see what you mean.   (Rankin, 1988: 126)

- Informants' Characteristics

As for subject characteristics i.e., how many and what kind of informants serve as verbal reporters, Rankin (1988) suggests that subjects should be chosen according to criteria set by the purpose of the study. If a study aims at examining strategies used by readers of different levels of proficiency, it is not uncommon to have different levels of subjects in think aloud research. On the other hand, the number of subjects may be limited because of the practical constraints of transcribing and analysing the protocols. Nevertheless, the selected subjects should not only be representative of the research population, but they should also exhibit the characteristics under investigation (Rankin, 1988). The informants may differ in their age, level of proficiency, native language and learning background. They may also be different in their ability to verbalize their thoughts. Young subjects may not have enough metacognitive awareness of their reading processes to report on them. Proficient subjects, however, may also have problems in reporting processes which have become automaticized. In this case, the use of an unfamiliar or difficult task can help de-automate the processes, thus, making them more accessible for reports. Training for think aloud can also solve problems about subjects' ability to report their thoughts (Afflerbach and Johnston, 1984)

-Selecting Appropriate Reading Materials

Like subject selection, the selection of reading passages should also reflect the aim of the study. Criteria for text selection involve text structure, length, difficulty and content. As for structure, "passages should be analysed for differences which may predispose subjects to use particular strategies and not others" (Rankin, 1988: 123). Passage length should also be considered in the selection. Passages should be long enough to allow for subjects to get involved in reading, but it should not be so long that the subjects get tired by the demands of thinking aloud for a long period of time. Generally, the characteristics of the research population are the deciding factors concerning the length of the passage. Younger and less proficient readers are likely to be asked to use shorter passages than older and more proficient readers. Rankin (1988) proposes that passages between 300 and 1000 words are appropriate under most conditions. The third criterion to consider in text selection concerns the level of difficulty. In this respect, when the cognitive load of the passage is too high it would make it difficult for subjects to think aloud. On the other hand, a passage that is below the subjects' ability will be dealt with only superficially, thus requiring little strategy use. Pressley and Afflerbach (1995: 14); however, state that "active and strategic efforts at meaning construction only occur in reaction to more challenging texts", and that when texts are difficult, reading is slower and consciously controlled, resulting in "substantial verbalization of information not explicitly given in the text" (Ericsson and Simon, 1988: xxxvi, cited in Pressley and Afflerbach 1995). Finally, the subjects' familiarity with the topic of the passage is an important factor to take into account. The subjects' responses to the passage may be biased if its subject matter requires prior cultural knowledge. Furthermore, if the researcher uses excerpts from larger works, s/he should take care that the understanding of the excerpt would not necessitate knowledge of the previous and/or subsequent parts of the larger work.

On the other hand, Ericsson and Simon (1993) claim that easy and well-written texts are not suitable for verbalization because most reading proceeds rapidly and automatically, so whatever the reader can say out loud is a mere reproduction itself. However, as soon as the text gets more difficult due to its topic, organization, poor writing or unfamiliar writing style, reading starts to resemble a problem-solving task and verbalization can produce information other than the actual style. For this reason, Ericsson and Simon think that think-aloud is particularly suitable for examining the strategies of poor readers who encounter difficulties when trying to read an unfamiliar text.

- Language of Verbalization

Another problem that may face the researcher using think-aloud procedure is the language of verbalization of think-alouds. Should it be in L1 or in L2? Advocates of the use of L2 give the argument that when L2 readers use their L1 to think aloud, it "may interfere with the way in which they perform the learning task" (Ellis (1994: 55). To minimize unwanted L1 interference, he suggests that participants use L2 as the sole means for verbalizing their abstract thoughts as reading the passage. On the other hand, a second group in favour of L1 use, suggests that in cases where all subjects share the same native language, it is more practical to give them a choice of language to verbalize since it would be difficult for less proficient subjects to do the task in the target language and verbalize in that language at the same time. This difficulty might distort the reading process and make the report counterproductive (Green, 1998). In Rankin's (1988) studies, the subjects were also allowed to verbalize in whatever language they felt most comfortable using.

- Think-aloud Directions

There is no consensus on the issue of how specific the directions given to subjects doing the think-aloud should be. Early studies avoided giving subjects directions about what

they should report in order to prevent any effects from biased processing that might be generated by the instructions. However, in more recent studies, more and more researchers (Sarig, 1987; Cohen, 1987; Pressley and Afflerbach, 1995) agree on the necessity of providing their subjects with specific instructions to ensure that a sample of the target process and relevant information are included in the report and to help improve the quality of the data. For Ericsson and Simon (1984, 1993), the instructions given to think aloud participants should be such as to discourage them from providing descriptions and explanations. They can be either open ended, or they can direct participants to report a specific type of information that they have in working memory. The nature of the verbal instruction is partly dependent on the interests of the researcher. If the aim is "to have a naturalistic cognition as possible, then participants should not be provided information about the particular processes of interest to the researcher" (Pressley and Afflerbach, 1995: 11), but if the researcher is interested in the nature of the mental images, for example, the participants are instructed to restrict their reports on the desired data. Nevertheless, both approaches are not without weaknesses. When leaving the instructions open ended, the participants might feel forced to report any and all information accessible in short-term memory; hence "it may not address aspects of cognitive processing that are of primary interest to the investigator" (Pressley and Afflerbach, ibid: 11), and when subjects are guided by specific directions, there will be the risk of a biased processing.

- Reporting Intervals

Like in think-aloud instructions, there is lack of agreement concerning reporting intervals. A review of related literature shows that there are two general trends. In the first one, the reporting interval is predetermined by the investigator and the subjects are asked to think aloud at a given point in a text, by inserting dots at predetermined points on the page (at the end of each sentence, or at the end of each paragraph). This is based on the view that the

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smaller the amount read, the clearer the reflection of the contents of the short-term memory (Pressley and Afflerbach, 1995). The advantage of this method is that the coordination between the text and the protocols can be easily made. The disadvantage, however, is that not only does it interfere with text processing above sentence level, but also the thoughts that occur between the points where the reporting is required may be lost (Rankin, 1988). Furthermore, this technique renders the reading conditions artificial (Cavalcanti, 1987). In the second trend, the participants read and verbalize at will, with the researcher prodding open-ended questions when necessary (Hosenfeld, 1984). Free think aloud, according to Rankin (1988), provides perhaps the most complete reports because it is the readers, and not the researcher, who control their progress through the text. However, and in order to match the protocols to the text the researcher needs to take copious notes. Rankin (ibid) suggests a compromise between the two methods where dots are used in practice texts, while allowing "free-form" verbalization in research texts.

- Probing

Although think-aloud sessions are generally audio taped, the researcher is still usually present during the experiment. His/her role is primarily to monitor the verbalization by reminding the subjects to report their thoughts, when they lapse into silence, hence, minimizing the loss of data during the procedure (Ericsson and Simon, 1987). This probing is given after 15 second to one minute pauses (the interval being different in different studies), and might take the forms of intersentence markers or verbal probes like "Keep talking" or "What are you thinking about?". Although these reminders help elicit think-aloud data, they might disrupt the reading task. For Afflerbach and Johnson (1984), marked passages may produce superfluous comments, thus giving a distorted picture of the reading process. In addition, the researcher's selective probing is likely to bias reports. Pressley and Afflerbach

(1995: 132-133) note that "researcher silence about how the text might be processed is more defensible than directions that prompt particular processes".

3.2.2.4. Analysis and Interpretation of Think-aloud Data

- Analysis of Think-aloud Data

Before engaging in the analysis of data, it is essential to transcribe the think-aloud reports. Rankin (1988) recommends a two-column format for transcription where the chunks of the text read are put in one column and the subjects' comments in the other. This would make it easy for the researcher to follow the subjects' progress through the text, and also to put notes on the transcript such as type of strategy used, time and other relevant factors. Then the data is analyzed in forms of protocols using a coding system. Although the analysis of the protocols is determined by the focus of the particular study, there are certain underlying principles.

(i) Subjects ' comments should be taken in the context of the situation;

(ii) Some "reconstruction" or missing words or syllables may be necessary in order to get the sense of the comment, but the only "reconstruction" done should be for literal meaning;

(ii) Each comment will indicate the use of at least one strategy since even a simple "O.K." or "right" can be seen as a type of comprehension check.

(iv) Some comments will be evidence of more than one strategy, since the reader may pose a question and then answer it before moving on in the text.   (Rankin, 1988: 128-9)

The next step consists in assigning each case of strategy use to a category. Here, the researcher may design his/her own categories. Olshavsky (1976-7), for example, identified and classified from her subjects' protocols three categories of strategies: word-related, clause-related, and story-related strategies. S/he may also borrow and/or adapt strategies found in

research on learning strategies, systems developed out of particular theories of reading, or from other disciplines as cognitive psychology.

Finally, after analysing protocols for strategy use and categorization, the researcher engages in making comparisons in order to determine "possible influence of other factors on different subjects' manner of approaching the text" (Rankin, ibid: 129). Here, the comparison may be between different subjects or groups of subjects reading the same text or between different texts read by the same subjects. "However the factors or variables are combined, combinations should be made to base the comparisons not only on frequency or relative frequency of strategy use in a particular situation, but also the appropriateness of such strategy use" (Rankin, ibid: 129).

Protocol coding is, thus, an interpretive act, and we could argue that the same data could be subjected to quite different coding systems, hence yielding quite different results according to different researchers with different assumptions (Smagorinsky, 1994). An important task for the researcher is then to thoroughly understand the theory underlying the study, delineate his/her own approach to the data and devise a coding system that corresponds to the investigation and describes the processes his/her theory anticipates. Criteria for protocol coding, thus, vary tremendously from study to study and a clear description of categorization in the coding system is vital (Rankin, 1988).

The coding system is then not developed in isolation, nor is it developed whole and intact prior to application to the data. Rather, the complete development of a coding system is recursive consisting of a researcher first developing a rough system, then applying it to pilot data, then revising the system, then applying it again and so on. As a result, hypotheses often develop through the application of the coding system; "therefore, researchers are faced with

the paradox that while their hypotheses determine the coding system, often their hypotheses emerge from or are shaped by the application of the system" (Smagorinsky, 1994: 11).

- Interpretation of Think-aloud Data

There are no clearly established means of reporting protocol data. In most protocol studies, researchers rely on few participants from whom to draw their results. Consequently, verbal report protocols are analyzed qualitatively, i.e. interpretatively without data quantification. In exceptional cases, however, when the size of the sample is large enough, the data will be quantified and subjected to statistical analysis in the same way as in any other normal experimental studies.

Due to the potentially mercurial nature of data, and in order to be accorded validity, Smagorinsky (1994) proposes that verbal protocols be put in a context, i.e. they should be related to other protocols collected in the same study, or from related studies conducted by other researchers. In addition, he guards against researchers making generalisations from data which may only reflect a process taking place at a particular time and under particular conditions. Finally, given the small samples that protocol researchers commonly work with, Smagorinsky, ibid: 16) claims "that most such investigations are exploratory rather than conclusive. Even so, the broader the context the researcher can provide for interpretation, the more compelling and persuasive the results will be to the educational community".

In sum, the aspects of the verbal report methodology demanding careful attention in the design and execution of research based on protocol analysis involve the characteristics of subjects, texts, the selection of protocol excerpts, the categories to score think-alouds, and the reliability of coding of protocol contents. The table below provides a summary of these aspects.

Table 04: Aspects of the Verbal Reporting Analysis Methodology

(Afflerbach, 2002:171)

Aspect of Methodology	Representative Concerns
Subjects	Verbal ability. Familiarity with the methodology. Knowledge of text content and structure. Relationship with researcher.
Texts	Degree of intactness. Difficulty or familiarity. Mode of text presentation. Influence of verbal reporting task on designated reading task. Automatic or nonautomatic processing. Novelty of task. Amount of text available for previewing or Rereading.
Directions to subjects	Focus on specific or general reading strategies. To read as one "normally would".
Transcription Process	Faithfulness of print to tape. Status of nonverbal utterances. Treatment of pause time.
Selection of protocol excerpts	Representativeness and typicality.
Categories used to score think-alouds	relationship to previous research and theory.
Coding of protocol excerpts	Reliability.

3.2.2.5. Limitations of Think-aloud Protocols

Although verbal report data may emerge as useful research tools, their application has raised concerns related mainly to two aspects: the subjects' ability to reflect on their cognitive behaviour i.e. the subjects may use strategies they fail to report (Cavanaugh and Perlmutter, 1982), and the truth value of the reports, i.e. subjects may report using strategies they did not really employ (Nisbett and Wilson, 1977). Baker and Brown (1984) question the accuracy of subject's reports on their own reading processes. In other words, the issue that remains problematic is whether verbal reports are genuine description of the actual processes the learners are involved in, or whether they are intelligent guesses based on the product.

Other drawbacks of think-aloud methods are as follows:

i) *Only the conscious processes are available for verbalization:* That is much of what is going on the reader's mind remains hidden (Seliger, 1983, cited in Cohen, 1998). Hence in order to be reported, such processes have to be brought to conscious level. Ericsson and Simon (1993) suggest that for the automatised processes to be brought to the conscious level, reading should be slowed down by providing pauses between sentences. For Cohen (1998: 37), researchers should 'raise the level of conscious awareness of processing or make do with insight regarding those processes to which respondents have conscious access'.

ii) *Incompleteness of reports:* That is subjects may be influenced by their own perception of what the researcher "wants" them to perform (Rankin, 1988). Verbal reports may also be attempts to provide information that would satisfy the researcher (Levine and Reves, 1998, cited in Al Barashdi, 2002: 29-31). As Matsumoto (1993: 49) puts it, " informants may report what they perceive they ought to know or do as an ideal learner, instead of what they in fact know or do".

iii) *The actual reading process is interrupted by the verbal reports:* That is when subjects read aloud they have to read, think and talk simultaneously (Horibe, 1995, cited in Al Barashdi, 2002: 29-31), and this may alter the actual reading process. The result will be less complete verbalization (Matsumoto, 1993). Thinking also needs to be slowed down to allow for the additional time that is required for verbalizing thought.

iv) *Verbal reports are time-consuming*: As expressed by Green (1998:20) the biggest problem with verbal reports is that the whole process is time consuming. Research based on this method "requires enough time to prepare tasks, train subjects, and finally a very long time consuming task when   analysing data".

v) Analysis problem: One of the fundamental problems with verbal protocol analysis the manner with which to explain the subjects' behaviuor (Davies, 1995) due to the fact that no consistent methodology exists among researchers to define categories of strategies under investigation. As a consequence, "there is a wide variation across studies in the way in which behaviours are defined and classified" (Davies, 1995: 49).

The think-aloud method is also sensitive to various subject and task variables.

Subject variables involve:

(i) native language,

(ii) amount and type of prior instructions research participants receive,

(iii) their level of reading skill, and

(iv) overall level of L2 proficiency.

Task variables include:

(i) the text type in the experiment,

(ii) familiarity of content,

(iii) difficulty, readability, and

(iv) the context in which texts are read (Rankin, 1988).

The above review of the methodological issues of the think-aloud research reveals the fact that the latter is a promising means of investigating reading strategies. It is also flexible and can be adjusted to suit the aims of different research studies; "it is especially well-suited to the task of providing perhaps the most direct access we have to the mental processes involved in reading while it is going on" (Rankin, 1988, p. 122). However, because of the above limitations of the method, some researchers call for more studies on the use of think-

aloud as a method of capturing the learners' mental processes (Alderson, 1984; Cohen, 1987); whereas, some others strongly recommend data triangulation i.e., the use of multiple research methods for identifying and validating language learning strategies (Oxford ,and Crookall, 1989).

3.2.3. Retrospective Verbal Reporting

In retrospective reporting, the verbalization is given after the completion of task-directed process, or it may sometimes be unrelated to any specific task. Retrospective verbalizations thus involve retrieval of information from long-term memory, which must be transferred to short term memory before it can be reported.

In most retrospective verbalizations, subjects are asked to tell researchers what they have thought and done while performing a particular task that has already been completed, either immediately after the task completion or quite some time after a specific language task is given. Retrospective reports may also be unrelated to any specific task, but they are based on the learner's past learning experience in general. Retrospective verbal reporting may be completed by using questionnaires, interviews or diary-keeping.

3.2.3.1. Questionnaires

Questionnaires, which involve predetermined questions set out in a written form and presented in a very systematic way, are answered by ticking responses or writing in short answers. Questionnaires are often used "when we are going for breadth, (i.e. wanting to get responses from a comparatively large number of people". They are perhaps the most common method of data collection in L2 survey research. Important considerations to take into account in the preparation of questionnaires involve the construction of questions, types of response items, piloting and sampling.

In constructing a questionnaire, the researcher needs to take care about making the questions clear and ensuring that the way they are constructed will lead to the kind of information s/he is seeking for. But what makes a good questionnaire item? The answer to this question, according to Johnson (1992: 113), lies partly in the extent to which the items that have been developed build on sound theory and previous studies because this not only "helps improve the quality of the instruments but allows researchers to relate the findings of similar studies to one another". Johnson further proposes the following principles as general guidelines:

(i) Items should be written in clear, non-technical language that is easy to understand.

(ii) Items should not contain negative phrasing that is difficult to process (For example, *Which one of these is not a disadvantage?*).

(iii) They should contain only one idea per item. For potentially confusing items, it is important to give the respondents an example that illustrates how they should answer the question.

Question wording is of such an importance that several attempts are needed before reaching the final form. It helps:

(i) remove ambiguity to achieve the degree of precision necessary to ensure that subjects understand exactly what the researcher is asking,

(ii) check that your language is jargon free,

(iii) decide which question type to use,

(iv) and ensure that the researcher will be able to classify and analyse responses.   (Bell, 1999: 119)

According to Burns (1999), for respondents not to be overwhelmed with a large and daunting document, it is important to keep the questionnaires relatively short and uncluttered. When constructing questionnaires for L2 learner, additional care needs to be taken as to:

(i) the language level of the students;

(ii) the brevity and clarity of the questions;

(iii) the extent to which learners have the knowledge required to answer the questions.

(Burns, ibid: 129)

As for types of response items used in questionnaires, there are generally three categories: closed items, open items, and scale items.

- **Closed Items**

They are those in which the respondents are required to select one form among a limited range of responses. The most common forms require a *Yes/No* or *Agree/ Disagree* response, although in some cases a third alternative such as *Don't know* or *Undecided* is added. Closed questions have the advantage of making the questionnaire easier and quicker to fill in. Their disadvantage is that they usually taker longer preparation time than open questions. On the other hand, closed question formats are useful for gathering quantitative information and are easier to analyse (Johnson, 1992).

- **Open-ended Items**

This type of questions allows respondents to reply in their own words, making the answers open-ended, and aims at exploring the informants' own perceptions, beliefs or opinions. One corresponding advantage of open-ended questions is that they are comparatively easy to prepare but more difficult to analyse. "Open questions are good for exploratory research where you have difficulty in anticipating the range of responses. They are also more likely to yield more unexpected (and therefore, perhaps, more interesting) data"

(Wallace, 1998: 135). Furthermore, open-ended questions can be useful for obtaining qualitative information and for discovering new variables in responses (Johnson, 1992).

It is also possible to combine closed and open elements within the same question, or have a question of one type with a follow-up question of another type.

- **Scale Items**

In this type of questions, respondents are requested to select their responses from amongst a set of fixed alternatives representing degrees of agreement or disagreement (for example, *Strongly agree, Agree, Disagree, Strongly disagree*). Other forms of forms of scale item responses are ranked responses where informants are asked to rank preferences from a number of fixed options (for example, *How long do you prefer to learn? Please number the following in the order you prefer. 1= the best; 5= the worst*).

Like any other data-gathering instrument, questionnaires should be piloted. Ideally, questionnaires should be tried out on groups who are similar to those who will form the population in the study. The aim behind piloting questionnaires is to check that all questions and instructions are clear, and to identify and detect any ambiguities and misunderstandings and then revise them and remove any items that do not yield usable data. In the piloting stage, the following questions can be asked:

(i) How long did it take you to complete?

(ii) Were the instructions clear and easy to follow?

(iii) Were any of the questions unclear or ambiguous? If so, will you say which and why?

(iv) Did you find any of the questions

    - embarrassing

    - irrelevant

- patronizing

- irritating

(v) Any comments and suggestions?

However, questionnaire piloting is not always easy. As expressed by Wallace (1998: 133):

> *Although conventional wisdom says that piloting should always have been done, it has to be admitted that in practice this is sometimes difficult. It may be that you simply want to get some feedback from a group that you haven't seen before and won't be seeing again. In such circumstances, piloting is difficult and probably wouldn't be attempted: you have to get it right first time.*

Equally important is the issue of sampling. Since surveying the total group of interest (the population) is usually not feasible, population too large to cover for example, researchers select a sub-group (a sample). A key issue in sampling is that the manner in which the sample units are selected affects the conclusions that can be drawn about the results. Furthermore, for the results of the study to apply to the target population, the selected sample must not only be similar to the population, i.e. the characteristics of the each of the units of the sample approximate the broad characteristics inherent in the whole population, but also be as representative sample as possible.

It is the purpose of the research which determines selection procedures involved in sampling. Commonly, the procedure consists in defining the population of interest, defining a *sampling frame;* that is putting a list of the set of people (or entities) in the population who actually has a chance of being selected, and finally selecting a sample that is representative of the sampling frame.

There are several ways offered to the researcher for selecting representative samples, namely *probability* and *nonprobability sampling*. In probability sampling, selection is such that it is possible to know the probability that each element has of being selected. Probability sampling can be either *simple random* or *stratified*. Simple random sampling which consists of a population whose texture is homogeneous gives each of the elements an equal chance of being selected, for example, choosing every tenth name on the staff list. However, in stratified sampling, the population is composed of strata (levels) of discretely different types of individual units and a sample is selected from each level, for example an equal number of men and women, or low-intermediate and high-intermediate students. The advantage of probability sampling procedures is that it makes it possible for the researcher to make inferences to the population of interest, and to specify how precisely the sample represents the population (Johnson, 1992). The second type of selecting samples is nonprobability sampling which uses either *samples of convenience* where the selected persons are chosen because of their accessibility or of *volunteers* where the persons volunteer to participate in the study. The major drawback of this method, however, is that it does not allow the researcher to make statistical inferences to the population due to possible differences between the sample group and the population. As stated by Smith and Glass, 1987: 228, cited in Johnson), "Any generalization from nonprobability sample to its population must be made on the basis of reasoned comparison of the sample with the population. That is, the inference is judgemental rather than statistical".

In addition to the two above cited methods, a purposive sampling (Lincoln and Guba, 1985) (Also called 'purposeful sampling' (Patton, 1990) and 'theoretical sampling' (Glasser and Strauss, 1967; cited in Heppner and Heppner, 2004) can also be used by the researcher. The method consists in the researcher handpicking 'the cases to be included in his sample on the basis of his judgement of their typicality', hence building up 'a sample that is satisfactory

for his needs' (Cohen and Manion, 1980:77). In qualitative research, the power of purposive sampling 'lies in choosing cases which abound in data for thorough investigation…[and] which provide the investigator with copious information about issues of pivotal importance to the direction of the research' (Patton, 1990:169, cited in Heppner and Heppner, 2004)

Finally we should point to Cohen and Manion's view (1994, cited in Wallace, 1998) that for the sample to be statistically significant a minimum sample size of 30 is usually thought to be desirable.

3.2.3.2. Interviews

Interviews are by definition oral more like conversations. They are often used "when we want to investigate people's views, attitudes, experience etc, in depth" (Wallace, 1998: 151). The advantage of interviews is their flexibility. In other words, if the respondents encounter problems with the questions, the latter can be explained to them. Moreover, "if the structure of the interview is sufficiently loose, sometimes unexpected avenues of investigation can be explored" (Wallace, 1998: 130). Johnson (1992: 115) speaks of the following advantages of interviews over questionnaires:

(i) Interviews yield quite high response rates compared to questionnaires;

(ii) In interviews, respondents are more likely to answer all the questions presented because of their personal involvement with the interviewer;

(iii) The interviewer can obtain more meaningful information because s/he can rephrase questions that are nor clear to respondents, probe for additional relevant information, and follow leads.

Like questionnaires, interviews come in many different forms and can vary along a continuum from structured, to semi structure, or unstructured. The list of the questions that an

interviewer uses to conduct constitutes an *interview guide* (Johnson, 1992) or an *interview schedule* (Wallace, 1998).

– Structured Interviews

They are interviews that have a very tight structure. A structured interview is roughly equivalent to a face-to- face administration of a questionnaire. It involves a set of straightforward and prearranged questions, probably read from a carefully prepared interview guide to which the interviewer adheres fairly rigidly. Being similar to questionnaires, structured interviews have therefore most of the advantages and disadvantages of the former.

– Semi-Structured Interviews

As its name suggests, a semi-structured interview is a kind of compromise between the two extremes. In such a kind of interview, there is certainly a prepared interview guide, but the questions are probably of the open- ended type. A semi- structured interview, thus, combines a certain degree of control with a certain degree of freedom; the reason why it is probably the most popular format of interviews.

– Unstructured Interviews

In an unstructured interview, the guide provides only a general plan for the topics of the interview. The interviewer probes for additional information and follows leads that emerge. So, the approach is open-ended, the atmosphere is relaxed, and "personal data can be revealed which might otherwise be withheld in a more formal setting" (Wallace, 1998: 147).

Successful interviewing can be considered both a skill and an art, and in order to interview people efficiently, the researcher needs time, experience and effort. S/he also needs

"to establish and maintain good rapport to be able to control the pace and direction of the conversation as needed, and to know how to follow up important issues" (Johnson, 1992: 88).

Questionnaire often take longer to prepare than interviews as the researcher needs to be confident that the questions can be interpreted independently as well as easily and unambiguously. However, they have the advantage of being easier and less time-consuming to administer compared to interviews. As the responses are supplied in a written form, the respondents can also answer more rapidly, and the researcher does not need to further record them with supplementary techniques such as recording or notes. Furthermore, questionnaires do not provide "the more in-depth or unexpected responses that may be obtainable from interviews" (Burns, 1999: 129).

In order to exploit the strengths of both procedures, some researchers combine the two techniques.

3.2.3.3. Diaries:

The keeping of diaries is an alternative, but related form of obtaining introspected written data. It usually involves the systematic recording of events, feelings about one's own L2 learning experience by the diarist. As diaries are basically private documents, there are no "rules" as to how to keep a diary and diarists can confide them "to whatever thoughts or feelings occur to them" (Wallace, 1998: 62). However, when they are oriented towards issues the teacher wants to investigate, diaries

can provide valuable insights into classroom interactions and the students' responses to their learning experiences....[and] usefully pinpoint areas of difficulty in learning in both a general or an individual sense, as well as provide feedback on classroom tasks, learning processes and strategies, or preferences for classroom grouping.

(Burns, 1999: 133).

Diaries involve retrospective rather than live observation. They are kept on a daily basis, and can be written either immediately after a teaching event, when the details are still fresh in the mind, or at the end of the day when the diarist has more free time. The main advantage of the diary, as opposed to the other ways of articulating reflection, is that the diarist can be totally honest and forthright in his or her comments.

As it has been explained, problems with the method of introspection relate to the varied quantity and varied informative value of the data, which makes identification of procedures difficult and leaves the analyst to infer on the basis of the product only and to the difficulty of controlling socio-psychological variables of peer thinking-aloud. (Nunan, 1992). Problems with retrospection, on the other hand, have to do with the data which are only informant initiated. The only data we have, after all, is what the informants choose to tell us. To some extent, these shortcomings are overcome when the two methods are combined.

Conclusion

A biased assessment of reading that might result from using a single or a limited number of techniques will necessarily provide a limited picture of the reading behaviour which is basically individual and private in nature. Therefore, and in order to report on a variety of the readers' ability to understand through reading tests, one should seek to use multiple techniques. However good a given test might be, a single score will always mislead (Spolsky, 1994). In addition to tests, a range of introspective methods can also be used in the assessment of reading such as interviewing readers about their reading habits, problems and performance and using self-report techniques, including think-alouds, for a combination of introspective verbal methods with other techniques such as tests would not only yield accurate and valid data on learners' cognitive processes but would also compensate for the problems inherent in each method (Matsumoto, 1993).

In the present study, the think aloud procedure was used with other instruments, namely a reading comprehension test and a questionnaire to investigate the reading strategies used in performing academic reading. The application of these methods and the details of the experimental pedagogic reading tasks employed will be presented in the following chapters.

CHAPTER FOUR:

THE EXPERIMENTAL DESIGN OF THE STUDY

Introduction

In order to test the research hypotheses, we have used three means of data collection, a reading comprehension test to depict the comprehension level of the students, and elicit their comprehension difficulties, a students' questionnaire to tap into learners' strategic repertoire and general strategy use free from context, and a think-aloud procedure to develop knowledge of the learners' actual strategy use in a specific reading situation and of the actual execution of online strategies during reading. The test is evidenced in the use of measurable techniques of data collection and analysis which take on the format of multiple-choice questions, cloze procedure, matching techniques and information transfer. The questionnaire involves informants reporting on themselves, their views, their beliefs and interaction. Think-aloud protocols are of particular interest because they build upon the more informal methods, based on interviews, questionnaires or reading diaries, in our case a questionnaire, for finding out about and analysing the students' reading behaviour. The results of the test are then triangulated with information from the two complementary methodologies of process measures; that is the questionnaire and think-aloud data.

4.1. The Sample

Our target population is that of Biology students in Algeria; our study population is that of Fourth Year Microbiology students at Ferhat Abbas University of Sétif. The sampling chosen is purposive.

The test and the questionnaire were administered to a hundred and twenty one students, but due to a large number of absentees (23) during the second sitting of the test which took place a week later because the test was scheduled in the students' regular English class, the results of 88 out 121 students were used for analysis. Amongst the 88 students, 46 represent MBN (The 'N' stands for 'Nationale'; that is those whose medium of instruction is

Arabic), and 42 represent MBE (The 'E' stands for 'Etrangère'; that is those whose medium of instruction is French).

Since the number of students who obtained below average scores in the reading comprehension test exceeds that of those who obtained above average scores (59 fo the former and 29 for the latter), and because we are interested in depicting the amount of strategies used by both low-performance students (henceforth, low-achievers) and high-performance (henceforth, high-achievers), we proceeded in another sampling within the first sub-group to obtain an equal number of students to that of the second sub-group; that is 29 students. The first method of sampling is stratified sampling. Stratifying a sample gives the researcher control of important variables in order to make the sample more representative of the parent population. In this study, it is determined by the distribution of scores of the whole sub-group as follows:

Table 05: Distribution of Test Scores
among Low-achievers

Score	N	%
25-29	08	13.55
20-24	19	32.22
15-19	23	38.98
10-14	09	15.25
Total	59	100%

Stratified sampling consists in taking a similar number of students (07) from each of the above four strata (levels) as indicated in the table. So, we first took seven students from levels one and four, and in order to select from levels two and three, we used a simple random sampling. Random sampling is a procedure that selects elements for a sample with equal probability of selection for each element. In this study, it consists in taking from the list every

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third student. The total number obtained is twenty eight. The largest number of students being in the third level, we further took an eighth student to reach the intended number; i.e.29.

For the think-aloud procedure, ten subjects participated in the experiment. These students were drawn the study population: five of the students are those who obtained the highest test scores (referred to here as number 01 to number 05) and the other five are those who obtained the lowest test scores (referred to as number 06 to number 10). The table below provides information pertaining to their results obtained in the test.

Table 06: Think-aloud Sample:

Students' Scores in the Test

Students	Test Score /60
01	48.00
02	43.00
03	43.00
04	43.00
05	42.00
06	19.00
07	16.00
08	15.00
09	13.00
10	12.00

4.2. The Reading Comprehension Test

4.2.1. Description

4.2.1.1. The Reading Passages

Given the variety of activities and test items, the test was divided into two parts with a reading passage for each part. The passage for part one is entitled "*Nutrition, Metabolism, and Biosynthesis*". It is accompanied with a diagram and a table, and is followed by eight activities. The passage for part two is entitled "*Indicators of Food Spoilage*", and is followed by three activities.

Both texts were taken from specialized books, entitled *Biology of Microorganisms for* the first passage*, and Fundamental Food Microbiology* for the second one. They are authentic in the sense that they are destined to a specialist readership. Thus, they exhibit as many salient features of the target situation texts for the population as possible; hence their form (syntactic and lexical features) has been kept intact. The texts fall within the expository type and involve definitions, descriptions, and classification.

Because it involves tasks requiring "identifying main ideas" (skimming), and "locating specific information" (scanning, which may call for passages up to 2000 words, according to Hughes, 1989), and other tasks involving "information transfer", and based on the related literature survey (chapter 3, section 3.1.2., p.106), the first selected text contains 751 words, eight paragraphs and 58 lines, i.e. it is neither too short, nor too long. In addition, we have been careful to give a self-contained text which does not necessitate knowledge of the previous and subsequent parts in the book. On the other hand, because of the limited number of activities (only three), the second text is relatively shorter than the first text; it contains 519 words, three paragraphs and 40 lines.

A number of skills and strategies on which there appears to be some consensus concerning their importance in academic reading are involved in the test; they include the ability to:

(i) Locate specific details;

(ii) Identify main ideas;

(iii) Understand relationship between stated ideas, and

(iv) Understand academic vocabulary.

4.2.1.2. Activities

− Reading Passage One

As we have said above, the test contains eight activities as follows.

Activity One: The aim of this activity is to process the text quickly to establish its main ideas (skimming). It consists of presenting the students with one-sentence summary of four paragraphs of the text and asking them to find the corresponding paragraph.

Activity Two: In this activity, the students are asked to locate specific information in the text.

Activity Three: The students are given four definitions and asked to find out the exact words to which they correspond in the text.

Activity Four: A list of seven connectives is given to students whose task is to determine the kind of relationship they indicate.

Activity Five: It consists of giving the students a list of four words and asking them to find their opposites in the text.

Activity Six: This activity consists of completing a table, based on the reading of the passage. (Information transfer)

Activity Seven: It is the second activity which contains information transfer. Here, the students are required to complete the missing information in a figure representing a simplified view of the major features of cell metabolism.

Activity Eight: It is a selective deletion gap-filling activity. The deleted words are all content words, and the aim of the activity is to test the students' overall understanding of the text. The topic of the text is the same as that of the main reading passage. Thus, the understanding of the main reading passage will help the students to answer this activity.

− **Reading Passage Two**

Activity One: In this activity, the students reading comprehension is tested by answering eight multiple-choice questions.

Activity Two: It asks students to find in the text synonyms to a list of six words.

Activity Three: It is an activity which requires the students to match elements from column A with elements from column B. Here also we have been careful to choose the paragraph with a similar topic as the main reading text i.e., "Food spoilage". Thus, a good understanding of the main reading passage will be helpful for the students to complete this activity.

4.2.2. Test Administration

Before administering the tests, the students were given several instructions as regards the sitting of the tests. They were reminded to work independently. The students were also briefed on how to answer the questions. Approximately ten minutes were given to the students to go through the test paper and to raise any question pertaining to the tests.

4.3. The Students' Questionnaire

4.3.1. The Description of the Questionnaire

The questionnaire is made of four sections: General Questions, Reading Strategies, Reading Comprehension Difficulties and Further Suggestions.

Section One: The Student' Reading Habits Q1- Q 09

This section is intended to inform us about the reading habits of the students in English, Arabic, and French. By reading habits we mean frequency, and type of reading as well as the ease/difficulty with which they read in the different languages.

Section Two: Reading Strategies Q10- Q25

In this section, we seek to gather information about the students' use of reading strategies. The response items involve sixty strategies: thirty seven effective and twenty three less-effective strategies. Effective strategies are marked with an asterisk *. The choice, in this study, of the expression 'less-effective' rather than 'ineffective' strategy is purposeful. It suggests that the so-called strategy is not inherently ineffective, but taking into account the reading context of our subjects, it is not totally effective and relevant in the sense that it does not ensure efficient reading. Effective reading is then about reading in a way that allows the students to understand the writer's message without spending too much time in the process. It is also about reading with a clear purpose in mind so that they only read material that is relevant. Questions 10, 11 and 12 are concerned with pre-reading strategies and more precisely with "setting a purpose for reading", Q10, "previewing", Q11 and "making predictions", Q12. Questions 13 to 24 are all concerned with strategies that the students likely use while reading. They involve word-level strategies which seek information about the 'imporatnce laid to vocabulary' (Q13), 'handling a vocabulary problem' (14), and 'guessing word meaning' (Q15). While reading, students also use such text-level as "adjusting the reading rate" (Q16), "identifying main ideas" (Q17), "reading in detail" (Q18), and "reading for specific information" (Q19), Questions 20, and 21 are concerned with using titles and illustrations. In

questions 22, and 23, we ask students about how they handle a comprehension problem, both at the sentence and text levels. Question 24 seeks information about whether or not students edit the text by 'underlining main ideas', 'taking notes', or putting the main ideas in a diagram'. The last question (Q25) in this section asks the students about whether or not they apply any post-reading strategies such as summarising or outlining the ideas.

Section Three: Reading Comprehension Difficulties Q26-28

In this section, we attempt to depict the source of the reading difficulties that the students face. Questions 26 and 27 relate to linguistic factors; whereas question 28 relates to psychological factors.

Section Four: Further Suggestions Q29

This section is an opportunity for students to make any comments or suggestions they would like (Q29).

4.3.2. Pilot Study of the Questionnaire

In order to check that all the questions and instructions are clear, the questionnaire was handed in to ten students who have the same profile as the study population i.e.; they are all fourth year biology from different specialities, more precisely seven students from the biochemistry and three students from the animal physiology departments. Only eight questionnaires were handed back.

An evaluation sheet of the questionnaire items was attached with the questionnaire. It contains four questions:

1. How long did it take you to complete the questionnaire?

The answers to this question are given in the table below.

Table 07: Piloting the Questionnaire:

Time for Answering Questionnaire Items

Time	N	%
30'	02	25
25	01	12.5
23	01	12.5
20	02	25
No answer	02	25
Total	08	100

Considering a questionnaire containing 29 questions, it took the slowest respondents an average one minute for each question. The task was much more rapid for the other students. Consequently, the duration of the questionnaire is deemed to be a reasonable one.

2. Were the instructions clear?

Yes

No

The answers to this question are reported in the following table.

Table 08: Piloting the Questionnaire:

Clarity of Instructions

	N	%
Yes	01	12.5
No	03	37.5
No answer	04	50
Total	08	100

3. Were any of the questions ambiguous?

Yes

No

The answers are summarized in the following table.

Table 09: Piloting the Questionnaire:

Clarity of Questions

	N	%
Yes	01	12.5
No	03	37.5
No answer	04	50
Total	08	100

If yes, please specify which one(s)?

The answers are given in the following table.

Table 10: Piloting the Questionnaire:

Ambiguous Questions

Questionnaire items Number	N	%
Q12	06	75
Q24	04	50
Q20	03	37.50
Qs 18, 27, 28	02	25
Qs 01, 02, 03, 05 , 10, 11, 13, 16, 17, 21, 27	01	12.50

When discussing with the respondents, it seemed that the lack of clarity of the above questions was caused by their unfamiliarity with the vocabulary used in those questions. So,

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the explanation or rather the translation into Arabic of difficult words, like 'preview', 'guess', 'predict', and 'skip' was considered in the future adimstration of the questionnaire.

4. Please, add any comment and suggestion?

Concerning the comments and suggestions, the latter were centred on the difficult words in both the questions and options which needed to be further clarified.

4.4. Think-aloud Procedure

4.4.1. The Reading Material

In our selection; we were cautious about the authenticity of the text in that it is taken from a specialized book, and also about its representativeness and typicality, i.e. it is the type of texts representative of material typically read by students in the target situation. As for the topics selected for training as well as for the actual experiment, and after consultation with the subject specialists, they all fall within the realm of interest of subjects, which can be quite motivating for them to read. Therefore, in order to further enhance the subjects' motivation, we decided to offer a list of topics for them to choose from or even to ask them to bring their own material and do practice on it. The list of topics proposed to the subjects includes:

- Environmental Microbiology

- Water Pollution.

- Water Purification.

- Methods for controlling Microoganisms in Air.

- Microorganisms in Soil.

- Factors Affecting Soil Microoganisms.

- The place of Microoganisms in Nature

- The Three Kingdoms: Animals, plants, and Protista.

- Host- Microbe Relationship

- Contamination, Infection, and Syndrome.

- How Bacteria cause Disease?

- How Viruses cause Disease?

- Types of Infectious Diseases.

- Important Human Pathogens.

- Cancer and Immunology.

- Therapeutic Uses of toxins: Vaccines

- Food Microbiology

- Milk

- Low-heat Processing and Pasteurization.

- Higher-heat Processed Foods.

The above list was then handed in to the 10 students selected for the think-aloud experiment. The following table indicates the six top choices of the subjects.

Table 11: Selected Topics for think-aloud

Text	N° of choices
Therapeutic Uses of toxins: Vaccines	10
How Bacteria cause Disease?	09
Important Human Pathogens.	07
Contamination, Infection, and Syndrome.	07
Types of Infectious Diseases.	07
Higher-heat Processed Foods.	07

Of the above selected topics, one further topic needs to be chosen for the final experiment. The subjects suggested practising on the one about vaccines, the reason being their unfamiliarity with the topic.

4.4.2. Training for Think-aloud

A number of exercises were prepared to familiarize subjects with the think-aloud task; all the exercises involved thinking aloud while doing the activity. In the first exercise, the subjects were asked to solve anagrams. The second type of exercises gets the students to mentally multiply numbers. The third exercise was a dictionary search of two unknown words. After the completion of the above activities, the subjects were given six examples of think-aloud responses taken from Olshavsky's (1976-77) study and translated into Arabic. Finally, the subjects practised the technique on two of the selected texts cited above.

Before the training session, subjects are told about the purpose of the study. Practice sessions are given to the subjects in order to familiarize them with the method, and to ensure that they are following the appropriate procedure rather than generating activity description, such as 'I am just reading the paragraph here', or 'I am looking at this word here and wondering what it means' (Green, 1998). Feedback on thinking aloud performance is given in order to make the subjects aware of what is required and what to avoid. Furthermore, when the subjects lapse into silence, they are prompted to 'keep talking'.

We proceeded in steps, following the Church and Bereiter (1983) method, proposed in the literature survey (cf. Section 3.2.2.3, p.125) which consists in explanation, modelling and supervised practice.

− **Explanation**

In this study I am interested in what you think about as you carry out the task that I am going to give you. To do this, I am going to ask you to think aloud as you work through the task. By 'think aloud', I mean that I want you to say out loud everything that you are thinking from the time you start the task until you complete it. I would like you to talk constantly. It is important that you do not plan out or try to explain to me what you are thinking. It may help you if you imagine that you are in the room by yourself. It is very important that you keep talking. If you are silent for any period of time, I shall remind you to keep talking. Do you understand what I am asking you to do? Do you have any question? (Green, 1998: 46)

− **Modelling**

We shall start with a few examples. First, I shall solve an anagram. An anagram consists of unscrambling a series of letters and rearranging them to form a word in English. For instance, the letters R F E L WO can be rearranged to form an English word.

'I'll try WOL to start with. FRE- That does not make sense. OK let's try FLO- FLOWER, I've got It.

Another example consists in mentally multiplying two numbers: 36 and 12.
'Ok, if I take 36 and multiply it by 10, that gives me three hundred and sixty. Thirty six times two, that is seventy two. Three hundred and sixty plus seventy two gives me zero plus two is two; six plus seven thirteen; three , carry the one; three and one four. The answer is four hundred and thirty two'.

−Supervised Practice

Now, I would like you to think aloud as:

- you solve the anagrams: SNEWAR, 'EWRATSE', 'NPEPHA' 'WLOFLO', 'ORDO',

'WNAESR', and 'OGELYCO'.

- you mentally multiply 93 and 11 and 25 and 16

- you search the words 'flavour' and 'sweater' in the dictionary.

While the subjects were working, they were given the following directions:

a) You will be given texts to read silently.

b) You should read the texts silently but stop reading when you come to a red dot and say out loud everything that you are thinking. The red dot is placed just to remind you that you have to think aloud. This means that you could stop before the red dot or after when you feel there is nothing to verbalize at that point. [A red dot is placed after each sentence].

c) You should continue reading and talking this way until you complete the texts.

d) You will be tape recorded.

The texts are entitled *'Contamination, Infection and Disease' (482 words), and 'Important Human Pathogens'* (559 words). At this stage the subjects felt at ease with the technique and ready for the actual experiment. This last was based on the top choice of the students; that is '*Therapeutic Uses of Toxins*' (680 words). A copy of the above three texts is attached in Appendix IV. For the last text, a red dot was placed at the end of each sentence in order to visually prompt the subjects to think aloud.

Three sessions were conducted before the real experiment. Each training sessions lasted between one to two hours, and all the sessions were practised on a daily basis. After one hour break and at the subjects' request, the recording of the actual experiment followed

the third training session. In order no to disrupt the reading task and bias reports, the subjects were not prompted by the researcher as they read.

The training took place in the language laboratory of the English department where the actual experiment was recorded. The aim behind that was not only to familiarize the subjects with the place, but also to initiate them to the technique of recording which they actually did and found quite interesting.

As for the language of verbalization, because the sample includes successful and less successful readers who may not be able to verbalize in English, choice was given to subjects to verbalize in whatever language they want Algerian Arabic, French, or English.

4.4.3. Analysis of Data

After collection, the audio-recorded think-aloud protocols were transcribed in the original language which is a mixture between Algerian Arabic and French; then translated by the researcher. The next step consisted in matching the verbal protocols with the corresponding sentence. For example, one sentence in the text and the corresponding protocol of one of the subjects were as follows:

Text	**Protocol**
A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.	*I don't understand the sentence.* *I don't understand 'whooping cough'. I need a dictionary. After I explain 'whooping cough' I'll reread the sentence...mm I don't understand much. I'll carry on reading, maybe I will understand later.*

Finally, each protocol was analyzed in order to identify strategies.

In preparing to identify and code the strategies uncovered during the analysis of the protocols, and based on the Students' Questionnaire and on related research, basically Olshavsky (1976-77), Anderson (1991), and Block (1986), a first list of strategies was tentatively identified. This initial list was then refined based on the collected data. The process of refining the second list in order to acquire the list of strategies for the purpose of data analysis consisted in carefully reading through the transcripts and determining the parts of the protocol which contained the possible use of strategies. Seeking objective data analysis and following Newell and Simon's view (1972) (cited in Olshavsky (1976-77), categories and processes are determined from the data rather than imposed on it. At this stage, strategies which were identified in the data but were not found in the list of strategies were added to the list. As an example, *'adjusting reading rate'* was found to be used by the students and hence was added to the list of strategies identified. On the other hand, strategies which were put in initially but were not identified in the data were omitted from the list. For instance, the strategy of 'summarizing' was omitted from the final list because it was not identified in the protocol of the actual study. In short, strategies were added to or deleted from the final list to reflect the strategies identified in the data of the actual study until a stabilised list of strategies was obtained (a copy of the stabilised list of the strategies is attached in Appendix V).

To make sense of the text, readers construct meaning by interacting with the reading materials using text-based and reader-based strategies. In the think-aloud protocols, the strategies have been categorized under these two broad categories: text-initiated and reader-initiated strategies.

Text-initiated strategies include problem-solving skills which rely most on the visual signs and focus more on the structural aspects of text. The strategies grouped under this category involve focusing on vocabulary, relating sentence with what preceded or follows,

using the title, and relating table to text. Some of the strategies might overlap with each other to some extent. For example, an indirect question asked [*It may be in a small quantity in a host?*] could perhaps be classified as either the strategy of questioning or paraphrasing. Based on the context and also on the description and examples given in the list of strategies, it was classified as questioning because the primary function of the utterance in that particular context was to question not to paraphrase. The grouping of text-initiated strategies applies at three levels: word level, sentence level and text level.

−**Word-level Strategies:** They include:

(i) Analysing the grammatical form.

(ii) Relating word with a French word.

(iii) Relating word with an Arabic word.

(iv) Relating word with an English word.

(v) Using context.

(vi) Skipping.

(vii) Questioning (word-related).

(viii) Stated failure to understand a word.

(ix) Expressing need for a dictionary.

− **Sentence-level Strategies***:* They involve:

(i) Rereading.

(ii) Relating sentence with what precedes.

(iii) Questioning (idea-related).

(iv) Reading sentence word by word.

(v) Reading aloud.

− **Text-level Strategies:** They involve:

(i) Expressing need to reread paragraph.

(ii) Establishing link of the title with text.

Reader-initiated strategies focus primarily on the readers' reactions to the text content including invoking prior knowledge, predicting, evaluating comprehension progress, inferencing. While doing this, readers utilize more information from within themselves rather than directly obtainable from the visual text. The established list of strategies involves the following:

(i) Guessing.

(ii) Rejecting of confirming guess.

(iii) Inferencing.

(iv) Invoking prior knowledge.

(v) Addition of information.

(vi) Reading on.

(vii) Evaluating Comprehension Progress.

(viii) Predicting.

(ix) Paraphrasing.

(x) Expressing feeling.

(xi) Adjusting reading rate.

Our final list which consists of 27 strategies will be used as a template for analysing the reading behaviour of our subjects.

In order to establish the reliability of the coding, two independent raters were given the stabilized list of strategies together with the definition and description of each strategy and asked to code the strategies in the ten collected protocols. They were also asked to identify strategies that they thought were used by the students but were not listed so that a final list may be acquired. The raters' codings were then compared with the researchers' own coding as well as between the raters themselves in order to determine inter-rater reliability. The

Spearman-Brown reliability estimation formula was used. Its mission is to assess the degree to which different raters give consistent estimates of the same phenomenon. The percentage of agreement between the researchers and one rater was 97.88 %, and with the other rater it was 97.94%. The agreement between the two independent raters themselves was 94.89%. Discrepancies in the assigning of codes were resolved through discussion with the raters and that consensus was the governing principle. Moreover, the raters reported that they did not find any strategies used by the students that have not been accounted for in the list given them.

Conclusion

The combination of a reading comprehension test with a strategy questionnaire and a think-aloud procedure will gather multiple perspectives and gain a richer and less subjective picture of the situation being studied. The next chapters (five and six) will present the results of the above instruments and depict the students' comprehension level and difficulties and elicit their reading processes and strategies.

CHAPTER FIVE:

READING STRATEGIES AND COMPREHENSION DIFFICULTIES

Introduction

The present chapter is devoted to the global results of the three data collection procedures: the test, the questionnaire and the think-aloud procedure. It is divided in three sections. Section one deals with the analysis of the test results; section two deals with the questionnaire items, and the third section with the think-aloud data results. The results of the test will depict the subjects' reading comprehension performance together with their specific comprehension difficulty areas. The results of the questionnaire will uncover the students' perceived use of reading strategies. The results of the think-aloud data, on the other hand, will reveal their real strategy use in a specific reading situation and the actual execution of online strategies during reading.

5.1. Results of the Test

Statistical analyses were conducted using the LISREL 88S Statistical Package (Karl G. Jöreskog and Dag Sörbom, 2006).The test results were analysed using both a descriptive and a multivariate statistical procedure. Descriptive statistics includes frequencies, percentages, means, standard error, coefficient of variation, and correlation between the test items. Multivariate statistics, on the other hand comprises a principal component analysis, factor analysis, and a structural modeling equation analysis.

5.2.1. Descriptive Statistics

5.2.1.1. Frequency and Percentage Analysis

The frequencies and percentages of test scores of the whole group are presented in the table below.

Table 12: Reading Comprehension Test Scores Frequencies and Percentages

Score /60	N	%
45-50	03	03.40
40-44	08	09.10
35-39	09	10.22
30-34	09	10.22
25-29	08	09.10
20-24	19	21.60
15-19	23	26.14
10-14	09	10.22
Total	88	100

Figure 05: Students' Test Scores
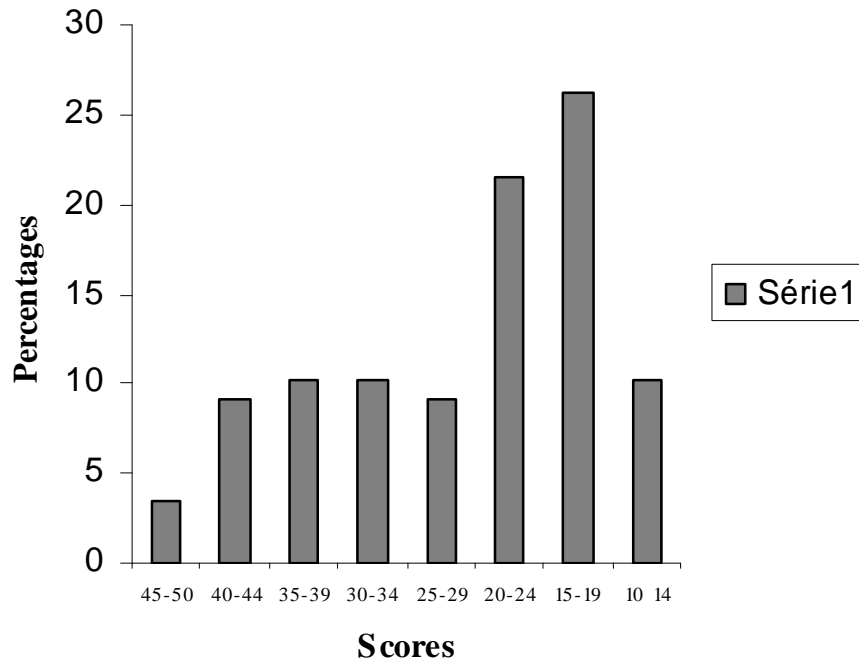
As can be read from Table 12 and Figure 05, the highest percentages are 26.14% and 21.60% and they cover the range of scores between 15 and 24 over 60, and if we further add the 10.22% covering the range between 10 and 14 out of 60, this will give us a total of 67.06% of the scores that are below average (The average mark is 30). The remaining 32.94% corresponds to the scores above average.

Table 12 clearly indicates that more than two-thirds (67.06%) of the students have a below-average level in reading in English, and the level of the remaining third (32.94%) is rather average to high. Thus, we can tentatively say that the level of the whole group is low. These first results come to support the statement raised in the general introduction that fourth year biology students cannot read are confronted with reading comprehension difficulties in English.

Although the test contains two parts, the scores were calculated globally (minimum 0/maximum 60) and for each individual question: 1 point for the correct response; 0 points for an incorrect response. The vocabulary items received 22 points (36.66%) out of the total score; wheras, the comprehension items received 38 points (63.33%) out of the total score. Each activity is allocated a mark according to the number of item that it contains. For example, activity one was attributed four marks because it contains four items, and activity three was attributed seven marks because it contained seven items.

Now, we will proceed in a detailed analysis of the test activities as they appeared in the two reading passages.

−Passage One

Activity One: Reading for Main Ideas

The reading passage has eight paragraphs. Which paragraphs contain the following information?

a) Knowing cellular metabolism has got many benefits.

b) Microbial cells need the environment for their constitution.

c) The biochemical synthesis of new material requires energy.

d) The cell is a continually changing living organism.

Table 13: Students' Test Performance (Reading for Main Ideas)

Score /04	N	%	Bar Chart
04	28	31.8	
03	26	29.5	
02	13	14.8	
01	14	15.9	
00	07	08.0	
Total	88	100	

We will examine the difficulty of the task by considering the percentage of average and above average scores; then compare it with that obtained by adding up the percentages of below average scores.   In this respect and as concerns *finding the main ideas* of the text; we can see that 76.10% of the participants had an average to high performance, against 23.9% either gave one correct answer, or did not answer correctly.

Activity Two: Reading for Details

Now find some more detailed information.

a) What are the four advantages of knowing cellular metabolism mentioned in the text?

b) What are the kinds of nutritional types of microorganisms?

c) What are the roles of catabolic and anabolic reactions?

d) What is the relationship between 'heterotrophs' and 'organotrophs'?

e) What does the cell need energy for?

Table 14: Students' Test Performance (Reading for Details)

Score /05	N	%	Bar Chart
05	01	01.1	
04	10	11.4	
03	18	20.5	
02	23	26.0	
01	18	20.5	
00	18	20.5	
Total	88	100	

As for *reading for details*, only 33% performed successfully in this task, against 67% who failed partly or completely to identify the text's details.

Activity Three: Guessing Words from Context

Read the text quickly, and quote the exact words used in the text to define the following.

a) Chemical reactions

b) Biochemical synthesis

c) Yeast waste products

d) Chemicals that feed the cell

Table 15: Students' Test Performance (Guessing Words from Text)

Score /04	N	%	Bar Chart
04	17	19.3	
03	10	11.4	
02	23	26.1	
01	22	25.0	
00	16	18.2	
Total	88	100	

Taking into account average and above average scores, and adding up the percentages, we find that 56.80% of the subjects succeeded, wholly or partly, in *guessing the words from the text*. The remaining proportion (43.20%) is divided between those who performed poorly in this task (only one correct answer): 25% and those who either did not answer the question or gave incorrect answers: 18.20%.

Activity Four: Determining Word Function

What type of relationship is being indicated by these 'pointer' words? Put an X in the appropriate box.

	Pointer	Cause	Result	Contrast	Illustration	Addition
Paragraph A, Line 6	Although					
Paragraph C Line 3	Because					
Paragraph D, Line 1	Thus					
Paragraph G, Line 10	Hence					
Paragraph H, Line 6	Such as					
Paragrapg H, Line 3	Also					
Pargraph H, Line 8	For Instance					

Table 16: Students' Test Performance (Determining Word Function)

Score /07	N	%	Bar Chart
07	01	01.1	
06	12	13.6	
05	06	06.8	
04	12	13.6	
03	15	17.0	
02	21	23.9	
01	14	15.9	
00	07	08.0	
Total	88	100	

As for *determining word function*, the percentage of those who obtained average and above average scores is 35.10%. Conversely, sixty-four percent (64.90%) of the test-takers faced difficulties in answering the question.

Activity Five: Finding Opposites

Find out in the text words that are opposites of the following:

- General

- Inside

- Complex

- Useless

Table 17: Students' Test Performance (Finding Opposites)

Score /04	N	%	Bar Chart
04	22	25.0	
03	24	27.3	
02	12	13.6	
01	17	19.3	
00	13	14.8	
Total	88	100	

Likewise, when we add up the percentages of average and above average scores, we find out that 65.90% of the subjects succeeded more or less in *finding out synonyms* against 34.10% of the subjects who rather performed poorly.

Activity Six: Table Completion

Here is a table giving the nutritional types of microorganisms. From the information contained in the text, complete the missing data.

Table 4.1   Terms used to describe various nutritional types of microorganisms

A. Three kinds of ………. Sources	
Energy source	**Term used**
Light ………… Organic chemicals	Phototroph Lithotroph ……………
B. kinds of carbon sources	
Carbon source	**Term used**
Inorganic (carbon dioxide) ……….……..	……………. Heterotroph
C. Some mixed terms	
Phototroph: Use light and inorganic carbon Photoheterotroph: Use light and organic carbon Lithotrophic heterotroph: Use inorganic energy source and organic carbon	

Table 18: Students' Test Performance (Table Completion)

Score /05	N	%	Bar Chart
05	04	04.5	
04	37	42.0	
03	29	33.0	
02	11	12.5	
01	03	03.5	
00	04	04.5	
Total	88	100	

Table completion is on of two information transfer techniques used in this test to assess the students' comprehension of the text for which the overwhelming majority of the students (79.50%) obtained average to very high scores (total score). Still, 20.50% of the respondents failed in the task.

Activity Seven: Figure Completion

The following figure gives a simplified view of the major features of cell metabolism. Complete the missing information words from information contained in the text.

Table 19: Students' Test Performance (Figure Completion)

Score /04	N	%	Bar Chart
04	08	09.1	
03	09	10.2	
02	22	25.0	
01	20	22.7	
00	29	33.0	
Total	88	100	

The second information transfer task which is *figure completion* seemed to be comparatively a more difficult task for 55.70% of the subjects who obtained below average scores, against 44.30% who did a better performance.

Activity Eight: Gap-filling

The following short text also speaks about the major metabolic processes of living organisms, but it contains some gaps. From your understanding of the above passage, complete the sentences with the appropriate words.

Metabolism is the sum of all the …1…. processes carried out by living organisms. It includes ……2……., reactions that require energy to synthesize complex molecules from simpler ones, and catabolism, reactions that release energy by breaking ……3…. molecules into simpler ones that can then be reused as building blocks. Anabolism is needed for ……4…, reproduction, and repair of cellular structures. Catabolism provides the organism with …5……. for its life processes, including ……6……., transport and the synthesis of complex molecules; that is anabolism.

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Table 20: Students' Test Performance (Gap-filling)

Score /06	N	%	Bar Chart
06	02	2.3	
05	03	3.4	
04	09	10.2	
03	10	11.4	
02	18	20.5	
01	20	22.7	
00	26	29.5	
Total	88	100	

−Passage Two

Activity One: Multiple-choice Questions

1. Read the text carefully. Then circle the letter which corresponds to the correct answer.

i) Loss of food due to microbial spoilage

    a. Affects food producers, processors, and consumers.

    b. Does not affect food producers, processors, and consumers.

    c. May or may not affect food producers, processors, and consumers.

ii) Famine in the world could be prevented if:

    a. We produce more food.

    b. We preserve food from spoilage.

    c. Both (a) and (b).

iii) Preservation methods apply :

    a. Only on raw food.

    b. Only on partially proceed food.

    c. On both (a) and (b).

iv) Methods of food preservation

    a. Prevent microbial spoilage of food.

    b. Do not prevent microbial spoilage of food.

    c. May or may not prevent microbial spoilage of food.

v) The factors that reduce loss of raw and partially processed food due to microbial spoilage are:

    a. Predicting expected shelf life.

    b. Estimating stages of microbial food spoilage.

    c. both (a) and (b).

vi) Microbial growth on food

    a. leads to its change in color.

    b. Does not lead to its change in color

    c. May or may not lead to its change in color

vii) The sensory criteria as indicators of food spoilage are:

    a. Effective when used alone.

    b. Effective when combined with the other criteria.

    c. Not effective.

viii) Microbiological and chemical tests used to depict the shelf life of a product or its spoilage status are:

    a. Effective when used only one time.

    b. Effective when used many times.

    c. Not effective.

Table 21: Students' Test Performance (Multiple-choice Questions)

Score /08	N	%	Bar Chart
07	05	05.7	
06	07	8.0	
05	26	29.5	
04	22	25.0	
03	17	19.3	
02	09	10.2	
01	01	01.1	
00	01	01.1	
Total	88	100	

The *multiple-choice* exercise was used to assess the respondents' comprehension of the second text used in the test. The results above reveal that 68.30% of the students did rather well in this task, against only 31.70% who performed poorly.

Activity Two: Finding Synonyms

Find words in the text which have similar meanings to the words listed below, and which could replace them in the text.

    a) Famine

    b) Minimize

    c) Disadvantage

    d) Developed

    e) Shown

    f) Characteristics

    g) Taste

Table 22: Students' Test Performance (Finding Synonyms)

Score /07	N	%	Bar Chart
06	01	01.1	
05	02	02.3	
04	09	10.2	
03	06	06.8	
02	19	21.6	
01	22	25.0	
00	29	33.0	
Total	88	100	

The highest and most noticeable percentage in this table is 33% (the highest) which is representative of the students who either did not answer or answered incorrectly this question, followed by another important percentage (25%) of those who gave only one correct answer. By adding up the percentages of the scores that are below average, we obtain 86.40% of the subjects who performed poorly in this question, against only 13.60% of the subjects who succeeded more or less in *finding out synonyms*.

Activity Three: Matching

Match an element from column A with an element from column B to form sentences. Then arrange the sentences you have produced to make a short paragraph.

A	B
a) Foodborne diseases result from	**i)** unless sanitation is practiced
b) A crucial factor in preventing spoilage and disease transmission in food and milk	**ii)** the direct effects of microorganisms and from microbial action on food substance
c) The increased popularity of convenience people, contaminated food	**iii)** also helps control disease transmission and spoilage.
d) In institutions that feed large numbers of food, especially fast food	**iv)** is cleanliness in handling.

e) Large processing plants (factories) provide

opportunities for contamination of great

quantities of food

f) Prompt and adequate processing of food

to be processed

v) has raised the risk of infection.

vi) will cause many cases of pathogens.

Table 23: Students' Test Performance (Matching)

Score /06	N	%	Bar Chart
06	03	03.4	
04	09	10.2	
03	11	12.5	
02	28	31.8	
01	31	35.2	
00	06	06.9	
Total	88	100	

The *matching* technique proved rather difficult for 73.90% of the respondents, against only 26.10% who obtained an average or above average score.

According to the test specifications, eleven activities were performed: four activities were devoted to vocabulary items, while seven activities were devoted to comprehension items. For an in-depth scrutiny of the test results, the different tasks and activities were then rearranged. Based on Urquhart and Weir, 1998 matrix of reading types which distinguishes between 'local' and 'global' reading, we grouped the vocabulary activities under the 'local' reading section and the comprehension activities under 'global' reading section, obtaining the following layout:

– **Local- reading strategies**

They operate at the word level and involve understanding lexis and deducing meaning of lexical items as follows:

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(i) Guess words from text   (Part One, Q3)

(ii) Determine word function   (Part One, Q4)

(iii) Find opposites   (Part One, Q5)

(iv) Find synonyms   (Part Two, Q2)

For the purpose of analysis, and because they are all related to vocabulary understanding, we will label the four above four tasks V1, V2, V3, and V4 respectively. The global score will be referred to as 'gl'.

−Global- reading strategies

They involve processing the text in order to establish an accurate comprehension as follows:

(i) Reading for main ideas   (Part One, Q1)

(ii) Reading for details   (Part One, Q2)

(iii) Table completion   (Part One, Q6)

(iv) Figure completion   (Part One, Q7)

(v) M.C.Q.   (Part Two, Q1)

(vi) Matching   (Part Two, Q3)

(v) Gap-filling exercise   (Part One, Q8)

Similarly, for the purpose of analysis, and because they are all related to text comprehension, we will label the above seven tasks as C1, C2, C3, C4, C5, C6, and C7, respectively.

Because the aim of the test is to depict the participants reading difficulties, and based on the students' low performance for every task which is calculated by adding up the percentages of the below average scores, we obtain the following visual display of the findings.

Figure 06: Students' Test Performance:
Local Reading
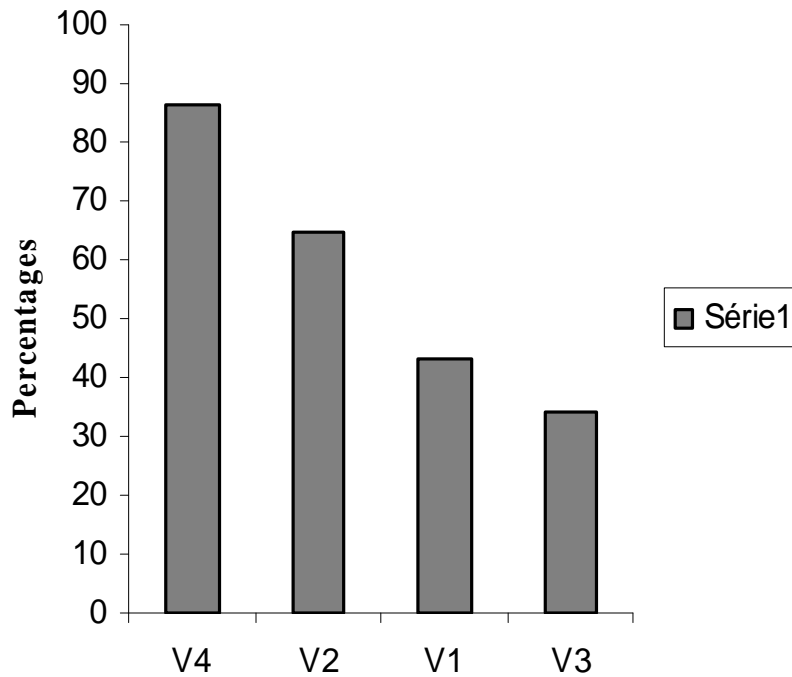
Overall, and as far as lexical knowledge is concerned, we can say that the participants faced problems mainly with *finding synonyms(V4)*, and with *guessing word function(V2)*. On the other hand, they had lesser troubles with *determining words from text (V1)*. The task at which they had the least difficulties was *finding opposites (V3)*.

The students' overall performance in the comprehension section, more precisely, the specific difficulty area degrees will be presented graphically in the figure below.

Figure 07: Students' Test Performance:
Global Reading
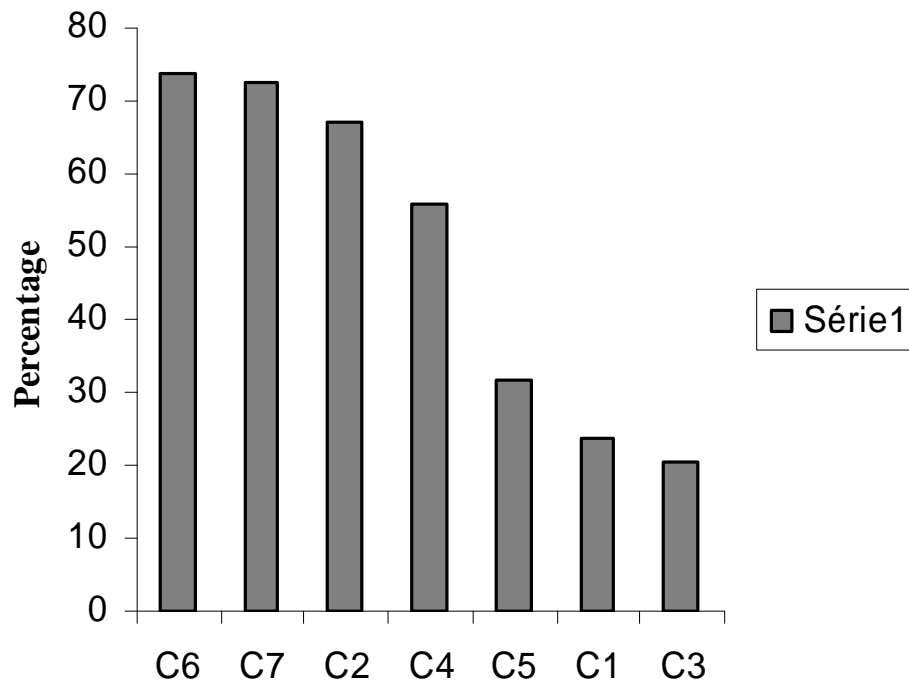
Overall, the poorest performance was on *matching* (C6) and *gap-filling* (C7) activities. Performance on *reading for details* (C2), and *figure completion* (C4) was also poor. *Multiple-choice questions* (C5), *finding the main ideas of the text* (C1), and *table completion* (C3) were more or less more accessible to the students.

5.1.1.2. Means, Standard Error (SE), and Coefficient of Variation (CV) Analysis

The table below shows the mean, standard deviation and coefficient of variation of the test main sections, namely 'local-reading' and 'global-reading sections as follows:

Table 24: Mean Scores and SE, CV for 'Local'

and 'Global' reading Strategies (N=88)

Measure	M	SE	CV (%)
Global Score /60	25.65	9.97	38.86
Local Reading /22	8.55	4.79	56.02
Global Reading /38	17.08	5.77	33.78

By comparing the mean scores of the two test section, we can see that the test-takers performed rather moderately both on global and local reading tasks. However, the coefficient of variation is higher for local reading which indicates that there was a higher variability in the distribution of scores (CV: 56.02%) with the vocabulary tasks than that of tasks related to comprehension (33.78%).

A more detailed statistical analysis about the mean scores, standard error and coefficient of variation of all the subtests for the whole group will be reported in the following table.

Table 25: Mean (M) Scores, Standard Error (SE), and

Coefficient of Variation (CV) for the Test Activities

Measure	M	SE	CV (%)
Global Score /60	25.65	09.97	38.8
V1 /04	01.88	01.36	72.3
V2 /07	02.93	01.84	62.7
V3 /04	02.28	01.40	61.4
V4 /07	01.48	01.46	98.6
C1 /04	02.62	01.29	49.4
C2 /05	02.02	01.32	65.3
C3 /05	03.19	01.10	34.4
C4 /04	01.42	01.28	90.1
C5 /08	04.14	01.41	34
C6 /06	01.97	01.30	65.9
C7 /06	01.69	01.58	93.4

To start with, we can notice that the total group mean score is 25 which is indicates that the test-takers' comprehension level is low. This low level is reflected in the mean scores of the individual tasks where we have weak mean scores for seven out eleven tasks. On the other hand, there is a large dispersion in the scores with the coefficient of variation values scattering widely especially with V4 (finding synonyms), 98.6%; C7 (gap-filling), 93.4%, and C4 (figure completion), 90%. However, the variables that are tightly clustered involve C5 (multiple-choice questions), 34%, and C3 (finding opposites), 34%.

5.1.1.3. Items Correlation

The correlation matrix provides the correlation coefficient between each variable and each of the other variables included in the analysis. Since the activities are intended to test different aspects of reading skills, they are not expected to correlate very highly with one another. The intercorrelation coefficients are supposed to fall in between 0.3 and 0.7 (Yang & Weir, 1998). But some coefficients fall out of this scope, which indicates that some items intercorrelations are not satisfactory. The table below provides the detailed correlation coefficient between the different activities.

Table 26: Correlation Matrix

	V1	V2	V3	V4	C1	C2	C3	C4	C5	C6	C7
V1	1.000										
V2	0.456	1.000									
V3	0.432	0.324	1.000								
V4	0.759	0.501	0.607	1.000							
C1	0.402	0.355	0.429	0.402	1.000						
C2	0.540	0.412	0.459	0.539	0.546	1.000					
C3	0.329	0.370	0.435	0.475	0.153	0.373	1.000				
C4	0.513	0.411	0.484	0.657	0.293	0.371	0.554	1.000			
C5	0.499	0.282	0.273	0.468	0.214	0.318	0.435	0.318	1.000		
C6	0.082	0.117	0.084	0.089	0.005	0.097	0.135	-0.086	0.183	1.000	
C7	0.582	0.474	0.510	0.664	0.246	0.543	0.531	0.597	0.400	0.082	1.000

An examination of the correlation matrix indicates that a considerable number of correlations exceeded .3, and thus the matrix is suitable for factoring. Table 26 indicates high correlation coefficients between most of the variables. For example, we can notice a very high positive correlation between V1 (guessing words from text) and V4 (finding synonyms) .759; that is an increase in the score of one implies an increase in the score of the other.

On the other hand, we can notice a very low coefficient between some variables such as V1 (guessing words from text) and C6 (matching), .082, V3 (finding opposites) and C6 (matching) .084. Indeed C6 (matching) fails to significantly correlate with all the other items. Matching which consists in reconstructing text meaning tests the students' ability to sees how the paragraph is structured seemed to be a difficult task for the students. This may be because it requires a variety of skills in order to be completed successfully such as skimming through the sentences to have a general idea; then reading carefully before sequencing segments of text, thinking about which sentence might come where and predicting next events. Furthermore, the development of ideas can be seen in different lexical and grammatical relations inside and between sentences; therefore, careful attention should also be paid to both lexical words and phrases, and grammatical structures that may indicate such relations in the paragraph.

It is also noticeable that most of the correlation coefficients of the local reading variables with the rest of the variables which range between .402 and .759 are higher than those of global reading which range between .214 and .597. These correlations are important to understand because as the value of one item increases, the value of the other item also tends to increase. According to Oller (1979), low correlations between different tests or measures are sometimes too simply taken to mean that they are measuring different skills. One possible reason for low intercorrelation may be found in Oller's explanation: 'A low correlation may

result from the fact that one of the tests is too easy or too hard for the population tested.'
(p.56)

5.1.2. Multivariate Statisticcs

The test mean scores are factor analysed as a step in understanding the clustering of the items and identifying groups of variables that are relatively homogeneous, i.e., highly correlate, and explaining these variables in terms of their common underlying dimensions (factors).

5.1.2.1. Factors Underlying Reading Performance

First, a Principal Component Analysis was conducted in order to examine the factor structure and internal consistency of the reading test. Overall, the indicators clustered highly on each factor with 11 indicators corresponding to 11 underlying factors in the test. As a criterion for retention, we selected the components whose eigenvalue is greater than 1.0. This criterion allows us to be fairly sure that the factor will account for the variance of at least one of the variables used in the analysis. Since the first 3 factors were the only ones with eigenvalues ≥ 1, the final solution will represent 65.90% of the variance in the data. Thus, we can say that this solution will explain 65.90% of the variance in these 11 variables. The last eight factors, having a weak contribution in the interpretation of the data have not been tackled. The tables below display the above information.

Table 27: Factors with Eigen values larger than 1

Component	Eigenvalue	% of Variance	Cumulative %
1	5.08	46.21	46.21
2	1.13	10.23	56.44
3	1.04	9.46	65.90

The loadings of each subtest on the 4 factors are shown in Table 28.

Table 28: Factors loadings for each Variable

Variables	Component		
	1	2	3
Guessing words from context V1	0.351		
Determining word function V2	0.285		
Finding Opposites V3	0.311		
Finding synonyms V4	0.388		
Reading for Main Ideas C1			0.540
Reading for Details C2			0.339
Table Completion C3			-0.359
Figure Completion C4	0.328		
MCQ C5			0.381
Matching C6		0.738	
Gap-filling C7	0.354		

Extraction Method: Principal Component Analysis.

The *factor loadings*, listed above" represent the correlations between factors (what the set of variables represent) and the variables themselves. These values range from -1.0 to +1.0 (like Pearson's *r*).

The first factor extracted accounts for 46.21% of variance and receives its highest loading from V4 (lambda 0.388), the second highest from C7 (lambda 0.354), and V1 (lambda 0.351), followed by V3 (lambda 0.311) C4 (lambda 0.328). Of the five strongest loaders on this factor, three (V1, V3, and V4) are vocabulary skills, and two (C4, and C7) are comprehension skills.

Figure completion (C4) and gap-filling (C7) although they test the understanding of the overall meaning of the text, they are word-based. Hence they can be said to overlap with 'local' reading section of the test in the sense that they load heavily on lexical knowledge on the part of the test-takers.The commonalities between them and vocabulary (V1, V2, V3, and V4) subtests help to explain that they are testing more or less the same trait; that is '*lexical knowledge*'.

Meanwhile, the second factor accountsfor 10.23% of variance. The strongest loader on factor 2: C6 (lambda 0.738) appears to represent what we will call '*coherency*'; that is the logical, orderly and consistent relation of parts which reflects the reader's understanding of the text as a coherent entity.

The third factor accounts for 9% of the variance and appears to represent '*comprehension*' dimension. The following items loaded highly (lambda>.30), C1 (lambda.540), C5 (lambda. .381), C3 (lambda .359), and C2 (lambda .339).

In summary, the factors for the test in order of variance were: (1) lexical knowledge (eigenvalue = 5.08, variance explained = 46%), (2) coherency (eigenvalue = 1.13, variance explained = 10%), and (3) comprehension (eigenvalue = 1.04, variance explained = 9%).

The factor solution of the test is presented graphically in the following figure.

Figure 08: Factor Structure of the Reading Test
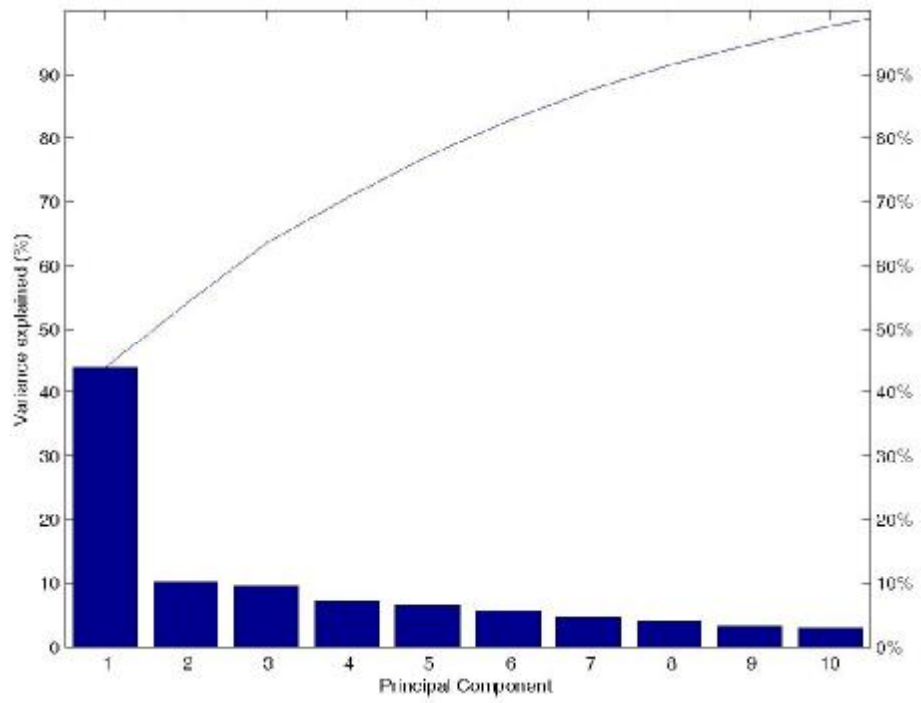
**Figure 09: First and Second Principal Components
of the Test**
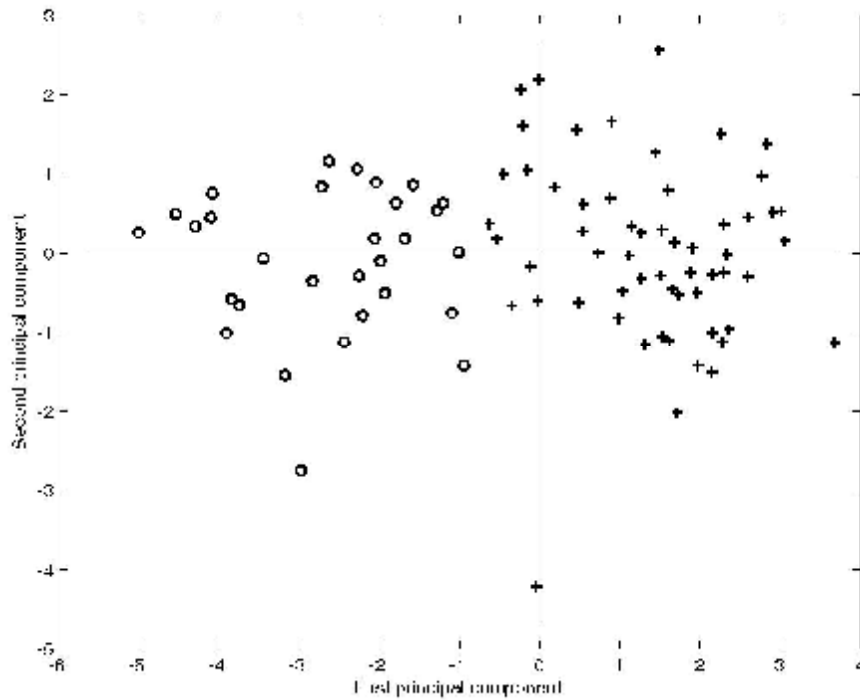
Figure 10 shows that the first principal component which represents the 'lexical knowledge' dimension clearly divides between the students who obtained > 30 (n=29), represented in the above graph by the symbol (^{o}) and those who obtained < 30 (n=59), represented graphically by the symbol (+). The second principle component which represents the 'coherency' dimension, on the other hand, includes test-takers from both sub groups.

The table below indicates the relative weight that each variable contributes to each factor (dimension).

Table 29: Correlations between Variables and Principal Components

Variable	1	2	3
Guessing words from context	0.791		
Determining word function	0.642		
Finding Opposites	0.702		
Finding synonyms	0.874		
Reading for Main Ideas			0.551
Reading for Details	0.719		
Table Completion	0.655		
Figure Completion	0.740		
MCQ	0.585		
Matching		0.782	
Gap-filling	0.799		

Nine variables can be said to contribute to the 'lexical knowledge' factor. They involve 'guessing words from context', 'determining word function', 'finding opposites', 'finding synonyms', 'reading for details', table completion', 'figure completion', 'multiple-

choice questions' , and 'gap filling'. As for 'coherency', the variable which contributed most is that of 'matching'.   Finally, 'reading for main ideas' is the variable with the highest coefficient which contributed to the 'comprehension' dimension.

Table 30: Factor Correlations

	Lexical Knowledge	Coherency	Comprehension
Lexical Knowledge	1.000		
Coherency	0.594	1.000	
Comprehension	0.674	0.549	1.000

All the factors are significantly intercorrelated: 'lexical knowledge' and 'coherency', 'lexical knowledge' and 'comprehension', 'coherency' and comprehension. Foremost in these pairwise relationships were 'lexical knowledge' and 'comprehension', which indicates a strong association between vocabulary and comprehension.

5.1.2.2. Relationship between Vocabulary Strategies and Comprehension

In order to measure the contribution of vocabulary to comprehension, we used a statistical method called Structural Equation Modeling (SEM). SEM is a statistical technique for testing and estimating causal relationships using a combination of statistical data and qualitative causal assumptions. Among its strengths is the ability to model constructs as latent variables (variables which are not measured directly, but are estimated in the model from measured variables which are assumed to 'tap into' the latent variables).There are usually two main parts to SEM: the *structural model* showing potential causal dependencies between "endogenous" variables which are effects of other exogenous variables and "exogeneous" variables; that is independents with no prior causal variable , and the *measurement model* showing the relations between the latent variables and their indicators. Specifying the model

delineates causal relationships between variables that are thought to be possible. The results of SEM are presented in iagram 10 below, known as Path Diagrams.

Figure 10: Relationship between Vocabulary and Comprehension

Chi-Square=52.62, df=43, P-value=0.14928, RMSEA=0.051
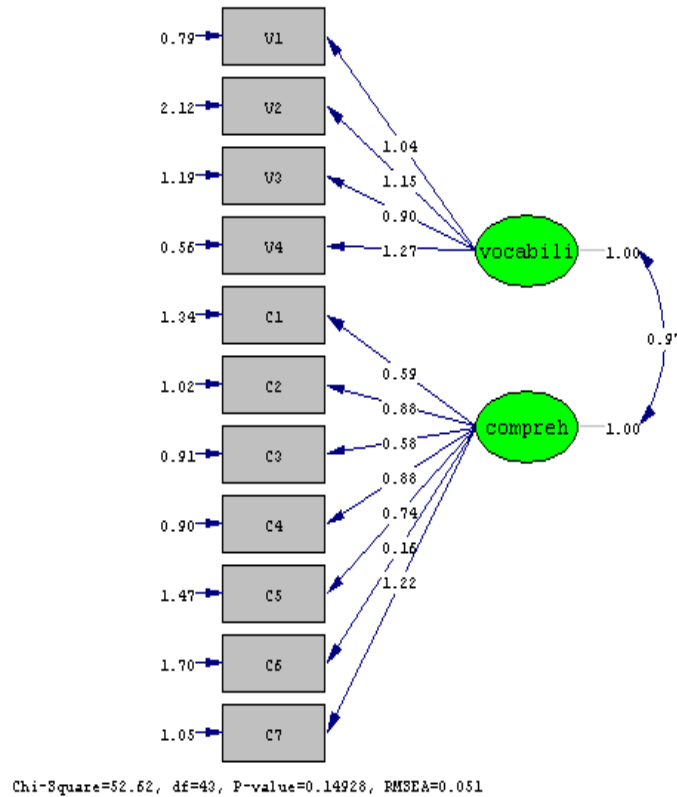
In this figure, the rectangles labeled V1 to C7 represent the eleven variables in the test. Each of these 11items has an arrow pointing toward a column of circles on the right of the figure. The circles on the right represent latent variables which we have labeled 'vocability' and 'comprehension'. The numbers from the items to the latent variables are analogous to factor loadings. The numbers on the arrows between the measured and latent variables show the weight each measured variable carries in defining the latent variable, just like a factor loading. In our example, measured items V4 (1.27), V3 (1.15) and V1 (1.04) all contribute substantial weight to the latent variable we have called 'Vocability'. In other words, these three items have a large correlation across respondents and we argue that this correlation is due to the fact that they all address some aspect of vocabulary. To be exact, the assertion is

that the latent variable, Vocabulary is the cause of the observed pattern of high correlation between these items.

Similarly, measured items C6 (1.22), C4 (0.88), C2 (0.88) having a large correlation among respondents all substantially contribute to the latent variable 'comprehension'. In other words, 'comprehension' is the cause of the observed pattern of high correlations between these items.

The double headed arrows between the latent variables indicate that there is a correlation between each. The coefficient (0.97) that appears on the path diagram between the two latent variables indicates a large correlation between 'vocabulary and comprehension.

We thus conclude that vocabulary made important contributions to comprehension both directly and indirectly. That is, knowing the meaning of a word allowed readers to draw inferences necessary to comprehend the text. For example, being able to determine the word function (V2) enabled readers to make the logical connections needed to understand what they were reading.

5.1.3. Discussion of the Results of the Test

What is the test-takers' reading level in English?

The statistical analysis of the mean scores did produce conclusive evidence that the test-takers' level in English is low. Moreover, the mean scores of 'local' and 'global' reading variables were also moderate. This provides some food for thought concerning the major factors influencing ESP reading comprehension.

What test tasks have a bearing on the reading achievement of the test-takers?

In order to answer the above question, let us first consider the findings of the descriptive statistics. The latter clearly denoted that the test-takers were confronted with some difficulties of varying degrees regarding the different activities. For example, a very large proportion among the respondents (86.40%) faced difficulties with finding out word synonyms. The respondents also faced problems with matching the sentence halves (73%), and filling the gaps activities (72.70%). Another 64.90% of the test-takers performed poorly on determining word functions which is essential for setting logical relationships between sentences, hence, affecting meaning construction and comprehension of the text. The test-takers performance on the other activities was rather average to good.

Meanwhile, a comparison of the mean scores of the test's main sections revealed that the test-takers performed modearately on the 'global' reading as well as on 'local' reading skills and strategies. This suggests that the lexical knowledge is tightly related with comprehension skills and strategies. Furthermore, a comparison between the coefficients of variation of the two test sections indicated a higher variability in the distribution of scores with the vocabulary activities than that related to comprehension subtests. The difference between the coefficients of variation for the above sections (56.02% and 33.78%, respectively) shows the fact that the subjects have performed rather more homogeneously on the latter than in the former.

What is the relationship between the test variables?

The correlation matrix revealed that most of the variables are significantly intercorrelated. Interestingly, the highest correlation coefficients were either between two vocabulary variable or between a vocabulary variable and another comprehension variable which is word- based such as table completion, figure completion, or filling the gaps; that is one that requires either some lexical knowledge on the part of the test-takers or requires the

ability of guessing the word from context. In other words, a high performance on one implies also a high performance on the other. For instance, we observed high correlations coefficients between *guessing words from context* and *finding opposites*, between *finding synonyms* and *finding opposites* , between *finding opposite* and *gap-filling*, *figure completion* and *gap-filling*, and *table completion* and *figure completion*. On the other hand, lower, but significant correlation coefficients were also found between the comprehension variables of the test such as between *finding the main ideas* and *finding details* or between *finding details* and *gap-filling*.

What are the factors that appear to underlie understanding of texts?

The findings indicate that there are three factors which underlie adequate understanding of texts: (i) lexical knowledge, (ii) coherency, and (iii) comprehension where 46.21% of the variance is accounted for by the lexical knowledge dimension. It also revealed a significant correlation between the different factors, especially between 'lexical knowledge' and 'comprehension'. They are the main determinants of reading ability.

What is the relationship between vocabulary and comprehension?

According to the results of the SEM reported above, the correlation coefficients between vocabulary and comprehension show that they are significantly correlated.

5.3. Results of the Students' Questionnaire

5.2.1. Analysis of the Results

Section One: The Students' Reading Habits

1. Do you read in English?

   Yes

   No

   Sixty (68.18%) students say they read in English; twenty eight (31.82%) say they do not. The high percentage for the 'Yes' answer is but an indication of the students' awareness about the importance or maybe the necessity of reading in English, especially in the content area.

2. If 'Yes', what do you read, and how often?

   a) Documentation related to your speciality.

   b) Books of fiction and stories.

   c) Newspapers and magazines.

   d) Other: Please specify ....

Table 31: Student's Reading Habits in English

	Always		Sometimes		Rarely		Never		No answer		Total
	N	%	N	%	N	%	N	%	N	%	
a	04	04.54	35	39.79	20	22.72	02	02.27	27	30.68	88
b	03	03.40	16	18.20	21	23.86	12	13.64	36	40.90	88
c	02	02.27	02	02.27	09	10.23	14	15.91	61	69.32	88

   The respondents' first motivation for reading in English is get information related to their speciality. This is clear from the rate of anwsers for option (a) which collected the highest rate 69.31% against 57.95% for the second option, and 30.68% for the third one. As for the

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frequency for reading, respondents seem to read documentation related to their speciality more frequently than the other two other options.

3. How do you do read in English?

a) Easily.

b) Fairly easily.

c) With difficulty.

d) With a great difficulty.

Table 32: Students' Reading Level in English

Option	N	%
A	03	03.40
B	41	46.60
C	32	36.36
D	05	05.68
No Answer	07	07.96
Total	88	100

As can be noticed from the table, 46.60% of the respondents say they read English 'fairly easily', against 36.36% of the subjects who rather read 'with difficulty'.

4. Do you read in Arabic?

Yes

No

Eighty four (95.45%) students say they read in Arabic, and only four (04.55%) students say they do not.

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5. If 'Yes', what do you read and how often?

   a) Documentation related to your speciality.

   b) Books of fiction and stories.

   c) Newspapers and magazines.

   d) Other: Please specify……………..……. …………………………………………………

Table 33: Student's Reading Habits in Arabic

	Always		Sometimes		Rarely		Never		No answer		Total
	N	%	N	%	N	%	N	%	N	%	
A	30	34.10	31	35.22	10	11.36	02	02.27	15	17.05	88
b	18	20.45	37	42.05	08	09.09	02	02.27	23	26.14	88
c	22	25	31	35.22	06	06.82	01	01.14	28	31.82	88

The reading situation for Arabic is somehow similar to that for English. The highest percentage of answers goes to 'reading documentation related to speciality' with 73 answers (82.95%), then 'books of fiction and stories' with 65 answers (73.86%). Finally, reading 'newspapres and magazines' collected the lowest rate of answers 60 answers (68.18%). Furthermore, the respondents seem to read specialized documentation more frequently than they do read the other options.

6. How do you do read in Arabic?

   a) Easily.

   b) Fairly easily.

   c) With difficulty.

   d) With a great difficulty.

Table34: Students' Reading Level in Arabic

Option	N	%
a	81	92.05
b	02	02.27
c	01	01.14
d	01	01.14
No Answer	03	03.40
Total	88	100

The overwhelming majority (92.04%) of the students said they read Arabic easily. Only 02.27% said they read fairly easily, and 02.28% said they read either with difficulty or with a great difficulty.

7. Do you read in French?

Yes

No

Eight one (92.05%) respondents say they read in French, and seven (07.95%) say they do not.

8. What do you read and how often?

 a) Documentation related to your speciality.

b) Books of fiction and stories.

c) Newspapers and magazines.

d) Other: Please specify ....

Table 35: Students' Readinf Habits in French

	Always		Sometimes		Rarely		Never		No answer		Total
	N	%	N	%	N	%	N	%	N	%	
a	41	46.60	32	36.36	02	02.27	02	02.27	11	12.50	88
b	-	-	28	31.82	23	26.13	09	10.23	28	31.82	88
c	07	07.96	28	31.82	17	19.31	10	11.36	26	29.55	88

Concerning French, the reading situation is a little bit different. The highest percentage with 77 answers (87.50%) goes to 'specialized documentation', but the second position goes to reading 'newspapres and magazines' with 60 (68.18%) answers. Finally, the lowest percentage goes to reading 'books of fiction and stories ' with 62 (70.45%) answers. Moreover, the respondents seem to read specialized more frequently than the two other options, and read journals and magazines more frequently than books of fiction and stories.

9. How do you do read in French?

   a) Easily.

   b) Fairly easily.

   c) With difficulty.

   d) With a great difficulty.

Table 36: Students'Reading Level in French

Option	N	%
a	30	34.10
b	31	35.22
c	21	23.87
d	02	02.27
No Answer	04	04.54
Total	88	100

The highest percentages (35.22%, 34.09%) go for options (a), and (b) with thirty and thirty-one students reading easily and fairly easily in French respectively. A lesser important proportion of the students (26.13%) reads either with difficulty or with a great difficulty in French.

In sum, in terms of reading habits, the highest pecentage for the 'yes' answer goes to Arabic, followed by French; then English. In terms of frequency of reading specialized documentation the highest rate goes for the French language, then Arabic then English. Concerning reading books of fiction and stories, the first position goes to Arabic, then French then English. As regards reading journals and magazines, the highest rate goes to Arabic, then to French, then to English. Finally, the level of reading, the respondents seem to have more troubles with reading in English than in French, and less in Arabic.

Section Two: Reading Strategies:

− Pre-reading strategies:

- **Setting a purpose for reading**

10. You read in English because:

a) You find the topic interesting.*

b) You have questions to answer about the text.*

c) You want to learn English.

d) Other: Please specify …………………………………………………………………..

Table37: Frequency of answers for 'Setting

a Purpose for Reading' (01)

Option	N	%
a*	17	19.32
b*	11	12.50
c	18	20.45
ab	04	04.55
ac	09	10.22
ad	01	01.14
ac	04	04.55
abc	10	11.37
Other	03	03.41
No Answer	11	12.50
Total	88	100

Effective strategies are marked with an asterisk (*)

A detailed reading of the above table allows us to make the following interpretations. The first interpretation concerns *single and combined use of strategies*. The figures show that 52.27% of the respondents gave one-option answers, while 31.82% combine two to three

strategies. Another 12.50 did not give an answer, and 03.40% proposed other purposes for reading in English. Regarding the 'Other' option, two respondents said they like English, and one respondent answered that 'English is an important language'.

The second interpretation concerns the *use of effective and less effective strategies*, and the figures show that 36.37% of the respondents opted for effective strategies, while 20.45% of the students opted for less effective strategies, and 27.27% combined between effective and less effective strategies. On the other hand, if we add together the number of choices obtained for each option, both alone and in combination with another option, we obtain the following table.

Table 38: Overall Strategy Use for 'Setting

a Purpose for Reading' (01)

Option	N	%
a*	31	35.22
b*	29	32.95
C	41	46.59

Considering the context of our study, and as stated in chapter one (p. 48) that the purpose underlying the learning of English , more specifically reading in English, is immediate rather than deferred, and that the text is used as vehicle for information (TAVI) rather than a linguistic object (TALO), one would say that the subjects' choices (a, and b with 68.17% of answers) fit perfectly the situation and that the two first options are primary needs compared with the last one which can be considered of secondary importance, thus less effective.

- **Previewing**

11. Before reading the whole text, you:

a) Guess the general idea from the title.*

b) Read headings and subheadings to predict the content of the text.*

c) Read the first and the last sentences of the text.

d) Read the introduction and the conclusion before you decide to read the whole text.

Table 39: Frequency of answers for 'Previewing' (01)

Option	N	%
a*	17	19.32
b*	11	12.50
c	04	04.55
d	06	06.81
ab	27	30.68
ac	01	01.14
ad	05	05.68
bc	01	01.14
bd	01	01.13
abc	01	01.13
abd	04	04.54
No Answer	10	11.36
Total	88	100

As stated in chapter two (Section 2.2.7., p 98), the value of previewing in the classroom context lies in the amount of time it saves in preventing prolonged reading of something of no value (Nuttal, 1996). In addition, previewing may be very useful, particularly for unsuccessful

readers who do not engage in strategies spontaneously. It helps generate a more positive attitude towards the text.

The above figures indicate the use of this strategy by the subjects either by 'guessing the general idea from the title (19.32%), or by 'reading headings and sub-headings' (12.50%), or by the combined use of the two (30.68%), giving us a total number of 62.50% of the students who make use of 'effective' strategies against 11.36% of the students who either 'read the first and last sentences of the text', or 'read the introduction and the conclusion'. The latter strategies can be considered as less effective. Another 14.81% of the subjects combine between *effective and less effective strategies*. It is also worth noting that 11.36% did not give an answer. Finally, as far as *'single' and 'combined' use of the strategies*, we can say that on the whole we have approximately the same percentages; that is we have 43.18% for single use and 45.45% for combined use of strategies.

- **Making Predictions**

12. Before reading a text, you:

a) Form hypotheses about the text meaning.*

b) Make analogies to your own experience by linking previous knowledge with new information.*

c) Predict the content of the text*.

d) Do not do any of the above, and simply begin reading the text itself.

e) Other: Please, specify …………………………………………………………………………..

Table 40: Frequency of answers for 'Making

Predictions' (01)

Option	N	%
a*	06	06.81
b*	15	17.05
c*	11	12.50
d	06	06.81
ab	03	03.41
ac	07	07.96
bc	07	07.96
bd	02	02.27
cd	05	05.68
abc	01	01.14
abd	08	09.09
abcd	02	02.27
No Answer	15	17.05
Total	88	100

'Making predictions' is another strategy which 36.36% of the subjects say they activate before reading, either in the form of 'generating some hypotheses about the text meaning' (06.81%), 'making analogies to their own experience' (17.05%), or in the form of 'making predictions about the content of the text (12.50%). Another proportion (20.47%) of the subjects combines between two to three of the above effective strategies. This gives us a total of 56.83% of students who use effective strategies. Another group consists of students (06.82%) who either 'simply begins reading the text' without making any predictions or combine between

effective and less effective strategies (19.31). Finally a proportion of subjects; i.e., 17.05% did not give an answer.

−While-reading strategies

- **Word-level strategies**

   Importance laid to vocabulary

13. In the process of reading, you think:

   a) All the words are important.

   b) Some words can be skipped without disturbing understanding.*

   c) You need to look in the dictionary for the words you don't know.

Table 41: Frequency of answers for 'Importance

laid to Vocabulary' (01)

Option	N	%
a	04	04.55
b*	22	25
c	32	36.36
ab	01	01.14
ac	12	13.63
bc	09	10.22
abc	01	01.14
Other	01	01.14
No Answer	06	06.82
Total	88	100

As can be read from the figures, the highest percentage 36.36% was attributed to the use of the dictionary, followed by 25% for skipping, while only 04.55% of the respondents

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would give all the words equal importance. By adding the number of answers for each option, both single and in combination with other options, we can notice that fifty four (61.36%) students rely on the dictionary; thirty three (37.50%) skip the words that do not disturb their understanding, and eighteen (20.45%) give equal importance to all the words in a text. On the other hand, concerning *single and combined use of strategies*, fifty eight (65.90%) students proposed single use of strategies, while twenty three (26.13%) combine two to three strategies. Although there is no option for 'Other' in the question, one student has added 'only key words'.

As far as the use of *effective and less effective strategies*, only twenty two students (25 %) opted for option 'b' which is considered as effective and the other fifty nine (67.04%) use either single less-effective strategies (36.36%) or combine two to three effective and less-effective strategies (26.13%). Only one student (1.14%) said s/he use the dictionary only for key words. Finally, 06.82%) of the respondents did not give an answer.

- **Handling a vocabulary problem**

1**4. If you come across a word you do not know, you:**

   a) Skip the word and come back to it later.

   b) Guess what the word might mean and go on.*

   c) Guess what the word might mean and reread the sentence.*

   d) Look up the word in a dictionary and write the English meaning on the page.

Table 42: Frequency of answers for 'Handling

a Vocabulary Problem' (01)

Option	N	%
a	05	05.68
b*	05	05.68
c*	05	05.68
d	36	40.90
ab	02	02.27
ac	02	02.27
ad	06	06.82
bd	04	04.55
cd	13	14.77
abc	01	01.14
bcd	04	04.55
abcd	04	04.55
No Answer	01	01.14
Total	88	100

When asked how they would handle a vocabulary problem, 40.90% of the respondents answered that they would look up the unfamiliar word in the dictionary and write its English meaning on the page; whereas, 05.68% of the students would 'skip the word and come back to it later', 'guess what the word might mean and go on' (05.68%), or 'guess what the word might mean and reread the sentence' (05.68%). By adding together the number of choices obtained for each option, both alone and in combination with another option, we can order the four options as follows:

Table 43: Overall Strategy Use for 'Handling a

Vocabulary Problem' (01)

Option	N	%
a	20	22.72
b*	20	22.72
c*	29	32.95
d	67	76.13

Concerning *single and combined use of strategies*, we can say that more than half (51) of the respondents (57.95%) opted for single strategies as indicated above, while thirty six (40.90%) students combined between two to four strategies.

As for *the use of effective and less effective strategies*, only 11.36% of the subjects use single effective strategies; whereas, 87.50% of them use either single less- effective strategies, or combine between effective and less effective strategies. Only one student (01.14%) did not give an answer.

- **Guessing word meaning**

15. To guess what an unfamiliar word might mean, you:

a) Consider what the rest of the sentence says*.

b) Consider what the rest of the paragraph says.*

c) See whether the word looks like an English word you know.*

d) See whether the word looks like a French word you know.*

e) Analyze the grammatical form of the word.*

f) Do not do any of the above.

Table44: Frequency of answers 'Guessing

Word Meaning' (01)

Option	N	%
a*	02	02.27
b*	02	02.27
c*	03	03.41
d*	07	07.96
e*	05	05.68
f	04	04.55
ad	02	02.27
be	02	02.27
cd	10	11.36
de	16	18.18
acd	02	02.27
bcd	02	02.27
ade	02	02.27
bde	01	01.14
cde	15	17.05
abcd	01	01.14
abde	02	02.27
acde	04	04.55
abcde	02	02.27
No Answer	04	04.55
Total	88	100

As the table suggests, the answers for this question are very dispersed. Consequently, several comments can be made. To start with, if we consider *single and combined use of strategies,* we can notice that 26.14% of subjects use single strategies against 69.31% who use two to five strategies in combination. Moreover, if we add the number of choices for each option both single and combined with other options, we obtain the table below.

Table 45: Overall Strategy Use for

'Guessing Word Meaning' (01)

Option	N	%
a*	17	19.31
b*	12	13.63
c*	38	43.18
d*	65	73.86
e*	49	55.68

It is clear that option « d » ; i.e. 'see whether the word looks like a French word you know' has gathered the highest percentage by being ticked by 73.86% of the students, followed by option 'e'; that is 'analyse the grammatical form of the word' with 49 (55.68%). In the third position comes option 'c'; that is 'see whether the word looks like an English word' with 38 (43.18%) answers. Finally, the use of context; i.e. options 'a' and 'b' come last with only 19.31% and 13.63% respectively.

− Text-level strategies: Adjusting the reading rate

16. You read English passages:

a) The same way because English passages are usually difficult for you.

b) The same way because they are in English.

c) Differently depending on what you need to learn from them.*

d) Differently depending on what kind of passages they are.*

Option	N	%
a	15	17.05
b	06	06.82
c*	32	36.36
d*	18	20.46
cd	09	10.22
No Answer	08	09.09
Total	88	100

As for adjusting the pace of reading, 67.04% of the students agreed that the reading rate is not static and that it is dependent on the purpose behind reading (36.36%), or on the kind of passage being read (20.46%), or both (10.22%). However, for 23.86% of the students all English passages are read in the same way, either because they are 'usually difficult' (17.05%) or because they are in English (06.82%). By adding the anwsers for each option, both alone or in combination with other options we obtain the following results:

Table 47: Overall Strategy Use for

'Adjusting the Reading Rate' (01)

Option	N	%
a	15	17.05
b	06	06.82
c*	41	46.59
d*	27	30.68

For *single and combined use of strategies*, the figures indicate that seventy one (80.68%) respondents opted for one option answers; wheres, nine respondents (10.22%) proposed a combined use of strategies. Concerning the *use of effective and less effective strategies*, the higher percentage (67.04%) goes for effective strategies against 23.86% for less effective ones.

Identifying main ideas

17. To find the main idea(s) of a reading passage you read:

   a) The title.

   b) The topic sentence.

   c) The headings.

   d) All of them.*

Table 48: Frequency of answers for

'Identifying Main Ideas' (01)

Option	N	%
a	06	06.82
b	19	21.60
c	03	03.41
d*	39	44.31
ab	08	09.09
ac	10	11.36
No Answer	03	03.41
Total	88	100

All the proposed options are indeed effective, but we put an asterisk just for the last one because using any one of the first three options alone would not allow the reader to identify the

main ideas effectively unless it is combined with the other two. So, the figures in the table indicate that less than half of the respondents use the three options in combination with 44.31% of the answers; whereas 20.45% of the respondents opted for two-option answers. Finally twenty eight (31.81%) proposed a one-option answer.

- **Reading for details**

18. To find details in a reading passage, you:

a) Read only the part you are interested in.

b) Pay attention to all the information in the text.*

c) Read more than one time in order to understand what the writer stated or implied*.

Table 49: Frequency of answers for

'Reading for Details' (01)

Option	N	%
a	23	26.13
b*	07	07.96
c*	42	47.72
ac	05	05.68
bc	07	07.96
No Answer	04	04.55
Total	88	100

When looking for details in a reading passage, the respondents proposed the following model: Concerning *single and combined use of strategies*, the great majority of subjects (81.81%) proposed a one-option approach; whereas only 13.63% of sudents combined between two strategies. Moreover, if we add the number of answers for each option, both alone and in combination with other options, we notice that the highest percentage goes for option 'c' with

54 answers (61.36%), then option 'a' with 28 answers (31.63%), finally option 'b' with 14 answers (15.90%).

As for *the use of effective and less effective strategies*, we notice that more than half of the respondents, more precisely 49 (55.68%) use single strategies; that is 'b' or 'c'; whereas seven (07.96%) students combine two effective strategies. On the other hand, twenty eight subjects (31.81%) use either single less effective strategy 'a', or combine bewteen it and another effective strategy,'b' or 'c'.

- **Reading for specific information**

19. To find a specific information in a reading passage, you:

   a) Read continually until you find specific information you need.

   b) Look through the text as quickly as possible until you reach the relevant part to get the
   information you want.*

   c) Look for clues*.

   d) Other: Please specify …………………………………………………………………….

Table 50: Frequency of answers for

'Reading for Specific Information' (01)

Option	N	%
a	12	13.63
b*	32	36.36
c*	19	21.60
ac	05	05.68
bc	16	18.18
abc	01	01.14
No Answer	03	03.41
Total	88	100

As far as *Single and combined strategy use*, the figures in the table reveal that 71.59% of the answers fall within single strategy use, while 25% of the answers fall within combined tartegy use. With respect to the *use of effective and less effective strategies,* we notice that 76.13% of the respondents use effective strategies, either single (57.95%) or combined (18.18%). Another proportion of the respondents opted for single less effective strategies (13.63%) or in combination with effective strategies (06.82%. Three (03.40%) students did not give an answer.

In other words, in order to find a specific information in a reading passage, most subjects (76.13%) 'look through the text as quickly as possible until they reach the relevant part', or 'look for clues', or use both strategies; whereas, only 13.63% of the respondents 'read continually until they find the specific information they need'.

- **Using Titles**

20. When a reading passage has a title, you:

a) Read the title but do not consider it as you read the passage.

b) Read it first and predict what the passage will be about.*

c) Think about what you already know and how it might relate to the title.*

Table 51: Frequency of answers for

'Using Titles' (01)

Option	N	%
a	08	09.09
b*	18	20.46
c*	25	28.40
ab	01	01.14
abc	02	02.27
bc	34	38.64
Total	88	100

The title of the reading passage can be effectively used by the reader in the sense that it helps him/her make prediction about the content of the text or activate prior knowledge. In this study, 28.40% of the subjects say the title helps them think about what they already know, 20.45% that they use it to make predictions about the text content, and 38.64% combine between the two. However, 09.09% say that they do not relate the title with the text. In addition, two respondents (02.27%) opted for 'a' and 'c'; whereas, one subject (01.14%) combines between 'a' and 'b'.

By adding the number of answers for each option both single and combined with other options, we find that 61(69.31%) students 'c', 55 (62.50%) chose 'b', against 11 (12.52%)

students who opted for 'a'. It is worth noting that the first options are considered mor effective than the last one. Finally, regarding *single and combined use of strategies*, 57.95% of the subjects propose a single use of strategies; whereas, 42.05% propose a combined one.

- **Using Illustrations**

21. When a reading passage has illustrations, you:

a) Look at the illustrations and guess what the reading passage might be about.*

b) Look at the illustrations without relating them to the reading passage.

c) Expect the reading passage to reflect what is in the illustrations.*

d) Compare what is in the illustrations to what you read.*

Table 52: Frequency of answers for

'Using Illustrations' (01)

Option	N	%
a*	07	07.96
b	03	03.41
c*	05	05.68
d*	33	37.50
ac	02	02.27
ad	07	07.96
cd	12	13.63
bd	01	01.14
abc	03	03.41
acd	12	13.63
No Answer	03	03.41
Total	88	100

The answers for this question are very dispersed; hence, different readings can be provided concerning the way the respondents deal with illustrations.

Firstly, if we consider *single and combined use of the strategies*, we can read from the table that more than half of the students, more precisely 48 (54.54%) ticked only one option; whereas, 37 (42.04%) respondents combine between two to three strategies. Secondly, as far as the *use of effective and less effective strategies* is concerned, 78 students which represent 88.86% of the total number opted for effective strategies, either in single or combined use; whereas, only three repondents (03.40%) use less effective strategy by not relating the illustration to the reading passage. Another proportion of students (04.55%) combines between effective and less effective strategies.

- **Handling a reading problem: Sentence level**

22. If you do not understand the meaning of a sentence, you:

   a) Read it word by word.

   b) Guess the meaning from the general context.*

   c) Relate it with the preceding and the following sentences.*

   d) Ignore it.

Table 53: Frequency of answers for

'Handling a reading problem' (sentence level) (01)

Option	N	%
a	23	26.13
b*	15	17.05
c*	09	10.22
d	06	06.82
ab	06	06.82
ac	16	18.18
ad	01	01.14
bc	05	05.68
bd	01	01.14
cd	02	02.27
abc	01	01.14
abcd	01	01.14
No Answer	02	02.27
Total	88	100

When they fail to understand a sentence, 26.13% of the respondents read it word by word, whereas 17.05% of the respondents guess the meaning from the general context. Another 10.22% relate the sentence with the preceding and following sentences. Finally, only 06.82% of the subjects ignore it.This would give us a total of 53 students (60.22%) who use a single strategy to solve a comprehension failure, 27.27% of whom have recourse to single effective strategies, while 32.95% have recourse to single less effective strategies. The other proportion of students, representing 37.50% of the whole group, combines effective and less effective strategies.

When adding together the number of answers per option both alone or in combination with other options, we obtain the highest number; that is 48 (54.54%) for 'reading the sentence word by word' which is considered as a less effective strategy than the strategy of 'relating the sentence with the preceding or following sentences' which gathered 34 answers (38.63%), or

the strategy of guessing meaning from the general context', with 29 (32.95%) answers. Finally, the option of 'ignoring the sentence' obtained 11 (12.50%) answers.

- **Text Level**

23. In facing any problem in grasping the text meaning, you:

a) Read it many times.

b) Give up reading.

c) Ask for help.*

d) Consult other reading references related to the same topic.*

Table 54: Frequency of answers for 'Handling a Rereading Problem' (Text- level) (01)

Option	N	%
a	17	19.31
b	04	04.55
c*	10	11.36
d*	04	04.55
ab	03	03.41
ac	29	32.95
ad	07	07.96
bc	02	02.27
cd	05	05.68
acd	03	03.41
abcd	01	01.14
No Answer	03	03.41
Total	88	100

The highest percentage gathered for this question seeking information about how students deal with a comprehension problem at the level of the text, goes for 'reading the text many times' with 19.31% of the answers, followed by 'aking for help', with 11.36% of the answers, then 'giving up reading', and 'consulting other reading references' with an equal

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percentage of 04.55% each. All the previous percentages make up together 39.77% for single option answers. As for *combined use of strategies*, we have 56.81% of the answers that are divided between two to four option answers.

Concerning the use of effective and less effective strategies, nineteen students (21.59%) opted for effective stratgies, and 24 students (27.27%) opted for less effective ones. The other fourty-two (47.72%) students combine effective and les effective strategies.

Finally, if we add together the number of answers for each option, both alone and in combination with other options, we obtain 68.18% of strategy use for option 'a' , 56.81% for option 'c', 22.72% for option 'd', and 11.36% for option 'b'.

- **Editing Strategy**

24. While reading, to understand the text, you:

a) Underline the main ideas.*

b) Make an outline.*

c) Take notes.*

d) Do not write anything; just keep it in your mind.

e) Other: Please, specify …………………………………………………………………..

Table 55: Frequency of answers for

'Editing Strategy' (01)

Option	N	%
a*	17	19.32
b*	09	10.22
c*	39	44.32
ab	02	02.27
ac	09	10.22
bc	01	01.14
abc	07	07.96
abcd	01	01.14
No Answer	03	03.41
Total	88	100

Editing is another effective, while-reading strategy that readers can activate to better handle the reading material in terms of highlighting important ideas by underlining them or taking notes. By examining the table above, we can clearly notice that 65 subjects (73.87%) edit the reading passage by taking notes (44.32%), underlyning main ideas (19.32%), or making an outline (10.22%). A smaller proportion of respondents (22.72%) uses the above strategies in combination.

−Post-reading strategies

25. After reading the text, in order to determine if reading goals have been met, you:

    a) Engage in self- questioning. *

    b) Summarise the text.*

    c) Outline the ideas.*

    d) Do not do any of the above.

e) Other, p lease specify………………………………………...

Table 56: Frequency of answers for using

'Post-reading Strategies' (01)

Option	N	%
a*	33	37.51
b*	09	10.22
c*	15	17.05
ab	02	02.27
ac	13	14.77
bc	01	01.14
abc	02	02.27
No Answer	13	14.77
Total	88	100

85.23% of the students say they use post-reading strategies. 37.51% of the respondents engage in self-questioning; 17.05% outline the ideas, and 10.22% summarize the text. Another 20.45% of the respondents combine between two to three strategies, all of which are effective ones. Finally, 14.77% did not give an answer.

Section Three: Reading Comprehension Difficulties

Linguistic Factors /Background Knowledge

26. You have difficulty in understanding a text because of:

a) Unknown words.

b) Lack of understanding the link between the sentences.

c) Lack of background knowledge.

d) Other: Please specify …………………………………………………………..

Table 57: Reading Comprehension Difficulties

Option	N	%
a	28	31.82
b	09	10.22
c	07	07.96
ab	18	20.46
ac	04	04.55
bc	02	02.27
abc	14	15.90
No Answer	06	06.82
Total	88	100

Reading difficulty seems to be located at one specific aspect for 49.98% of respondents. More precisely, 31.82% of the respondents attribute it to poor vocabulary knowledge, 10.22% to weak understanding of the meaning of sentence connectors and 07.96% to lack of background knowledge. Another proportion of students (43.18%) locate their difficulty at more than one level by ticking two to three options, 27.27%, and 15.90% respectively. Moreover, if we add the number of answers per option both alone or in combination with other option, we see that 64 respondents (68.18%) suffer from lexical problems, while 43 subjects (48.86%) from sentence connectors, and 27 subjects (30.68%) from lack of background knowledge.

27. The text factors which affect your comprehension of the text are:

a) The length of the text.

b) The length of sentences.

c) Grammar.

d) Other: please, specify…………………………………………...................................

Table 58: The Linguistic Factors

Affecting Comprehension

Option	N	%
a	19	21.59
b	11	12.50
c	27	30.68
ab	03	03.41
ac	07	07.96
bc	01	01.14
abc	11	12.50
No Answer	09	10.22
Total	88	100

For a better scrutiny of the subjects' reading comprehension difficulties, three other linguistic factors were proposed to the students, namely 'grammar' which collected 30.68% of the answers, 'long texts' which collected 21.59% of the answers, and 'long sentences' which collected 12.50% of the answers. This gives us a total of 50% of the answers. Another 25% of the answers is equally distributed between two and three option answers. Nine students (10.22%) did not give an answer.

Another reading of the figures which consists of adding up the number of answers per option both alone and in combination with other option reveals that 46 students (52.27%) have a grammar problem, 40 (45.45%) students find that English texts are long; whereas, 23 (29.54%) see that it is the sentences that are rather long.

- Psychological Factors

28. The psychological factors which can affect your comprehension of the text are:

a) Lack of confidence in ability to understand a text from a first reading.

b) Losing concentration when reading.

c) Exhaustion, that is the act of reading is mentally a tiresome activity.

d) Other: Please, specify………………………………………...

Table 59: The Psychological Factors

Affecting Comprehension

Option	N	%
a	04	04.55
b	51	57.95
ab	17	19.32
ac	01	01.14
Other	01	01.14
No Answer	14	15.90
Total	88	100

Other: No willingness to read.

Psychologogical factors can also inerfere in the reading process. As we said in chapter one (section 1.3.2.1, p32), each reader brings to the process a unique set of past experiences, emotional and mental processes which interact with both text and reader factors to make reading a successful or unsuccessful task. On the whole, we can say that the 84.10% of the respondents are affected at one level or the other by psychological factors such as 'losing concentration' which seems to be a porblem for 57.95% of the respondents. The other factors also interfere at varying levels either alone or in combinaton.

On the whole, comprehension difficulties facing our subjects seem to be located at more than one level, with a particular emphasis on poor vocabualry knowlege (68.18%), then

on grammar (52.27%). On the other hand, the psychological factors that may hinder their comprehension have to do with losing concentration, or lack of confidence.

Section Four: Further Suggestions

29. Would you like to add any comment or suggestion?

Seventy five students, representing 85.22% of the students, made 24 types of suggestions which they believe will make the English course cope with their specific learning needs. The list and frequency of each suggestion are summarized in the following table.

Table 60: **Suggestions for a better teaching of English**

01	More English language sessions	17
02	Introduce English from first year	15
03	Scientific English	15
04	Put Programs	08
05	Terminology/translation	07
06	Teach pronunciation	07
07	Specialized teachers	05
08	Use English to teach speciality modules	05
09	Focus on teaching vocabulary	04
10	Competent teachers	04
11	Read in the classroom	03
12	Study General English in the 1st year and ESP in 2nd year	02
13	Impose assignments in English	02
14	More scientific books in the library	02
15	Use Arabic and French in the English sessions	02
16	Constant contact with people who speak scientific English	02
17	Improve teaching methods	01
18	Put a coefficient for the English module	01
18	Teach grammar	01
20	Coordination between English programs through the years	01
21	Drop the English module	01
22	Go to Britain to study English	01
23	Practice speaking	01
24	Text analysis	01

5.2.2 Discussion of the Results of the Students' Questionnaire

The first conclusion that can be drawn from the students' answers concerns the students' reading habits. On the whole, most students read in the three proposed languages, but they can be said to read more in Arabic than in French and English, but they read specialized documentation more frequently in French than in Arabic or English. As concerns books of fiction, journals and magazines, subjects read more frequently in Arabic than in French and English.

Concerning the use of pre-reading strategies, we can say that most to students (up to 87%) do use this kind of strategies by setting themselves a purpose for reading, the latter being more for the sake of learning to read in English than interest in the topic or finding answers to questions. On the other hand, the subjects (62.48%) seem to activate the strategy of 'previewing' by the use of such effective guessing strategies as using the title to guess the general idea of the test, making use of headings and sub-headings as predictors of text content. However, only 27.12% of the respondents say that they make hypotheses, or activate prior knowledge.

As far as the third section is concerned with while-reading strategies, the first conclusions relate to the word-level strategies. By putting together the answers for the three questions of this section, we can say that while reading, and at the vocabulary level, the subjects activate the following strategies: they consider the need of using the dictionary rather than skipping the unfamiliar words or guessing the meaning. The latter strategies are considered to be more effective than the former. To guess the meaning of unfamiliar words, they use the following method: First they relate it with a French word; second analyse the grammatical form, and finally they use the context. Finally, concerning single and combined

use of strategies, we gathered higher percentages for one-option answers than for combined use answers.

Within the text-level strategies, there are two further sub-sections: the first seeks information about normal reading behaviour of the subjects, and the strategies used; whereas the second attempts to depict the staretgies they use when a comprehension failaure occurs. Results of the first sub-section denote that most of the respondents are strategic readers in the sense that their choices are on the whole oriented towards effective strategies use. Furthermore, the majority of the respondents seems to approach the reading material by single rather than combined use of strategies (for six questions out of seven the higher percentages, sometimes up to 80% of the answers, include using one strategy).

Results of the second sub-section, on the other hand, show that when the subjects fail to understand a sentence, they (60%) are almost equally divided between those who use such effective strategies as 'putting the sentence in context' (27%), and those who use a rather less effective strategy by 'reading the sentence word by word' (26%). The other 40% of the respondents combine between both effective and less effective strategies. As concerns the last question in this section about how students deal with a difficult text, the results reveal that rather than giving up reading, students favour rereading the text, asking for help, or consult other references with a related topic.

Concerning post-reading strategies, the overwhelming majority of students (85.22%) seems to use such strategies either to ascertain that comprehension has taken place, or to summarize the comprehended information.

As for comprehension difficulties facing our subjects, they seem to be located at more than one level, with a particular emphasis on poor vocabualry knowlege (68.18%), then on grammar (52.27%). On the other hand, the psychological factors that may hinder their comprehension have to do with losing concentration, or not lack of confidence.

5.3. Results of the Think-aloud Procedure

As it was posited in chapter three (section 3.2.2.3), protocol coding is an interpretative act and the same data could be subjected to quite different analyses. In this study, the subjects' think-aloud reports are examined to ascertain whether differences in strategy use existed between high and low-achievers. More specifically, they are analyzed to test the hypothesis that both sub-groups differ in their bottom-up, top-down strategies use, with high-achievers using more top-down strategies than low-achievers.

After the collection of data, and the identification and categorization of the strategies, the verbal protocols reported by the subjects are analyzed quantitatively − subjected to statistical analysis including frequencies, percentages and means- then they will be analyzed qualitatively, i.e. interpretatively in terms of the categories of strategies used.

5.3.1. Quantitative Data Analysis
The frequencies for strategy use by the whole groups are given in the tables below.

Table 61: Frequency of Text-initiated Strategy Use

Students	01	02	03	04	05	06	07	08	09	10	Total
(A) Text-initiated Strategies											
(i) word-related Strategies											
Analyzing the grammatical form	09	03	19	06	11	01	09	04	07	02	**71**
Relating word with a French word	30	26	40	22	20	04	06	05	09	05	**167**
Relating word with an Arabic word	-	02	01	01	09	01	09	10	13	05	**51**
Relating word with an English word	01	-	08	04	13	03	01	01	-	02	**33**
Using context	03	01	05	05	08	04	02	02	01	-	**31**
Skipping	-	03	11	01	01	-	-	-	-	-	**16**
Questioning (word-related)	02	05	14	00	07	02	04	29	03	08	**74**
Stated failure to understand a word	24	20	43	28	20	24	55	35	25	53	**327**
Expressing need for a dictionary	22	11	22	13	04	-	22	26	25	28	**173**
Sub-total (01)	**91**	**71**	**163**	**80**	**93**	**39**	**108**	**112**	**83**	**103**	**943**
%	**41.17**	**49.65**	**51.09**	**42.32**	**41.33**	**34.51**	**54.27**	**57.73**	**41.91**	**54.78**	**47.41**
(ii) Sentence-related Strategies											
Rereading	19	19	40	31	41	14	30	10	33	20	**257**
Relating sentence with what precedes	02	03	02	-	-	01	-	-	01	01	**10**
Questioning (idea-related)	02	01	09	-	06	-	-	03	01	08	**30**

Reading word by word	-	01	-	-	-	-	06	03	02	01	**13**
Reading aloud	-	01	-	-	-	01	-	08	01	11	**22**
Sub-total (02)	**23**	**25**	**51**	**31**	**47**	**16**	**36**	**24**	**38**	**41**	**332**
%	**10.40**	**17.48**	**15.98**	**16.40**	**20.88**	**14.15**	**18.09**	**12.37**	**19.19**	**21.80**	**16.69**
(ii) Text-related Strategies											
Expressing need to reread paragraph	03	02	01	03	01	03	01	01	01	02	**18**
Establishing link of the title with text	01	-	01	-	-	-	-	-	-	-	**02**
Sub-total (03)	**04**	**02**	**02**	**03**	**01**	**03**	**01**	**01**	**01**	**02**	**20**
%	**01.80**	**01.39**	**00.62**	**01.58**	**00.44**	**02.65**	**00.50**	**00.51**	**00.50**	**01.06**	**01**
	118	**98**	**216**	**114**	**141**	**58**	**145**	**137**	**122**	**146**	

Table 62: Frequency of Reader-initiated Strategy Use

Students	01	02	03	04	05	06	07	08	09	10	
B) Reader-initiated Strategies											
Guessing	16	02	03	07	10	-	07	-	01	05	**51**
Rejecting or Confirming guess	03	02	08	02	07	01	01	01	02	-	**27**
Inferencing	07	01	08	05	02	01	-	01	04	-	**29**
Invoking prior knowledge	27	01	20	23	19	04	05	11	06	05	**121**
Addition of information	06	03	07	03	04	-	01	06	02	03	**35**
Reading on	14	14	19	04	12	17	16	05	08	01	**110**
Evaluating comprehension Progress	30	21	33	25	28	29	24	26	43	20	**279**
Predicting	-	-	03	06	01	-	-	-	-	-	**10**
Paraphrasing	-	01	02	-	01	03	00	01	04	05	**17**
Adjusting the reading rate	-	-	-	-	-	-	-	04	03	01	**08**
Expressing feeling	-	-	-	-	-	-	-	02	03	02	**07**
Sub Total (04)	**103**	**45**	**103**	**75**	**84**	**55**	**54**	**57**	**76**	**42**	**694**
%	**46.60**	**31.46**	**32.28**	**39.68**	**37.33**	**48.67**	**27.13**	**29.38**	**38.38**	**22.34**	**34.89**
Total	**221**	**143**	**319**	**189**	**225**	**113**	**199**	**194**	**198**	**188**	**1989**

The tables above represent two sections A, and B. Table 61 (Section A) which consists of the text-based strategies is divided into three sub-sections: word-related, sentence-related, and text-related strategies.   Table 62 (Section B) consists of the reader-based strategies.

The tables show the number of strategies used by each student (sub-totals (01), (02), and (03) in Section A and sub-total (04) in Section B). In addition, the corresponding percentage for sub-sections is calculated by adding the figures in sub-total A and sub-total B, then dividing each sub-total by the global number of strategy of both sections. Thus, say for student 01, the number of text-related strategies is 97 strategies distributed as follows: 91 (41.17%) for word-related strategies, 23 (10.40%) for sentence-related strategies and 04 (01.80%) for text-related strategies as shown in sub-total A (01), (02), and (03). Additionally, sub-total B shows that the number of reader-based strategies (for student 01) is 103 (46.60%). Adding these sub-totals from both Sections A and B will give a total of 221. This figure indicates the instances of strategy use attributed to student 01. To obtain the percentage of word-related strategy use by the same student, we divide 91 by 221 and we get 41.17%.

On the other hand, the totals that appear on the right side of the table indicate the sum of an individual strategy use by the whole group. For instance there were 71 instances of the use of the strategy of *analysing the grammatical form* by the whole group.

There were 1989 instances of stratgy use. The frequency of each strategy is shown in tables 61 and 62 above, together with the corresponding percentages. Using these frequencies and percentages, the strategies were ranked accordingly from the highest percentage to the lowest. The result of the ranking is presented in table 63 below.

Table 63: Ranking of Strategies as Used in Think-aloud Procedure

Rank	Strategy	Total	%	Mean
01	Stated failure to understand a word	327	16.45	32.7
2	Evaluating comprehension progress	279	14.02	27.9
3	Rereading	257	12.92	25.7
4	Expressing need for a dictionary	173	08.70	17.3
5	Relating word with a French word	167	08.40	16.7
6	Invoking prior kowledge	121	06.10	12.1
7	Reading on	110	05.53	11
8	Questioning (word-related)	74	03.72	07.4
09	Analysing grammaticl form	71	03.57	07.1
10	Relating word with an Arabic word	51	02.57	05.1
10	Guessing	51	02.57	05.1
12	Addition of information	35	01.76	03.5
13	Relating word with an English word	33	01.66	03.3
14	Using Context (word-related)	31	01.56	03.1
15	Questioning (sentence-related)	30	01.50	03
16	Inferencing	29	01.46	02.9
17	Rejecting/confirming guess	27	01.36	02.7
18	Reading aloud	22	01.10	02.2
19	Expressing need to reread paragraph/Text	18	00.90	02.8
20	Paraphrasing	17	00.85	01.7
21	Skipping	16	00.80	01.6
22	Reading word by word	13	00.65	01.3
23	Predicting	10	00.50	01
23	Relating sentence with what precedes/ follows	10	00.50	01
25	Adjusting the reading rate	08	00.40	00.8
26	Expressing feeling	07	00.35	00.7
27	Establishing link beween table and text	02	0.10	00.2

It is clear from table 63 that 'stated failure to understand a word' was the strategy which was used most. It makes up 327 (16.45%) of the total number (1989) of strategy use, 25.25% of the total number of text-related strategies, and 34.67% of the total number of word-

initiated strategies (943). This high percentage reflects the subjects' poor vocabulary knowledge.

The following table displays the frequency and percentage of strategy use of each of the two sections; that is text-initiated (word-related, sentence-related and text-related) strategies section and reader-initiated strategies section.

Table 64: Frequency and Percentage of Type of

Strategy Use (Think-aloud Procedure)

Strategy Type	N	%
A. Text-initiated	1295	65.10
(i) Word-related	943	47.41
(ii) Sentence-related	332	16.69
(iii) Text-related	20	01
B. Reader-initiated	694	34.89
Total	1989	

Results in this table reveal a higher use of text-initiated strategies (65.10%) than reader-initiated strategies (34.89%). As for text-initiated strategies, 72.81% of strategy use is focused on individual word focus such as questioning word meaning, analyzing grammatical form, then, to a rather low level comes the sentence-related strategies with only 16.69%. Finally, text-related strategies obtained only 01% of use.

5.3.2. Qualitative Data Analysis

The twenty seven distinctive strategies that have been identified in the participants' think-aloud protocols holistically illustrate the efforts that these ESP readers have exerted in comprehending an English expository text. Moreover, the results indicate that the participants choose a variety of on-line strategies in order to make sense of what they read.

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It is clear from the above tables that 'stated failure to understand a word' which is a problem-identification strategy (Olshavsky, 1977) was the strategy most used by the participants. It makes up 16.45% of the total number of strategies used. This is but an indication of the importance the subjects attribute to vocabulary while reading in English. Vocabulary was obviously an obstacle to comprehension. Thus, they spent more time and demonstrated more strategy use in working out the meaning of words. This focus on vocabulary prevented the readers from paying more attention to the overall text for getting the author's view. Another explanantion why the participants focused so much on the vocabularies might be related to the process in which they learned English. English is taught on a bottom-up fashion, and vocabularies are usually taught with meaning isolated from the text and sometimes on one-to-one translation base. The subjects' constant expressed need for a dictionary together with the high rate of relating the unknown word with a French word showed that the words were memorized for their own sake. The bottom-up learning process might condition the participants' way of approaching the English text.

Evaluating comprehension or monotoring comprehension is the second mostly used strategy. It makes uo 14% of global strategy use.This strategy is of particular importance for L2 readers; it is in fact seen as a hallmark of strategic reading (Casanave, 1988, and Block, 1992). It is one kind of metacognitive behaviour which involves the use of self-regulatory mechanisms which allow the readers to judge whether they have understood what they read and decide whether to take compensatory, corrective action when necessary.

The participants constantly checked whether comprehension was taking place or not. In the latter case, they adopted repair strategies as rereading (12.92%), expressing need for a dictionary (08.69%), relating the unknown word with a French word (08.39%) invoking prior knowledge (06.08%), and reading on (05.53%).

Other fix-up strategies with relatively lower percentages were also used. They involve questioning (03.72%), analyzing the grammatical form of the word (03.52%), and guessing (02.52%). Together, they constitute 12.36% of strategy use. The other remaining sixteen strategies, constituting 15.40% of strategy use can be grouped into those which obtained between 01.75% and 01.10% of strategy use (eight strategies), and those which obtained between 0.90% and 0.10% (eight strategies).

So, on the whole, we notice that 41.61% of fix-up strategies are concentrated in five strategies, and 27.76% of strategies are widely dispersed between twenty strategies with percentages varying between 03.56% and 0.10%.

5.3.3. Discussion of the Results of the Think-aloud Procedure

Think-aloud proved useful as a data collecting procedure and a research tool providing a direct access to the readers' cognitive processes. In addition, this technique has provided us with the means of making some of the readers' on-line strategies transparent. The chief benefit of the procedure has been the wealth of data which it has generated regarding the readers' current level of comprehension. It has also been extremely revealing about the dynamics of comprehension difficulties.

The results of think-aloud procedure revealed that the subjects engaged in three main categories of reading strategies: constructing meaning, monitoring comprehension, and activating strategies to reach comprehension. Concerning comprehension difficulties, the subjects were confronted with unknown vocabulary which some times constituted one of the obstacles to text comprehension. In certain contexts, a sentence or even an entire paragraph migh be incomprehensible because of the occurrence of even a small number of unknown vocabualry items.

The protocols analysis also revealed that the participants used a variety of strategies to attack the unknown vocabulary items. After they identified the problematic words, they resorted to the dictionary, sometimes decoded the components of the words for meaning, and sometimes inferred the meaning from the contexts and their own general knowledge.

Conclusion

The present study can be said to have a number of theoretical contributions. First, it has revealed the subjects' level in reading in English, and second, it depicted the various difficulty areas has laid out a picture of the components of reading comprehension.

The findings of the reading comprehension test should be viewed in the light of its limtations. Firstly, the variability of the test scores might have been affected by the question types so widely ranging between (cloze, matching, table/figure completion, and MCQ). Secondly, despite the familiarity of the test-takers with the texts topics, namely, *Nutrition, Metabolism, and Biosynthesis and Indicators of Microbial Food Spoilage,* the test did not control the effect of text type on the variance of test scores. Our findings also suggest that more research is needed on ESP reading context, especially in the Algerian context, to determine comprehension difficulties as well as to identify the factors undelying the students reading performance. In addition, questions about the relationship between lexical knowledge and comprehension should be further explored.

The outcome of the questionnaire analysis showed that the students' approach is predominantly effective. Furhtermore, results of the questionnaire denote that most of the respondents are strategic readers in the sense that their choices are on the whole oriented towards effective strategies use. Furthermore, the majority of the respondents seems to approach the reading material by single rather than combined use of strategies.

Strategies identified through the protocols were analysed in order to examine the reading behaviour of the subjects as they attempted to comprehend the reading text. The analyses have provided clearer understanding on the types and frequencies of strategies used. This in turn revealed how the students went about comprehending the text when asked to think aloud during reading. The findings of this experiment should also be viewed in the light of its limtations. First, although the technique is a widely used method to investigate the learners' reading processes, the protocols are still limited in how much light they can throw on these processes. Second, as is the case of most prcoess studies, it is difficult to draw strong generalizations due to the limited number of participants.

CHAPTER SIX:

ANALYSIS   OF   THE   RESEARCH   HYPOTHESES

Introduction

This chapter deals with analysis and interpretation of the results obtained from the three data collection instruments, namely the test, the students' questionnaire and the think-aloud procedure. It aims at testing the research hypotheses raised in this study which consist mainly in eliciting and depicting high and low-achievers' differences in vocabulary level and strategy use.

6.1. Hypothesis One

Hypothesis: There is a statistically significant difference between high-achievers and low-achievers as far the use of effective and less-effective strategies:

High-achievers >Low-achievers

Null Hypothesis: There is no statistically significant difference between high-achievers and low-achievers as far the use of effective and less-effective strategies:

High-achievers= Low-achievers

This first hypothesis requires both a qualitative and quantitative analysis in terms of effective versus less-effective strategies by comparing the subjects' answers in the questionnaire (Q10-Q25). The analysis covers the pre-reading, while-reading, and post-reading strategies. The total number of strategies contained in the questionnaire is sixty strategies: thirty seven effective twenty three less-effective. Effective strategies are marked with an asterisk (*).

10. You read in English because you:

a) You find the topic interesting.*

b) You have questions to answer about the text.*

c) You want to learn English.

d) Other: Please, specify …………………………………………………………

Table 65: Frequency of Answers for 'Setting a Purpose

for Reading' (02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a*	16	55.17	14	48.27
b*	08	27.58	10	34.48
C	14	48.27	17	58.62

Table 66: Overall Use of Effective and Less-effective

Strategies for 'Setting a purpose for Reading'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	24	63.16	24	58.54
Less-effective	14	36.84	17	41.46
Total	38	100	41	100

By adding the answers for the three options and calculating the percentages of effective and less-effective strategies use, we notice that both sub-groups gave an equal number (24) for effective strategies and that although low-achievers use a slightly bigger number of strategies, their use of less-effective strategies is higher than that of high-achievers.

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11. Before reading the whole text, you:

a) Guess the general idea from the title.*

b) Read headings and subheadings to predict the content of the text. *

c) Read the first and the last sentences of the text.

d) Read the introduction and the conclusion before you decide to read the whole text.

Table 67: Frequency of answers for 'Previewing'(02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a*	20	68.96	18	62.06
b*	18	62.06	12	41.37
c	01	03.44	04	13.79
d	05	17.24	05	17.24

We can notice very high percentages for both effective strategies use by both sub-groups. By adding the answers for both effective and less-effective strategies we obtain the following table:

Table 68: Overall Use of Effective and Less-effective

Strategies for 'Previewing'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	38	86.36	30	76.92
Less-effective	06	13.64	09	23.08
Total	44	100	39	100

The high-achievers' use of effective strategies is higher than that of low-achievers; conversely, the rate of less-effective strategies use is significantly lower for the former.

12. Before reading a text, you:

a) Form hypotheses about the text meaning.*

b) Make analogies to your own experience by linking previous knowledge with new information.*

c) Predict the content of the text.*

d) Do not do any of the above, and simply decide to read it or not.

e) Other: Please, specify …………………………………………………………………..

Table 69: Frequency of answers for 'Making Predictions' (02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a*	08	27.58	08	27.58
b*	10	34.48	15	51.72
c*	19	65.51	11	37.93
d	08	27.58	08	27.58

The majority of respondents from both sub-groups tends to activate one or more pre-reading strategies such as 'forming hypotheses', 'activating prior knowledge' or 'making predictions about the text content'. On the other hand an equal number of respondents (08) from both sub-groups said they do not use any one of the proposed options, but simply start reading.

Table 70: Overall Use of Effective and Less-effective

Strategies for 'Making Predictions'

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
Effective	37	82.22	34	80.96
Less-effective	08	17.78	08	19.05
Total	45	100	42	100

Figures in the table indicate very close percentages for effective strategies use for both sub-groups and an equal number of responses for less-effective ones.

The total number of effective Vs less-effective pre-reading strategies for both high and low-achievers is summarized in the table below.

Table 71: Overall Use of Effective and Less-effective

Use of 'Pre-reading' Strategies

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
Effective	99	77.95	88	72.14
Less-effective	28	22.05	34	27.87
Total	127	100	122	100

Figure 11: Overall Use of Pre-reading Strategies
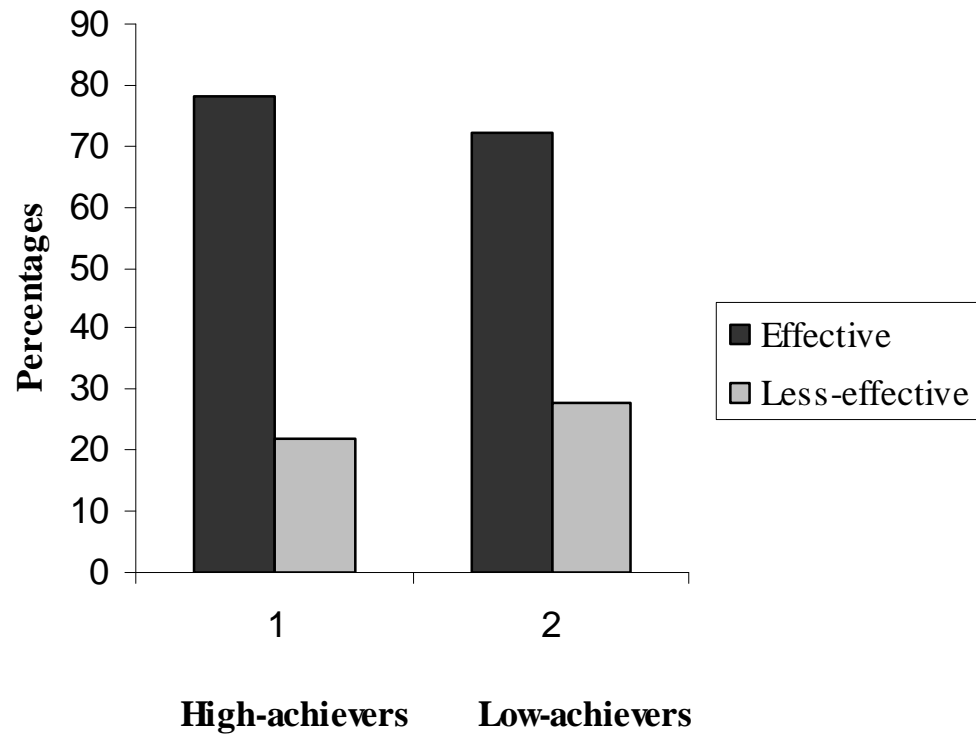
Overall, we can say that high-achievers use more strategies than low-achievers, and more importantly that the use of less-effective strategies is significantly higher for low-achievers.

13. In the process of reading, you think:

a)   All the words are important.

b)   Some words can be skipped without disturbing understanding.*

c)   You need to look in the dictionary for the words you don't know.

Table 72: Frequency of answers for 'Importance

laid to vocabulary'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a	05	17.24	08	27.58
b*	07	24.13	15	51.72
c	22	75.86	14	48.27

The figures in the table indicate that high-achievers rely more heavily on the dictionary than do low-achievers, and that there are more students from the low-achievers sub-group who use the 'skipping' strategy than high-achievers. Finally, only five students from high-achivers say that they consider all the words in a reading passage to be of equal importance against eight for low-achievers.

Table 73: Overall Use of Effective and Less-effective

Use of 'word-level' Strategies

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	07	20.59	15	40.55
Less-effective	27	79.42	22	59.46
Total	34	100	37	100

By adding together the answers for the above question, we can see that for the first time low-achievers give a higher number of answers than high-achievers and that the former also gave a higher rate for effective strategies use than the latter. The percentage of less-effective strategy use is also significantly higher for low-achievers.

14. If you come across a word you do not know, you:

a) Skip the word and come back to it later.

b) Guess what the word might mean and go on.*

c) Guess what the word might mean and reread the sentence.*

d) Look up the word in a dictionary and write the English meaning on the page.

Table 74: Frequency for 'Handling a Vocabulary Problem' (02)

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
a	05	17.24	07	24.13
b *	09	31.03	05	17.24
c *	13	44.82	09	31.03
d	23	79.31	20	68.96

Here again, we can notice that there are more students from low-achievers who skip words, and more high-achievers who rely on the dictionary. Concerning the use of the 'guessing' strategy, the higher percentages are obtained by high-achievers. By adding the answers for effective and less-effective strategies we obtain the following table:

Table 75: Overall Use of Effective and Less-effective

Strategies for 'Handling a Vocabulary Problem'

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
Effective	22	44	14	34.15
Less-effective	28	56	27	65.85
Total	50	100	41	100

The percentage of effective strategies use is significantly higher for high-achievers. As for less-effective strategies use, although the margin of answers for both sub-groups is narrow, the percentage is higher for low-achievers, given the smaller number of global answers.

15. To guess what an unfamiliar word might mean, you:

   a) Consider what the rest of the sentence says.*

   b) Consider what the rest of the paragraph says.*

   c) See whether the word looks like an English word you know.*

   d) See whether the word looks like a French word you know.*

   e) Analyze the grammatical form of the word.*

   f) Do not do any of the above.

Because options (a) and (b) both refer to putting the word into context to guess its meaning we decided to put them under one option, (a), similarly since options (c) and (d) consist in relating the word to another word, be it an English or a French word, we combined the frequencies of both answers into one total. We thus obtain four instead of six options for this question, as it is indicated in the table below.

Table 76: Frequency of Answers for 'Guessing word meaning' (02)

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
a*	17	58.62	07	24.13
b*	27	93.10	23	79.31
c*	19	65.51	15	51.72
Total	63	-	45	-

As can be read from the above table, all the respondents use one or more strategies to guess the word meaning at varying degrees of use, but the option which gathered most answers is 'relating word with an English or a French word', followed by the strategy of 'analyzing the grammatical form of the word. 'Using context' is the strategy which came last with the smallest rate of answers.

The total number of effective Vs less-effective while-reading strategies at the word-level for both high and low-achievers is summarized in the table below.

Table 77: Overall Use of Effective and Less-effective

Strategies for 'word-level Strategies'

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
Effective	92	62.58	74	60.16
Less-effective	55	37.41	49	39.83
Total	147		123	

Figure 12: Overall Use of Word-level Strategies

High-achievers   Low-achievers
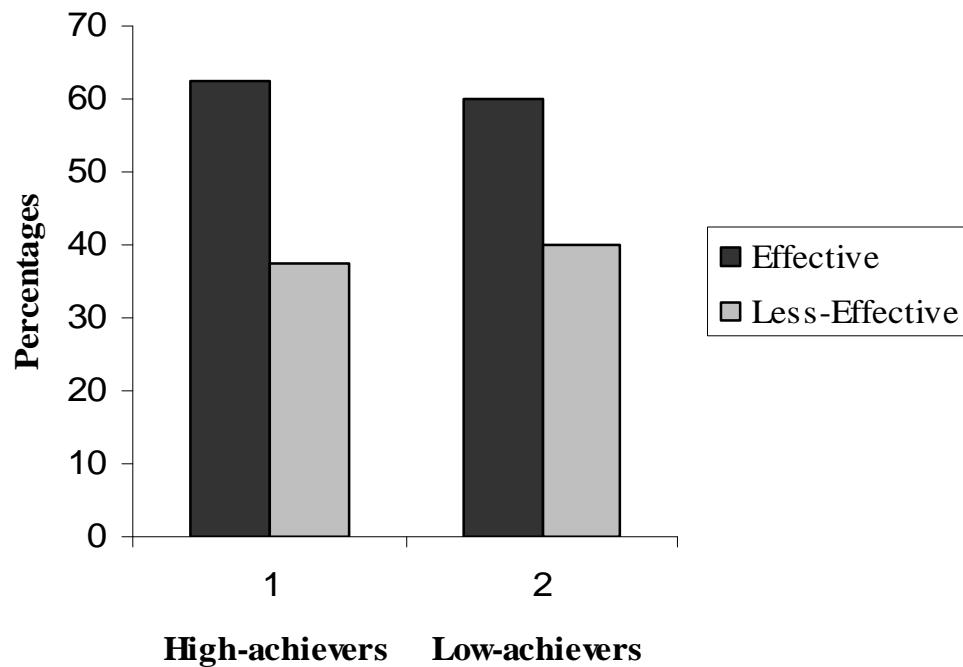
Overall, we can notice that the number of effective strategies used at the word level is significantly higher for high-achievers than for low-achievers. We can also notice that the frequency of use of less-effective strategies is also obtained by high-achievers, but it is the low-achievers who obtained a higher percentage because the global number of strategies they used is smaller.

16. You read English passages:

   a) The same way because English passages are usually difficult for you.

   b) The same way because they are in English.

   c) Differently depending on what you need to learn from them.*

   d) Differently depending on what kind of passages they are.*

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Table 78: Frequency of answers for 'Adjusting the

reading Rate' (02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
A	04	13.79	06	20.68
B	02	06.89	01	03.44
c*	16	55.17	11	37.93
d*	10	34.48	08	27.58

Again, we notice that the percentages related to effective strategies use are higher than those related to less-effective strategies for both sub-groups, but with the low-achievers obtaining a higher percentage for less-effective strategies. The table below gives more details as to the overall effective and less-effective strategy use.

Table 79: Overall Use of Effective and Less-effective

Strategies for 'Adjusting the reading rate'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	26	81.25	19	73.08
Less-effective	06	18.75	07	26.92
Total	32	100	26	100

We can notice a wide margin of differences regading effective and less-effective strategies use by both sub-groups, with high-achievers obtaining a higher rate for the former and a lower rate for the latter type of strategies.

17. To find the main idea(s) of a reading passage you read:

a) The title only.

b) The topic sentence only.

c) The headings only.

d) All of them.*

Table 80: Frequency of Answers for 'Identifying Main Ideas' (02)

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
A	02	06.89	07	24.13
B	02	06.89	10	34.48
C	03	10.34	04	13.79
d*	11	37.93	13	44.82

As stated in chapter five, all the options proposed in this question are indeed effective, but we put an asterisk just for the last one because using any one of the first three options alone would not allow the reader to identify the main ideas effectively unless it is combined with the other two. The higher rate for effective strategy use is obtained by low-achievers. There is also a bigger number (21) from the latter group who opted for a single strategy approach than from the former (07). By adding together the global answers of each sub-group, and then calculating percentages, we can make a different reading of the results as follows:

Table 81: Overall Use of Effective and Less-effective

Strategies for 'Identifying Main Ideas'

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
Effective	11	61.12	13	38.24
Less-effective	07	38.88	21	61.76
Total	18	100	34	100

Now, the percentages obtained for each sub-group show clearly the dominance of high-achievers as to effective strategy use over low-achievers. Conversely, the rate of low-achievers' use of less-effective strategies is significantly higher than that of high-achievers.

18. To find detail in a reading passage you:

a) Read only the part you are interested in.

b) Pay attention to all the information in the text.*

c) Read more than one time in order to understand what the writer stated or implied.*

Table 82: Frequency of Answers for 'Reading for Details' (02)

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
a	09	31.03	13	44.82
b*	04	13.79	04	13.79
c*	22	75.86	16	55.17

As can be read from the table, the highest percentage is obtained for option 'c', that is in order to find details in a reading passage, the subjects would 'read more than one time to understand what the writer stated or implied'. A smaller proportion of students would 'read

only the part it is interested in'. Finally, a smaller and equal number of respondents from both sub-groups said that they would 'pay attention to all the information in the text'. Now, if we add the answers of each sub-group together then compare the results, we will obtain a better idea about 'effective and less-effective strategies use by both sub-groups.

Table 83: Overall Use of Effective and Less-effective

Strategies for 'Reading for Details'

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
Effective	26	74.29	20	60.60
Less-effective	09	25.72	13	39.40
Total	35	100	33	100

Overall, high-achievers did make use of effective strategies more than did low-achievers; whereas, low-achievers' rate of less-effective strategies is significantly higher.

19. To find a specific information in a reading passage, you:

a) Read continually until you find specific information you need.

b) Look through the text as quickly as possible until you reach the relevant part to get the information you want.*

c) Look for clues. *

d) Other: Please, specify…………………………………………………………………….

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
A	09	31.03	06	20.68
B	16	55.17	13	44.82
c*	12	41.37	17	58.62

More respondents from both sub-groups opted for effective strategies than those who opted for less-effective ones. The table below gives more details about the overall use of these two types of strategies.

Table 85: Overall Use of Effective and Less-effective

Strategies for 'Reading for Specific Information'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	28	75.68	30	83.34
Less-effective	09	24.32	06	16.67
Total	37	100	36	100

On the whole, we can see a higher percentage for effective strategies use by high-achievers and a significantly higher rate for less-effective strategies use by low-achievers.

20. When a reading passage has a title, you:

a) Read the title but do not consider it as you read the passage.

b) Read it first and predict what the passage will be about.*

c) Think about what you already know and how it might relate to the title.*

Table 86: Frequency of Answers for 'Using Titles' (02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a	03	10.34	04	13.79
b*	19	65.51	17	58.62
c*	21	72.41	19	65.51

Most students from both sub-groups use the title either to activate their prior knowledge or to guess what the reading passage might be about. A relatively smaller number of respondents said that they do not relate the title to what they read.

Table 87: Overall Use of Effective and Less-effective Strategies for 'Using Titles'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	40	93.02	36	90
Less-effective	03	06.98	04	10
Total	43	100	40	100

As for most questions, the above table indicates a clear dominance of high-achievers in respect of effective strategies use. Concerning less-effective strategies use, although the margin of answers for both sub-groups is narrow, the percentage is higher for low-achievers, given the smaller number of global answers.

21. When a reading passage has illustrations, you:

a) Look at the illustrations and guess what the reading passage might be about.*

b) Look at the illustrations without relating them to the reading passage.

c) Expect the reading passage to reflect what is in the illustrations.*

d) Compare what is in the illustrations to what you read. *

Table 88: Frequency of Answers for 'Using Illustartions' (02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a*	09	31.03	12	41.37
b	02	06.89	04	13.79
c*	08	27.58	12	41.37
d*	25	86.20	19	65.51

Here too, the majority of respondents from both sub-groups say they make use of illustrations as a complementary support for the processing of the verbal information in order to achieve a complete understanding of the text. Only six students from both sub-goups say they do not use them.

Table 89: Overall Use of Effective and Less-effective

Strategies for 'Using Illustrations'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	42	95.46	43	91.48
Less-effective	02	04.54	04	08.52
Total	44	100	47	100

We can notice in the above table very high percentages for effective strategies use by both sub-groups with a slightly higher percentage fo high-achievers. The rate of less-effective strategies although low, is lower for high-achievers.

22. If you do not understand the meaning of a sentence, you:

a) Read it word by word.

b) Guess the meaning from the general context.*

c) Relate it with the preceding and the following sentences.*

d) Ignore it.

Table 90: ' Frequency of Answers for 'Handling a

Reading Problem'(Sentence-level) (02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a	21	72.41	20	68.96
b*	07	24.13	07	24.13
c*	12	41.37	10	34.48
d	04	13.79	04	13.79

A careful reading of the figures in the table gives us an idea the approach followed in order to handle a reading problem related to the sentence which is roughly the same for both sub-groups. The approach consists in first reading the sentence word by word, then if comprehension is not reached, the students will relate it with the preceding or following sentences, or put it in context to guess its meaning. An identical number of students (04) from both sub-groups say they would ignore the sentence. If we add up the answers together, we obtain a better idea about effective and less-effective strategies use as follows:

Table 91: Overall Use of Effective and Less-effective

Strategies for 'Handling a Reading Problem'

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
Effective	19	43.18	17	41.46
Less-effective	25	56.82	24	58.54
Total	44	100	41	100

The table displays considerable differences between high and low-achievers, with the former obtaining a higher rate for effective strategies and a lower rate for less-effective strategies.

23. In facing any problem in grasping the text meaning, you:

a) Read it many times.

b) Give up reading.

c) Ask for help.*

d) Consult other reading references related to the same topic.*

Table 92: Frequency of Answers for 'Handling a Reading

Problem' (Text-level) (02)

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
a	21	72.41	22	75.86
b	02	06.89	03	10.34
c*	16	55.17	16	55.17
d*	09	31.03	04	13.79

The figures in the above table reflect the way the students tackle a difficult text. First, they would read it many times; then they would ask for help. Finally, they would consult other references with a related topic. Only five students from both sub-groups would give up reading.

Table 93: Overall Use of Effective and Less-effective Strategies
for 'Handling a Reading Problem' (Text-level)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	25	52.08	20	44.45
Less-effective	23	47.92	25	55.55
Total	48	100	45	100

On the whole, more students from the high-achievers sub-group would make us of effective strategies to deal with a reading problem; however, the weak margin between effective and less-effective strategies use is clearly noticeable for both sub-groups, though it is slightly higher for high-achievers regarding effective strategies and slightly higher for low-achievers concerning less-effective strategies.

24. While reading, to understand the text, you:

a)   Underline the main ideas.*

b)   Make an outline. *

c)   Take notes.*

d)   Do not write anything; just keep the information in your mind.

e)   Other: Please, specify ………………………………………………………

Table 94: Frequency of Answers for 'Editing' Strategy (02)

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
a*	10	34.48	11	37.93
b*	09	31.03	08	27.58
c*	17	58.62	18	62.06
d	05	17.24	07	24.13

As it is indicated by the table, we can see that an important of respondents from both sub-groups use 'editing' as an aid to comprehension, but the most frequently used method is 'taking notes', followed by 'underlining the main ideas'. 'Putting the main ideas in a diagram' is the least used method. A small proportion of respondents from both sub-groups say they do not use such a strategy. Below is the total number of responses made by both sub-groups.

Table 95: Overall Use of Effective and Less-effective

Strategies for 'Editing'

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	36	87.80	37	84.10
Less-effective	05	12.20	07	15.90
Total	41	100	44	100

The figures above show that the margin of responses between the two sub-groups is narrow, with clear dominance of effective strategies, but the percentage of high-achievers is slightly superior to that of low-achievers. Conversely, the latter's use of less-effective strategies is slightly superior to that of the former.

The total number of effective Vs less-effective while-reading strategies at the text-level for both high and low-achievers is summarized in the table below.

Table 96: Overall Use of Effective and Less-effective

for 'While-reading Strategies

	High-achievers (n=29)		Low-achievers (n=29)	
Option	N	%	N	%
Effective	253	73.98	235	67.92
Less-effective	89	26.02	111	32.08
Total	342	100	346	100

Figure 13: Overall Use of Text-level Strategies

High-achievere   Low-achievers
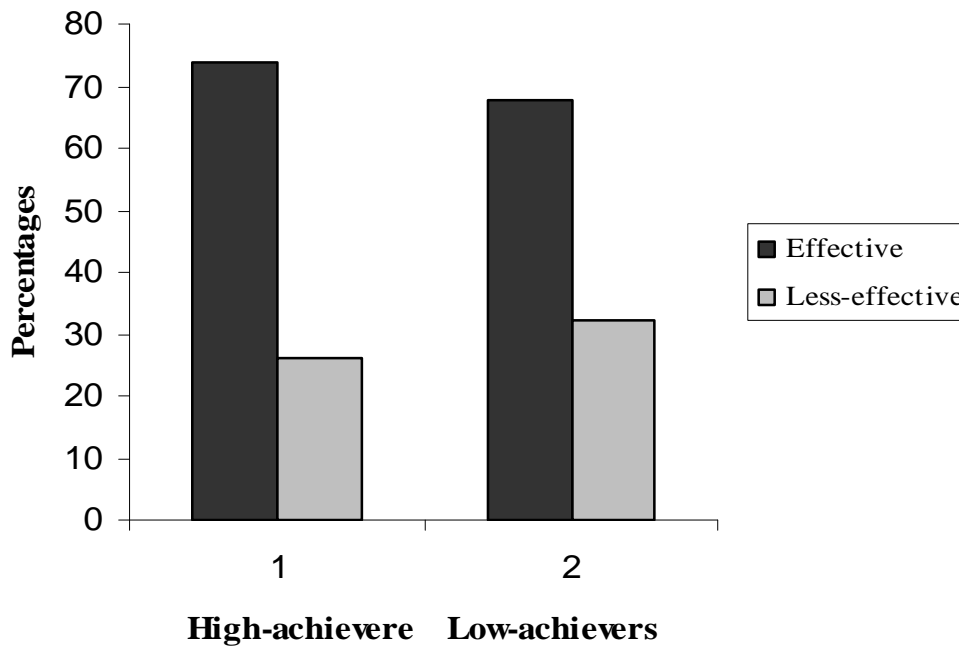
High-achievers outnumber low-achievers in terms of effective strategies use: 253 strategies for high-achievers against 235 for low-achievers. The percentage of the effective strategies is significantly higher than less-effective ones for both sub-groups, but is relatively

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higher for high-achievers. On the other hand, low-achievers exceed high-achievers in terms of 'less-effective' strategies use.

25. After reading the text, in order to determine if reading goals have been met, you:

a) Engage in self- questioning. *

b) Summarise the text.*

c) Outline the ideas.*

d) Other: Please, specify………………………………...

Table 97: Frequency of Answers for 'Post-reading Strategies' (02)

Option	High-achievers (n=29)		Low-achievers (n=29)	
	N	%	N	%
a*	18	62.06	14	48.27
b*	08	27.58	06	20.68
c*	17	58.62	12	41.37
Total	43	-	32	-

A large number of subjects from both sub-groups seem to be aware of the importance of post-reading strategies in consolidating and reflecting upon what has been read. This is reflected in rate of answers gathered for this question which is high for both sub-groups, but is significantly higher for high achievers. In spite of the difference in the percentages, respondents from both groups seem to agree on giving the same degree of importance to 'self-questioning', followed by 'outlining', followed by 'summarizing the text'.

Figure 14: Overall Use of Post-reading Strategies
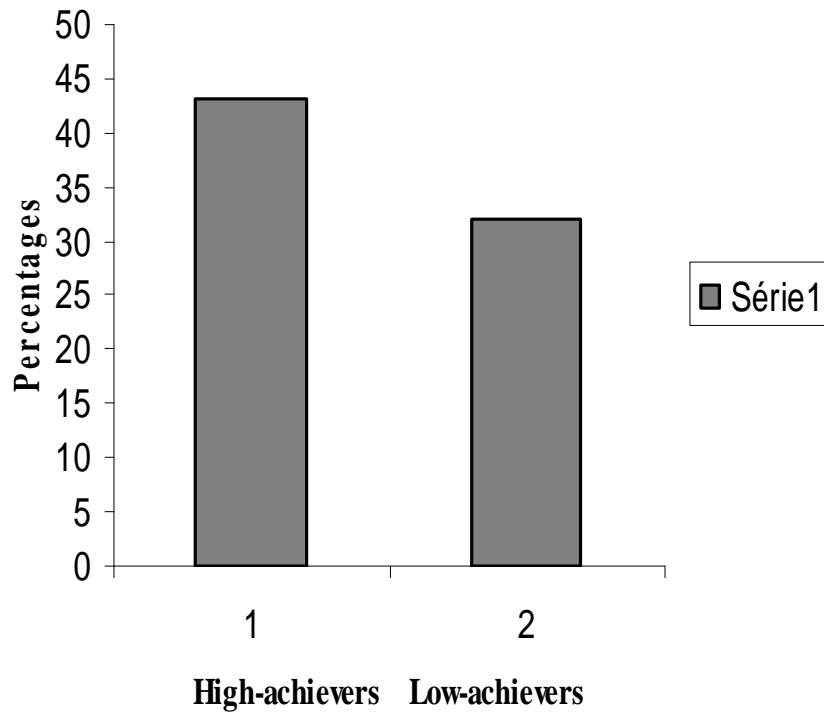
Now, if we add all the three sub-totals corresponding to the three sections of the questionnaire, namely pre-reading, while –reading, and post-reading strategies obtained above, we will have a better idea about the overall strategy types used by the two sub-groups. The following table diplays the information more clearly.

Table 98: Overall Effective Vs Less-effective Strategy Use by

High and Low-achievers

	High-achievers (n=29)			Low-achievers (n=29)		
	Eff.	Less.eff.	Sub-Total	Eff.	Less.eff.	Sub-Total
(a)Pre-reading Strategies	99	28	**127**	88	34	**122**
(b)While-reading strategies						
(i)Word-Level	92	55	**147**	74	49	**123**
(ii)Text-level	253	89	**342**	235	111	**346**
(c) Post-reading Strategies	43	-	**43**	32	-	**32**
Total	**487**	**172**	**659**	**429**	**194**	**623**
Percentage	73.90	26.10		68.86	31.14	

Figure 15: Overall Strategy Use

High-achievers Low-achievers

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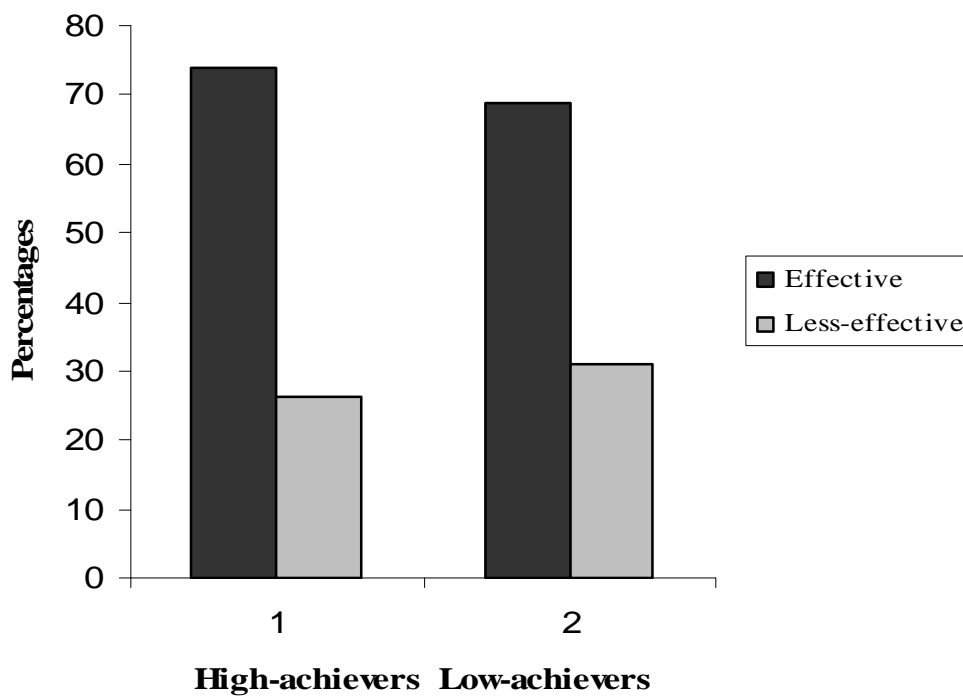
6.1.1. Hypothesis Testing

In order to statistically test the hypothesis, and because we have frequency data and percentages rather than numerical data, we used a two-proportion z-test, equal variances. This test is used to compare two proportions created by two random samples or two sub-groups of one random sample. The critical value of Z equals 1.96 which proves that there is 95% probability that the differences between the two sub-groups did not occur by chance.

Since the test statistic 1.99 (*) exceeds the critical value of 1.96, we conclude that there is a statistically significant difference between high-achievers and low-achievers concerning effective versus less-effective strategies use. Because the dichotomy effective/ less-effective strategies is symmetrical or complementary, it implies that there is a statistically significant difference between high and low-achievers as far as less-effective strategies. The above result permits the rejection of the null hypothesis that there is no statistically significant difference between high-achievers and low-achievers as far the use of effective and less-effective strategies.

6.1.2. Discussion

A careful reading of the results of the table above shows that for all the four sub-totals, corresponding to pre-reading, while-reading (word-level and text-level) and post-reading sections, it is the high-achievers who obtained higher rates for effective strategies and lower rates for less-effective strategies: 487 against 429 for effective strategies, and 172 against 194 for less-effective ones. If we convert the above totals into percentages, we obtain 73.89% against 68.86% for effective and 26.10% against 31.13% for less-efective for high-achievers and low-achievers respectively.

In sum, the overall approach is predominantly for effective use of strategies by both sub-groups, but high-achievers tend to use more effective strategies more than less-effective ones and to use the former more than low-achievers. This finding confirms the hypothesis above that the two sub-groups differ in their use of effective versus less-effective strategies, with high-achievers using more effective strategies than do low-achievers.

6.2. Hypothesis Two

Hypothesis: There is a statistically significant difference between high-achievers and low-achievers as far the use of bottom-up and top-down strategies: High-achievers > Low-achievers.

Null Hypothesis: There is no statistically significant difference between high-achievers and low-achievers as far the use of bottom-up and top-down strategies: High-achievers= Low-achievers.

6.2.1. Results of the Questionnaire

To test hypothesis two, we worked out a list of strategies including the above two types from the students' questionnaire. In order to have as accurate comparison as possible, we made sure we compare an equal number of bottom-up and top-down strategies (here six strategies for each type) as well as an equal number of options from the ones proposed in the questionnaire (here eleven options for each type). As far as the bottom-up strategies, we were cautious about the strategy type regarding the level at which it may operate. Hence our selection covers word-level, sentence-level, and text-level strategies.

Bottom-up strategies involve the use of the visual signs provided by the available text. The strategies chosen for scrutiny involve:

- Analysing the grammatical form of the word.

- Relating word with French or an English word.

- Using context (both for word and sentence meaning).

- Rereading.

- Reading sentence word by word.

- Skipping.

On the other hand, top-down strategies require the readers to use information from within themselves rather than from the visual text. Top-down strategies include:

- Guessing .

- Making predictions.

- Invoking prior knowledge.

- Self-questioning.

- Forming Hypotheses.

- Summarizing.

The following tables summarize information gathered from the students' questionnaire responses for both bottom-up and top-down strategy use.

Table 99: Frequency of Bottom-up Strategies Use by

High and Low-achievers (Questionnaire)

Strategy	High-achiev (n=29)		Low-achiev (n=29)	
	N	%	N	%
Analysing grammatical form	19	06.29	15	05.77
Relating word with a French or an English word	27	08.94	23	08.85
Using Context	36	11.92	24	09.23
Rereading	21	06.95	22	08.46
Reading the sentence word by word	21	06.95	20	07.69
Skipping	12	03.98	22	08.46
Sub-total A	**136**	**45.03**	**126**	**48.46**

By analysing the above table, we first notice that in terms of number, it is high-achievers who use a larger number of bottom-up strategies than low-achievers; however, it is the low-achievers' who obtained the higher percentage for bottom-up strategies use. Looking at the answers from the perspective of percentages gives us a different idea about the comprehension processes of both sub-groups. By comparing the percentages of individual strategies, we notice that high-achievers obtained higher rates for 'using context', 'relating the word with a French or an English word', and 'analyzing the grammatical form'; whereas, low-achievers obtained higher rates for 'skipping', 'rereading', and 'reading the sentence word by word'.

Furthermore, 'using context', 'relating the word with a French or English word', and 'rereading', although they obtained different rates by the two sub-groups, all ranked similarly as first, second, and third, respectively. On the other hand, 'reading the sentence word by word' ranked third with 'rereading' for high-achievers; whereas, it the strategy of 'skipping'

which came in the third position for 'rereading' for low-achievers. Moreover, 'analyzing the grammatical form' ranked fifth for high-achievers; whereas for low-achievers it is 'reading the sentence word by word' which came in the fifth position. Finally, 'skipping' comes in the last position for high-achievers, but it 'analyzing the grammatical form' which comes last for low-achievers.

Table 100: Frequency of Top-down Strategies Use by

High and Low-achievers (Questionnaire)

Strategy	High-achiev (n=29)		Low-achiev (n=29)	
	N	%	N	%
Guessing	82	27.15	61	23.46
Making Predictions	19	06.29	11	04.23
Invoking Prior Knowledge	31	10.27	34	13.08
Self-questioning	18	05.96	14	05.39
Forming Hypotheses	08	02.65	08	03.08
Summarizing	08	02.65	06	02.30
Sub-total B	**166**	**54.97**	**134**	**51.54**
Total	**302**		**260**	

Conversely, it is the high-achievers who obtained a higher rate and percentage for top-down strategies. Unexpectedly, the percentages are evenly distributed between the two sub-groups ; that is the high-achievers obtained higher percentages for three strategies, namely 'guessing', making predictions', and 'self-questioning' ; whereas, low-achievers obtained higher percentages in the other three strategies, namely 'invoking prior knowledge', 'forming hypotheses', and 'summarizing'.

As for the ranking of strategies, 'guessing' and 'invoking prior knowledge' ranked in the first and second position, respectively for both sub-groups. 'Making predictions' came in the third position for high-achievers; whereas, it is 'self-questioning' which comes in the the third position for low-achievers. This last strategy came in the fourth position for high-achievers; for low-achievers, it is the strategy of 'making predictions' which came in the fourth position. The least used strategies for both sub-groups are 'forming hypotheses' and 'summarizing'.

The figure below summarizes visually the two above tables.

Figure 16: Overall Use of Bottom-up/top-down Strategies

(Questionnaire)
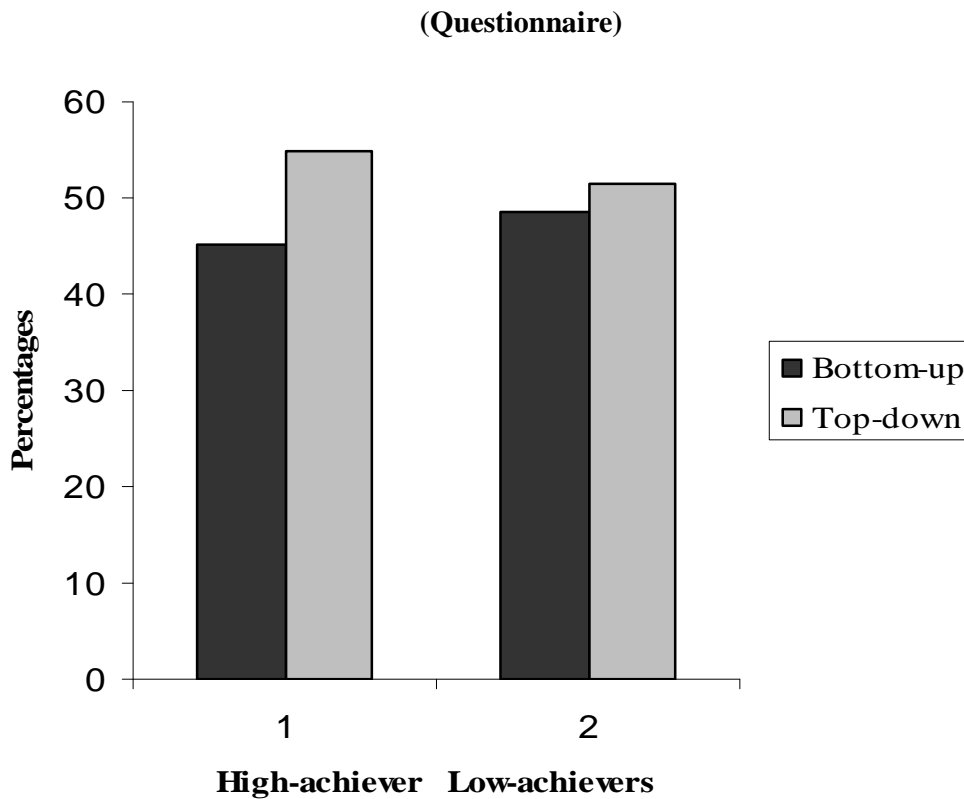
Overall, we can notice not only did the two sub-groups obtained very close percentages for bottom-up, top-down strategy use, but also obtained the higher percentages for top-down strategy use: 54.97% for high-achievers, against 51.54% for low-achievers. The

third finding concerns the ranking of the strategies. In this respect, we noticed that out of the twelve compared strategies, seven strategies were ranked similarly for both sub-groups.

6.2.2. Results of Think-aloud Protocols

For a further scrutiny of bottom-up and top-down-strategy use by both sub-groups we also compared the responses of the ten students who participated in the think-loud experience. The tables below display the obtained information for both sub-groups.

Table 101: Frequency of Text-initiated Strategies Use

(High-achievers)

Students	01	02	03	04	05	Total B	%
Text-initiated Strategies							
(i) word-related							
Analyzing the grammatical form	09	03	19	06	11	**48**	**04.38**
Relating word with a French word	30	26	40	22	20	**138**	**12.58**
Relating word with an Arabic word	-	02	01	01	09	**13**	**01.20**
Relating word with an English word	01	-	08	04	13	**26**	**02.37**
Using context	03	01	05	05	08	**22**	**02**
Skipping	-	03	11	01	01	**16**	**01.46**
Questioning (word-related)	02	05	14	-	07	**28**	**02.55**
Stated Failure to understand a word	24	20	43	28	20	**135**	**12.31**
Expressing need for a dictionary	22	11	22	13	04	**72**	**06.57**
Sub-total (1)	**91**	**71**	**163**	**80**	**93**	**498**	
Percentage	**41.18**	**49.66**	**51.10**	**42.33**	**41.33**	**45.40**	
(ii) Sentence-related							
Rereading	19	19	40	31	41	**150**	**13.67**
Relate sentence with what precedes	02	03	02	-	-	**07**	**00.64**
Questioning (idea-related)	02	01	09	-	06	**18**	**01.64**
Reading word by word	-	01	-	-	-	**01**	**00.09**
Reading aloud	-	01	-	-	-	**01**	**00.09**
Sub-total (2)	**23**	**25**	**51**	**31**	**47**	**177**	
Percentage	**10.41**	**17.48**	**15.99**	**16.40**	**20.90**	**16.14**	
(ii) Text-related							
Expressing need to reread paragraph/Text	03	02	01	03	01	**10**	**00.91**
Establishing link of the title with text	01	00	01	-	-	**02**	**00.18**
Sub-total (3)	**04**	**02**	**02**	**03**	**01**	**12**	
Percentage	**01.80**	**01.39**	**0.62**	**01.58**	**0.44**	**01.09**	
	118	**98**	**216**	**114**	**141**	**687**	

Table 102: Frequency Reader-initiated Strategies Use

(High-achievers)

B) Reader-initiated Strategies							
Guessing	16	02	03	07	10	**38**	**03.46**
Rejecting or Confirming guess	03	02	08	02	07	**22**	**02**
Inferencing	07	01	08	05	02	**23**	**02.10**
Invoking prior knowledge	27	01	20	23	19	**90**	**08.20**
Addition of information	06	03	07	03	04	**23**	**02.10**
Reading on	14	14	19	04	12	**63**	**05.74**
Evaluating comprehension Progress	30	21	33	25	28	**137**	**12.49**
Predicting	-	-	03	06	01	**10**	**00.91**
Paraphrasing	-	01	02	-	01	**04**	**00.36**
Adjusting the reading rate	-	-	-	-	-	**-**	**-**
Expressing feeling	-	-	-	-	-	**-**	**-**
Sub Total (4)	**103**	**45**	**103**	**75**	**84**	**410**	
Percentage	**46.61**	**31.46**	**32.28**	**39.68**	**37.33**	**37.37**	
Total (A)	**221**	**143**	**319**	**189**	**225**	**1097**	

Table 103: Frequency of Text-initiated Strategies Use

(Low-achievers)

Students	06	07	08	09	10	Total B	%
Text-initiated Strategies							
(i) word-related							
Analyzing the grammatical form	01	09	04	07	02	**23**	**02.58**
Relating word with a French word	04	06	05	09	05	**29**	**03.25**
Relating word with an Arabic word	01	09	10	13	05	**38**	**04.26**
Relating word with an English word	03	01	01	-	02	**07**	**00.79**
Using context	04	02	02	01	-	**09**	**01**
Skipping	-	-	-	-	-	**-**	**-**
Questioning (word-related)	02	04	29	03	08	**46**	**05.15**
Stated failure to understand a word	24	55	35	25	53	**192**	**21.52**
Expressing need for a dictionary	-	22	26	25	28	**101**	**11.32**
Sub-total(1)	**39**	**108**	**112**	**83**	**103**	**445**	
Percentage	**34.51**	**54.27**	**57.73**	**41.91**	**54.78**	**49.88**	
(ii) Sentence-related							
Rereading	14	30	10	33	20	**107**	**12**
Relate sentence with what precedes	01	-	-	01	01	**03**	**00.33**
Questioning (idea-related)	-	-	03	01	08	**12**	**01.35**
Reading word by word	-	06	03	02	01	**12**	**01.35**
Reading aloud	01	-	08	01	11	**21**	**02.35**
Sub-total (02)	**16**	**36**	**24**	**38**	**41**	**155**	
Percentage	**14.16**	**18.10**	**12.37**	**19.19**	**21.81**	**17.38**	
(ii) Text-related							
Expressing need to reread paragraph	03	01	01	01	02	08	**01.31**
Establishing link of title with text	-	-	-	-	-	**-**	**-**
Sub-total (03)	**03**	**01**	**01**	**01**	**02**	**08**	
Percentage	**02.65**	**0.50**	**0.51**	**0.50**	**01.06**	**0.89**	
	58	**145**	**137**	**122**	**146**		

(Low-achievers)

B) Reader-initiated Strategies							
Guessing	-	07	-	01	05	**13**	**01.46**
Rejecting or Confirming guess	01	01	01	02	-	**05**	**00.56**
Inferencing	01	-	01	04	-	**06**	**00.76**
Invoking prior knowledge	04	05	11	06	05	**31**	**03.47**
Addition of information	-	01	06	02	03	**12**	**01.35**
Reading on	17	16	05	08	01	**47**	**05.27**
Evaluating comprehension Progress	29	24	26	43	20	**142**	**15.92**
Predicting	-	-	-	-	-	**-**	**-**
Paraphrasing	03	-	01	04	05	**13**	**01.46**
Adjusting the reading rate	-	-	04	03	01	**08**	**00.90**
Expressing Feeling	-	-	02	03	02	**07**	**00.79**
Sub Total (04)	**55**	**54**	**57**	**76**	**42**	**284**	
Percentage	**48.67**	**27.13**	**29.38**	**38.38**	**22.34**	**31.84**	
Total (A)	**113**	**199**	**194**	**198**	**188**	**892**	

Broadly speaking, there were 1097 instances of strategy use by high-achievers against 892 for low-achievers. The frequency of strategy use in each section, together with the corresponding percentages for both sub-groups is shown in the following tables.

Table 105: Frequency and Percentage of Strategies Use

(Think-aloud Data)

	High-achievers (n=05)		Low-achievers (n=05)	
Strategy Type	**N**	**%**	**N**	**%**
A. Text-initiated	**687**	**62.63**	**608**	**68.16**
(i) Word-related	498	72.50	445	73.19
(ii) Sentence-related	177	25.76	155	25.49
(iii) Text-related	12	01.74	08	01.32
B. Reader-initiated	**410**	**37.37**	**284**	**31.84**
Total	**1097**		**892**	

Figure 17: Overall Use of Bottom/Top-down Strategies

(Think-aloud Data)

High-achievers   Low-achievers
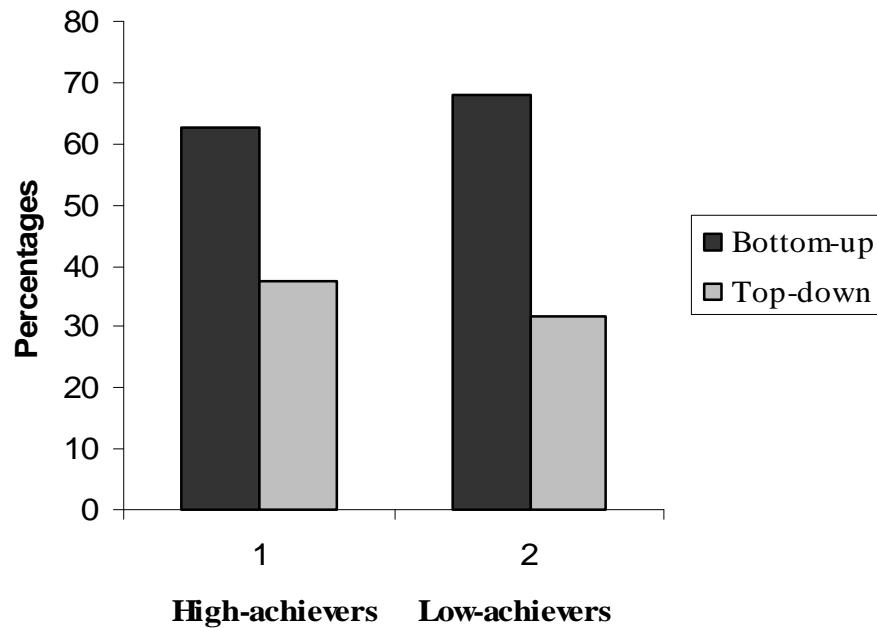
6.2.2. Hypothesis Testing

In order to statistically test the hypothesis, we used the same test as for hypothesis one ; that is a Z-test used to compare the two proportions created by the two sub-groups. The result of the test statistic   as revealed by the results of the questionnaire is 0.81 which is below the critical value of 1.96. We thus conclude that there is no statistically significant difference between high-achievers and low-achievers concerning bottom-up versus top-down strategies. Thus, the null hypothesis that there is no significant difference between the two sub-groups is not rejected.

Moreover, the result obtained for think-aloud procedure is 2.52 (**) which exceeds the critical value of 1.96. We thus conclude that there is a statistically significant difference between high-achievers and low-achievers concerning the use of bottom-up and top-down strategies. This result also permits the rejection of the null hypothesis.

5.2.3. Discussion

In sum, concerning the results of the questionnaire, there were more observed similarities than differences between the two sub-groups. This indicates that the subjects from both sub-groups share more or less the same view about the reading process; that is the latter is perceived as being an interaction between bottom-up and top- down strategies, but it is predominantly a top-down process.

As far as think-aloud procedure, and based on the subjects' reports, we can say that the text was difficult to participants from both sub-groups. It was linguistically and cognitively demanding, resulting in substantial verbalization of information, by the two sub-groups, but with high-achievers using more verbalization than low-achievers. Out of 1989 instances of strategy use, 1097 strategies (55.16%) were used by high-achievers, against 892 strategies (44.84%) for low-achievers. This first finding is consistent with prior research by Pressley and Afflerbach (1995) who have stated that 'active and strategic efforts at meaning construction only occur in reaction to more challenging texts' (p.14).

The second finding is that both high and low-achievers used bottom-up strategies more and used top-down strategies less frequently; however, low-achievers rely more strongly on text-initiated 'bottom-up' strategies with 68.16% of overall strategy use, against 62.63% for high-achievers. In fact this finding was expected and it reflects the observation made by other researchers (Alderson, 1984; Bossers, 1991) that lower-proficient readers are seen as

having more focus on decoding text-initiated elements of text because their proficiency is not at point where automatic processing of these elements can occur, as it does with more fluent readers. It is only when the text-initiated elements are automatically processed that the reader can focus more on retaining contextual clues needed to predict, as well as infer and develop the necessary inferences to gain full understanding of a text.

The question which can now be posed is the following: Do high-achievers and low-achievers process the text similarly or differently? The first element for the answer, based on the above discussion, suggests that they process the text differently, with the latter using less top-down strategies than the former. The second element for the answer can be obtained by examining more thoroughly the above results. Concerning word-related strategies use, the table above suggests very close percentages: 72.50% of overall text-initiated strategies use for high-achievers, against 73.19% for low-achievers is devoted to vocabulary. A more detailed comparison of word-strategies treatment will be provided in the next section.

Similarly, both sub-groups obtained very close percentages of strategy use regarding sentence and text-related strategies, with high-achievers obtaining slightly higher rates for both types as follows: 25.76% for high-achievers, against 25.49% for low-achievers, and 01.74% for high-achievers against 01.32 for low-achievers, for sentence-related and text-related strategies respectively.

The next important finding is that both sub-groups monitor comprehension actively by identifying the source of the problems and attempting to solve them. Low-achievers even obtained a higher percentage for 'evaluating comprehension' than high-achievers: 15.92% of overall strategy use for the former, against 12.49% for the latter. This suggests that low-achievers were confronted with more comprehension difficulties than high-achievers. Indeed,

subjects from both sub-groups invoked a variety of fix-up strategies in attempt to control and regulate their comprehension processes and understand the material. For instance, high-achievers utilized 13.67% of sentence-related strategies for rereading, against 12% for low-achievers. Another example of fix-up strategies which was used more extensively by high-achievers than low-achievers is the 'activation of prior knowledge' with 08.20% for the former and only 03.47% for the latter. 'Reading on' is another repair strategy used with a rate of 05.27% by low-achievers, and 05.74% by high-achievers. Noteworthy, low-achievers seemed to be the ones with more comprehension troubles are the ones who utilized less fix-up strategies.

Another interesting finding is related to a number of strategies which were used almost exclusively by low-achievers. They involve 'reading the sentence word by word', 'reading aloud', expressing feeling', 'adjusting the reading rate'. There were only two uses of the two first strategies by high-achievers. Except for the last one, the first two strategies are characteristic of poor reading and they can be said to distinguish the reading processes of the two sub-groups. Other distinctive strategies which this time are exclusively used by high-achievers concern 'making predictions', 'relating text with table', and 'skipping'. Interestingly, all these strategies are characteristic of successful reading. Finally, for the rest of top-down-strategies identified in the study, it is the high-achievers who obtained the higher rates.

By combining all the above findings together we can say that the two instruments think-aloud and strategies questionnaire reveal certain similarities as well as differences in the students' reports, both in terms of the amount of bottom-up, top-down strategies use, and also in the process of reading.

6.4. Hypothesis Three

Hypothesis: There is a statistically significant difference between high-achievers and low-achievers as far vocabulary difficulties: High-achievers> Low-achievers.

Null Hypothesis: There is no statistically significant difference between high-achievers and low-achievers as far vocabulary difficulties: High-acievers= Low-achievers

In order to test this hypothesis, we need to bring together information from the test, more precisely from the partial test score, obtained in the word-level strategies section, and from the word-related section of the think-aloud data, and more precisely the problem-identification strategies used by the subjects. Results of high-achievers are then compared with those of low-achievers to determine the degree of difficulty they face with vocabulary.

6.4.1. The students' Vocabulary Level

An in-depth analysis the tests scores obtained by the participants in both sub-groups was conducted to obtain a more detailed information about whether there existed differences among the sub-groups as far as vocabulary dificulty is concernrd. First the frequencies and percentage scores of the four vocabulary activities of the reading test are given, followed by the mean scores, standard errors, and coefficients of variation percentages.

The following tables give the frequencies and the percentages of the test scores obtained in the four vocabulary questions, namely guessing word from context, determining word function, finding opposites, and finding synonyms as obtained by the two-sub-groups.

─High-achievers' Performance

Table 106: High-achievers ' Test Performance:

Guessing Words from Context (V1)

Score /04	N	%	Bar Chart
04	16	55.1	
03	06	20.7	
02	07	24.1	
Total	29	100	

As can be noticed from the table above, high-achievers performed very highly on 'guessing words from context' (V1), where the whole sub-group obtained average and above average scores, and 55.20 % of whom got the total score. The other respondents' (44.80%) scores range between two and three.

Table 107: High-achievers ' Test Performance:

Determining Word Function (V2)

Score /07	N	%	Bar Chart
07	01	03.5	
06	11	37.9	
05	04	13.8	
04	08	27.6	
03	03	10.3	
02	01	03.5	
01	01	03.4	
Total	09	100	

As far as determining word funtion, the students' performance can also be said to be high, since 82.80% of the respondents got average and adove average scores. Only 17.20% obtained below-average scores.

Table 108: High-achievers ' Test Performance:

Finding Opposites (V3)

Score /04	N	%	Bar Chart
04	12	41.4	
03	15	51.8	
01	01	03.4	
00	01	03.4	
Total	29	100	

Twenty-seven (93.20%) students did not find difficulties in finding opposites. Only one student (03.4%) succeeded in providing one correct answer ; whereas one other student (03.40%) did not provide any correct answer.

Table 109: High-achievers ' Test Performance:

Finding Synonyms (V4)

Score /07	N	%	Bar Chart
6	01	03.5	
5	02	06.9	
04	09	31.0	
03	04	13.8	
02	11	37.9	
01	02	06.9	
Total	29	100	

Compared to the other activities, 'finding synonyms' was a relatively difficult activity since only 41.40% of the respondents got average and above average scores, against 58.60% of test-takers who obtained below average scores.

Because the aim of the hypothesis is to compare the two sub-groups' performance on local reading activities and depict their vocabulary level, and based on the students' low performance for every task which is calculated by adding up the percentages of the below

average scores, we obtain the following visual display of the findings.

Figure 1 High-achievers' Test Performance (Local Reading)
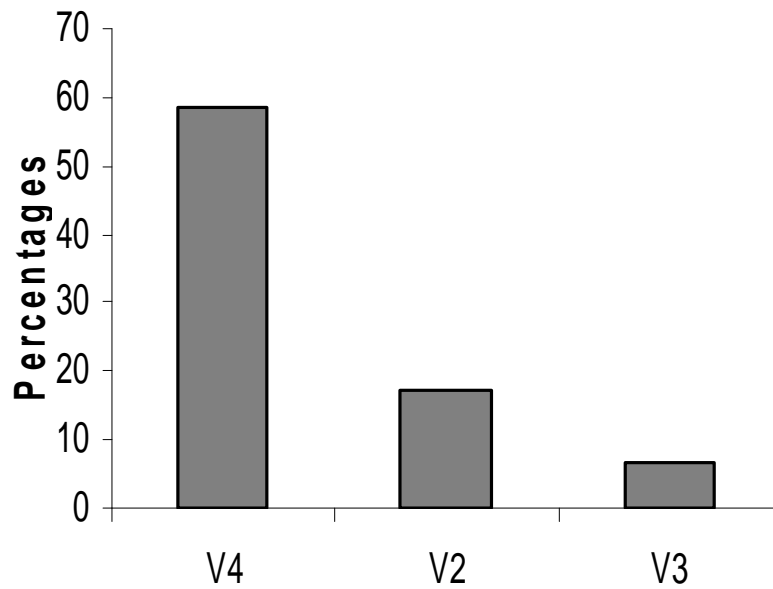
Overall, and as far as lexical knowledge is concerned, we can say that high-achievers faced problems mainly with *finding synonyms(V4).* On the other hand, they had lesser troubles with *determining word function(V2), and finding opposites* (V3). The task at which they not have the least difficulties was *guessing words from text (V1).*

−Low-achievers' Performance

Table 110: Low-achievers' Test Performance:

Guessing Words from Text (V1)

Score /04	N	%	Bar Chart
03	03	10.3	
02	09	31.0	
01	11	38	
00	06	20.7	
Total	29	100	

We can notice the apparent difficulty of the the task of *guessing words from context* for 17 (58.7%) of the respondents who obtained below average scores. The other proportion of test-takers, 12 (41.3%) succeeded in guessing two (31%) or three (10.3%) words from context.

Table 111: Low-achievers'' Test Performance:

Determining Word Function (V2)

Score /07	N	%	Bar Chart
06	01	03.5	
03	06	20.7	
02	09	31.0	
01	07	24.1	
00	06	20.7	
Total	29	100	

The overwhelming majority of respondents 28 (96.5%) partly (74.8%) or wholly (20.7%) failed to determine the function of the words. Only one student representing 03.5% of the students succeeded in determining the function of six out seven words.

Table 112: Low-achievers'' Test Performance:

Finding Opposites (V3)

Score /04	N	%	Bar Chart
04	07	24.1	
03	04	13.8	
02	07	24.1	
01	06	20.8	
00	05	17.2	
Total	29	100	

Likewise, when we add up the percentages of average and above average scores, we find out that 62% of the subjects succeeded more or less in *finding out synonyms* against 38% of the subjects who rather performed poorly. Of the three tasks analysed so far, this is the best performance.

Table 113: Low-achievers' Test Performance:

Finding Synonyms (V4)

Score /07	N	%	Bar Chart
03	2	06.9	
02	4	13.8	
01	11	37.9	
00	12	41.4	
Total	29	100	

The most noticeable finding in this activity is that the totality of the respondents obtained below average scores in this test task which illustrates the difficulty they faced in finding out the words synonyms. What is also noticeable is the percentage 41.4% (the highest) which is representative of the students who either did not answer or answered incorrectly this question.

The figure below, visually displays the low-achievers' vocabulary difficulties which we obtained by adding up the percentages of below-average scores for every activity.

Figure 19 : Low- achievers' Test Performance (Local Reading)
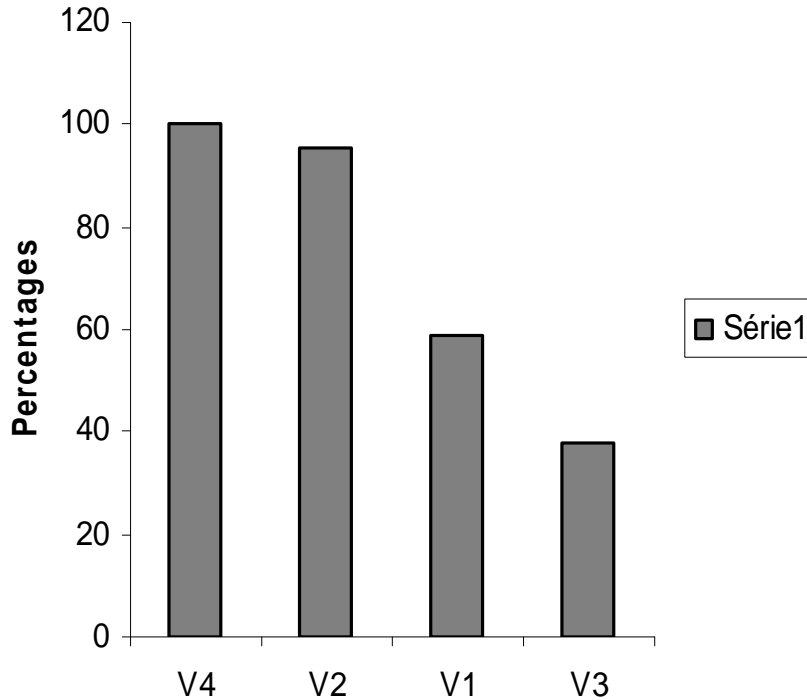
Overall, the low-achievers' poorest performance was on finding synonyms (V4) with 100% of the respondents who got below average scores , followed by *determining word function* (V2) with 95.5%. On the other hand, 58.7% of the respondents performed poorly on *guessing words from context* (V1) activity. Finally, only 38% faced difficulties in *finding word opposites* (V3).

Now, a comparison between the preformance of the two sub-groups reveals many discrepancies between them as far as lexical knowledge is concerned, with high-achievers performing largely better than low-achievers in the four activities. For instance, where low-achievers faced major difficulties, like in activity V4, high-achievers did an average performance. Converrsly, where high-achievers performed highly, as in V1, low-achievers

performed rather moderately. Noteworthy, the two most difficult tasks for both sub-groups, although with varying degrees of difficulty were *finding word synonyms* (V4), *and finding word function* (V2).

Table 114 and table 115 below show the mean scores, standard error (SE) and the coeffiecient of variation (CV) of the local reading strategies of both sub-groups.

Table 114: Mean Scores, Standard Error (S.E) and Coeffecient of Variation (CV) of 'local Reading' (High- achievers n=29)

Measure	M	SE	CV (%)
Local Reading Score /22	14.31	02.60	18.16
V1 /04	03.31	00.83	25.07
V2 /07	04.72	01.41	29.78
V3 /04	03.24	00.89	27.46
V4 /07	03.03	01.24	40.92

Table 115: Mean Scores and Standard Error(S.E) and Coeffecient of Variation (CV) of 'local Reading' Tasks for Low-achievers. (N=29)

Measure	M	SE	CV (%)
Local Reading Score /22	05.94	02.98	50.16
V1 /04	01.31	00.91	69.46
V2 /07	01.68	01.31	77.97
V3 /04	02.06	01.41	68.44
V4 /07	00.87	00.88	101.14

As illustrated by the data in Tables 114 and 115, the descriptive summary of the data does show a marked difference in the scores of the total mean scores of both sub-groups. The mean score of high-achievers is significantly higher than that of low-achievers. The standard error for both sub-groups provides a 95% confidence interval (Plus or minus 2 standard errors usually provides a 95% confidence). On the other hand, the coefficient of variation is higher for low-achiever for both local and global reading indicating more heterogeneity in the group than for high-achievers. When the dispersion is large, the values are widely scattered; when it is small they are tightly clustered. Moreover, the low-achieveres sub-group has higher variability, since the scores are more widely distributed among the different subjects. On the other hand, the high-achievers sub-group has lower variabiltiy. It is therefore a more homegeneous group. The coefficient of variation for the low-achievers was actually 50.16% and for high-achievers 18.16%; the more varied the group, the higher the coefficient of variation.

6.3.1.2. Problem-identification Strategies

To bring further support to the above findings, we have compared between the frequencies of the word-related strategies used by the ten subjects in their think-aloud reports with their partial test scores; that is those related to the word-level section of the test.

Following Olshavsky's (1976-77) categorization of strategies into problem-identification and problem-solving strategies, we selected from the stabilised list of strategies identified in the students' think-aloud protocols those which fall within the first category, then we compared the frequencies of high-achievers with those of low-achievers. The selected categories include: stated failure to understand a word, and questioning (word-related). The table below displays the above information.

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Table 116: Word-related Problem-identification Strategies

	High-achievers (n=05)		Low-achievers (n=05)	
Option	**Total**	**Mean**	**Total**	**Mean**
Stated failure to uderstand a word	135	27	192	38.40
Questioning	28	5.60	46	9.20
Total	163	32.60	238	47.60

Here also we notice higher means for problem-identification strategies obtained by low-achievers 47.60 against 32.60 for high-achievers. This indicates that the former are confronted with inefficient word access more than the latter.

6.3.2. Hypothesis Testing

In order to calculate the Z score which is used to compare two proportions created by two random samples or two sub-groups of one random sample, we followed the same procedure as for the above hypotheses by converting the total number of responses for both sub-groups, adding up the two proportions, and then calculating the percentages for each sub group. We thus obtained 40.65% of problem identification strategies for high-achievers and 59.35% for low-achievers.

For the test, since the test statistic 5.29 (***) exceeds the critical value of 1.96, we conclude that there is a statistically significant difference between high-achievers and low-achievers concerning vocabulary difficulties. We thus can conclude that low-achievers were confronted with unknown vocabulary more than high-achievers.

Regarding think-aloud data, the result of the test statistic 11.19 (***) which exceeds the critical value of 1.96. We conclude that there is a statistically significant difference

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between high-achievers and low-achievers concerning the use of bottom-up and top-down strategies.

Putting the above results together, we obtain the following picture about the high and low-achievers' level in vocabulary knowledge from two perspectives, the mean test scores for local reading, and problem-identification strategy use.

Table 117: The Subjects' Vocabulary Knowledge

Option	High-achievers		Low-achievers	
	Total	Mean	Total	Mean
Word-related Scores	415	14.31	172.5	05.94
Problem-identification Strategies	163	32.60	238	47.60

Figure 20: Students' Vocabulary Difficulties
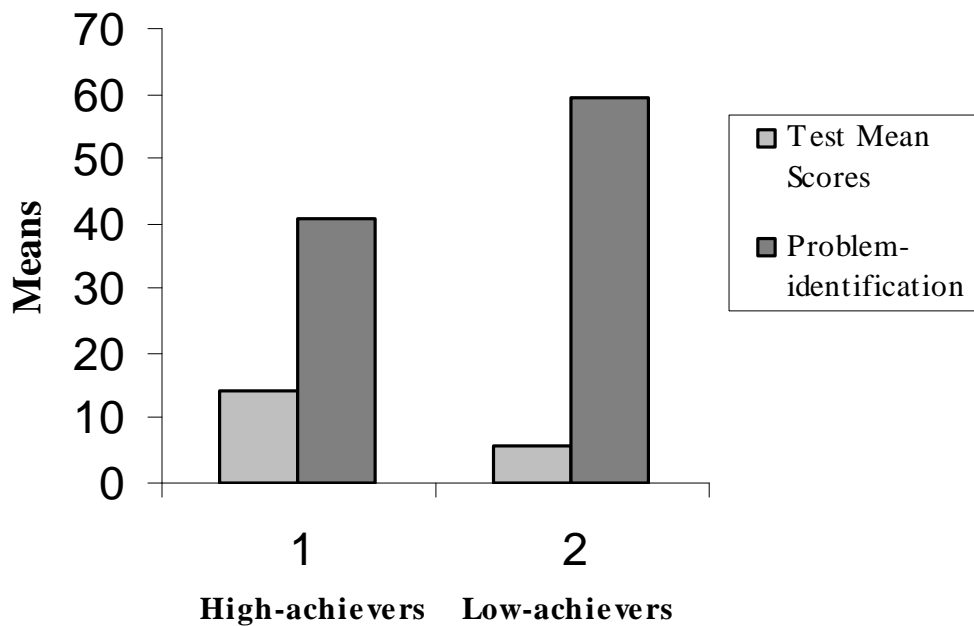
6.3.3. Discussion

The descriptive statistical analysis of the data does show a marked difference in the scores of both sub-groups. On the whole, there is a significant link between vocabulary knowledge and the students' level i.e., high-achievers did higher performance, and low-achievers did a lower performance. This is indicative of the fact that high-achievers have a more solid lexical base in place than low-achievers.,

Concerning think-aloud data, the tables above show that the participants from both sub-groups were confronted with a lack of vocabulary knowledge which indicates that the lexical and conceptual load of the text was high resulting in an extensive verbalization especially at the word level. However, we can notice that it is the low-achievers who obtained lower mean scores for the vocabulary section of the test and also identified more unknown words. This insufficient word access has certainly contributed to texts difficulty and impeded the comprehension process, especially for low-achievers.

Overall, the results of the hypothesis highlight the differences in the vocabulary levels of both sub-groups. The results also indicate that the lack of vocabulary knowledge is more important for low-achievers.

6.4. Analysis of the Results of Hypothesis Four

6.4.1. Word-treatment Strategies

Hypothesis: There is a statistically significant difference between high-achievers and low-achievers as far the type and amount of fix-up strategies: High-achievers> Low-achievers.

Null Hypothesis: There is no statistically significant difference between high-achievers and low-achievers as far as the type and amount of fix-up strategies: High-achievers= Low-achievers.

A strategic approach to word recognition fosters efficiency in reading. A strategic reader would first determine the importance of the word to the text. If the word is considered unimportant or if the remainder of the sentence is comprehended, the reader would skip it, and if it was deemed important, then this reader would use context clues to make an educated guess. If insufficient clues are available, then this strategic reader would analyze the grammatical form of the word by decoding its components for meaning. If this was ineffective, then finally this reader might look it up in the dictionary. Other strategies appropriate for foreign language context into which our study falls may involve translating the word into French or Arabic. It may also involve –as was the case of our subjects- relating the word to another English word. And because reading an interactive process, the reader may eventually confirm or reject the initially-made guesses.

Using the same source of data; that is think-aloud protocols, we further examined the fix-up strategies utilized by the subjects to solve the vocabulary problem. These include: skipping, using context, analyzing the grammatical form, expressing need for a dictionary, guessing, rejecting or confirming guess, and relating word with an English/ French/ Arabic word.

Table 118: Word-level Fix-up strategies

Strategy	High-achievers (n=05)		Low-achievers (n=05)	
	N	%	N	%
Skipping	16	04.05	-	-
Using context	22	05.57	09	04
Analyzing the grammatical form	48	12.15	23	10.22
Expressing need for a dictionary	72	18.23	101	44.89
Guessing	38	09.62	13	05.78
Rejecting or Confirming guess	22	05.57	05	02.22
Relating word with an English word	26	06.58	07	03.11
Relating word with a French word	138	34.93	29	12.89
Relating word with an Arabic word	13	03.30	38	16.89
Total	**395**	**100**	**225**	**100**

Based on the above totals and percentages we can reorder the strategies from most to least used as follows:

Table 119: Ranking of the word level Strategies (High-achievers)

Rank	Strategy	Total	%
01	Translating French: 138 (34.93%) Arabic: 13 (03.29%)	**151**	**38.23**
02	Expressing need for a dictionary	**72**	**18.23**
03	Analyzing the grammatical form	**48**	**12.15**
04	Guessing	**38**	**09.62**
	Relating word with an English word	**26**	**06.58**
05	Using context	**22**	**05.57**
05	Rejecting or Confirming guess	**22**	**05.57**
07	Skipping	**16**	**04.05**
	Total	**395**	**100**
	Mean	**79**	

Table120: Ranking of the word level Strategies (Low-achievers)

Rank	Strategy	Total	%
01	Expressing need for a dictionary	101	44.89
02	Translating French: 29 (12.89%) Arabic : 38 (16.88%)	67	29.78
03	Analyzing the grammatical form	23	10.22
04	Guessing	13	04.78
05	Using context	09	04
	Relating word with an English word	07	03.11
06	Rejecting or Confirming guess	05	02.22
07	Skipping	-	-
	Total	**225**	**100**
	Mean	**45**	

Figure 21: Students' Fix-up Strategies
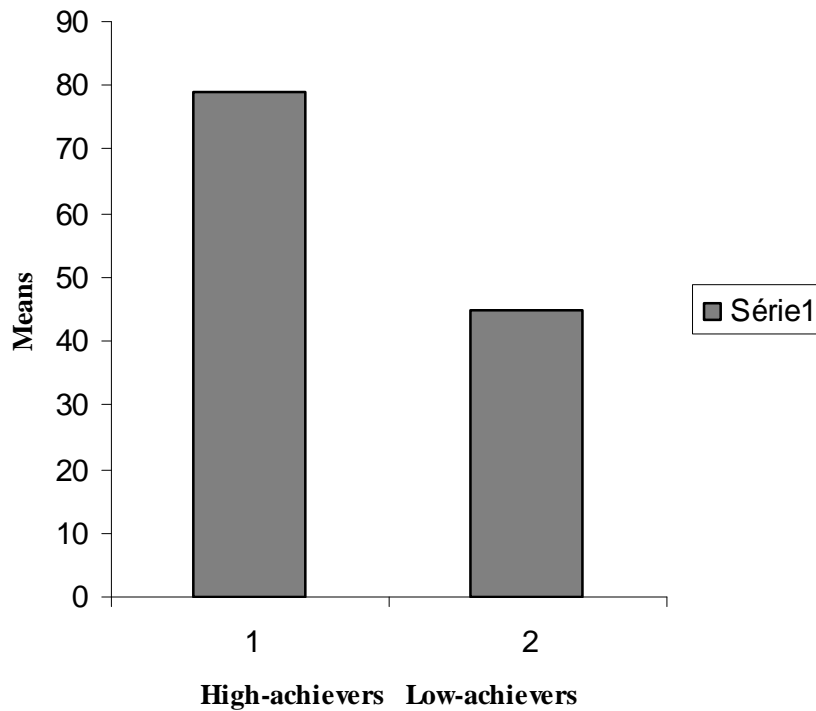
6.4.2. Hypothesis Testing

We followed the same procedure as for the above sections; i.e., calculating the total number of responses for both sub-groups, adding up the two proportions, and then calculating the percentages for each sub-group. We thus obtained 63.71% of fix-up strategies for high-achievers and 39.29% for low-achievers.

Since the test statistic 9.65 (***) exceeds the critical value of 1.96, we conclude that there is a statistically very significant difference between high-achievers and low-achievers concerning the use fix-up strategies. We thus can conclude that low-achievers, although they were confronted with unknown vocabulary more than high-achievers, used fewer strategies to handle the problem of unfamiliar words.

6.4.3. Discussion

The protocols analysis revealed that the participants resorted to various strategies to attack the unknown vocabulary items and gain adequate comprehension. After they identified the problematic words, they resorted to the dictionary, sometimes decoded the components of the words for meaning, and sometimes inferred the meaning from the contexts and their own general knowledge.

Except for skipping which was exclusively used by high-achievers, both sub-groups used the same type of strategies to handle unfamiliar words in the text, but each sub-group used these strategies with different rates. Low-achievers did not take the risk of skipping the unknown words in the attempt to understand the text as a whole, but rather resorted to the dictionary. This last strategy ranked first in the overall strategy use with 44.89% by low-achievers, against only 18.23% for high-achievers. Moreover, for the latter, 04.05% of the word treatment strategies was used for skipping words which indicates that they did not give equal importance to all the unknown words, but rather decided to skip the ones thy judged unimportant or not disturbing sentence comprehension. In addition, high-achievers skipped some words because they made use of more top-down strategies, aiming at a more overall comprehension of the text.

High-achievers consistently preferred to translate the unknown words either into French (34.93%) or to a lesser extent into Arabic (03.29%) before reaching for a dictionary. This latter strategy ranked second with 18.22% of overall strategy use. The second word treatment strategy for low-achievers is translation which obtained 29.78% of overall strategy use, divided between translating the word into Arabic with 16.88% or into French with 12.89%. Participants from both sub-groups have had recourse to translation because as Kern (1994) argues, it 'may facilitate the generation and conservation of meaning' (p.144). Finally,

by comparing the rates of translation of both sub-groups, we notice that the high-achievers' rate is higher and that translation is more oriented towards French rather than Arabic which is quite the opposite for low-achievers.

Analyzing the grammatical form and using context were more or less used to a similar extent by both sub-groups: 12.15% (high-achievers), against 10.22% (low-achievers) for the former strategy, and 05.57 (high-achievers), against 04% (low-achievers) for the latter strategy. However, word guessing –a top-down strategy– was used more by high-achievers (09.62%) than low-achievers (05.78%). The rate of another top-down strategy which is 'rejecting or confirming guess' was also slightly higher for high-achievers (05.57%), against 02.22% for low-achievers. At last, in an attempt to understand the unknown words, participants from both sub-groups related them with other English words at varying degrees: 06.58% for high-achievers and 03.11% for low-achievers.

Overall, more fix-up strategies were used by high-achievers. This may be indicative of the automaticity with which word-treatment strategies are used by high-achievers. It can also be explained by the fact that the latter follow a combined-strategies approach to word treatment, unlike low-achievers who tend to use single fix-up strategies for single words. Finally, the results also show a difference between the two sub-groups in respect of the processes they use to handle a vocabulary problem. Low-achievers differ not only in the type and amount of word treatment strategies but adopt a less strategic approach in handling unfamiliar words than high-achievers.

Conclusion

The findings of this chapter confirm hypothesis one that the two sub-groups differ in their use of effective versus less-effective strategies, with high-achievers using more effective strategies than do low-achievers. As for hypothesis two, the findings also confirm that the two sub- groups do not only differ in the quantity of strategies used, but also differ in the type of strategies (bottom-up, top-down) and in the process of reading. Most significant of all are the results obtained for hypothesis three which indicate a lack of vocabulary knowledge for both high-achievers and low-achievers, but it is more important for low-achievers. Finally, the results of hypothesis four show a significant difference between the two sub-groups in respect of the processes they use to handle a vocabulary problem.

CHAPTER SEVEN

PEDAGOGICAL   IMPLICATIONS

Theory, practice and research suggest that students need a rich variety of stimulating and comprehensible reading materials and pedagogical activities that reflect real-world reading to discover what L2 reading means to them to acquire the automatic word recognition skills that are the foundation of comprehension. Ultimately, it is the people who can and do read that are most willing to learn strategies to enable them to become more skilled in doing particular types of reading they wish to and need to.   Bramford and Day (1998: 135

Introduction

To meet the requirements dictated by the specific instructional setting of our subjects, namely an ESP situation, and taking into account the problem stated in the introduction, that is the graduates' low-level reading proficiency in English that fails to meet the requirement of their academic needs, a course that does not provide sufficient or adequate skills for those students pursuing their academic career, and teachers that lack adequate training, an adapted instructional approach should be developed in order to help the learners, especially the less-competent ones, improve their reading performance.

On a practical level, the findings of the study may be used to determine instructional actions to be undertaken in this or similar teaching contexts. In fact, the most important contribution of this study is its classroom applications. Specific instruction should be integrated into the ESP reading course to prepare students become more successful readers and succeed in environments where they will have to comprehend academic texts and read an extensive amount of material in a limited amount of time. These are particularly crucial in academic fields in which most students have scientific backgrounds and scarce knowledge of linguistic notions.

The present chapter seeks to suggest some operational guidelines in the form of recommendations which will contribute to enhance the learners' reading performance and assist them in developing their reading abilities. We shall group the recommendations into five major points: the importance of needs analysis, the importance of syllabus and course design, the importance of teacher training, and finally the importance of strategic instruction and vocabulary teaching. The chapter also deals with the research limitations and offers some suggestions for further research.

7.1. Teaching Methodology

7.1.1. Teacher Training

ESP teachers often feel isolated both from professionals in their students' specialism and their colleagues in other institutions. They also have difficulty in getting or exchanging information in the field. In addition to that, the concentration of learner needs has led to the neglect of teacher needs, particularly in the case of teacher training courses. A solution to the problem should be to apply ESP principles to the design of teacher training courses. The language needs of teachers, both those required to complete the course successfully (course needs and study skills) and to operate in a full professional role (teaching needs and activities) must be considered.

We also recommend a multi-level model of pre-service ESP teacher training course including both content-based and methodology learning. The course involves giving trainees the opportunity to design teaching materials and evaluate them in their classrooms; teaching trainees how to evaluate teaching materials on the market; teaching trainees how to assess the language needs of students in technical education and plan courses relevant to their needs.

It is also recommended that projects be initiated to develop the teaching of ESP as a profession and encourage ESP teachers both at the local, national and why not international level to work together to solve and deal with the problems that exist, to share their expertise and knowledge, obtain new ideas and information on methods and techniques in teaching ESP, and actually get together and form their own professional community.

7.1.2. Course Design

Course design which consists in identifying and defining course objectives should also be conducted. It also consists in establishing a list of the skills to be developed either at the end of the course (general objectives), or in a short time (short-term objectives). ESP course design is the result of a dynamic interaction between: the results of needs analysis, the course designers' approach to syllabus and methodology, existing materials, and contextual constraints including government attitude, status of English and the students' motivation (Robinson 1991).

7.1.3. The Importance of Needs Analysis

The milestone of ESP is the learner and his needs. Indeed, few studies have investigated the learners' needs of Algerian ESP students. We then recommend that learners' target and present situation needs be analysed. Target situation needs analysis focuses on the learners' needs at the end of the course; whereas present situation needs analysis seeks to establish what the learners are like at the beginning of the language course by investigating their strengths and weaknesses. Questionnaires and interviews are the most widely used instruments to gather information about the respondents. They can also be supplemented by direct observations and ideally by a test administered before the ESP course.

7.2 Strategic Reading Instruction

Research on strategy training revealed that reading strategies can be explicitly taught. Such training should be integrated into courses in order to help students monitor their reading processes and improve their reading comprehension.

Strategic reading programme should be based on the examination of a number of variables including:

(i) existing use of strategies prior to instruction,

(ii) levels of English proficiency,

(iii) age of learners,

(iv) L1 background,

(v) quality of pre-test post-test measures,

and (vi) the length instruction (total hours per treatment and total time of overall instruction). (Phakiti (2006).

7.2.1. Characteristics of Strategic Reading

Because of discrepancies in instructional settings and students' characteristics and needs, strategic reading instruction takes on many configurations. Nevertheless, four general principles can guide instructors in their teaching enterprise. The principles involve selecting texts, selecting strategies, planning lessons, and adapting materials.

Text selection demands a high degree of skill on the part of the teacher. The most important selection criteria suggested in the literature on text selection involve the learners' interest and background knowledge. Teachers should also consider texts in terms of vocabulary, grammatical complexity and organization. Moreover, the selected text should be at an appropriate level of difficulty to match the learners' proficiency level in L2.

On the other hand, when choosing strategies for direct instruction, teachers should consider 'the complexity of the reading process and the range of strategic thinking abilities that reading can and should evoke' (Janzen and Stoller, 1998: 225). Other factors for choosing appropriate strategies include students' characteristics such as language proficiency, experience in reading and purpose of reading. Finally, demands of reading texts in terms of content and genre and the goals of reading instruction should also be considered. For example in the context of this study, i.e. reading academic and professional texts we recommend that the following strategies be selected for direct instruction:

(i) use background knowledge to interpret text,

(ii) discover author's purpose or theme,

(iii) pick out main ideas,

(iv) understand logical relationships between parts of a text,

(v) extract information relevant to a specific purpose,

(vi) Guess at meanings of unfamiliar words,

and (vii) Evaluate text.

To ensure an effective training, teachers should also develop an overall plan prior to the lesson which will guide them in the presentation of strategies. We suggest some steps for the reading teacher, based on Winograd and Hare, 1988. The steps involve:

(i) describing the nature of the strategy the learners are going to learn,

(ii) explaining why a targeted strategy is important,

(iii) pointing out when and where a particular strategy can be used,

(iv) demonstrating how to use a strategy by teacher modeling strategic reading processes and behaviour with reading tasks and activities, and

(v) teaching them how to evaluate their successful use of strategy.

Finally, for reading strategy instruction to be effective, it should satisfy the demands dictated by the interaction between the reader and the text, and should be adapted to such factors as the reader's purpose, the reading task and the text genre.

7.2.2. Models of Strategic Reading Strategy Instruction

Several models of strategic reading instruction which have been developed to meet the learners' specific pedagogical needs exist in the literature. A selection of four of the most widely used models is suggested below.

The first model is Reciprocal Teaching Approach (RTA) (Palincsar and Brown 1984). As its name suggests, RTA is a comprehension-fostering activity which consists of the students and teachers taking turns in leading a dialogue concerning the use of strategies while reading a text. RTA also employs a model of transferred responsibility with the teacher initially modelling the kind of behaviour which RTA sets out to establish, supporting learners as they adopt the strategies and providing feedback. At the same time, the amount of support is reduced gradually and one of the students is assigned the role of group leader. Thus, responsibility is handed over to students who will perform independently.

The second model is Experience-Text Relaltionship (ETR) (Au 1979). The efficiency of this model lies in encouraging students to use their background knowledge while reading. The model is compsed of three steps :

(i) E : Teacher starts discussion to help students activate backgroud knowledge about the topic of the text to be read,

(ii) T : Students read short parts of the text and ask questions on the content of the text to make sure they understand what they read,

and (iii)R : Students relate the content of the text with their personal experiences and knowledge.

The third model is Transactional Strategy Instruction (TSI) (Pressley and Wharton Mc Donald 1997). The model is based on the view that 'learners who construct their own knowledge of subject areas rather than being 'taught' such knowledge have a greater ownership of the material' (Allen 2003, 326). The training procedure in this model consists of students reading and talking. Thus, they exchange personal interpretations and individual responses to the passage. Such strategy instruction model is transactional because it emphasizes the reader transaction with the text.

The fourth model is the Cognitive Academic Language Learning Approach (CALLA) (Chamot and O'Malley1994). Through a broad set of studies in the field of language- learning strategies, Chamot and O'Malley determined that the differences between successful and less-succesful language learners had to do more with selecting and coordinating strategies that are suitable to the task than understanding specific strategies. The model offers a five-stage instructional sequence that will help L2 students learn more effectively. It involves preparation, presentation, practice, evaluation, and expansion.

In order to create variety in their class, enhance students' motivation and promote successful comprehension of texts, we recommend that teachers introduce such models in their classrooms.

7.2.3. Role of the Teacher

The teacher can assume many roles in a strategic reading instruction class starting by setting up the general context and reading tasks for the students to practise content reading

and weaving reading comprehension strategy training into regular classroom events in a natural and explicit way. S/he can also help students identify their current reading comprehension strategies and enquire about their weaknesses by means of surveys, interviews, think-aloud protocols, face-to-face conversations, or through checklists. S/he can further provide ongoing guidance and individual counselling for students who face problems. Finally, by using a think-aloud demonstration, the teacher can role model the strategies required for academic reading.

7.3. Vocabulary Instruction

Lexical knowledge appears to be a prerequisite for comprehending text. Laufer (1989) found that the lexical "threshold level" is 95%; that is if the student understands less than 95% of the text lexis, his/her comprehension of the text will be unsatisfactory. One of the research hypotheses tested in the present study that was statistically confirmed was related to the students' −especially low-achievers− limited vocabulary knowledge and lack of strategic approach to handle unfamiliar words consisting mainly of using a dictionary or translating words to Arabic and French rather than using context clues and decoding word components for meaning or making educated guesses.

In order for reading to be successful, then, the learners must have a solid lexical knowledge in place, must process word rapidly and automatically and approach new words strategically to learn content matter. The results of the study enables us to suggest the need for multiple ways both for acquiring new vocabulary and strategically handling unfamiliar words in the text to achieve the above goals. The former can be achieved through extensive reading; whereas, the latter requires a thorough and systematic vocabulary instruction.

7.3.1. Extensive Reading

The advantages of extensive reading are numerous. They involve promoting a positive attitude to reading, increasing the amount of reading, encouraging the use of reading strategies, and above all acquiring not only a new amount of vocabulary but also an understanding of the properties of words in use. For Zimmerman, 1997, cited in Bramford and Day, 1998), learners should be encouraged to 'adopt the habit of self-selected materials, based on the evidence that incremental knowledge of words may be gained from reading' (p136-137).

7.3.2. Methods of Teaching vocabulary

In addition to extensive reading, a thorough and systematic vocabulary instruction should be accommodated in the reading classroom. McNeil (1987:123) emphasizes on the 'active processing of new vocabulary so that vocabulary development enhances reading comprehension not just word knowledge.' In this respect, a range of different methods can be used.

Vocabulary teaching can be integrated into language learning by using various methods, ranging between direct and less direct ones. These methods may involve:

(i) explicit preparation of language learning materials through carefully controlling the vocabulary presented in the text,

(ii) discussion of unfamiliar vocabulary as it naturally comes up,

(iii) teaching vocabulary in connection with other language activities, for example as a pre-reading or a post-reading activity,

(iv) teaching vocabulary independently of other language activities. Typical classroom activities that fall into this last method involve knowing spelling rules, analyzing word structure, mnemonic techniques, paraphrase activities and vocabulary puzzle. They may also

involve putting glossaries and key word sections, and presenting defining, and providing clear context clues in a variety of ways such as semantic or meaning clues, syntactic or word order clues and morphological clues.

7.3.3. Vocabulary Recognition Strategies

Classroom approaches for developing word recognition skills and coping with the vocabulary load of the texts may involve the utilization of a number of strategies. The latter involve −to use Phakiti's (2006) terms− 'memory strategies' to store the new vocabulary such as repetition, rehearsal, learning by heart, or 'retrieval strategies' to practice and revise existing vocabulary such as word meaning recall, and matching words with similar meanings.

In addition to the above strategies, it is also recommended that in the course of instruction, students should be made aware of a variety of other effective strategies of the treatment of unknown words in the text such as using a dictionary, guessing the meaning of the unknown word, or choosing to disregard the unknown word if they do not feel any breakdown in text comprehension. This kind of explicit vocabulary instruction can help students learn enough words to become better readers.

Last but not least, vocabulary instruction should be accomodated to the variety of learning styles among second language learners. Moreover, methods should be varied and combined according to the learner's individual needs and preferences.

Conclusion

The most effective guidelines for a better learning/teaching of English for Specific Purposes setting where both teacher and students act as active participants in terms of needs analysis, course design, teacher training and reading strategy instruction are likely to be a long and an ongoing process; one in which the teacher, aware of the multiplicity of learner

identities, makes the necessary changes to suit the students' interests and needs, even when the course is in progress.

This study aimed at exploring the learners' reading comprehension problems and strategies. There are several limitations that should be considered in future studies on. One limitation is the fact that the passages selected for both the test and think-aloud procedure may have been too difficult for the participants in this study, and consequently were not sensitive enough to reveal gains from reading comprehension difficulties and strategies. A second limitation of the study is the small number of the subjects ($n = 88$). It may have been difficult to find significant differences with such a small sample. Similarly, due to the limited number of participants in the think-aloud experiment ($n = 10$), it is difficult to draw strong generalizations. A third limitation is that the training sessions for the think-aloud experiment, which consisted of three sessions, may have been too short for the participants to demonstrate significant gains. This suggests that with more training, the group could demonstrate significantly greater amount of reading strategies.

In order to investigate the situation more thoroughly, future research can be conducted by taking larger samples from larger populations, evaluating English language proficiency level of students which will determine text selection for reading or thinking aloud in terms of adequate difficulty level, and giving ample room for learners to gain enough familiarization about the think-aloud procedure before the actual experience.

CONCLUSION

The ability to read academic texts is considered one of the most important skills that university students need to acquire. Although a large portion of time at university is spent working with written sources of information, a significant proportion of ESP students struggle with reading comprehension. This study aimed at shedding light on the comprehension difficulties that fourth year Microbilology students encounter when reading in their academic learning area, and depicting the repertoire of reading strategies they use in order to overcome their difficulties. For this aim, we set up four hypotheses as follows: students' difficulties in reading in English may result from the inadequate use of reading strategies; students' reading problems in English may be due to the fact that they mainly engage in bottom-up strategies or data-driven processing by passively decoding the text rather than in top-down or reader-driven processing by actively participating in the act of reading; students' reading problems may be rooted in their poor vocabulary in English, and students' reading problems may be related to lack of strategic approach to handle unfamiliar words.

Prior to the the analysis and testing of the hypotheses, a survey of the related literature was given. We started with an overview of various issues concerning first and second language reading processes, developing reading skills and strategies and assessing reading. Our aim was to lay some background information relevant to the practical details of the present thesis. Our next step consisted in discussing the experimental design of the present study by describing the three data collection procedures used in the study: a reading comprehension test, a students' questionnaire, and a think-aloud procedure.

In order to test the hypotheses, we proceeded in a qualitative and quantitative investigation by adopting a triangulated approach via the three research instruments. The

combination between different assessment methods did not only yield accurate and valid data on learners' cognitive processes but also compensated for the problems inherent in each method. The main concern of the test was to depict the comprehension level of the students; then elicit their comprehension difficulties. The aim of the questionnaire was to develop knowledge of the learners' strategic repertoire and general strategy use free from context. Think-aloud procedure, on the other hand, aimed at developing knowledge of the learners' actual strategy use in a specific reading situation and of the actual execution of online strategies during reading.

The statistical analysis of the test scores did produce conclusive evidence that 67% of the students faced reading difficulties in English. In other words, the participants in the study have a low reading proficiency level in English. These results have come to support the statement raised in the general introduction that fourth year biology students cannot read successfully in English. Moreover, the test results have laid out a picture of the components of reading comprehension and clearly revealed the causal relationship between these factors, especially vocabulary knowledge and comprehension.

On the basis of their test results, the participants were divided into high-achievers and low-achievers; then a comparison of the results of the two sub-groups was drawn. The results have revealed a wealth of data concerning not only the comprehension processes of the two sub-groups and their reading strategies, but also comprehension difficulties, especially of low-achievers.

The four hypotheses have been confirmed statistically. The first hypothesis confirmed that subjects with higher reading ability (high-achievers) are more purposeful and efficient than subjects with lower reading ability (low-achievers) in the sense that they read in a way

that allows them to understand the writer's message without spending too much time in the process by using effective strategies.

The results of hypothesis two are also congruent with other studies (Carrell 1989, Devine1987) that strategy monitoring is significantly related to reading performance. High-achievers favoured global processes, i.e., those having to do with background knowledge, inferences, and predictions; whereas, less-proficient readers employed more localized processes, i.e., those having to do with word meaning, and text details.

Furthermore, much of low-achiever's attention resources are spent on decoding words in print which disrupted their comprehension (hypothesis three). The readers' less developed word recognition skills and strategies also caused them to read less effectively than high-achievers and to read the text in isolated units rather than as meaningful sentences. Henceforth, the construction of the text's meaning was not executed effectively (hypothesis four).

On the light of the results obtained, some proposed pedagogical implications and operational guidelines in the form of recommendations to enhance the learners' reading performance and assist them in developing their reading abilities were proposed. The recommendations were grouped into a number of points involving the importance of needs analysis, the importance of syllabus and course design, the importance of teacher training, and finally the importance of strategic instruction and vocabulary teaching. Finally, the research limitations some suggestions for further research are offered.

The present study has focused on the comprehension difficulties and strategies employed by university students reading academic texts in English for Specific Purposes. A larger-scale study with more participants, more test and questionnaire items would provide more data, and therefore a more reliable picture and determine whether the findings of the

study could be extended to readers at different levels of language proficiency who read texts of different genre and carry out different reading tasks Nevertheless, these findings indicate that comprehension difficulties and reading strategies is a topic that deserves attention in L2 reading research, and perhaps most importantly, identifies some specific directions for further research.

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APPENDFICES

Nutrition, Metabolism, and Biosynthesis

A key feature of organism is its ability to organize molecules and chemical reactions into specific structures and systematic sequences. The ultimate expression of this organization is the ability of a living organism to replicate itself. The term metabolism is used to refer to all the chemical processes taking place within a cell. The word metabolism is derived from the Greek word metabole which means change, and we can think of a cell as continually changing as it carries out its life processes. Although the cell appears under the microscope to be a fixed and stable structure, it is actually a dynamic entity, continually undergoing change, as a result of all the chemical reactions which are constantly taking place.

Microbial cells are built of chemical substances of a wide variety of types, and when a cell grows, all of these chemical constituents increase in amount. The basic chemical elements of a cell come from outside the cell, from the environment, but these chemical elements are transformed by the cell into the characteristic constituents of which the cell is composed.

The chemicals from the environment of which a cell is built are called nutrients. Nutrients are taken up into the cell and are changed into cell constituents. This process by which a cell is built up from the simple nutrients obtained from its environment is called anabolism. Because anabolism results in the biochemical synthesis of new material, it is often called biosynthesis.

Biosynthesis is an energy-requiring process, and each cell must thus have a means of obtaining energy. This is obtained from the environment, and three kinds of energy sources are used: light, inorganic chemicals, and organic chemicals. Although a number of organisms obtain their energy from light, most microorganisms obtain energy from chemical compounds. Chemicals used as energy sources are broken down and energy released is called catabolism. Cells also need energy for other cell functions, such as cell movement (motility).

We thus see that there are two basic kinds of chemical transformation processes occurring in cells, the building-up processes called anabolism and the breaking-down processes called catabolism. Metabolism is thus the collective result of anabolic and catabolic reaction.

A simplified overview of cell metabolism is shown in figure 4.1, which depicts how catabolic reactions supply energy needed for cell functions, and how anabolic (biosynthetic)

reactions bring about the synthesis of cell components from nutrients. Note that in anabolism, nutrients from the environment are converted into cell components whereas in catabolism, nutrients from the environment are converted into waste products. Catabolic reactions result in the release of energy whereas anabolic reactions result in the consumption of energy. In this chapter, we will consider some of the anabolic and catabolic processes used by microorganisms.

As we have noted, three different kinds of energy sources are used. It is conventional to place microorganisms into classes, depending on the sources of energy which they use, and these classes are summarized in Table 4.1. All of the terms used to describe these classes employ the combining form troph, derived from a Greek word meaning to feed. Thus, organisms which use light as an energy source are called phototrophs (photo is from the Greek for light). Organisms which use inorganic chemicals as energy sources are called lithotrophs (litho is from the Greek for rock). Organisms which use organic chemicals as energy sources are called heterotrophs (which means, literally, feeding from sources other than self). Because they use organic compounds, heterotrophs are sometimes called organotrophs. Most of the organisms which we deal with in microbiology use organic compounds as energy sources, and are hence heterotrophs. The material in the present chapter will deal with heterotrophic metabolism and we reserve for chapter 16 a discussion of the utilization of light and inorganic chemicals as energy sources.

A Knowledge of cell metabolism is useful in understanding the biochemistry of microbial growth. Energy is needed for macromolecular synthesis and for the variety of chemical reactions needed for cell growth. Also, a knowledge of metabolism aids in developing useful laboratory procedures for culturing microorganisms, and in developing suitable procedures for preventing the growth of unwanted microbes. Because many of the important practical consequences of microbial growth, such as infectious diseases, are linked to microbial metabolism, a knowledge of cellular metabolism is of great use in applied and medical microbiology. Even the formation of metabolic waste products is of interest. For instance, one important waste product produced by yeast during catabolism is ethanol, the key constituent of alcoholic beverage (wine, beer, whisky, etc.).

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QUESTIONS:

1. The reading passage has eight paragraphs. Which paragraphs contain the following information?

  a) Knowing cellular metabolism has got many benefits.

  b) Microbial cells need the environment for their constitution.

  c) The biochemical synthesis of new material requires energy.

  d) The cell is a continually changing living organism.

2. Now find some more detailed information.

  a) What are the four advantages of knowing cellular metabolism mentioned in the text?

  b) What are the roles of catabolic and anabolic reactions?

  c) What is the relationship between 'heterotrophs' and 'organotrophs'?

  d) What does the cell need energy for?

3. Read the text again, and quote the exact words used in the text to define the following.

  a) Chemical reactions.

  b) Biochemical synthesis.

  c) Yeast waste products.

  d) Chemicals that feed the cell.

4. What type of relationship is being indicated by these 'pointer' words? Put an X in the appropriate box.

	Pointer	Cause	Result	Contrast	llustration	Addition
Paragraph 1, Line, 6	Although					
Paragraph 2 Line, 3	Because					
Paragraph 3, Line, 1	Thus					
Paragraph 7, Line, 10	Hence					
Paragraph 8, Line, 6	Such as					
Paragraph 8, Line 3	Also					
Pargraph 8, Line, 8	For Instance					

5. Find out in the text the words that are opposites of the following words:

   a) General.

   b) Inside.

   c) Build-up.

   d) Useless.

6. The following table gives the nutritional types of microorganisms. From the information contained in the text, complete the missing data.

Table 4.1   Terms used to describe various nutritional types of microorganisms

A. Three kinds of ………. Sources	
Energy source	**Term used**
Light	Phototroph
…………	Lithotroph
Organic chemicals	……………
B. kinds of carbon sources	
Carbon source	**Term used**
Inorganic (carbon dioxide)	……………
……….……..	Heterotroph
C. Some mixed terms	
Phototroph: Use light and inorganic carbon	
Photoheterotroph: Use light and organic carbon	
Lithotrophic heterotroph: Use inorganic energy source and organic carbon	

7. The following figure gives a simplified view of the major features of cell metabolism. From information contained in the text, complete the missing words.

8. The following short text also speaks about the major metabolic processes of living organisms, but it contains some gaps. From your understanding of the above passage, complete the sentences with the appropriate words.

Metabolism is the sum of all the …1…. processes carried out by living organisms. It includes ……2……., reactions that require energy to synthesize complex molecules from simpler ones, and catabolism, reactions that release energy by breaking ……3…. molecules into simpler ones that can then be reused as building blocks. Anabolism is needed for ……4…, reproduction, and repair of cellular structures. Catabolism provides the organism with …5……. for its life processes, including ……6……., transport and the synthesis of complex molecules, that is anabolism.

Indicators of Microbial Food Spoilage.

Microorganisms are capable of causing food spoilage in two ways. The most important one is through the growth and active metabolism of food components by the live cells. The other one is produced, even in the absence of live cells, by their extracellular and intracellular enzymes that react with the food components and change their functional properties, leading to spoilage. The loss of food due to microbial spoilage has economic consequences for the producer, processors, and consumers. With the increase in world population, loss of food due to microbial (and nonmicrobial) spoilage means less food is available for the hungry mouth. To fight against world hunger, efforts should be directed not only to increase food production, but also to minimize spoilage so that enough food is available for consumption. Many preservation methods have been devised to reduce microbial spoilage and these are discussed in Section VI. Under certain methods of preservation, both raw and partially processed (semipreserved, perishable, nonsterile) foods are susceptible to microbial spoilage. This is more evident in foods that are expected to have a long shelf life. To reduce loss of raw and partially processed foods due to microbial spoilage, two things are important. One is to predict how long a food, following production, will stay acceptable under the condition(s) of storage normally used for that food, i.e., what is its expected shelf life under normal conditions of handling and storage? The other is to determine the current status, with respect to spoilage of a food, that has been stored for some time. This information needs to be available well before food has developed obvious detectable spoilage and thus is unacceptable.

Many criteria have been evaluated to determine their efficiency as indicators to predict expected shelf life, as well as to estimate stages of microbial food spoilage. These criteria or indicators can be grouped as sensory; microbial, and chemical (microbial metabolites). The sensory criteria (e.g., changes in color, odor, flavor, texture, and general appearance) have several drawbacks as indicators, especially if used alone. Changes in texture and flavor generally appear at the advanced stages of spoilage. Odor changes can be masked by the spices used in many products. Odor changes from volatile metabolites may not be detected in a product that is exposed to air, as compared to the same product in a package. Color changes, such as in meat exposed to air, may not be associated with microbial growth. Finally, individuals differ greatly in their perception for the organoleptic criteria. However,

sensory criteria can be used advantageously along with microbiological and/or chemical criteria.

Studies by a large number of researchers have clearly revealed that a single microbiological or chemical test is not effective in predicting either the shelf life of a product or its spoilage status. The contributing factors in microbiological spoilage of a food include the type of product, its composition, methods used during processing, contamination during processing, nature of packaging, temperature and time of storage, and possible temperature abuse. As these factors differ with products, it may be rational to select indicators on the basis of a product or a group of similar products.

From 'Indicators of Microbial Food Spoilage'. By Ray, B. (2001).*Fundamental Food Microbiology*. CRC Press.]

QUESTIONS:

1. Read the text carefully. Then circle the letter which corresponds to the correct answer.

i) Loss of food due to microbial spoilage

    a) Affects food producers, processors, and consumers.

    b) Does not affect food producers, processors, and consumers.

    c) May or may not affect food producers, processors, and consumers.

ii) Famine in the world could be prevented if:

    a) We produce more food.

    b) We preserve food from spoilage.

    c) Both (a) and (b).

iii) Preservation methods apply :

    a) Only on raw food.

    b) Only on partially proceed food.

    c) On both (a) and (b).

iv) Methods of food preservation

    a) Prevent microbial spoilage of food.

    b) Do not prevent microbial spoilage of food.

    c) May or may not prevent microbial spoilage of food.

v) The factors that reduce loss of raw and partially processed food due to microbial spoilage are:

    a) Predicting expected shelf life.

    b) Estimating stages of microbial food spoilage.

    c) both (a) and (b).

vi) Microbial growth on food

    a) leads to its change in color.

    b) Does not lead to its change in color

    c) May or may not lead to its change in color

vii) The sensory criteria as indicators of food spoilage are:

    a) Effective when used alone.

    b) Effective when combined with the other criteria.

    c) Not effective.

viii) Microbiological and chemical tests used to depict the shelf life of a product or its spoilage status are:

    a) Effective when used only one time.

    b) Effective when used many times.

    c) Not effective.

2. Find words in the text which have similar meanings to the words listed below, and which could replace them in the text.

    a) Famine

    b) minimize

    c) disadvantage

    d) developed

    e) shown

    f) characteristics

    g) taste

3. Match an element from column A with an element from column B to form sentences. Then arrange the sentences you have produced to make a short paragraph.

A	B
a) Foodborne diseases result from	**i)** unless sanitation is practiced
b) A crucial factor in preventing spoilage and disease transmission in food and milk	**ii)** the direct effects of microorganisms and from microbial action on food substance
c) The increased popularity of convenience people, contaminated food	**iii)** also helps control disease transmission and spoilage.
d) In institutions that feed large numbers of food, especially fast food	**iv)** is cleanliness in handling.
e) Large processing plants (factories) provide opportunities for contamination of great quantities of food	**v)** has raised the risk of infection.
f) Prompt and adequate processing of food to be processed	**vi)** will cause many cases of pathogens.

Answers Key: Reading Comprehension Test

Passage One

1. a) 8

b) 2

c) 4

d) 1

2. a) Knowing cellular metabolism is useful in:

(i) Understanding the biochemistry of microbial growth;

(ii) Developing useful laboratory procedures for culturing microorganisms;

(iii) Developing suitable procedures for preventing the growth of unwanted microbes,

(iv) Its great use in applied and medical microbiology.

b) The role of catabolic reactions is to supply energy needed for cell functions, and the role of catabolic reactions is to bring about the synthesis of cell components from nutrients.

c) The relationship between "heterotrophs" and "organotrophs" is that they both refer to the same organisms.

d) The cell needs energy for the building-up processes, the breaking-up processes, and for movement.

3. a) Metabolism

b) Biosynthesis

c) Ethanol

d) Nutrients

4. Type of relationship indicated by the 'pointer' words:

	Pointer	Cause	Result	Contrast	llustration	Addition
Paragraph 1, Line, 6	Although			X		
Paragraph 3 Line, 3	Because	X				
Paragraph 4, Line, 1	Thus		X			
Paragraph 7, Line, 10	Hence		X			
Paragraph 8, Line, 6	Such as				X	
Paragraph 8, Line 3	Also					X
Paragraph 8, Line, 8	For Instance				X	

5.

   a) General # Specific

   b) Inside # Outside

   c) Build-up # break- down

   d) Useless # Useful

6. The nutritional types of microorganisms.

Table 4.1   Terms used to describe various nutritional types of microorganisms
A. Three kinds of <u>energy</u> sources

Energy source	**Term used**
Light	Phototroph
<u>Inorganic chemicals</u>	Lithotroph
Organic chemicals	<u>Heterotroph</u>

B. Two kinds of carbon sources	
Carbon source	**Term used**
Inorganic (carbon dioxide)	<u>Autotroph</u>
<u>Organic</u>	Heterotroph

C. Some mixed terms
Photoautotroph: Use light and inorganic carbon
Photoheterotroph: Use light and organic carbon
Lithotrophic heterotroph: Use inorganic energy source and organic carbon

7. Nutritients

Organic waste products

Energy for movement

Catabolism

8. Metabolism is the sum of all the <u>chemical</u> processes carried out by living organisms. It includes <u>anabolism</u>, reactions that require energy to synthesize complex molecules from simpler ones, and catabolism, reactions that release energy by breaking <u>complex</u> molecules into simpler ones that can then be reused as building blocks. Anabolism is needed for <u>growth</u>, reproduction, and repair of cellular structures. Catabolism provides the organism with <u>energy</u> for its life processes, including <u>movement</u>, transport and the synthesis of complex molecules, that is anabolism (Black, 1999: 106).

Answers Key

Reading Comprehension test (Passage Two)

1. i)   a

  ii)   c

  iii)   c

  iv)   c

  v)   c

  vi)   c

  vii)   b

  viii) b

    a) Famine   =   hunger

    b) minimize   =   reduce

    c) disadvantage   =   drawback

    d) developed   =   devised

    e) shown   =   revealed

    f) characteristics =   properties

    g) taste   =   flavor

3.   **A**   **B**

a) Foodborne diseases result from   the direct effects of microorganisms and from

                                      microbial action on food substance.

b) Large processing plants (factories)   unless sanitation is practiced.

provide opportunities for contamination

of great quantities of food

c) In institutions that feed large numbers of people, contaminated food   will cause many cases of pathogens.

d) The increased popularity of convenience food, especially fast food   has raised the risk of infection.

e) A crucial factor in preventing spoilage and disease transmission in food and milk   is cleanliness in handling.

f) Prompt and adequate processing of food to be processed   also helps control disease transmission and spoilage.

APPENDIX III

STUDENTS' QUESTIONNAIRE

Dear students,

You are invited to participate in the current research through filling in the questionnaire below. The questionnaire is designed to gather information about how you read in English. Please, answer each statement by ticking / √ / in the right box, according to what you do as you read in English.

May I thank you for your collaboration.

Mrs. MEBARKI Zahia
Department of Languages
Faculty of Letters and Languages
Mentouri University - Constantine

SECTION ONE: THE STUDENTS READING HABITS

1. Do you read in English?

Yes ☐

No ☐

2. If 'Yes', what do you read and how often?

	Always	Sometimes	Rarely	Never
a) Documentation linked to your speciality.				
b) Books of fiction and stories.				
c) Newspapers and magazines.				

d) Other: Please, specify ....

3. How do you do read in English?

a) Easily. ☐

b) Fairly easily. ☐

c) With difficulty. ☐

4. Do you read in Arabic?

Yes ☐

No ☐

5. If 'Yes', what do you read and how often?

	Always	Sometimes	Rarely	Never
a) Documentation linked to your speciality.				
b) Books of fiction and stories.				
c) Newspapers and magazines.				

d) Other: Please, specify…...................................

6. How do you do read in Arabic?

    a) Easily. ☐

    b) Fairly easily. ☐

    c) With difficulty. ☐

7. Do you read in French?

  Yes ☐

  No ☐

8. If 'Yes', What do you read and how often?

	Always	Sometimes	Rarely	Never
a) Documentation linked to your speciality.				
b) Books of fiction and stories.				
c) Newspapers and magazines.				

    d) Other: Please, specify ....…………………

9. How do you do read in French?

    a) Easily. ☐

    b) With difficulty. ☐

SECTION TWO: READING STRATEGIES

10. You read in English because:

    a) You find the topic interesting. ☐

    b) You have questions to answer about the text. ☐

    c) You want to learn English. ☐

    d) Other: Please, specify …………………………………………………………………..

11. Before reading the whole text, you:

    e) Guess the general idea from the title. ☐

    f) Read headings and subheadings to predict the content of the text. ☐

    g) Read the first and the last sentences of the text. ☐

    h) Read the introduction and the conclusion before you decide to read the whole text. ☐

12. Before reading the text, you:

    c) Form hypotheses about the text meaning. ☐

    d) Make analogies to your own experience by linking previous knowledge with new information ☐

    c) Predict the content of the text. ☐

    d) Do not do any of the above, and simply decide to read it or not. ☐

    e) Other: Please, specify …………………………………………………………..

13. In the process of reading, you think:

    d) All the words are important. ☐

    e) Some words can be skipped without disturbing understanding. ☐

    f) You need to look in the dictionary for the words you don't know. ☐

14. If you you do not understand a word, you:

    e) Skip the word and come back to it later. ☐

    f) Guess what the word might mean and go on. ☐

    g) Guess what the word might mean and reread the sentence. ☐

    h) Look up the word in a dictionary and write the English meaning on the page. ☐

15. To guess what an unfamiliar word might mean, you:

g) Consider what the rest of the sentence says. ☐

h) Consider what the rest of the paragraph says. ☐

i) See whether the word looks like an English word you know. ☐

j) See whether the word looks like a French word you know. ☐

k) Analyze the grammatical form of the word. ☐

l) Do not do any of the above. ☐

16. You read all English passages:

a) The same way because English passages are usually difficult for you. ☐

b) The same way because they are in English. ☐

c) Differently depending on what you need to learn from them. ☐

d) Differently depending on what kind of passages they are. ☐

17. To find the main idea(s) of a reading passage, you read:

e) The title only. ☐

f) The topic sentence only. ☐

g) The headings only. ☐

h) All of them. ☐

18. To find details in a reading passage, you:

d) Read only the part you are interested in. ☐

e) Pay attention to all the information in the text. ☐

f) Read more than one time in order to understand what the writer stated or implied. ☐

19. To find a specific information in a reading passage, you:

    e) Read continually until you find specific information you need. ☐

    f) Look through the text as quickly as possible until you reach the relevant part to get the

       information you want. ☐

    g) Look for clues. ☐

    h) Other: Please, specify ………………………………………………………….

20. When a reading passage has a title, you:

    d) Read the title but do not consider it as you read the passage. ☐

    e) Read it first and predict what the passage will be about. ☐

    f) Think about what you already know and how it might relate to the title. ☐

21. When a reading passage has illustrations, you:

    e) Look at the illustrations and guess what the reading passage might be about. ☐

    f) Look at the illustrations without relating them to the reading passage. ☐

    g) Expect the reading passage to reflect what is in the illustrations. ☐

    h) Compare what is in the illustrations to what you read. ☐

22. If you do not understand the meaning of a sentence, you:

    e) Read it word by word. ☐

    f) Guess the meaning from the general context. ☐

    g) Relate it with the preceding and the following sentences. ☐

    h) Ignore it. ☐

23. In facing any problem in grasping text meaning, you:

e) Read it many times. □

f) Give up reading. □

g) Ask for help. □

h) Consult other reading references related to the same topic. □

24. While reading, to understand the text, you:

f) Underline the main ideas. □

g) Make an outline. □

h) Take notes. □

i) Do not write anything; just keep the information in your mind. □

j) Other: Please, specify…………………………………………………………………….

25. After reading the text, in order to determine if reading goals have been met, you:

e) Engage in self- questioning. □

f) Summarise the text. □

g) Outline the ideas. □

h) Other: Please, specify……………………………………...

SECTION THREE: READING COMPREHENSION DIFFICULTIES

26. You have difficulty in understanding a text because of:

a) Unknown words. □

b) Lack of understanding the link between the sentences. □

c) Lack of background knowledge. □

d) Other: Please, specify …………………………………………………………………..

27. The text factors which affect your comprehension of a text are:

a) The length of the text.

☐

b) The length of sentences.

☐

c) Grammar.

☐

d) Other: Please, specify…………………………………….......................................

28. The psychological factors which can affect your comprehension of the text are:

a) Lack of confidence in ability to understand a text from a first reading.

☐

b) Losing concentration when reading.

☐

c) Exhaustion; that is the act of reading is mentally a tiresome activity.

☐

d) Other: Please, specify…………………………….......................................

SECTION FOUR: FURTHER SUGGESTIONS

29. Would you like to add any comment or suggestion?

………………………………………………………………………………………..

………………………………………………………………………………………..

………………………………………………………………………………………..

………………………………………………………………………………………..

………………………………………………………………………………………..

………………………………………………………………………………………..

APPENDIX IV

TEXTS   FOR   THINK-ALOUD

Contamination, Infection, and Disease

Contamination, infection, and disease can be viewed as a sequence of conditions in which the severity of the effects microorganisms have on their hosts increases. **Contaminarion** means that the microrganisms are preasent. Inanimate objects and surfaces of skin and mucous membranes can be contaminated with a wide variety of microorganisms. Commensals do not harm, but parasites have the capcity to invade tissues. **Infection** refers to a multiplication of any parasitic organisms xithin or upon the host's body. (Sometimes the term **infestation** is used to refer to the presence of larger parasites, such as worms or arthropods, in or on the body.) If an infection disrupts the normal functioning of the host, disease occurs. **Disease** is a disturbance in the state of health wherin in the body cannot carry out all its normal functions.

Both infection and disease result from intercations between parasites and their hosts. Sometimes an infection produces no observable effect on the host even though organisms have invaded tissues. More often an infection produces observable disturbances in the host's state of health; that is, disease occurs. When an infection causes disease, the effects of the disease range from mild to severe.

Let us look at some examples to understand the differences among contamination, infection, and disease. A health care worker who fails to follow aseptic procedures while dressing a skin wound contaminates her hands with staphylococci. However, after she finishes her task, she washes her hands properly and suffers no ill effects. Although her hands were contaminated, shed id not develop an infection. Another worker performing the same task on another patient fails to wash his hands properly after treating the patient, and the organisms gain entrance to the body and infect a small cut. Soonthe skin around the cut becomes

reddened for a day or so. This worker was contaminated and infected. In a similar situation, a third worker develops a reddened area on her skin; she ignores it and in a few days has a marge boil. This worker has experienced contamination, infection, and disease.

Disease, or illness, is characterized by change in the host that interfere with normal function. These changes can be mild, severe, but reversible, or irreversible. For example, if youbecome infected with one of the viruses that cause a common cold, you may have just a runny nose for a few days. Or you may have a severe cold with a sore throat, cough, fever, and headache, but the disease is runs its course in a xeek or so without any permanent effects. Tye changes in your state of health arte reversible. But if you develop trachoma, a bacterial infection of the eye, without treatment scarring of the cornea can occur, leading to permanent vision impairment and sometimes to blindness. Likewise, if you fail to get propertreatment for streptococcal infections, you might suffer irreversible damage to your heart or kidneys.

[From 'Contamination, Infection, and Disease'. By Black, J. G. (1999) Microbiology: Principles and Explorations. John Wiley&Sons, INC. p377]

Important Human Viral Pathogens

The common cold and influenza are about the commonest human illnesses. They are caused by RNA viruses which mainly infect the upper respiratory tract. Theye are transmitted between humans by droplet infection. The symptoms of the common cold (rhinitis, inflammation of the seral mucosa in the nose and throat) are caused by rhinoviruses, all small, single stranded RNA viruses without envelope (picorna and coronal viruses). They multiply in the mucosal cells which are killed. The optimal temperature for their replication is 33°C, about the temperature of the nasal cavity. The lack of development of any persistent immunity against the common cold is most probably due to the large number of serotypes in the rhinoviruses.

The influenza viruses belong to the orthomyxovirus group, RNA viruses with envelopes. The illness at first resembles the common cold, but the inflammation is not limited to the nose and throat area: it also affects the lungs and strongly depresses general health. As the virus is very easily transmitted, it often causes widespread attack and 'flu epidemics'. The pandemic of 1957 was caused by the appearance of a highly virulent virus mutant, to which no immunity existed anywhere. Immunity against the capsid and envelope proteins of the influenza virus can last for several years. However, sometimes infections of one cell with several virus particles can lead to exchange and 'antigenic shift', so that the virus becomes resistant to the pre-existing antibodies, leading to its uninhibited development in a previously immune individual.

Apart from the influenza and the common cold viruses, the Human Immune Deficiency virus (HIV) is now one of the most widely known viruses, not because of the fatal disease, AIDS, that it causes. AIDS (Acquired Immune Deficiency Syndrome) was recognised as a disease of the immune system because infection with the HIV virus was accompanied by infections with typical opportunistic organisms. Such infections with opportunistic pathogens, like *Pseudonomas aeruginosa*, some protozoa, yeasts and other fungi, are very rarely found in individuals with a normally functioning immune system. They usually attack individuals weakened by some other illness or treatment, and become pathogenic when the central immune system is compromised.

HIV is a retovirus, and therefore depends for its replication on the integration of its genome into that of the host. HIV is also a lymphotropic virus and specifically infects T lymphocytes. These do not actually produce antibodies, but play an essential part as helper cells in the antibody production by B-lymphocytes. Practically, no T lymphocytes are demonstrable in AIDS patients. The HIV virus thus abolishes an important link in the chain of

antibody production (immune defence) and thus renders the individual prone to all infectious diseases and the tumor formation.

Viral infections in general are currently among the most prominent diseases. This is easily explained by the fact that bacteria offer a variety of targets for therapeutic agents to inhibit their growth. The multiplication of viruses, on the other hand, is intimately coupled to essential metabolic processes of the host cell, such as nucleic acid synthesis. It is, therefore, extremely difficult (up to now more or less impossible) to inhibit intracellular viral growth without serious damage to the host cell metabolism. The development of antiviral therapeutics has therefore met with little success so far, and the old-fashioned methods for dealing with the common cold, for instance, will seem the best.

[From "Important Human Viral Pathogens" By Schlegel, H, G. (1986) *General Microbiology*. Cambridge University Press. Pp 167-169]

Therapeutic Uses of Toxins

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with the advantage of a greater knowledge and the ability to manipulate their toxicity genetically. In addition, their potent actions have found widespread uses in other aspects of biology.

As the major effector of bacterially induced host damage, toxins play a prominent part in both conventional emperical vaccines and the new generation of rationally designed vaccines. It was recognized early that inactivation of the toxic activity could produce highly effective

Table 7.9 Common targets attacked by several toxins

Target	Example
Membrane	Pore-froming toxins
	Phospholipases
	Superantigens
	E. Coli stable Toxin (ST)
Translation apparatus	Diphtheria Toxin (DT)
	Ps. Aeruginosa exotoxin A (ETA)
	Shiga Toxin
GTP-binding proteins	Diphteria Toxin
	Ps. Aeruginosa exotoxin A (ETA)
	Cholera toxin (CT)
	E. col labile toxin (LT)
	E. coli cytoxic necrtizing toxin (CNF)
	Bord. Pertussis toxin (PT)
	Bordetella dermonecrtic toxin (DNT)
	Cl. difficile and related toxins
	Cl. botulinum C3
	Staph. Aureus EDIN
Synaptosomal proteins	Cl. Botulinum toxins 'except C2 and C3)
	Cl. tetani toxin

immunogens because inactivation did not destroy epitopic structure. Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphteria). However, this has not been a universally successful approach , either because the inducedimmunity was poor and short lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects. A good example in this latter case is whooping cough, where the public acceptance of the whole cell inactivated vaccine has not always been

high. Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins). These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity. Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations. First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reactiuon that will recognize the active toxin. Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host. Thirdly, in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry. This enables the immune system to process the protein more effeciently and better immunity is raised by vaccination with whole toxin than just the active domain. In this regard, it is interesting that intracellular toxins as a group appear to very effective adjuvants.

This approach relies on fundamental knowledge about the toxins and other virulence deteminants (e.g. adhesins) a bactirium makes. It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products. This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modification was identified. Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein was more immunigenic than the chemically inactivated one.

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems, using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host. Such systems have the potential advantage that they have a greater liklihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administred live vaccine will be cheaper and will not require continual refrigeration.

[From 'Therapeuric Uses of Toxins' by Henderson, B et al. (1999). *Cellular Microbiology: Bacteria-Host Interaction in Health and Disease*. John Wiley and Sons pp305-307]

STABILIZED   LIST   OF   STRATEGIES

A) Text-based Strategies
(i) Word –related
Analysing the grammatical form
Relating word with a French word
Relating word with an Arabic word
Relating word with an English word
Using context
Skipping
Questioning (word-related)
Expressing need to use a dictionary
Stated failure to understand a word
(ii) Sentence-related
Rereading
Relating sentence with what precedes
Questioning (idea-related)
Read the sentence word by word
Read the sentence aloud
(iii) Text/paragraph-related
Expressing need to reread paragraph
Establishing link of the title with text
B) Reader-based Strategies
Guessing
Rejecting or Confirming guess
Inferencing
Predicting
Invoking prior knowledge
Addition of information
Reading on
Evaluating Comprehension Progress
Paraphrasing
Adjusting reading rate
Expressing feeling

Strategy	Description	Sample Responses
Analysing grammatical form **RS 1 A-Gram**	Decode word components for meaning.	*'widespread' I have already seen this word. 'wide' means 'large'; 'spread' I don't understand spread.*
Relating word with an English, a French, or an Arabic word **RS 2/3/4 RWW**	Link the English word with another English, or a French word, usually of the same or approximate form, or relate it with an equivalent word in Arabic.	*I don't understand the word'potent'; I think I should relate it with 'potentiel' in French.It will make sense.*
Using context **RS 5 Contx.**	Look for nearby relevant information to determine the meaning of a word or a sentence.	*1 'devoid' I don't understand it. I have to reread the whole sentence; it may be 'different'...'devoid'...mm...that is from the sentence context it may mean 'different'.*
Skipping **RS 6 Skp.**	Intentionally skip words while the remainder of the sentence is comprehended.	*'epitopic' I don't understand it, but I can skip it.*
Questioning (word-related) **RS 7 Q-word**	Pose questions regarding the significance of an unfamiliar word.	*'However' I don't know why they have put 'however'. I don't understand it.*
Expressing need for a dictionary **RS 8 E-Dict**	Express need to look up an unfamiliar word in the dictionary.	*I'll look 'approaches' up in the dictionary.*
Stated failure to understand a word **RS 9 Fail- word**	Fail to understand what a word means.	*I don't what this 'synaptosomal' is.*
Relating sentence with what precedes **RS 10 Rel. Sent**	Link sentence with the previous one.	*'sites' I stop at 'sites' and reread 'was' ...'was shown to affect' it's linked with the previous sentence.*
Rereading **RS 11 Rerdg**	Read again an entire sentence or parts of sentences for better understanding.	*... I'll read for a second time.*
Questioning (idea-related) **RS 12 Q-idea**	Pose questions regarding the idea being expressed in a portion of text (clause, sentence, sentences).	*I don't know why they are talking about proteins and amino acids?*
Read the sentence word by word **RS 13 Read-w.w**	Read the sentence word by word for better understanding.	
RS 14 R- aloud	Read the sentence aloud.	

Expressing need to reread paragraph **RS 15 Rerdg-para.**	Read the paragraph again for better understanding.	*Ok, I'll reread the whole paragraph.*
Establishing link of the title with text **RS 16 Link**	Connect information in the text with the text title.	*Now I've got an idea about the Title'Therapeutic Uses of Toxins'. I've understood the meaning of the title.*
Guessing **RS 17 Guess**	Guess the probable meaning of a word	*'convention' ... maybe 'something agreed upon'.*
Rejecting or Confirming guess **RS 18 R/C-gs**	Refute or accept a guess made beforehand.	*'prominent' I said before that it means 'important, but when I have reread, it sounds like it is probably wrong.*
Inferencing **RS 19 Infer**	Add interpretation that is not explicitly found or stated within the text.	*'interesting' means the writer is emphasizing something that is important.*
Predicting **RS 20 Pred**	Foretell or anticipate what is to happen in the upcoming portion of the text.	*'First' indicates that the writer is going to give us steps which start with 'First'*
Invoking prior knowledge **RS 21 Prior**	Activate prior knowledge and refer to speciality in comprehending the text.	*'Ps. Aerugenosa' I've seen it a lot, especially in the 'Techniques de Contrôles' module. The teacher always repeated it, especially when we studied 'ultraviolets'*
Addition of information **RS 22 Ad-inf**	Supply additional information to support some contained in the text.	*'...the induced immunity was poor and short-lived' Its life may be short like cholera. It affects the intestine as a result of intoxication.*
Reading on **RS 23 Rdgon**	Read another portion of text despite a comprehension failure.	*...mm, I don't understand much. I will carry on reading, maybe I will understand l later.*
Evaluating Comprehension progress **RS 24 E-Comp**	Assess understanding of what is being read (sentence, paragraph, or text) by expressing comprehension success (+), or failure (-).	*e.g.1: I'll reread the sentence. I don't understand it.* *e.g.2: I have understood the sentence; it is very clear.*
Paraphrasing **RS 25 Paraph.**	Substitute own words for the original wording of the text for better understanding.	*It says that we can change it with genetic engineering to obtain proteins.*

Adjusting reading rate **RS 26 Adj-rte**	Adjust reading pace according to text difficulty	*e.g. I am reading quickly to get a general idea.*
Expressing feeling **RS 27 Exp-feel**	Express feeling of irritation, boredom, stress when unable to understand.	*Honestly, I can't understand. I'll go* *the next paragraph. I am just in the first paragraph. This is too much. I can't understand it. I feel tense.*

STUDENT 01

Therapeutic Uses of Toxins	*-Eh, Toxin, eh I think in the 'food Microbiology' module; i.e. the toxins.*
The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with advantage of a greater knowledge and the ability to manipulate their toxicity genetically.	*-'Powerful' It seems that the word comes from 'power', that is 'energy'* *- mm 'Historically' means 'history', that is something historical.* *-'knowledge' is derived from 'know', so information.* *-'manipulate' makes me remember manipulation in the laboratory.* *-'genetically' means 'genetiquement' from genes. I It reminds me a lot of the module of genie génétique' and 'manipulation génétique'.*
In addition, their potent actions have found widespread uses in other aspects of biology.	*-I don't understand the word 'potent'. I think should relate it with 'potentiel' in French:, it will make sense.* *-'Widespread' I understand wide, but spread; I think I have crossed the word. It is in the list of verbs, but I don't know what it means. However, the sentence meaning is clear.*
As the major effectors of bacterially induced host damage; toxins play a prominent part in both conventional and empirical vaccines and the new generation of rationally designed vaccines.	*-I don't understand the sentence. I will reread it.* *- 'Conventional' I don't understand it. It seems to me it is like the French word'conventionnel'; 'convention'; maybe 'something agreed upon',* *-'empirical' I don't understand it. In French 'empirique' means theory; not experiment. Maybe, the opposite. No; 'empirique' in French means experimented. Now I remember.* *-'Rationally' I don't understand it. In French 'rationnel'. Maybe 'reason'.*
It was recognized early that inactivation of the toxic activity could produce highly effective immunogens because inactivation did not destroy epitopic structure.	*…I'll reread the sentence. I don't understand it. …I'll read for a second time.* *I don't understand ' epitopic'. Maybe it is like the one we studied in immunology 'les épitopes'. This is what it means; but I understand the sentence somehow.*

Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).

-'chemically attenuated vaccines' I don't understand it in English; but it is like in French 'les vaccins attenués'. I've already got some information about them from second year in immunology. We studied them. Attenuated vaccines are used for vaccination.
-'Tetanus', 'Diphtheria' I've heard about them.We use vaccines against tetanus, and diphtheria. I understand the sentence.

However, this has not been a universally successful approach, either because the induced immunity was poor and shirt lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.

...Before I finish the sentence; I'm caught by the word 'cholera'. I remember 'les bactéries cholerés' which we studied in the module 'Techniques de controle'.
-'Side' I don't understand it. Maybe it is derived from 'another side'; but I'm not sure. I need to check it in the dictionary. I don't understand side.
I'll reread the sentence; it is long...
I've read for a second time; but I don't understand very well. I will read it for a third time...I can't understand it. I will carry on reading. Maybe I will understand it later.

A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.

I can't understand the sentence.
I don't understand 'whooping cough'. I need a dictionary. After I explain 'whooping cough, I will reread the sentence...mm, I don't understand much. I will carry on reading, maybe I will understand l later.

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

The word 'safer' has caught my attention.
'Safer' comes from 'safe'...'safe' in English is the opposite of dangerous.
-'approaches' ... At first I have not understood but in French 'approche', 'les approches'. I understand this sentence.

Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).

In this sentence, I have not understood the word 'enabled', but from the context, I guess it means 'oblige', or oblige the scientists.
...Eh, 'catalytically' Eh, it reminds me of a lesson in enzymology. Catalytique, it comes from 'catalytique', 'le site catalytique'.
... I have somehow understood the sentence.

These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.

When I have read 'genetic engineering', I've remembered the 'Scientific English' module in the third year. We studied a text on cloning, and the teacher told us that genetic engineering I ' la génie génétique'. It was the first time I knew that 'la genie génétique' is gentic engineering in English.
- I don't understand the word 'devoid'. I know I have crossed the word, but I can't remember its meaning. I need to check it up in the dictionary.
After I use the dictionary, I will reread the sentence..
...I understand it.(02); it is similar to what we've studied in Molecular biology: the protein synthesis, and changing the amino acids.
I have understood the sentence somehow.

Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.

...I'll reread the sentence.
-'mutant' reminds me of genetics and the mutants.
-'Effective' I notice that the word is repeated many times in the text, so I need to check it up in the dictionary in order to confirm what I have understood and see whether I am right or wrong. After I explain effective, I will reread the sentence.
-'gross alterations' Maybe the word 'gross' comes from the French word 'gros', big alterations, maybe.
... I have understood the sentence somehow.

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

...I don't understand anything in this sentence. I will reread it, but I'll stop at...
-'First' means that something is explained step by step. This is why we have 'first'.
...'Stucture',...'folded'; I'll stop at' structure'.
- 'folded' ...I don't understand the meaning of this word. A dictionary is necessary... I'll carry on.
Eh, I don't understand 'trigger'... A dictionary is necessary. But I don't understand the whole sentence. ... I'll go to the second, eh, next sentence maybe I'll understand something.

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-I stop at 'molecule' ...
-The word 'folded' has caught my attention; it is repeated twice. I must explain it in the dictionary, otherwise it will not be possible for me to carry on.

- 'proteolytic' is like in French 'protéolytique'. I understand it; but the word 'folded', I feel it is a scientific word that I must explain in order to understand what the sentence means. So a dictionary is necessary. Eh, I will continue the third... the next sentence.

Thirdly; in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

…I will reread the sentence.
Now I've reached i.e. I remember the teacher who has taught us scientific English this year. We asked her what 'i.e.' means. She gave us the answer which I am trying to remember. Eh, I know it is a Latin thing i.e. I can't remember. -'binding' I remember it. In scientific English, third year, we studied 'binding'...'binding', but I can't remember the meaning.'To bind' maybe to tie. I can't remember. I must confirm with a dictionary... I'll pass to the next sentence.

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

-The sentence is long; I have to reread it. I'll reread it loudly. -'enables' reminds me the previous paragraph 'knowledge....scientists'; and I thought that 'enabled' means oblige. Here I find that it has the same meaning, so I am on the safe side (right). -'Efficiently' I don't understand it, but it seems to be like the 'éfficace' in French -'raised' maybe from 'reason' or 'results', 'results from'. I have understood it from context. I have not understood the sentence very well; I will pass to the next one.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

I've reached the word 'adjuvant'. I remember The module 'Techniques de contrôle' with Mr. Ghoul. It was the first time I heard the word. He told us about the word. He told us that the'adjuvants' means 'les additifs'. Here it is acceptable with this meaning. … I will reread the sentence. It is clear.

This approach relies on fundamental knowledge about the toxins and other virulence determinants (e.g. adhesins) a bacterium makes.

…I'll reread it. I have not understood it well. I'll stop at virulence. I remember in French we say 'virulence'... 'virulence' means something difficult, pathogen. 'Les adhesines', adhesions Eh; I remember the food microbiology module. I remember 'les adhesines'. In my mind it is a bacterium that has got adhesions. Eh, I can't remember exactly...I am trying to remember; maybe ….The 'adhesions'... where have I seen this?(2)...I must remember (2) the bacteria

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whose toxins are adhesions .Eh...maybe 'Clostredium' ... Maybe 'Closterdium perfringens' is the one which has adhesions... No, I am not sure about the information. I must go back to my 'Food Microbiology' copy book to make sure about where I found adhesions and what bacterium causes them. The 'adhesions' ...what bacterium causes them? ...I can't finish the text. I will still think about ' adhesions'... But the sentence is clear. I'll pass to the next sentence.

It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products

As I have reached 'therefore'; I remember Souhila who has said that 'therefore' is Darfour. It makes me laugh. I'll finish the sentence. I can't understand the sentence; I have to read it a second time.
.... I don't understand 'extraneous'. Maybe...'extraneous bacterial products' means eh...'extra'...'extra cellular', that is something outside. I am not sure. I'll confirm with a dictionary because it's the first time I meet this word ....' extraneous'...
I notice that 'side' is repeated. I must be sure about its meaning with the help of a dictionary in order to understand well because we have found 'side' before in paragraph....I am looking in which paragraph I've found 'side' . I don't find 'side'..'side' ...eh...I don't find it, eh....I don't find it. Maybe it is another word which looks like it. No, I am sure I crossed it. Now I can carry on
before I find where 'side' was used before. ...
-'Side'; I've found it. I've found it in the second paragraph. Now I am sure I was right. Now I can carry on.
mm..., the sentence is not 100% clear. I have only approximately understood it... I carry on; maybe I'll understand from the next sentence.

This is being applied to pertissus toxin, where the further advantage of such an approach over chemical modification was identified.

The word 'pertussis toxin' has stopped me.
'Pertussis'... eh looks like...We studied something....Maybe...I don't know...in phosiology or...I've heard this word before. 'La toxine pertussique'; maybe. I've crossed it. I know it is a kind of toxins, but I cant remember where exactly ...I'll carry on reading, maybe I'll find some information about it in the sentence when I finish it ...I don't understand. I'll reread the sentence

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Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein, was more immunogenic than the chemically inactivated one.

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems; using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

.... I understand the sentence, but the meaning of ' pertussis toxin' is not mentioned, so I'll underline it and carry on with the text, and thenI'll look up the meaning of 'pertussis toxin'. Now I'll read the next sentence.

As I see 'formaldehyde', I remember the 'Food Microbiology' module. Eh...'Formaldehyde',I remember there are reactions that happen maybe with fish that will give 'formaldehyde'The important thing is that I remember that it is reaction that happens with fish or I don't know.
Anyway, I've revised it. This word has caught my attention.
Eh... I stopped at 'cross-link'... 'cross-link' reminds me of genetics in the second year. Eh... of 'molecular biology' where we studied the cross- link. So I understand it somehow, but when I finish the sentence I'll confirm.
The sentence is very long; I will reread it. I've read it three times. Eh... I'll carry on. I can't understand the sentence because I feel there are many things I have not understood in the previous paragraph. Eh... now I try to just explain the difficult words and understand what has come before in order to (2) understand (2) this sentence because it seem to me that it speaks about a method, and this method I can't skip it like that. I must carry on, then explain the difficult words, then understand it and relate it with all what precedes it because I see that I have not understood 100% all what precedes. I have understood approximately40% only. So now I'll carry on; then I will reread the whole text. I start the last paragraph.

I've reached 'newer' which comes from 'new', so I understand it.
-'delivery system'...'delivery', I don't understand it, but I'll carry on maybe I'll understand it from the sentence.
-I've reached 'aro'. I don't know what 'aro' means and it is written differently from the rest of the words, so it is something special. It is either a bacterium or a toxin or..., but I'll carry on maybe I'll understand it. Eh.. 'aro strains' .
'strain'...normally, I studied it last year in the 'Scientific English' module. The meaning of 'strain' is normally 'souche'. So' aro' is 'une souche'. Oh yes, 'strain of Salmonella'. So I am

right. ' aro' is 'une souche' of 'salmonella'.
Now, I'll reread the sentence to relate it with what I've understood.
-'Orally' means 'oralement' in …i.e. 'par voie orale'.
…. I have somehow understood, not 100%, but I will carry on as I have not understood all what preceded at 100%. I'll read the next sentence.

Such systems have the potential advantage that they have the greater likelihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administered live vaccine will be cheaper and will not require continual refrigeration.	*When I've reached 'likelihood' because I haven't understood it; I will divide I; I find 'to like', but it does not fit because there is 'li'. It is a problem. When I see 'hood', I remember Robinhood, but I don't understand the word. I need a dictionary in order to understand it. But I relate Robinhood….'Hood' means… 'hood'… maybe… eh eh…'le bois'. What's the relationship of 'le bois' with what I am reading? No, it is better to use a dictionary. I've reached 'oral route'. 'Route' seems like 'la voie', i.e. 'la voie orale', in English 'oral route'.* *This is how I understand it. Now, I'll carry on.* *-I've reached 'cheaper'. I remember when I was 8^{Th} grade, they used to tell us' cheap' is the opposite of expensive. 'Cheaper' means something that costs little money, not expensive. Now I carry on…* *I can't understand the whole sentence. I've to reread it…Eh, I can't understand it, so I have to reread the whole text. I will have explained the difficult words and reread it and read the table because I haven't read it before. So I read the table.*
Common targets attacked by several toxins	*When I find 'common targets'…targets means 'la cible'.*
Pore-froming toxins (There was a typing mistake)	*Eh…Eh…I don't understand 'froming'…'pore froming'….'froming , no 'form' is not possible. It can't be from 'from'. 'pore-froming'; I must explain it in the dictionary because it seems like a scientific word.*
Phospholipases	*'Les phosopholipases' reminds me of physiology, third year. I remember 'les phospholipases'. It reminds me of venom, when the teacher, Mr. Gharzouli, told us that the venom attacks 'les phospholipases'. Eh… now I remember the illustration that he gave us about*

	'les phospholipases', and their kinds and the effect of each one.
Superantigens	*-'Superantigen'...This word has caught my attention. I've never heard that there is a 'superantigen'. I don't know if the translation is correct and if we say in French 'superantigen' (FP) because I've never met it before; so I have to explain it in the dictionary.*
E. Coli stable Toxin	*mm...I've never heard of 'stable toxin'. I need a dictionary. What I need now is something scientific because I think I am going.....I know that 'stable' means 'not likely to move', but I can't understand it in literary sense. I have to read about 'E. Coli' and read about its toxin and what 'stable toxin' means. So it will take time, but it is necessary otherwise I won't understand. I have to find the characteristics of E.Coli' and its toxins.*
Translation apparatrus	*-'Translation apparatus'...I don't understand ' apparatus'....'Translation' means... I think of 'translocation' (FP). I don't know if I am right, so I need a dictionary.*
Diphtheria Toxin	*Eh...'Diphtheria Toxin'. It comes to mind.....I didn't think that the bacterium which causes diphtheria is called 'salmonella diphtheria', but I am not sure. But I confirm whether there is 'Salmonella diphtheria' or I am wrong.*
Ps. Aeruginosa	*-'Pseudomonas aerugenosa'...I remember the teacher of 'Techniques de Contrôle'. He used to tell us and emphasize...Now I notice something. 'Pseudonomas' is written....'Aerugenosa' is written with a capital letter and this is wrong. The 'A' should be a small letter because he used to tell us all these things. Now I remember all these things. Now I remember them all. That is why, I've immediately noticed the capital 'A'.*
Shiga Toxin	*-'Shiga Toxin' (2). I know that 'Shiga' comes from....I remember the 'Shigella bacterium'. Now it is not difficult.*
GTP-binding proteins	*-'GTP'... I remember the 'CREB's Cycle' where there is GTP.* *-'binding' (2). This word comes again. I was stuck with it before.Maybe 'binding protein' means 'to stick' or 'to bind', 'stick'.*

Diphtheria Toxin, Ps. Aerugenosa Exotoxin A (ETA)	*-I know these toxins: Diphtheria Toxin, Ps. Aerugenosa. The same thing 'Areugenosa', capital 'A', and it must be a small letter.*
Cholera Toxin	*-'Cholera Toxin'. It comes to my mind Vibrio Cholerae.*
E. Coli cytoxic necrotising toxin (CNF) *(There was a typing mistake)*	*Eh; I am stuck with 'necrotising'. Necrotise seems like 'necrose'. Maybe ....But I need a dictionary in order to understand it.*
Bord. Pertussis Toxin (PT)	*-'Bord'....Ah...maybe Ah.... At first I haven't understood it, but when I've looked below, I've found 'Bordetella'. Only then I've remembered I that 'Bord.' is 'Boredetella', the bacterium.* *-'Pertussis'... It's only now that I remember that I have studied it in physiology.'The Bordetella Pertussis Toxin'. I remember having studied that in physiology, third year.*
Bordetella dermonecrotic toxin (DNT)	*-'Bordetella dermonecrotic toxin'... I feel I am right because 'necrotic' means 'nécrose'; because 'les necroses'' are about 'dermo', and 'dermo' means (2) 'la peau'. It is as if the toxin of 'Bordetella' causes 'une nécrose' in the skin. Still, I have to look for it in the dictionary because it is something scientific. I can't give only probabilities about it.*
Cl. difficile and related toxin	*-'Cl.' normally means 'clostridium'...* *-'Difficile'? 'Difficile' (2); because normally in English we say 'difficult', and now why is 'difficile' put here? Is there a species called 'Cl. Difficile'? Eh... This 'difficile' thing is not something normal for me. I have not heard before that there is 'Cl. Difficile'. I'll try to look in the dictionary whether this word exists... 'difficile'.*
Cl. Botulinum	*Eh... 'Cl. Botulinum'... I remember(2) 'Botulinum'.... I remember the teacher of 'Techniques de contrôle'. Eh... I remember 'La ' toxine Botulique'. It comes to my mind canned food where we find 'Cl. Botulinum' a lot.*
Staph. Aureus EDIN	*Now 'staph'... 'Staphylococcus aureus'.* *Eh... 'staphylococcus'. It comes to my mind my dissertation which will be about it. 'Staphylococcus aureus'.*

Synaptomosal proteins	*Now, 'Synaptomosal (2) proteins'. I don't understand 'synaptomosal'. Eh…but maybe it comes from 'synapse'. I studied it in the third year(2) in Physiology. 'synapse' maybe the proteins of the 'synapse'… Oh yes, now I am sure about it because 'Cl. Botulinum' is a toxin which attacks the synapse. So what I am thinking of is true.*
Cl. Tetani	*-'Clostidium Tetani toxin'… 'Clostidium Tetani'…eh…It is the first time I know that 'tetanus' is caused by 'Cl. Tetani'. This is an information. Eh… now I've got an idea about the title' Therapeutic Uses of Toxins'. I've understood the meaning of the title.*
	But I have to read for another time, for a second time (2) . I know it will take time because it is something scientific, and it contains many methods. In addition, I will have explained the difficult words. So it would be easy, and I would understand it, and thank you.

STUDENT 02

Therapeutic Uses of Toxins

I will reread the title. Alright, the word 'toxin'. I studied it a lot in microbiology , almost in all the modules; we spoke about the toxins... Good, I'll start the first sentence.

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with advantage of a greater knowledge and the ability to manipulate their toxicity genetically.

I will reread the sentence because it is very long. -'powerful' This word ... this word... is said about something,about a very big force. Well I have somehow understood what the sentence is talking about....em, the word 'vaccines', that is.... I reread the first part only .... I have understood the first sentence; it is very clear. The word 'genetically' speaks about genetics which we have studied in the second year, no the third year.

In addition, their potent actions have found widespread uses in other aspects of biology.

-'Potent' I haven't understood this word. I have to reread the sentence to understand well. I can get an idea about this word. I think that 'potent action' ... I relate this with 'powerful'. So it means 'a very big action'... 'a very strong action'.
-'widespread' I have already seen this word. 'wide' means large... 'spread'? I don't understand 'spread'... 'widespread' I'll understand the word in the sentence. It has not affected the sentence meaning... I'll reread the second sentence... Although the meaning of' widespread' is not clear, I have well understood the sentence. It has not affected the sentence meaning.
I have well understood this first paragraph; I'll pass to the second.

As the major effectors of bacterially induced host damage, toxins play a prominent part in both conventional and empirical vaccines and the new generation of rationally designed vaccines.

I'll reread the sentence because I have stopped at the comma. There are many words that I haven't understood well, for example 'damage' 'des domages'? normally like in French.(2)... 'des domages'... that is er....
-'prominent' It's a word a little bit.... I haven't understood 'prominent'. I have come across the word before, but I haven't tried to look it up in the dictionary. I'll see whether it will affect the sentence meaning or not.
-'both' means the author is going to talk about two things.
-'conventional empirical' I haven't understood this expression...'conventional'.. 'conven'

It was recognized early that inactivation of the toxic activity could produce highly effective immunogens because inactivation did not destroy epitopic structure.

I haven't understood the word ' recognized'(02)...No idea.I have to look it up in the dictionary, because it affects the sentence meaning. It is interesting.
-'immunogens' I remember 'immunology' which we studied in the second year.
-'epitopic' I haven't understood this...word. I have no idea... I have to look it up in the dictionary. It's interesting...I'll reread the sentence.
'could' er...It's like...'cold'. No! 'could'...'could' means 'must' - er- could...'can' 'could produce' 'it is able to'. It is derived from 'can – er- 'can' It is the past of 'can'...'could produce'.
- 'destroy' I don't like this word.
- 'epitopic structure' I haven't understood it, but I have understood the sentence even though I haven't understood 'epitopic' well ...and 'recognized'.
I am not going to read the table now. I don't think it is interesting. I 'll finish the paragraph, and come back ...I won't read the table....I'll carry on.

Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).

- 'attenuated' (03) This word exists in French' atténuer', that is or 'atténuer'
'stop'. I'll carry on to better understand... Ah 'attenuated vaccines' we studied it in the 'Immunology' module in the second year.
-'attenuated vaccines' that is – er – I think it contains viruses that have a lost their pathogenic effects...yes; I'll finish the sentence. Well...'e.g.': example
-'Tetanus and diphtheria' are two diseases –er- yes.. I'll reread the sentence....I have understood the sentence well. Ok, I'll pass.

However, this has not been a universally successful approach, either because the induced immunity was poor and shirt lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.

-'however'... I don't like this word. It always disturbs. When 'however' is the first word, I feel that I am not going to understand the sentence at all. But I'll try, though.

-'approach' I think it's like 'approche' in French...yes.

- 'either because?' I have never seen them together...Either...or, like 'neither... nor'. 'because...either because' I don't know. I'll reread.

- 'poor' ...'pauvre'. I remember a certain film. I think the title is ...I've forgotten it, but it's about poverty. It's a fantastic film.

-'Cholera' It is a disease related to water, because we studied it. I've come across it many times. ...'Cholera'...ah...it means a vaccine against cholera because we are talking about toxins.

-'or because'...ah... 'or' of ' either'... 'either because'....'or because' So I have to reread it from 'either'...- er - Now I have understood.

-'perceived?' I haven't understood this word ...'are perceived to 'cause' ...From the sentence I think that it means 'they are capable', but I don't think so. I have a doubt.

-'side' means from the other side... 'effects'...'side effects'...'effets secondaires?' I'll reread the sentence.

-'however'...I don't know why they have put 'however'. I don't understand it. We've studied 'however'. Normally I know its sense. I think 'although' (malgré). But If I am wrong the sentence sense will be lost.

'induced immunity' ...'induced' means –er- it means 'acquired immunity' ...'induced immunity'...Ok, I've understood this sentence. I'll pass to the next.

A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.

'A good example'...I adore examples. I think I'll understand very well what I haven't understood before. I always like examples...and parentheses too! Generally, it seems to me I am going to understand well.

-'latter'... 'letter?' No, it contains an 'a'. I haven't understood ...I'll carry on.

-'latter' I have to look it up in the dictionary because I haven't understood anything. I'll carry on reading the sentence maybe I'll understand.

-'whooping catch[sic]...I haven't understood ...'who' (02) like 'who?' No, no, no. I don't think so; it has no link with 'who'.
I know 'catch' 'attraper'... 'cought'...I think it is the past of 'cut'... 'whooping cought'[sic]... I'll reread from the beginning.' A good example in this latter case is whooping cought'[sic]. I have not understood...I'll reread from 'where' It seems to me that I am not concentrating.
-'acceptance' accept...I know 'acceptable' ...'acceptance' the noun of 'accept?' In French, we don't say 'acceptance' ...I think it exists. Well...Let's carry on and see...em...
-'whole cell' 'whole?' No, it has not affected the sentence. I'll carry on.
I'll reread the sentence from 'good'...Ah 'example', that is 'whooping cough' is just an example. In the previous sentence, we've talked about cholera.
'A good example in the latter case is whooping catch' [sic]...em...he is explaining from here 'where...OK, I have understood. 'whooping catch' [sic] I have to look it up I the dictionary. I think it's a disease em...from the sentence. Alright....The next sentence.

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

... I'll reread...
-'Technology' It is a very used word... 'technology'...'vaccine technology' ...em.
- 'contributed' (02). I haven't understood this word. 'conribuer?' It's like in French...em.
- 'Approaches' I've seen it before, but it is 'des approaches', so it normally must be 'suppositions' or 'possibilities'.
-'adopted'...'adapter?' 'adopter?' Like in French.
-'safer'...em. What does it mean? ...'safe'...em the vaccines that ...'safer' means 'sain' normally like in French...em I have understood. Let's pass to the next paragraph.

Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).

-'Knowledge' ...em ...In the English tests, they always put the noun of 'know' is 'knowledge'.
It has always remained in my mind.
-'enabled?' 'enable'.. 'has enabled' Ah, past perfect...'enabled...amino acids' that is 'acides aminés'. It reminds me right away of 'proteins'. The succession of amino acids, we dealt with it in the lesson on proteins.

- Between parentheses. I don't read what is Between parentheses. I first reread the sentence.
- 'involved', that is ... from the sentence...I don't understand the word 'involved', but from the entence it means 'what is included in'. The amino acids, that is - sort of- responsible –sort of – incriminate or...
-'catalytically active site', 'le site catalytique actif'. We stusied it last year in the 'Enzymology' module...em...
-Ah, 'intracellular toxins' . There are '' extracellular toxins', right... We talked about them in the 'Mycology' module. D'ailleurs, we got a question like this in the exam; I haven't answered it. I have understood this sentence. I pass to the next.

These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.	*...I don't know why they are talking about proteins and amino acids? We were talking about vaccines and toxins? That is toxins ...succession of amino acids or what?* *Let's carry on. I stopped at 'two amino acids'... I don't understand. I'll reread* *–'devoid' I think it means 'different'! 'devoid', no, tut, tut...I don't understand what it means 'devoid'...Ah I understand why they have talked about 'devoid of toxin activity'. It means they are comparing between the activities of toxins and...I don't understand the sentence only because it contains the word 'devoid' which means that it is an interesting word that I have to look up in the dictionary.* *I'll reread the sentence for the third time.* *- 'one or two amino acids'...I also remember the succession of amino acids...'Devoid' ...This word annoys me ...I'll carry on.*
Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.	*-...'mutant' I remember 'les mutuations', genetics. We've understood it. 'Mutant proteins; 'proteine mutée'...* *-'Ah 'likely' from 'like'? 'more likely?' I've never heard this word, but I think it is derived from 'like'...'likely'...'more likely...em because we've put more only...ah.* *-'reasons' It is used a lot in the songs that I listen to.* *-'gross alteration?' What does it mean gross? 'gross' is from 'gros?' tut, tut*

...'gross alterations?' ...I haven't understood 'gross' but it has not affected.... I'll reread the sentence.

-I haven't understood the sentence. I haven't understood it at all because it contains 'gross alterations.' I have to look up 'gross alterations' (02). I know it. 'gross' (02). I have to look it up in the dictionary...

...Next sentence...

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

-'First' It means that is, it going to talk about.... I'll read the sentence first...It is not long; I'll read it first.

-'folded' I haven't well understood this word. 'fold' (02) tut, tut...I have to look it up in the dictionary.

-'native', 'native structure'. I've heard this word, 'native', like when we say 'natif' tut, tut... Yes, yes, I have understood it. We used to say in English 'native language is Arabic'.

-'Epitopes' I have read it in a text...'epitopes'... I haven't understood it. I have to look it up in the dictionary.

- 'trigger' I haven't understood it, so I 'll carry on reading the sentence.

-'recognize' I have found it for the second time now. I'll reread the sentence is...' First...'

-'display' ...'epitopes' I can't understand it; I've to look it up in the dictionary together with 'trigger'. Because I haven't understood them, I can't understand the sentence. I'll search them in the dictionary.

The second sentence...

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-'Secondly' ... mm I'll reread before I turn the page.

-'likely' does not seem to be derived from 'like' in this sentence, so I have to look it up in the dictionary.

-'stable'...' stable (French pronunciation) mm... like in French.

-'proteolytic'...'lytic', that is (la lyse?) ...'proteo- lytic' that is the analysis of proteins. It is like in French.

-'the host', 'la cellule hôte' mm...I'll reread the sentence from the beginning.

- 'folded' has changed the sense a bit. I have to look it up in the dictionary.

.... I've understood the sentence.

Thirdly; in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

-'Thirdly in, the case'...'case' 'dans le cas'... 'enzymatic'...(04 seconds)...
-'carry' from 'care?' tut, tut, I don't think so. I have to look it up in the dictionary.
The comma, intoxication...I have to reread first before I carry on...'toxin...mutated' mm ...
-'function' 'la fonction'
-'carry' It seems to be derived from 'care', but I don't know. I'll carry on.
-i.e.?
-'bind' (02) 'binding' means to tie, 'lier' I have understood it (02). I'll reread the sentence, but what is this i.e.? I'll carry on.
I'll reread … I have understood the sentence. Ok, I'll carry on reading.

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

-'enables' It is derived from 'enable' and 'les', but normally with double's'...'enables' (02) I haven't understood it. I have to look it up in the dictionary.
-' efficiently' … em... When I did the exposé in English about food microbiology, she told us whether we know 'efficiently' and I found that it means 'efficacement'...em...
- 'raise, raised'...raise not rise? That word is different. 'raised' I haven't understood raised but I have come across it many times....I remember that song...'raised'...But I haven't understood. I have to look it up in the dictionary.
- 'whole' once again! I have seen it before, but I haven't understood. I have to look it up in the dictionary too. I'll carry on reading maybe I'll understand.
- I'll reread the sentence. It is a bit....
-'vaccination' It's only now that we talk about vaccines! ...'vaccination'....
Ok, I have understood the sentence.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

- 'regard' This is a figurative sense 'Dans ce regard'...em like in French.
- 'adjuvant' from 'adjacent?'...I don't understand this 'adjuvant'...'to very effective adjuvant' ...Let's reread the sentence and see...Normally, I have understood the sentence. 'Adjuvant' has not affected the meaning.
I remember the table! I think it is because I haven't read it that I haven't understood well. … No, I'll carry on and come back to it later.

This approach relies on fundamental knowledge about the toxins and other virulence determinants (e.g. adhesions) a bacterium makes.	-'relies' , relier? 'This approach'...em...Like in French, relier, normally. - 'fundamental', 'fondamental...em... -'virulence' we studied it in microbiology. 'virulent'; it has got a good relation with viruses. - 'Determinants' eh...I'll read what is in the parentheses. - e.g ...I'll reread d the sentence. ...'L'école fondamentale'...'fundamental knowledge' ...mm... that is ...Yes...Between parentheses means he is explaining. I may not read it and still understand the sentence. -'bacterium'(2) The teacher told us that when we have 'um' in the end it means that it is singular. -'Bacteria' is the plural. Generally, we always find 'bacteria'.This is why bacterium sounds... I'll carry on.
It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products	-'Therefore'...These words always stop me: therefore',' however'. Even though I know their meanings, it's like I haven't understood anything. I'll carry on. -those' (02)...em... Ok -'Thus' I haven't understood this 'thus'. I always read it, but I think...but I think it does not affect ...Let's read the sentence. - 'avoid'...' -'side effects' I'll see whether it looks like I explained it before or not... -'potentially avoid'...maybe...em... But what does 'extraneous' mean?...'extra' 'neous' It is derived from 'extra', that is 'outside', the opposite of 'intra', but why 'neous'? 'intraneous?' I haven't understood it. 'extraneous bacterial'...But it does not affect the meaning. I'll reread the sentence ...(20 seconds). I'll carry on with the other sentence.
This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modifications was identified.	...I've stopped at 'toxin', the comma... I'll reread because I haven't understood anything. ...I'll carry on because I haven't understood anything. ... -'pertussis'... - 'further' far? -'chemical modifications'...I'll reread the sentence. I haven't understood the sentence

completely. I think it's because of this word 'pertussis'. But only one word affects the sentence?

-'applied'... 'applied' too. Maybe I'll understand what is after the comma.

-'where' 'where' is used to ask for a place. 'where...further'....

I haven't understood the sentence. Let's carry on.

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein, was more immunogenic than the chemically inactivated one.

-'Formaldehyde'... em... We studied it in the chemistry module.

- 'acts... cross-link' Ah 'cross-link' We studied it in the 'Genetics' module. ...

- I'll reread before I finish because the sentence is too long. I'll divide it.

-'Formaledehyde' ...I'll carry on...'was shown' ...show...I don't know whenever I see 'show' I remember the song 'Show me the meaning'.

-'sites' I stop at 'sites' and reread from 'was' ...'was shown to affect' ...Ah, it's linked with the previous sentence.

-'potenlièllement [sic] mask' means 'masquer' like in French? Yes.

-'since'(2) When I see since, it seems to me they are talking about the past or... because generally when we use 'since' , we put a date 19.. something somehow old.

-'untreated' It is derived from...It is the contrary 'treated'...I haven't understood the sentence. It's long. I'll start from 'formaldehyde'. I'll reread it. I have understood the sentence. I'll pass to the other one.

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems; using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

It's long; I haven't understood it. Let's read it first and see.

-'newer delivery' What is 'newer'? ...

-'further'... I've read 'further 'before and now...'further' means...I don't know...'the newer'... Ah, 'le récent'...new – er.

-'delivery'... 'deliverer' ? I haven't understood 'delivery'. I look it up in the dictionary.

- 'metabolically' When I read 'metabolism', I remember biochemistry. We studied it in the second year.

-'attenuated' It's like I've read it before ...'attenuated vaccine'; I think...

-'Orally' (02) I haven't understood it...tut, tut... I'll look it up in the dictionary.
I don't know why 'aro' is written like this in italics...'aro'. It could be a scienti.... Generally it's the names of bacteria that are written in italics. This one I don't know why they have written it like that. I'll carry on and see ...em...'strains' , 'souches'.
-'Salmonella' a very dangerous bacterium. We did a TP on it in the 'food microbiology' module. She asked us to bring some meat and...
-'Salmonella' Why is he talking about it under viruses? I'll carry on ...eh, under vaccines?
I'll reread the sentence from the beginning...
I haven't understood the sentence.
I haven't understood why he talking about 'Salmonella'. I'll read it for a third time and see.
-'Orally' has affected the sentence meaning. I don't understand...em I'll carry on reading...The next sentence.

Such systems have the potential advantage that they have the greater likelihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administered live vaccine will be cheaper and will not require continual refrigeration.

It's too long. I'll read in bits.
- 'potential'...potentiel
- 'greater' ...great
-'likelihood' I don't know the sense of 'likelihood'...'like'...I know. 'lihood'... I don't know there is such a word in English... 'likelihood'... I'll look it up in the dictionary.
-'mucosal' 'la muqueuse'
-'via' (02) I know its meaning, but I've forgotten it. I'll carry on maybe I'll find the .... I understand it like 'à partir', 'à travers'.
-'Third World' I'll reread the sentence.
- I don't understand 'likelihood'. It has affected the sentence meaning.
- 'administration via'? ...then we talk about oral route'...That is 'la voie d'administration', like in French? ...em ...'via' means 'voie', a Latin word, I think...whatever
-Third World' It's our case. Whenever they talk about something that is not good, it's always 'third World' of course.
-'orally' The word is repeated many times now.
-'cheaper'...'cheap' means 'costing little money'...em...
- I don't understand 'refrigeration'?
I don't understand the sentence; it's long. I'll reread from the beginning.
...em...That is why they are talking about the conservation of the vaccines ...because I've

- *'synaptosomal preotein' (02) ...I don't know...*	*found 'refrigeration'. From what we've studied, the strains (les souches) and the vaccines, we conserve them in a cold temperature.* *-'cheaper' ...em... they are talking about the Third World...'be cheaper and will not require...' But I haven't understood this 'orally'.* *Oh, I haven't seen the table, let's see it now.*
Common targets attacked by several toxins	*-'targets'? 'trajets'? No, my friend told me when we have read the text (the training session) , we found 'targets'. She told me it means 'cibles'* *- common' ...'common cold'? what is 'common'? I always read in 'common cold'. I know it's a disease. We dealt with it in the text of the English exam. But what relationship hasit got with targets? ... 'common' (02) It sounds like 'courant' ...I don't know.* *-'targets' ...eh...that is 'les cibles'.*
Membrane	*-'membrane'*
Translation apparatus	*- What does it mean 'apparatus'? I'll read the examples. The examples on 'membrane'...I don't like concentrating too much on them. I just read them like that. (superficially). I don't give them importance ... these examples. Maybe I'll read the targets, but not their examples.*
E. coli stable toxin (ST)	*-' Eschererchia coli'...I remember it. We've studied it a lot. It's a bacterium that we must know. It's beneficial...Oh, yes. They work with it a lot in genetics and ...* *-'S T' What is 'ST'? ...I don't know.* *-'translation apparatus' I don't understand 'apparatus'. I'll look it up in the dictionary....'translation' We studied it in the ' physiology' module last year ... 'translation'...*
Diphtheria Toxin (DT)	*-'Diphtheria Toxin' Why should I read these? I won't read the examples. I'll just skim them ...* *What is that they are putting between parentheses? ETA, CT, LT, CNT, PT?* *I don't understand them.... I won't read the examples.*
Synaptosomal proteins	*-'synapto/somal' I know 'les synapses' 'synapt'... We've studied them in the 'physiology' module. It about ...I can't remember.*

So the targets are: the membrane, Translation apparatus, GTP-binding Proteins. No need to read the examples.

But I think I have understood the text although it contains many difficult words. But I have to reread it to get a recapitulative idea...to get a deeper idea. It seem to me there is no relationship between 'therapeutic' (02)
...'Therapeutic Uses of Toxins'...that is between...when I have read the title and the text. I have to find a relationship between them...em ... 'Therapeutic Uses of Toxins'...Oh, it's true, we've spoken about them...

STUDENT 03

The powerful Uses of Toxins	*The title means we are going to talk about the use toxins.*
The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with advantage of a greater knowledge and the ability to manipulate their toxicity genetically.	*…. The sentence is long.* *-'historically' means the writer is going to give us a historical overview …mm … I have to stop at the punctuation mark.* *-'manipulate' …We usually use this word 'manipulation' (French pronunciation' …Ok.*
In addition, their potent actions have found widespread uses in other aspects of biology.	*- 'In addition' means something will be added.* *-'widespread' I have seen it before. We can divide it into 'wide', that is vast, … and 'spread'. … I'll carry on reading the sentence, then understand the .. … Ok, the sentence is clear.*
As the major effectors of bacterially induced host damage; toxins play a prominent part in both conventional and empirical vaccines and the new generation of rationally designed vaccines.	*Eh …'host' we've seen before; it is 'hôte' in French… Even this sentence is long. I'll have to reread it.* *- 'conventional' …It's like in French 'convent..', normally like in French.* *-'empirical' I don't understand it…I'll reread the sentence…I'll pass to the next sentence.*
It was recognized early that inactivation of the toxic activity could produce	*… I'll reread. 'recognized' I've stopped at it twice. I don't understand it, but I'll try to finish the sentence to understand it…I can understand it now…I don't understand the word, but the sentence is clear. I'll pass to the table.* *The table normally gives points that make clear many points.*
Common targets attacked by several toxins	*-'Target' we've seen it before; I have seen it before… I don't understand it, but from the table it seems like the types we are going to…* *So in the table there is 'target' and 'example'*
Membrane	*-'la membrane' We've seen it in the 'physiology' and 'Mycology' modules and others.*
Phospholipases E. coli stable toxin (ST)	*We've seen it a lot in the 'physiology' module.* *-'E. coli' We've also seen it a lot in the 'systématique' and 'Techniques de Contôle' modules. I've seen it a lot….*

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Translation apparatus	-'Translation' I've also seen it in 'Molecular Biology' module. -'apparatus' I don't understand it, but I don't know whether it looks like 'apparait'. Normally, I look it up in the dictionary…'Apparatus'…I don't know whether it is like the verb 'apparaitre' or …I don't know.
Ps. aeruginosa	- 'Ps. aeruginosa' I've seen it a lot, especially in the 'Techniques de Contrôle' module. The teacher always repeats it, especially when we studied the ultraviolets.
Shiga Toxin	-'Shiga Toxin' (02) Normally the name of the toxin. This is something scientific. …'GTP-binding protein'…'Diphtheria Toxin' …'cholera Toxin' E. coli …I've seen them all. They are clear; these are normally names of microbes. We've seen them a lot in all the modules…We speak about them a lot.
Synptosomal Protein	-'Synaptosomal protein' …'synapto' Normally it is like we've studied… -'synapse'… . We studied it in 'Physiology'and 'transmissions hormon…'; 'transmissions nerveuses'…normally in the synapse 'transmissions nerveuses'
Cl.. Botulinum…Cl. Tetani	The examples 'Cl. Botulinum', 'Cl. Tetani'…I've seen them a lot, especially in the 'Food Microbiology' module…I've seen them a lot. So the table is clear, that is it gives us the types of parts of the body, and the Toxins or the microbes that can affect that part. The table is clear. I'll pass.
highly effective immunogens because inactivation did not destroy epitopic structure.	-'high[t]ly'[sic] 'highly' Normally like 'high'…I don't understand it exactly. 'highly' means 'big' or …I have to read the sentence for a second time. - 'epitopic' I don't understand it. I have to use a scientific dictionary …'epi…topic'…'epi…' which means 'superficial' and 'topic'…. structure'… But I have to reread the sentence because I was perturbed when I stopped… 'highly effective structure…' I'll pass to the next sentence.

Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).

I have to reread the sentence.
-'chemically' I always come across it.
-'vaccine'…We've studied in the second year, but I haven't got a lot of information about it.
- 'protection' like in French
-'against' I've seen it …'disease… tetanus… diphtheria'…I've seen them a lot in the   , that is anti' tetanus, anti diphtheria vaccines…Good…The sentence is clear; I'll pass to the next sentence…

However, this has not been a universally successful approach, either because the induced immunity was poor and shirt lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.

The sentence starts with 'however'; it will be a long one; I will read it many times and divide it according to punctuation.
-'universally' means 'universel', like in French.
- 'successful' is clear.
-'approach'…I don't know what it means. Normally, I'll explain it in the dictionary… I'll carry on maybe I'll understand it…
- 'poor' is clear …'short lived (e.g. cholera) I've heard it a lot, especially in the 'Techniques de contrôles' module and I 'Food Microbiology' because what causes it is 'vibrio cholerae', the cholera microbe.
… I have to read the part of the sentence after the comma for a second time.
-'perceived' I don't know what it means exactly … 'perceived to' maybe 'leads to'…
-'unacceptable' is clear.
…Now I have to reread the whole sentence because…I have understood the sentence because I have divided it and reread it for a second time, but I haven't understood some words like 'approach'; I need a dictionary.

A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.

This sentence is also long; I have to reread it…I don't understand 'acceptance', but the first part of the word 'accept' is like in French 'accepte', but we have added the adjective. I can't understand it…I mean…in the sentences...
-'whole' I don't understand it…I have to reread the sentence.
Always… this 'whole' I don't understand it. It perturbs the meaning. I need to look it up in the dictionary to further understand.
… I have understood the sentence, but I still don't understand that word… '…always been high[t][sic]…I'll pass to the next sentence.

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

-'several' I've already seen it many times...
-'approach' I've also come across it. I understand it like 'the future', or 'the coming days'...or... I have to reread the sentence .
-'adopted' normally 'adopter'... The last sentence seems clear, but normally I should reread the paragraph because my comprehension has been perturbed .... Now I'll pass to the next paragraph

Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).

- This word 'knowledge' (02))...normally it means 'connaissances' ...
- 'toxin' I have seen this word a lot.
- 'enabled' I haven't understood it, but I try to finish the sentence maybe I'll understand it ...'amino acids', 'les acides aminés' We studied them a lot, especially in biochemistry.
- 'are involved' This 'involved' ...I stop at it ... I don't know what it means.
-'cata...lytically' This I have seen a lot, especially in the 'enzymology' module ...'catalytique'...
The parentheses indicate that more explanation will be added. I'll reread the sentence...I have understood it, but not very well.
-'has enabled' I think it means...'knowledge about toxin structure has enabled scientists to identify' ...It means' it means 'it facilitates us' to know which amino acids....
-'involved' It is as if it is included in the catalytic activity. Normally I understand it like 'it is included'...I'll explain it in the dictionary...I'll pass to the next sentence.
I'll reread the sentence.

These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.

'enginee...engineering...genetic engineering' This is clear. It is like in French. ...This sentence is simple...Ok, I'll pass to the next sentence.

Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.

-'mutant' I have seen it a lot, especially in the' Genetics' module.
-'alterations' I have seen it a lot, especially in food alterations or in the 'Food Microbiology' module.
... I'll reread the sentence... Simple sentence; I'll pass.

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

-*'First' indicates that the writer is going to give us steps which start with 'First'.*
-*'correctly' normally 'correctement'.*
- *'epitope' I see it for a second (another) time, but I don't know... I'll always divide it into 'epi' which means 'superficial' and 'tope'...*
- *This 'trigger' /trizer/ or 'trigger' /triger/ I don't know what it means, but I'll finish the sentence maybe I'll understand it. ... I'll reread the sentence.*
-*This 'trigger' I don't understand it. A dictionary is necessary because I haven't got any idea about it.   -'recognize' I have seen it before.*

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-*'Secondly' So it's like we've got steps.*
-*'folded' I've already seen it, but ...'correctly folded molecule'...This 'folded' I thought I have understood, but now I don't know...It is as if it has changed...I don't understand...In this sentence, I haven't understood it.*
-*'correctly folded molecule' ...This 'folded' I don't know what it means ...eh...I need a dictionary, but I try to finish the sentence maybe I'll understand it... I'll reread the sentence... Always the problem with 'folded'. I don't understand it.*
-*'proteolytic' I have seen it a lot.*
- *'host'... eh...'la cellule hôte'.I'll pass to the next sentence.*

Thirdly; in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

-*'Thirdly' means the third step.*
- *The 'enzymatic function' I saw it a lot last year in the 'Enzymology' module.*
- *'will be able', 'able', normally 'capable'.*
...I'll reread the sentence...Ok, when I have reread the sentence, I have understood well. I'll pass to the next sentence.

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

The sentence is long; I have to reread it.... Ok, when I have reread it, I have understood it. ...I'll pass to the next sentence.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

-*'interesting' means the writer is emphasizing something that is important.*
-*'adjuvant' I've seen it in the 'Techniques de contrôles' module... 'les adjuvants' ...'adjuvants' ...Yes, I've seen it in the ...Normally...he told us ...'adjuvants' looks like 'additives'. This is how I understand it; this is*

This approach relies on fundamental knowledge about toxinsand virulence determinants (e.g. adhesions) a bacterium makes.	*-'This approach'… The word approach once again, but now I think I understand it as: 'This view' or 'This point' about the...* *-'relies' means relate... Ok...I'll reread the sentence.* *Parentheses , always…Normally he gives us examples or better explanation.When the parenthesis is short, it helps a lot, but when it is long, it affects my understanding. …Ok... After I have reread the sentence, I've understood it.*
It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.	*-'Therefore' I have seen it before; I've got an idea about it...* *-… have to reread the sentence.* *- 'concentrate' Normally, it is like 'concentrer'; I relate it with French.* *- 'Pathogenesis'…'pathogènes'…I have seen it many times in all the modules.* *-'potentially'… It's like in French.* *-'extraneous' …I don't understand it. I have to reread the sentence for a third time…The first part is clear, but the last part because of the word 'extraneous'…* *-'extraneous bacterial products'; it is like 'extracellular bacterial products'…I've understood it like this... 'extra' means 'external', but I can't understand 'neous'.* *Normally, I need a dictionary to explain it. I understand it like 'extracellular bacterial products'…I'll pass to the next sentence.* *… I have to reread the sentence. When the sentence is long, I can't …or I have to divide it according to the punctuation and when I understand it, I reread the whole sentence in order to understand it well.*
This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modifications was identified.	*-I don't understand 'pertussis'…'pertussis' reminds me of 'persist', but it doesn't have this meaning at all. I'll pass…* *-'Further' We studied it in English last year, because she gave us examples on it.* *-'approach' It is the fourth time I see it, but I think it means 'an overview', or 'viewpoint' about…' a scientific overview'…*

Such systems have the potential advantage that they have the greater likelihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administered live vaccine will be cheaper and will not require continual refrigeration.

I have to reread the sentence for the third time. …(17 seconds) It is somehow (02) clear.

- This last sentence is very long; I have to reread it many times and try to divide according to punctuation, because I can't understand it.
-'Formaldehyde' We studied it a lot; my mind goes directly to the 'Biochemistry' module of last year.
-'cross-link' There is 'cross'…When I hear it; I think of 'cross over?' which we studied in genetics, second year…'cross…since…'
…I haven't understood anything in this sentence.
The words are clear, but not the sentence. I try to reread it. …(19 seconds)…When I find the word 'since' It's like he is narrating…talking about 'time', like or…My mind goes directly to ' time'.
…I have to reread the sentence…The words are clear; but I can't understand the sentence
…I don't know what to do…I'll read one more time. (24 seconds) …Done….Normally I have understood it. I'll pass to the next sentence.
-'metabolically' I always find it.
This example 'aro strains of Salmonella' I don't understand 'aro', but I've heard a lot about 'Salmonella'. We always talk about it, especially in the 'Techniques de Contrôles' module.
…I haven't understood the example, mainly because of the word 'aro'…'strains of'…I don't understand what 'aro' is … 'aro' I haven't seen it before…I don't know maybe it's …they are abbreviations, but I don't understand what they are…I have to reread the whole sentence.
- Yes, this 'delivery' I have to…I can't understand it. A dictionary is necessary.
Every time I read the sentence I stop at it. That means I have to understand it. In spite of the example used in the sentence
-Normally the example gives more explanation, but I haven't understood it.
Although the words are clear, except the words 'delivery' and 'aro', especially 'delivery', a dictionary is necessary.
-'aro' seems to be something scientific, but I don't understand it. I'll read the sentence again.'bacteria' My minds goes straight ahead to the English module this year…We studied…

She gave us a text about bacteria...She gave it on the exam and told us to summarize it. ...The same problem in the sentence; I can't understand the word 'aro' and the example. But I have an idea about the sentence in my mind. I'll pass to the next sentence.

This last sentence is very (03) long. I can't read like this. If I read the sentence all at one time, I will forget everything. I have to read a first time ...Now I have to read the sentence word by word and stop at any punctuation mark because for me it is very long.
-'advantage' Normally it is like in French 'avantage'.
-'greater', normally re adjective of 'great'.
- likelihood' I don't understand it. I mean I can divide it into'like', but 'lihood' (02) I don't understand anything. A dictionary is necessary.
-'mucosal' I've seen it a lot, 'la muqueuse'
-'via' The teacher told us about it. He told us it is like 'by the intermediary of' This is how I understand it.
-'in the Third World' I don't like this word 'Third World' because I feel we are underdeveloped. We are not even in the second world. We are in the Third World, that is two worlds before us.
-This 'refrigeration' we studied it in the 'Techniques de Contrôles' module. I remember when he told us about the refrigeration and the freezing temperatures. But I have to reread the sentence.
- That word, every time I reread I am stuck with it 'likelihood'
-'since', as usual. Whenever I see it, I feel the writer is talking about 'time'.
-'require', normally like in French. I understand it like 'requière' in French.
I have a general idea about this sentence, but that word 'likelihood'... No, I have to understand because this is the last sentence, so it must contain the conclusion of all what I have read. So, I must understand it well....
-'likelihood'...A dictionary is necessary...No other solution...
I have a general idea about this sentence, but because it is very long, especially because it contains.... This sentence contains only one comma, so it is long and even I divide it, it is

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still very long.

It is over …It's clear like this.… I have assimilated the idea, but I have to reread this last paragraph because I feel it contains the conclusion of the whole text. It contains many ideas, that is it contains all the important things …the conclusion.

Normally it is clear, but because I have read the sentences individually, I have ideas but I feel they are scattered (éparpillées). I don't feel they are connected ; I have to reread the text to relate the ideas.

STUDENT 04

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with advantage of a greater knowledge and the ability to manipulate their toxicity genetically.

-*'powerful' I don't understand it.*
The sentence is very long; I have to reread it.
-'greater' It consists of 'great' which means ; 'greater' is an adjective, that is
-'genetically', that is genetics of the third year...genetic manipulation...

In addition, their potent actions have found widespread uses in other aspects of biology.

-*'potent' I don't understand it.*
-'widespread' We've already seen it in the text of this morning (training session)...'wide-spread'...But she didn't tell us its meaning. I'll carry on and see from the sentence context. ...I'll reread the sentence to have a full idea.
- That is, here the importance of toxins. Still, I am not familiar with the text.

As the major effectors of bacterially induced host damage; toxins play a prominent part in both conventional and empirical vaccines and the new generation of rationally designed vaccines.

-*'prominent' (03) ...important, or...'promi-nent' ...'pro' (02)...*
-'conventional empirical' I haven't seen this word before, but 'empirical'... I remember the 'ampere' in physics, the unit for measuring electric current. But what is its relation with 'empirical'? I don't know...
-'rationality'(02) [sic] 'ratio' It seems to me I have studied it.... Yes, in the 'Mycology' module, but what does it mean here? ...I don't understand ... My understanding is 'choppy' The ideas are not connected together; I have to reread.
- 'prominent' I said before that it means important', but when I have reread, it sounds like it is probably wrong... or maybe it is true because I have reread it...
-'conventional empirical'...'convention' means 'mixed up' or...'empirical' ... I don't understand well... I'll pass to the next sentence maybe it'll make the meaning of the previous sentence clear.

It was recognized early that inactivation of the toxic activity could produce highly effective immunogens because inactivation did not destroy epitopic structure.

-*'recognized' I've heard it...I am familiar with ...I know that I know it, but I've forgotten it ...or 'recognized' means 'they knew' or 'they confirmed'.*
The table...I'll come back to it later. I'll finish the sentence in order not to lose the idea.
-'effective' The same word as in French. .

	-'epitopic' There are two parts in the word: 'epi' means 'on', 'topic' means , that is ...'epitopic' means Indeed, it involves , but this 'epi' I don't know its place in the context. But in spite of this, I haven't understood the previous sentence...Maybe I have forgotten it altogether... I'll carry on. I first read the table, then come back to the sentence because the table usually summarizes the important ideas that may be in the text. So, it isn't very full, and it is summarized. In this way, I'll have a better idea.
Common targets attacked by several toxins	*- 'targets' I've already read it this morning (training session)... ...'targets', normally, 'parts'...'parties', not 'parties', 'parts'. ...I am reading the title of the table. It contains some terms that I can't assimilate, or put together...No, I understand...yes...*
Pore-froming toxins	*-'pore-froming' When I read 'froming'...I remembered 'fromage' . I don't know. Maybe I am hungry.*
Phospholipases	*-'Phospholipases' I remember the 'Physiology' module of last year.*
Translation apparatus	*-'translation' 'trans' means ,em... -'apparatus' 'appearance'...'apparatus'...I'll read them together 'translation apparatus', or 'appareil'?(02) Isn't it the plural of 'appareil'? Let's read the examples and see...*
Ps. Aeruginosa exotoxin (DT)	*When I have seen 'Pseudomonas aeruginosa', I have noticed that they've written 'aeruginosa' with a capital letter, and this observation the teacher always emphasizes that it is written with small letters. Genre is written with a capital letter, and species with small letters.*
Shiga Toxin	*- When I have seen 'Shiga' I remembered 'Shigel' which is a kind of bacteria. Maybe 'Shiga' is the clipping of 'Shigel'*
GTP-binding proteins	*- 'GTP-binding proteins' I remember the 'Physiology' module of last year.*
Ps Aeruginosa exotoxin A (ETA)	*...The same mistake...*

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E. coli cytoxic necrtizing toxin (CNF)	-*'necrtizing' I haven't understood it. Normally, I'll search it in the dictionary.*
Bord. Pertussis toxin (PT)	-*'pertussis' I've read it twice, but...no information. I'll skip it, because with the examples.… It is not necessary to understand all the examples, but I have to know this 'pertussis'*
Bordetella dermonecrtic toxin (PT)	- *When I've read 'Bordetella', it comes to my mind 'bordeaux'' (02); a place in France normally... I know it .* -*'dermonecrtic' At first, the word seemed long, but when I've read it... It is made up of 'derm' that is skin, so it has an influence on the skin...so we will see the structure of the word, maybe it gives us an idea.*
Cl. botulinum C3	-*'Cl. boulinum' I remember the lesson of 'Food microbiology', so I am using information that I already have...familiar.*
Staph. Aureus EDIN	-*'Staph. Aureus' The same mistake of the capital letter. I don't know why he is repeating it.* *Normally he writes in small letters...I don't know.*
Synaptosomal proteins	-*'synaptosomal' …When I have seen 'synapte', it seems to me it is like or...we have already studied them in the 'Physiology' module...'somal' means maybe.…*
Cl. tetani toxin	-*'tetani... Cl. Tetani' I remember last year 'tetanus'; it is a disease; it causes ...So previous information...In spite of this, I can't put ideas together from the table. I am reading in a broken way, but normally I have a general idea.* *Now I'll pass from the table to the text...I feel I have forgotten what I have read in the previous paragraph. Maybe the table has interrupted my comprehension. But when I have read the table, has it benefited me or not? I'll continue and see...*
Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).	-*'attenuated' It is difficult...'attendre'? So I am trying to relate it with French. Is there a relation or not? ...* -*'against' We know it...* - *When I see 'e.g.', example, I remember an information that the teacher gave us , but I can't*

However, this has not been a universally successful approach, either because the induced immunity was poor and shirt lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.

-'either'...I remember the English grammar. ... I'll reread the sentence because I haven't understood....
-'perceived' (02) I don't understand it. I'll reread what is before it before I pass.
- Now I have normally understood it. It means or.... This means that one has to finish the sentence and see.
-'side' It means 'sadness'? or...No, it is not 'sadness' ; what is the relation of 'sadness' with effects? Maybe it is something sad or destructive, i.e. its effects are not good. It expresses this meaning not necessarily.... I'll pass to the next sentence, but at the same time I can't put all the sentences together.

A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.

-'whooping cough' /koi/ [sic]... 'whooping' When I read this 'whooping' I remember 'weapons'... No, but... what have weapons to do here, now? I don't understand 'whooping cough'...I'll reread from the beginning maybe it will serve...
Normally, I finish first because what comes after is the explanation.
- 'acceptance'...'acceptable?' (French pronunciation)
-'whole cell' (02) ...'the host cell?' I'll reread the sentence ... I don't understand 'whooping cough'. I feel I understand the words but not the meaning. I have to reread the sentence before I finish it.
-'public'...What has public to do here? ...or important; it means 'important'...Normally; I have understood; I'll finish the sentence.

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

When I read 'technology', it always comes to my mind the word 'micro-computer'. I don't know why.
-'approaches' normally 'les approches'; I have directly linked it with French.I've read it 'approche' , not 'appro-ach' because of our habit with these words.
-'adopted' (02) 'adaptation' (French pronunciation) maybe.... I'll reread the sentence.When it is a long sentence I have to go back (regress) ... I am repeating...Normally

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Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).

-'catalyti-cally' (02) 'catalytisation' (French pronunciation)...No, I've forgotten 'catalytic'. I know the word, but I confuse things...I'll reread what's before...Now I understand 'catalytic; it means 'the effective situation, or

*   .*

I've forgotten 'active'...Yes, that's where the interaction takes place. I've remembered the 'Enzymology' module of last year.
-I don't like parentheses. I'll reread the sentence ……Yes I understand. I'll pass to the next sentence.

These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.

- When I've read 'genetic' I immediately think of the 'Genetics' module of last year. I remember all the handouts...
(04 seconds) I am rereading because the word 'genetics' has stopped me . I have to remember the meaning... (12 seconds) At the same time, I've remembered a documentary film my friend told me about where young people are kept always young thanks to genetic engineering. But when I've remembered this, I've lost the sentence meaning. I have to reread the sentence.

-'devoid' I don't understand it. I have to reread the whole sentence; it may be 'different'...'devoid'...'different' mm... that is from the sentence context, it may mean 'different'... I'll pass to the next sentence....

Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.

I know the sentence is easy, but I can't understand it. I'll reread it ... I'll pass to the next sentence, although I haven't understood very well the previous sentence.
Up to now, I can't assimilate specific information because I don't have a big background knowledge in this domain. This is a new domain, or new information. So I'll read the next sentence.

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

Because he has said 'first', this means there is 'second' and 'third', that is there is a classification, or enumerating various things.
-'folded' I haven't understood, when I have read it, but I'll carry on.

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-'native...'native structure'? I don't understand it. I'll reread the sentence... 'Native' sounds like   . I'll reread the sentence in order to find the meaning of 'folded', and the sentence meaning

- Native' sounds like   . I'll reread the sentence in order to find the meaning of 'folded', and the sentence meaning to this point .... 'folded' maybe it means 'transport'; I'll carry on and see.

-'so display' ...'dis' and 'play'.

-'epitope' once again. I've seen it in the very beginning.

-'trigger' I don't understand 'trigger'. Maybe it means 'constitutes' or because I've finished the sentence, it seems...so... 'constitutes'.

-'recognize' I've read it before, and.... I'll reread only the last part of the sentence.

-'display'(02) normally means 'inhibition'; 'play' means 'amuse one self'; 'dis' means 'negation'. So, there is 'movement' and 'dis' means 'inhibition'.

-'trigger' ...Yes, normally when I have reread the sentence, it is confirmed or I am convinced that its meaning is ...'constitute', or 'create'.

-'recognize'? Maybe it means 'inhibition' also, but I am not convinced.

-I'll reread the last part. ... Yes, there is 'recognize' and there is 'active toxin' so it was active...and this reaction inhibits it mm I'll pass the next sentence.

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-Here is 'secondly'...Since he said 'First' it means there is 'secondly'.

- 'folded'(02) Once again ...mm... When I have read the second 'folded', I've gone back to the first one to find out whether there is a relationship between the two and whether my previous guess was right or not.... I am reading the sentence of the first 'folded' ...

-'folded' ...Before, I said it means 'transport' and here? ...(26 seconds) Maybe that is the meaning.... The meaning is'transport'.

-'proteolytic' I remember this year's lesson. We always forget the 'y' of 'lytic'. I remember when the teacher passed, but I wrote it correctly.

Honestly, I can't relate between the sentences meanings. I feel that after I finish a sentence I forget it. Maybe a second reading of the whole

Thirdly; in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

-'Thirdly' …'intracellular' means there is 'extra'…
-'intoxication' I remember the 'Food Microbiology' module…. I'll reread the sentence.
-'intoxication' Normally I can put the ideas together, somehow.
-'i.e.' What does it mean? It is not an example…. I don't understand this last part. I'll reread it…. I'll pass the next sentence..

   This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

-'efficiently'(02)I know this word …I'll reread the sentence. Eh! 'effe'…'efficace?' 'éfficacement'
-'is raised' When I have 'raised' I've remembered the sun rise.e pron't know why. Maybe it means 'sustain' or'reinforce'. I'll finish the sentence to see whether this probability is true or false.
-'whole' When I read 'whole', it seems to me that it is like 'big'…'whole'…
I haven't understood this last sentence at all. I'll reread from the middle of the sentence.
- Normally I have understood; I'll pass to the next sentence.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

-'regard' It immediately comes to my mind 'for this purpose', or
This word does not exist in Arabic…or …'in this context'.
-'adjuvant' I know this word in French. In French 'adjuvant' means 'additifs'. I remember the additives that we add to food, but I have to reread the sentence…. 'Adjuvant' here does not have the same meaning as in French. Normally, it means 'facteurs', here. But up to now, I can't put the ideas together. I'll pass.

This approach relies on fundamental knowledge about the toxins and other virulence determinants (e.g. adhesins) a bacterium makes.

The sentence is long. I'll reread it before I finish it…. 'adhesins' I have immediately the last page of my 'Food Microbiology' copy book where I have written this word. Although I had revised it, I couldn't grasp it, but here I have immediately remembered it. I'll reread. When I remember something, it interrupts the meaning. I have to read the sentence from the beginning.
- I'll reread …When they put parentheses, the interrupt the sense for me…. I haven't understood it…. I'll reread it.

It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.

- 'Therefore' once again (laugh)...
-'potentially' It's like in French 'potentièllement'
-'avoid?' ...I'll finish first...
-'the side' or /sid/ once again.I haven't understood; I have to reread. When the sentence is long, I lose the first meaning.
-'avoid' means 'capable' and 'side' means something not good; a feature not good.
-'extra-neous' I don't understand it. 'extra' I know it means 'external'; 'ne-ous'? I'll reread the last part of the sentence.
... I don't understand it. Normally I have to use a dictionary.
There are many words that must be explained in the dictionary. Sometimes the meaning helps you to get the meaning[sic]. Sometimes the dictionary is the solution, but when you don't understand it, the word will leave you uneasy (irritated). I'll pass to the next sentence.

This is being applied to pertussis toxin where the further advantage of such an approach over chemical modifications was identified.

- 'pertussis' I have read it before in the table. Although I am familiar with the word, I can't remember its meaning. I'll pass.
- I 'll reread; I feel that the conceptual load is high in the sentences. When I have seen 'pertussis', I feel obliged to go back to the table... No, it's not the table.
Where have I read it? ...So it's in the text...I've found it in the text; I am sure, because I haven't understood it well. This is why I still remember it. Anyway, I finish first, then .... I'll reread the sentence... I'll pass to the next sentence.

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein, was more immunogenic than the chemically inactivated one.

'Formaldehyde' I know it already; I've studied it in the 'Food Microbiology' module.
-'cross-link' : 'link' to tie'; 'cross' 'bent'... 'cross' like a stick, because I remember I have studied it in a module...So, it is bent.
-'untreated' It contains 'treated' and 'un', negation. Normally 'not treated'
I'll reread the sentence once more, but it's long; I 'll reread it from the middle....I'll pass to the next paragraph.

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-'genetic manipulation' I know it in French. I remember the module of last year. I remember sound and image how I was studying, but when I remember like this, I lose the other meaning.
-'newer'...'near'? 'delivery'...'live' I don't understand 'newer delivery' I'll reread the sentence.
- I don't understand, although I have reread it.
-'attenuated';I don't understand it. It seems that I need a dictionary for all these words. Sometimes the sentence meaning helps you; sometimes it can't give you anything....I am rereading the sentence.
-'aro' I have no idea.
-'stains' I remember the exposé. I searched it, but the meaning that I found was wrong and my friend corrected it for me; it mean 'souches'.
*-'Salmonella' I remember the **TP** and the mistakes we did.*
-'survive' (French pronunciation) It is like in French.
- I haven't understood the last meaning. I'll reread.
- 'aro' I haven't understood it, although I have reread the sentence.
- When I have finished, a certain meaning has appeared. I'll carry on with the next...

Such systems have the potential advantage that they have the greater likelihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administered live vaccine will be cheaper and will not require continual refrigeration.

- Before I finish the sentence, I'll reread it. I feel it's going to be very long.
–'like-li-hood' 'Hollywood', no.'like' 'similar to'. I don't understand the last part of the word. I'll reread the sentence because when I stop I lose the previous meaning.
- From the context, it could be 'preservation' or the 'capacity', possible...
-'mucosal' (02) I know it, but I have read it many times. I remember the first time I have searched it.
-'administration' (French pronunciation) The same word as in French.
-'route' I remember the 'road'.
*I'll reread what is before it...'to be of use' It seems to be a poor structure (style); I mean **heavy**; not...*
-'administered' I don't underst...I'll reread the sentence; I want to...
-'cheaper' means 'costing little money'.
-'refrigeration' I remember a lecture...but I have to reread the sentence.

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It's long; I have to put the ideas together.
- I have reread it, but it's like I haven't read it before.
- When I have read 'route' it sounds like it's the **'wrong way'.** *I have some doubt. I have read it, but I can't put the main ideas of the text together maybe because the information is new. I have to read more about it and I must have a dictionary. We can't do without it. Thank you.*

STUDENT 05

Therapeutic Uses of Toxins

I first read the title. The title is important.
-'Therapeutic Uses of Toxins' 'Toxins' is clear …'venoms'
-'Use' the utilization of toxins…. Yes, I understand it.

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with advantage of a greater knowledge and the ability to manipulate their toxicity genetically.

I read the first sentence a first time and see... Yes, it is clear (02).
-'historically' …yes...Here, normally I have understood.
-'attack' It's like in French. Normally I have understood...'attack...vaccine' …'vaccin' (in French) …I have understood the whole sentence.Normally, I'll reread to understand. 'The powerful …' Here the sentence up to the comma I have understood it. I'll read the sentence after the comma.
-'advantage' I don't understand it (02) Normally, I'll use a dictionary. I'll reread because this word seems to be the key to understanding, I'll reread it... Normally I have understood in the second time.

In addition, their potent actions have found widespread uses in other aspects of biology.

…I'll reread it... It's clear. There are difficult words; the important thing is that I have understood the overall meaning. There are difficult words such as 'addition' which I haven't understood (02) . For m e, usually, I'll use a dictionary.

As the major effectors of bacterially induced host damage; toxins play a prominent part in both conventional and empirical vaccines and the new generation of rationally designed vaccines.

I am reading the second paragraph [sic].
-'host' always reminds me of the English lesson of last year. 'host cell' means
I've understood up to the comma.
-'toxins play...' From small terms [sic] …I try to understand from small terms [sic]; as for big terms [sic] that specify the meaning, I have to use a dictionary. The paragraph [sic] is too long; I have to reread it (02).
-'major' has got two senses (02). I mean it reminds me of the biscuits (brand) …laugh , and 'majority' that is the majority. I am sure... It's the small terms that help me understand; whereas, big terms... I mean I have to scrutinize the small words, but the big terms…. Here, I have understood up to the red dot from small terms. My eyes hurt me…. I have to reread.

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It was recognized early that inactivation of the toxic activity could produce	...'activity could produce' (02) *The table! Here, before I move to the table; I have understood what is above. The majority of words are clear, but...eh...the first word: 'It was (recognized)' The problem is if I could readit, I would understand, but I can't read it (02). Eh... I have nearly understood, but I can't read it, so I can't understand it. If I could read it, I would understand it.* -*'of toxic activity could produce' ...But I have to use a dictionary because the word seems to be the key (02) for the whole sentence.*
Common targets attacked by several toxins	*I read the question...eh I read the title of the able to understand it. We've got the example, and we have the organs which are represented here by 'membrane'.*
GTP-binding proteins	-*'GTP' , that is energy...and the protein and the examples that are found in the (02)...eh...Here, we've got the table...I repeat (02)... Here the title of the table is the toxins that are found in the membranes(02) and in the GTP- binding protein and in the synapto...synaptosomal*
Synaptosomal proteins	*protein ...'synapto' . I've never come across this word before. I can't understand it...'synapto-somal' (02) It may be...I can make an approximate sense, but I am afraid I will make an error ...'synaptosomal proteins ... synaptosomal' I don't understand it here, but I'll reread what's above in order to understand what this is; what its constituents are.*
Pore-forming toxin Phopholipases	*We've got 'membrane' and the example for the 'membrane'. The example is 'pore-froming toxins', 'phosphalipases'...'phosppho-lipases' that is here 'phospho means 'phosphorus'; 'lipases'... I divide my word into 'phopho-lipases'. 'Phospho' means the* **hydration of lipids** *...mm... 'phospholipases'...'lipases' means the hydration of lipids , and 'phospho' means the phosphoring and hydration of lipids. What relationship has it got with toxins, here? 'membrane'... the example is the toxin that phosphorizes and hydrates lipids.*
E.coli stable toxin (ST)	- *Here 'escherichia coli' is a bacterium that we all know. 'E.coli' always reminds me of microbiology, that is the speciality 'micro' ...em... that is it always reminds me of it...'escherichia coli toxin.*

Translation apparatus	*Here we have (02) 'translation apparatus' I'll reread it; I haven't understood it. It seems that the table talks the kinds of toxins that are found in the ...in the (02) em...I'll pass to the paragraph because it seems to me ...I'll carry on with the paragraph maybe I can understand what 'translation' means...'tran' (02) ...'trans-o-lation' [sic]...I can't read it. My problem is in the pronunciation, in phonetics, not in phonetics, that is I can't read it in English. I'll pass to ...eh...the text. I'll carry on with the text. I can understand from it...em...* *-'immunogens' (02) How shall I understand this 'immunogens'?*
highly effective immunogens because inactivation did not destroy epitopic structure.	*-'highly effective immunogens' ...'immuno' means...I'll divide it; 'immuno' means ...eh ...'immunity'; 'gens' ...eh...a gene is a gene. We know it's a gene, but ...gene...'genetic immunology'.* *-'because ...structure' Here, I have to reread. 'll reread to...to...understand better. I feel I got the meaning wrong...I don't understand it. I have to understand the other words. I can't understand most of the words. I have to use a dictionary. I know 'immunogens' is 'genetic immunology' and here he is explaining ... Most of the words are not clear; I have to use a dictionary. I'll read the second sentence maybe I'll understand the first.*
Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).	*-'such...' The same problem every time, that is difficult words handicap my understanding the full idea. I understand some words, but they don't help me to get the meaning. I have to use a dictionary.* *... I've read for a second time, but I can't grasp. I have to use a dictionary. I must ...I'll read for a third time maybe... I can understand small words, but there are many words that are keys to understanding. I have nearly understood (02) but I have to use a dictionary; some words are still vague. I have nearly understood, but I want to understand these words to confirm what I have understood.*
However, this has not been a universally successful approach, either because the induced immunity was poor and shirt lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.	*- I'll read the sentence for a first time. It's very long; I have to divide it to understand the first meaning, then continue...I'll read it from the beginning and divide it. It's very long.* *.... I am reading for the second time.*

-'or because' I am reading for the first time. I can't understand it…   I always (02) understand small words. I am not cultivated in English. I don't know the majority of words. I know small words. Words are still vague. My problem is that I read word by word…ehm…Most words are not clear; I have to use the dictionary.

-'vaccin' [sic] I generally understand it because it's a common word, but the … I must try (02) to understand it, at least give an approximate sense. I can't deal with it superficially. Every time I cross a word…a sentence like this, meaning is not clear. I'll reread the paragraph from the beginning because I can't finish if I don't understand the first part…I am rereading. This 'some' reminds me of …I am rereading it. I have reached thisparagraph…'immunogens.' I have reached 'epitopic'.

-'some' (02) always reminds me of a certain teacher. She used to repeat it all the time when we were 8th grade. She repeated its meaning…. I'll carry on. The words are difficult; I have to use the dictionary.

A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.

-'a good example' The lines are mixed; I must use my fingers.
-'A good example…cough' (02) I don't understand this 'whooping cough'…'cough'; I don't understand it.
-'where …inactivated' A problem with words… problem. I can't understand the sense.
Honestly, I can't understand. I'll go to the next paragraph. I am just in the paragraph. This is too much. I can't understand it. I feel tense.

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

-'several advances…contributed' (02), but 'contributed'? It seems here… I don't know whether I have gone out of context or not. It seems to me 'buted', reach the goals. I can't confirm until I look it up in the dictionary. I can't even divide it until I search it in the dictionary. I'll reread it…I have to concentrate. Here, I nearly understood. I am happy (02).The first time since I started reading; this is the first paragraph that I understand. So that's good. Let's carry on. It gives me some enthusiasm to finish the third paragraph . No; first, second, third. I am in the fourth paragraph. Never mind, let's carry on, maybe….

Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).

My problem is 'rereading'; I read and reread. -'amino acids'   a common word in Biology...Ok. I have   understood its meaning...

I haven't understood. There are words that I haven't understood, but what is between parentheses has made the meaning clear, that is what he is talking about.

At first, I was out of context, but thanks to the parentheses I was able to understand that he is talking about 'intracellular toxins' . 'intra' means 'inside' and 'cellular' means 'inside the cell', inside the toxin cell...'toxin'. No, no, it's the   opposite,   normally   the   opposite ...'intracellular toxins', the toxins inside the cells. Here, he is talking about toxins inside the cells...ehm...I have been able to understand its meaning. I've divided it into 'intra' which means ' inside', 'cellular' is the cell, 'toxin' is poison, i.e. poison inside the cell(02) Thank God, I have understood from the first time.I haven't reread it. I have understood from the first time (02), from the general context. I don't want to concentrate every time on words because words are causing me a handicap. I have to refer to the dictionary.I want to skip the words that I don't understand and if I can't analyse them, I'll skip them because I can't understand them and this gets me irritated a thing which I did before and I don't want to get irritated. I understand the   idea and that's it.

These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.

I am reading the second sentence 'These can be ...' I'll reread...I stopped at... I mixed the lines ...I'll reread another time...Speech around me disturbs me. I can't understand; I'll reread …I've understood it (02) from small words, like every time. I was able to understand the meaning 'can be changed', that is 'make different'...'genetic' I have understood it...eh... -'produce... amino acids' that is changes take place. I've understood it.

-'toxin   activity' I've   understood   without restricting myself to big terms which I haven't understood words like 'en- en gineering (02).The problem is in the articulation. If I can articulate it well, I can make an approximate guess, but I can't articulate and so I can't reach its meaning. The important thing(02), from small words, I was able to (02) understand the

general meaning. I don't want to get irritated…eh…let's continue.
- I am reading a first time 'such…' I'll reread Here, he is nearly talking about proteins. I start to understand. Here, I have confirmed that …
- (02). I don't understand 'alterations' (02)…
I don't understand it. I have understood the meaning, but the last word has confused me. I am not sure about my understanding; so I'll reread it (02)
- 'likely' I haven't understood it.
- 'several' I've heard the word before, but I can't remember (02).
My problem is that I haven't got a lot of words in English. I don't have their explanation.
- 'effective' (02) The important thing is that I keep the meaning… The next sentence.

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

It seems there are stages; 'First' the beginning, first step (02). It reminds me of a TV programme in an Egyptian channel 'The first Step'. From it I have understood what 'step' and 'first' mean. 'first step' of small children… I'll carry on.
- 'First' I'll read for a first time…It is very long; I'll reread it…It's long (02); I'll reread it.
- 'correctly' At first I thought it was 'caractère' …No it is not 'caractère' …'correctly'. The problem is with the articulation of the word which gives sense to the word 'correctly' …'correct' (03) …I've related it with the French word. I'll divide it in order to understand it…It's very long; I'll reread the sentence. The first part; I don't understand it. It's very long; I'll divide it… 'It is likely to be' …A dictionary is necessary. There are words that I can't understand at all.
- 'folded' I don't understand it, even 'native' I don't understand it. 'native structure' ; they are related…'native structure'. It's clear that it is concerned with 'structure' (FP)…
I'll carry on with the second part. I've stopped at 'and so display'…'reco/gnize' …'reco/nize [sic] I don't understand it. I can't get the meaning; I have to use the dictionary here. I can't work without it. Indeed, we are talking about steps: first, secondly.

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-'correctly' ….
I can't turn the page; I have to reread this part well, and then turn the page. I'll read it for a first time...
-'molecule'...ah... 'molecule'. I can't articulate it. My problem is in the articulation. If I could articulate well...'molecule' means   eh, it reminds me of 'Molecular Biology' module ...'molecule'

-'is more likely to...' It's very long.
- 'proteolytic'...'proteo'...'proteolytic'. Here, we must divide the word. 'proteolytic'. ' proteo': protein; 'lytic'? I don't know. I'll search 'lytic'. I can't understand 'proteolytic';
the important thing is that it is something 'proteinic'.
-'stable'(FP)...'stable (EP)...'stable' (FP). It's a French word; I can relate it with ….
-'attack' The same as in French ...'proteolytic attack in the host'. I have understood approximately (02). It attacks the cell...The third step. We've seen the first, then the second; now, we're in the third.

Thirdly; in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

- I'll read for a first time.
-'intracellular toxin' I've crossed it before and I was able to explain it. I said a toxin inside cellular...inside the cell. It affects the cell from inside. Here, em...I can understand approximately.
-'enzymatic'   . It's a module 'Enzymo' The science of enzymes (02). This module upsets me because I once did not get a good grade and I was upset. I anwsered well, but I didn't get a good grade ...   'enzymatic'
-'function (FP) will...' I've forgotten that I am reading in English. I read most words with a French pronunciation.
-'carry' (02) ...'Maria Carrey' (laugh)...I've understood approximately (02)but I haven't finished this ...
-'binding' (02) this word...last year...eh...this term I asked...'binding', no, it is not it (03). It looks like it...No. What does it look like? It looks like...'binding'? The cartoon film 'Lady Sally': her family name is 'Binding'? ... 'Lady Binding' (laugh). Anyway, let's continue. What is important here is that I have understood approximately.

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

I'll read for a first time... I don't understand it; I'll reread it. It's very long.
-'This enables (02) the immune...' My problem is with the English vocabulary. I don't know what words mean...I know only small terms. I have to use a dictionary.

-'This enables...more...' here is a word that I can't read (efficiently). If I were able to read it, I would hear it and know its meaning.
-'more effi/ciently' (02) 'and better' ...eh...'better'. The meaning of better is 'you can understand before'? No, let's carry on 'and better...domain' (Student reads aloud) ... 'active domain...domain' . Pronunciation zero...approximately. I need a dictionary to understand it. If I skip it (02), I won't understand the rest well. So I need a dictionary to understand the first sentence in order to understand the second sentence.
I'll reread this long sentence to be able to understand the next. …………………………….
I understand approximately small ideas. I can't understand all the sentences. There are sentences that I understand approximately; there are sentences about which I have some doubt, and there are sentences that I am sure about depending on the terms. That is if I have enough background knowledge and if I have a dictionary here, I would understand them...I'll carry on...The noise around disturbs me...I can't understand; it annoys me...I have to use a dictionary; without a dictionary, I can't continue...mm... I'll start slowly.
-'This enables the immune...more' I can't read this 'efficiently'...'and better...than just the active' ...eh, I have approximately (02) understood it (02), but a dictionary is necessary for me to know the meaning of words...mm... I'll carry on.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

-'adjuvants'? we read it like this?
-'inter...in this...it is inter...' How would I read this, understand this? ...'inter...sing that intracellular toxin as a group appear to be very effective adjuvants...adjuvants' I must use a dictionary to understand; I can't understand in this way.
Let's pass to before the last paragraph. Up to now, I have assimilated too little information. If I've had a dictionary, I would have continued; I

would have understood more. Most of the terms are vague for me. Even if Igive them an approximate sense, I get out of context. I don't understand. On the contrary, one word cannot give me the exact sense; I have to use a dictionary.

This approach relies on fundamental knowledge about the toxins and other virulence determinants (e.g. adhesions) a bacterium makes.

I am going fast; let's read slowly...I am reading the first sentence in the paragraph before the last. I have to read slowly...at least I ………. what I was not able to understand. I'll assimilate other ideas from this paragraph -'determinants' I don't know how I have read it? That is 'the end...the concentration'. Sometimes, I don't read the words well. I have to reread it. ...eh... I understand (02) That is some words are the key to understanding... mm...I'll reread. Maybe I have missed the exact meaning... Ah, the end of the Making [sic].... I have approximately understood, but I need a dictionary (02) to confirm my understanding.

It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.

-'therefore' I like this word in English. 'therefore'; I like the terms which I understand; whereas, those that I don't understand, I don't like them. But I have to like them all...small terms...let's continue.
-'It is therefore possible...pathogens'...ah, 'pathogens' (02). It reminds me of what I have seen before. 'Pathogens': opportunist … 'opportunism'. We've just read it. It also reminds me of . We were going to study it in the 'Mycology' module.
cause diseases for Man and animals. Anyway let's reread (02) to understand the whole idea because here I have understood most words. … I can't read this word 'concen/trate... concentrate'. I have almost understood. I have understood. It further confirms the meaning of he previous sentence. I'll read the next sentence.

This is being applied to pertussis toxin, where the further inactivation of such an approach over chemical modification was identified.

I'll read a first time. The surrounding noise annoys me; I can't read. I have read twice and understood somehow. I'll read for a third time maybe ... Good lord! There are words that I on't understand (02). My problem is with language. I get bored rapidly ….Let's read for a third time; maybe I'll understand. I must try to understand it. -'such' always reminds me of the laboratory... approximately (02)

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein, was more immunogenic than the chemically inactivated one.

-'Formaldehyde' (02) I've seen it before... 'Formaldehyde'. Yes, the 'aldehydes', in biochemistry...'inactivation of toxin...'. Approximately... That's good; I've understood. -' inactivation of toxin which... affect' (Student reads word by word). I'll reread (02); I am getting confused. I can't carry on without relating them to each other.
My problem is always in the articulation of words, and in the fact that I can't understand most words, and so I need a dictionary to link the ideas, but the second comma, I can't understand. I'll carry on.
-'was shown (student reads word by word) ...mask' I remember the film 'The Mask' ...'immunogenic', I have read it before, good.... Indeed, I haven't linked the ideas with each other, but I have assimilated ideas only in a broken way. Let's pass top the last paragraph.

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems; using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

The paragraph is long. I have to read it twice. -'coupled' It is a word that looks like the French word, that is we approximate it.
-'Salmonella' Yes, I understand it. It reminds me of a disease that affects chickens; it attacks respiratory system of chickens and so it causes disease.
-'host'...I'll reread it. The words in the first sentence are easy...the first sentence of the last paragraph. I know what 'host cell' means; I first heard it last year (02). The English teacher told us about it. We read it in text about 'Recombinant DNA'...Let's carry on. I have understood approximately. Let's carry on with the last paragraph. (Student uses paragraph for sentence)

Such systems have the potential advantage that they have the greater likelihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administered live vaccine will be cheaper and will not require continual refrigeration.

It's very long; I'll reread it. It seems that I'm going to read it ten times.-'advantage', a word in French. I'll reread it (02) slowly. I'll divide it.-'mucosal' (02) We've already crossed it. 'mucose'. I remember when the girl was talking about it. She explained it... I'll reread it. I'll divide it to continue... I can't understand. Most of the words in this last sentence are scientific (02) but I can't understand them (02). I must use a dictionary. All in all, I have ssimilated only a few ideas from the text because haven't understood most words in it. I'll reread it for a last time in order to summarize the ideas that I have understood.

STUDENT 06

Therapeutic Uses of Toxins

Title: Therapeutic Uses of Toxins. Normally, Therapeutic Uses of Toxins.
-'toxins' I know it.
-'use'…'uses'…
-'therapeutic', I know it. Normally, I have seen it before…eh, no, I start the text.

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with advantage of a greater knowledge and the ability to manipulate their toxicity genetically.

-'attack' (02), yes…'attack', yes.
-'search', I have seen it, but where? …no.
-'of effective vaccines' the effects on vaccines of …'vaccine', normally, 'vaccination'. I don't know …anyway.
-'and this process…knowledge…knowledge', 'know' , normally…Yes, 'ledge'? No, normally… no, I'll see it later on.
-'the ability …genetically' …'manipulate' (03) ; 'k/nowledge'[sic] (02)…Normally I don't know these two words. I need a dictionary, yes (02). The next sentence.

In addition, their potent actions have found widespread uses in other aspects of biology.

-'In addition'…'in addition' (FP); I've seen it before.
-'biology' …(laugh), it's my domain.
I haven't understood the sentence very well; I have to reread it. 'their potent actions have …'
-'widespread' What does this word mean?
So, we have in this paragraph many words that I haven't understood… Let's finish the sentence (The student reads aloud)…Still, I haven't understood the sentence yet.
-'In addition, (student reads aloud)…biology'.
-'In addition' I have understood it.
-'their potental [sic] actions have found'(2), yes, I have come across this word.
This 'widespread' I haven't understood it.
-'uses in other' 'uses'…   ? (02)
'in other aspects of biology'…
No, let's pass to the next paragraph…No, for this last sentence I need a   dictionary to understand it word by word in order to get the sense, that is the meaning…mm…

As the major effectors of bacterially induced host damage; toxins play a prominent part in both conventional and empirical vaccines and the new generation of rationally designed vaccines.

As …toxins'…No, I read this part because the sentence is very long. Let's start again…'In the Name of Allah'
-'As the major effectors'…'major effectors'
*   ? …'major'…anyway! A major*
thing.

	-'of bacterially induced damage' 'damage', what is this 'damage'?
	Normally, 'damage' ...I see...I don't understand it; I must have a dictionary.
	-'toxins play...conventional...vaccines' I 'll reread the last part of this sentence. I haven't understood it completely.
	-'Toxins play prominent' What is this 'prominent'? I don't understand it.
	-'part in both conventional (FP) conventional (EP)...mm...'prominent' I need a dictionary (02) to understand, to complete the meaning. Now, I pass to the last sentence before the table.
It was recognized early that inactivation of the toxic activity could produce	*'It was...produce' I'll reread.*
	My mind was wandering; it has gone outside. When we were children; I mean babies are vaccinated for different sorts of diseases in order not to...I am thinking what this vaccine contains because...I remember its history too.
	The history of how it was discovered, and how the first person was vaccinated, yes...Let's get back to the topic.
	-'It was recognized' 'recognized', what does this mean? Eh...no, I'll carry on...mm...
	-'early that inactivation of the toxin activity could produce'. Normally, I have understood 'recognized. Normally, I need a dictionary... Let's see the table.
Common Targets attacked by several toxins	*-'common targets' What does it mean 'targets'?*
	-'attacked by'...'target' what is it? No, let's carry on 'by several toxins'
	-'several' ...always the same problem. Yes, 'several' what does it mean ? I can't remember, 'several' (03) In my dissertation topic, I've found it, explained it in the dictionary, but I've forgotten it.
	-'common targets' 'targets' (02) and 'several'; I need a dictionary for these words. I'll carry on. 'target' and 'example'; I must have a dictionary... Let's see...
Membrane	*-'membrane' (02) 'target' and its' example' (02) 'membrane'; what is 'membrane'?*
Phospholipases	*-'phospholipases' I know it.*
Superantigen	*-'superantigen' What is this? Oh, yes (03)*
E. Coli stable toxin (ST)	*-'E. Coli stable toxin' Ok*

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Pore-froming Toxin	**-'** *Pore-froming toxin' ...'pore' I understand it, but 'froming', I don't understand it...I need...'forming'?... mm...I don't know. What does this word mean? Anyway! Normally, 'froming'; I'll use a dictionary. Ok, we've finished with 'membrane'. Let's go to the 'trans'...'translation apparatus'...*
Translation appartus	*-'apparatus translation' ...'appareil' translation'?...'apparatus', 'appareil'? 'translation ' . Normally, it's speaking about . No, I've to understand it; I'll see the example, maybe I'll understand.*
Diphtheria Toxin	*-'Diphtheria Toxin'...'diphtheria', yes, we know it.*
Ps. Aeruginosa exotoxin A (ETA)	*-'Pc.[sic] aaaaeruginosa [sic] toxin A' (02) ...'aeruginosa', I've heard about it but...*
Shiga Toxin	*Let's see Shiga Toxin (02) ...What is 'Shiga Toxin'? ...'Toxin' is clear, but what is 'Shiga'? No, 'Shiga', here... 'Shiga' and 'aeruginosa' (02). Normally Ps. 'pseudomonas' (02) aeruginosa exotoxin, that is Ok, I've understood.*
GTP-binding proteins	*I go to 'GTP-binding proteins'. Yes, this is what we did in the 'Physiology' module last year...yes, yes, the 'physio'...(laugh).*
Diphtheria Toxin	*-'Diphtheria Toxin' It's the same thing. 'Diphtheria' ...yes, I know it, but I can't find the word in Arabic, but...Ok, I'll search them. When I finish the table, I'll bring the dictionary...yes.*
s. Aeruginosa exotoxin A (ETA)	*This 'pseudomonas aeruginosa' is the same as before.*
Cholera Toxin	*-'Cholera Toxin'...oh yes, 'cholera'*
E. col labile toxin (LT)	*-'escherichia col'? What is this 'escherichia col'? or 'escherichia colabile'toxin'? ...'labile toxin'?-'escherichia coli cytoxin [sic]... mm ...cytoxic' eh...toxin, 'cytoxin',*

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E. coli cytoxic necrtizing toxin (CNF)	, yes. -'necrtizing toxin' What is this? These words are going to drive me mad. -'necr/ tizing' What does it mean 'necrtizing'? No, I must have a dictionary because I have never ever seen this word. Yes...let's see the other one.
Bord. Perussis Toxin (PT)	-'Bord. Perussisis [sic]toxin' Even for this, I need ... 'Bord/ Pertussisis [sic] (03) No, normally a dictionary....
Bordetella dermonecrtic toxin (DNT)	-'Bordetella' (02) yes ...mm...the 'systématique' module last year. -'dermo- necrtic toxin' ...'nec/rotic toxin' ...'dermo' (02) , normally, 'la derme' [sic] or the skin. Normally, in French, ' derme' is the skin. This 'necrtix' [sic] never in my life...that is I need a scientific dictionary to explain 'nectrus' [sic], yes a dictionary...mm....
Cl. difficile and related toxins	Yes, what is 'clostredium'? (02) ...yes... 'clostredium' it hasn't got in the end... . No, she hasn't put it. Normally, this 'Cl' is 'clostredium' ...'difficile and related toxins'...yes, Ok.
Cl. botulinum C3	-'clostredium botu- li- nium' [sic]... Environmental Micribiology' with Mr. Harzallah, yes... mm... yes.
Staph. Aureus EDIN	-'Staphylococcus aureus' (02) affect the propolise. Yes, propolise 'staphylo'(02). Normally, propolise (02) ...normally, 'staphylo' affects it...inhibition only, not like 'Salmonella (02) Typhim'... 'Salmonella Typhim' of mice?, yes (02).
Synaptosomal proteins	I pass now to 'synapto/somal protein' ... What does it mean this 'synapto/smal'?'synapto', clear; what does 'somal' mean? -'synapto' I understand it from the 'Physio' module last year, yes, and 'somal' I don't know. Normally, I've understood 'synapto' and 'somal', I need a dictionary. -'protein' is known...'protein', even in Arabic it's protein.

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Cl. Botulinum toxin 'except C2 and C3'	-'Clostredium Botulinum toxin'...yes, 'clostredium' we studied it in 'Environmental Microbiology'. It lives in the soil and causes many many and very dangerous diseases. Now, does it require vaccination? Oh yes, a new information. -'except C2 and C3' What is this C2 and C3?
Cl. tetani toxin	-'C1 [sic] tetani toxin' What is Tetani Toxin? What i this C2, C3, and C ? No, no, this last one is 'Clostredium tetani toxin'... -'except' (02) what does it mean? 'except' Let's see 'except C2 and C3. I need someone who studied microbiology and well-informed in order to explain to me 'except C2... Let's pass to the last 'clostredium tetani toxin' ...'tetani' that is, oh yes, 'clostredium tetani'... Yes, I've understood it (02). I've finished the table now.
highly effective immunogens because inactivation did not destroy epitopic structure.	-'high(t)ly [sic] effective immunogens...did no destroy' 'Destroy'...What does 'destroy' mean? -'highly' yes 'effective' immunogens' immunogens'; it's clear, yes, from 'immuno'. -'because' (02) the reason, yes...'inactivation' (02): It does not function. Mm... -'did not distor' [suc] This 'destroy'... -'epito...epito/pic' what is this? 'structure' No, tut tut...no,no, no, I wouldn't pass superficially...tsuh tsuh.I need a dictionary; I have to understand 'destroy' and 'epitopic'(02). Nomally, I need a dictionary ...
Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).	- What does it mean 'attenuated'? -'such chemically' they are clear, but 'attenuated vaccines' ...This 'attenuated' I have never come across it before. Normally, I need a dictionary. Yes, and it contains 'ed', normally, it is a verb. I don't know. -'vaccines have served well' Yes, in my dissertation... -'in the protection' (02) 'again' [sic] . 'some diseases' (02); yes, 'disease'. We saw it yesterday (referring to the training session) and 'protection against'. What is that? ...Oh yes, 'this attenuated vaccination' ...'attenuated' I haven't understood the word. So a dictionary is necessary. Let's see the example'. -'example, tetanus and diphtheria' 'Tetanus'

However, this has not been a universally successful approach, either because the induced immunity was poor and shirt lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.

(02) Yes, it is known. I know 'tetanus' and even 'diphtheria'.

-'However' (02) Yes, it's normally clear.
-'this has not been' Let's now pass to ...Ok, we've finished with the example.
-'However' yes...mm...'however, this has not been a universally sucsful' [sic] (02) Yes...'approach'. I have understood, but not exactly (03).
-'However, this has not been a universal [sic] sisfu[sic] approach' (02) ...'sesful [sic] approach' Ok, let's carry on.
-'either (02) because the induced' yes 'immunity was poor" (02) This 'poor', let's finish 'and short-lived'; yes, 'example cholera'. Oh yes, but 'poor' is still unclear. I'll see maybe I'll understand the meaning...mm...otherwise, I'll need a dictionary.
-'or because the vaccines are perceived to cause inaseptable [sic] side effects'. Let's reread ...mm...Right, this 'poor', I need a dictionary, Ok.
-'or because the vaccines are perceived' 'are perceived' ...'perceived to cause inaseptable' [sic] (03) ...mm... So, I have two words: 'poor' , and 'inaseptable' (02) ...'side effects'...'effects', yes.

A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.

-'A good...' That is the other sentence has no relation, normally. Let's read and see...'A good example...high' ... Even 'poor' and 'inaseptable' [sic], I haven't understood them. Ok, I need a dictionary.
-'A good example in this letter [sic]' ...clear up to here...mm...'letter' [sic] case is...whole cell' ...'wal [sic] (02) cell', 'cell wall' [sic]...'wall' (02). No, I think that 'wall' is not written like this. Yes, 'wall', normally, w-o- Double 'l'. Yes, but this one I haven't understood it. Let's see, 'inactivated vaccine has not been high' ...eh...yes...There is no 'wall'.

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

The same thing. 'several' is always behind me, and up to now, I haven't understood it. It's a problem. Last time, I decided to look it up in the dictionary. Well, let's see...'Several advances in vaccine technology'...
Several' (02)...yes...no, I have to find the meaning of this word by God's will...How? My

memory is zero…eha; let's see in the end; maybe I'll remember the meaning or find it from the context, or…I don't know. If I don't I find it, I'll use a dictionary. Ok, I am defying my memory…(The student reads aloud)…Ok, that is only 'several' is not clear. The same problem with it…yes…eha.

Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).

- '/k/nowledge' (02) yes…'about…site'.
- 'catalyseur' [sic] Normally, the same thing.
- 'active site', ?   Yes…'the cataly/tically active site'; yes. Let's see the parentheses; 'of intracellular toxins', that is inside the cell…that is it secretes toxins inside the cell (02) …oh, yes, and we said before, toxins inside the cell – the cell must explode to free themselves. That is… mm…yes.
Let's see the sentence. Normally, it contains some nnew information.
- 'about toxin structure' that is …mm… the constituents of the toxin… approximately.
- 'has enabled…involved' (student reads word by word)…'involved' (02)? … mm… yes, I'll add this word to 'k/nowledge'. I'll finish the sentence before I use the dictionary…yes…What is 'involved'? …Ok (02) I'll finish the sentence, then use a dictionary.
- 'at the catalytically active site'…ye, Ok, we've understood this. This too, we've studied it. So, the dictionary is for 'knowledge'; that I have normally seen before…yes (03), I've explained it before; I've seen it before, yes. Here it is in the first text; here it is. What remains is only'involved'. Ok (02), let's see the other sentence.

These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.

- 'These can be changed by genetic engi…' but where is it? I've lost concentration…No, I'll reread (02) slowly.
- 'These can be changed…devoid' (Student reads aloud) …'devoid'? What is 'devoid'? 'of toxin activity'(03) …What is this 'devoid'? …'devoid of toxin'?... of active toxin? No, I've lost it. I need a dictionary; I've never seen this word before. 'Such', let's see the next sentence.

Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.

…mm… ah, 'several' is always behind me.
- 'reasons to be alter… alteration' Ok, I'll reread it slowly.
- 'such…' several (02) always causes me a problem. My memory has given in, so a

-'reasons...alter/ation' Ok (03) ...aha...there is no problem.

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

'First, it is likely (03) ' In the text about bacteria in 'Scientific English' module...Oh, yes.
-'correctly folded...structure' Normally, up to the comma, everything is clear. Let's carry on 'and so display (02) the epitopes (02)...epi...epitopes' We've seen it this morning (training session) or no...I don't know; let's see.
-'that will trigger an immune...reconize (02) [sic] ehm...'the active toxin' that is, 'display (02) the epitopes'...that is 'the epitopes' Ok...ehm...

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-'Secondly' Let's see...'secondly, a correctly folded molecule' eha, up to now, it's clear 'is more likely' (laughter) always here...'to be stable' 'stable (French pronunciation) (02) in French...'stable' (English pronunciation) and 'résistante' [sic], also the same...'to proteolytic' (03) I've seen it before ...yes, I've seen it before. Alright; but 'proteolytic', normally in the 'Physiology' module... 'attack in the host'. Ok, this sentence is clear.

Thirdly; in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

-'Thirdly' I'll go to 'Thirdly'. 'in the case (02) of intracellular toxin' Yes (02)...'intracellular toxin' ...mm...we said before 'intracellular toxin' (03). 'intracellular', that is inside the cell, so it secretes inside the cell, Ok (02).
-'a toxin...steps' It's alright up to now.
-'in intoxication' (02) yes, Ok. Normally, this I have seen it before in the... She told us how to pronounce it. Yes, but I have to go the copybook to see it.
-'binding'(02) yes 'and cellular entry' yes, Ok. there's no problem with this sentence. This means he has finished; we did 'first' (03), 'secondly', 'thirdly'. This means we've finished, so I'll see the next sentence.

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

-'This ...with whole /wo/l [sic] ...the whole /wol/ [sic]' I 've already seen it . Where?(02) Where have I found and explained it? Here it is 'the whole /wol/ [sic] ... the whole /wol/ [sic] cell'...mm...'the whole /wol/ [sic] cell'...'the

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

-'In this regard' 'regard'; it's interesting (05). Where (03) have I seen it? Yes, I've come across this word before; I nearly know what it means. Let's see what's after, maybe it will confirm what I have understood...ehm...
-'intracellular toxin (02) as a group... adjuvants'...'intracellular toxin', yes Ok (02). So, the next paragraph.

This approach relies on fundamental knowledge about the toxins and other virulence determinants (e.g. adhesins) a bacterium makes.

-...'fundamental', yes...'k/nowledge', yes...'about the toxin', even 'toxin'.
-'and other virulence determinants; eg. ad/he/sins'? What is this 'ad/he/sins'? No, no, let's see... 'a bacterium make' [sic] ...ehm ...yes, yes.
-'toxin', that is (02) the majority of toxins are produced by bacteria and they act as .... This is in 'genetics', so they are produced by most bacterial cells as ...., so it is not important for me...but it affects other creatures. This is a previous information which has come to my mind. But still, there is the word 'adhesins' which I haven't understood. Normally, I wouldn't find it in a literary dictionary like this, normally a scientific dictionary. Ok, we have to explain it to understand. Anyhow, the sentence is clear, but this example has made things difficult for me. I don't know... Ok, we explain and that's it. We'll pass to the other sentence now.

Itis therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.

The student reads aloud...'on only ...pathogenesis' ...., bacterial, yes.
-'this[sic] potential/ ly (student read aloud) ...products' Yes...ehm
-'concentration'...'concentrate', Ok, clear.I'll reread rapidly...Ok, I've understood, so I can pass to the next sentence.

This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modifications was identified.

- (student reads aloud) 'This...identified' It's a very long sentence. I've lost concentration. I'll read up to the comma then continue.
-'This...toxin' Ok, clear.
-'where...identified' Ok.

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or in inactivate immunogenic sites, since the untreated protein was more immunogenic than the chemically inactivated one.

-'Formal/dehyde', yes (02) ...'Enzymology', 'Physiology' , yes. This text reminds me of past things, especially 'enzymo'? They drove me mad last year.
-'inactivation of the toxin'...Up to here, it's clear.
-'which...protein'...'essentially'...mm... Ok.
-'cross-link'? Up to this point, it's clear.
 -'was shown to ...sites' Ok, up to this point; I'll carry on.
-'since...one' Up to this point, it's clear.

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems; using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

 -'Genetic manipulation'... Yes... Genetic manipulation'...Yes.
-'of toxin...orally' Up to here, it is normally clear. There's no problem. Let's carry on.
-'aro' What is this 'aro'? ...'aro strains' What is this 'aro'? It's written in italics ...So, let's continue.
-'Salmonella' (02) Yes...'Salmonella' We studied it last year. We said that this 'Salmonella' lives inside the human body. Normally, it is opportunist. Ok...Shame on her this 'Salmonella'
-'that can ...host'...'such system'... No. I've understood the sentence even though it is long. I've understood it bit by bit (02) Yes, ok.

  Oh God! This sentence is long, so I'll read it word by word and see. Student reads aloud. Up to 'advantage' Up to this point, it's clear.
-'that ...likelihood' ...'greater like/li/hood' No, this 'likelihood' is difficult. Ok, I'll carry on and see. -'of inducing protection and mucosal' ...'mucose' (French pronunciation) ok 'surfaces by administration' (02) We use this word a lot.-'via the oral route' Yes, 'oral' is clear. -'and also more likely' It seems this poor one   is not lucky. This is why for a while now 'likely' (03).
-' to be of use in the Third World ... refrigeration' ...I have the word 'like'...yes, 'like'...'luck' or what? 'likely'...'like'...'likely'
  (02) and 'likelihood'.I need a dictionary to understand (02) in order to understand the sentence.Ok. I'll reread the sentence rapidly. ...Ok, the sentence is clear.
I've finished the text; I have to reread it, ok.
I have to summarize it so that it remains in my memory and I can use it another time. Ok, we've finished now.

STUDENT O7

Therapeutic Uses of Toxins   *The title is simple. Ok; I've understood it.*

The powerful nature of toxin action *…I'll reread half of the sentence, not the whole*
historically made them the first line of attack *sentence. Yes…the sentence is long; I have to*
in the search of effective vaccines, and this *reread it.*
process still goes on today but with *…The first part from 'the' until 'vaccines',*
advantage of a greater knowledge and the *somehow, but the rest ok.*
ability to manipulate their toxicity
genetically.

In addition, their potent actions have found *-'In addition', that is ……………….. old'…I'll*
widespread uses in other aspects of biology. *reread.*
                                                … 'aspects' (02) I don't know what it is.

As the major effectors of bacterially induced *…I'll reread because I haven't understood*
host damage; toxins play a prominent part in *anything.*
both conventional and empirical vaccines *- This 'induced', I haven't understood it.*
and the new generation of rationally *- 'host damage', Ok.*
designed vaccines. *- 'toxins play a prominent...' 'prominent' too, I*
haven't understood it...also'empirical'. So,
there are many words that I haven't understood
in this sentence. I have to look them up in the
dictionary.

It was recognized early that inactivation of *-'recognized'…tut, tutI haven't understood*
the toxic activity could produce highly *'recognized', but the sentence is Ok. I'll read...*
effective immunogens because inactivation *This table...*
did not destroy epitopic structure.

Common targets attacked by several toxins *-'target'…We saw it this morning (training*
session)

Membrane *-'Membrane, Translation, GTP-binding*
Translation apparatus *Synaptosomal proteins' The three first ones, ok.*
GTP-binding *This last one 'synaptosomal proteins' I don't*
Synaptosomal proteins *know what is this 'synaptosomal'. Ok...*
-'Membrane', the example...

Pore-froming toxins *-'pore' is derived from 'pore', normally …….. or*
something…'froming toxin', yes it is possible
that it produces a hole? …It is possible...
Phospholipases - Superantigen *-'Phospholipases – Super/antigen', ok.*

-'Escherichia Coli stable Toxin ST', that is 'it
E.Coli stableToxin (ST) *does not affect escherichia coli?... maybe.*

Translation apparatus	*'Translation apparatus', 'Diphtheria toxin' -'translation' This 'translation', I heard it before. I know it, but I've forgotten it. It's a problem. That is ...I have ... this 'apparatus', clear. This 'translation', we've to look it up in the dictionary to finish the examples... to understand what the examples are about.*
Diphtheria Toxin	*-'Diphtheria Toxin', ok.*
Ps. Aeruginosa exotoxin A (ETA)	*-'Ps. Aeruginosa exotoxin A' (02) I don't understand this.*
Shiga Toxin	*-'Shiga Toxin' ...'Shiga' I don't know what 'Shiga' is.*
GTP-binding protein	*-'GTP-binding protein', ok.*
Diphtheria Toxin	*-'Diphtheria Toxin'*
Ps. Aeruginosa exotoxin A (ETA)	*-'Ps.', even before, 'Ps.' I haven't ... Maybe ...'aeruginosa exotoxin A', the same. Even the abbrteviation 'ETA'? 'E - T - A'...'A' is clear.*
Cholera Toxin	*-'Cholera Toxin', ok.*
E. Col Labile toxin (LT)	*-'E.Col Labile toxin''label' or 'labil' (02) I don't know what it is.*
E. coli cytoxic necrtizing toxin (CNF)	*-'E. coli cytoxic nec/rtizing toxin' ...'nec'...I don't even know how to read it.*
Bord. Perussis Toxin,	*-' Bord. Perussis Toxin*
Bordetella dermonecrtic toxin (DNT)	*-'Bordetella dermonecrtic toxin'*
Cl. difficile and related toxins	*- 'Cl. difficile and related toxins' This one; it is possible that it catches a toxin*
Cl. botulinum C3	*-'Clostredium Botulinum C3' This clostridium botulinum cause 'Botulism' ... Yes, we know this.*
Staph. Aureus EDIN	*-'Staphylococcus aureus' (02) Yes, it's like we studied it with Mr. Zerroug, among the (coley form?) indicators of contamination. Alright, we said this 'Synaptosomal protein' we don't know what 'Synaptosomal' means....*

Cl. Botulinum toxins except C2 and C3	*-The example 'Clostredium Botulinum toxins except C2 and C3' Ok...C2, C3. These are in the 'Systèmatique' module or something...These C2 and C3....*
Cl. tetani toxin	*-'Clostreidium tetani toxin' This one causes Tetanus...Alright.*
	So, I may say that the table is important and not important in the same time. That is, there are things that I know like 'Clostredium' and 'E. coli' and 'Diphtheria' and 'Phospholipases'. These ones I know. I may grasp them with their targets, but the others like 'Ps. Aeruginosa' and the second 'aeruginosa exotoxin' of 'GTP-binding' or 'Bord.' Couldn't it be 'Bordetella'? These ones I don't understand them...well....
It was recognized early that inactivation of the toxic activity could produce highly effective immunogens because inactivation did not destroy epitopic structure.	*-'Immunogens' (02) I'll reread the sentence. ...'destroy' (02) I know it, but I've forgotten it. Even 'epitopic' I don't know it... So, 'epitopic structure'...so everything is about 'epitopic structure' (French pronunciation (FP)) ...er ...'structure (FP)...''destroy' This I haven't understood.*
Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).	*...I'll reread it ...tut, tut...*
However, this has not been a universally successful approach, either because the induced immunity was poor and shirt lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.	*-'approche'[sic]...'appro/ach' or 'appro/ak' I don't know, but it is probably derived from 'approche', but 'appro...induced...' There are many words...* *-'...induced immunity was poor and short lived' like the example of cholera. This is clear, ok.* *-'or because...effects' It says that it is possible that the vaccines 'are perceived' This 'perceived' I have to explain it to understand what ...this vaccine is.* *-'...to cause unacceptable side' ...'unacceptable' is clear; 'unacceptable side' 'side' too is not clear, that is I have to look it up in the dictionary.* *-'effect' [sic]... So, I have to understand the sense of 'side' and 'perceived'.*
A good example in this latter case is whooping cough; where the public acceptance of the whole cell inactivated vaccines has not always been high.	*-'A good example in this latter /leiter/ case (02). Normally, that is , , case, or I don't know....*

-' is whooping cought'[sic] or 'cou' [sic] - or I don't know. This 'whooping' is not clear.
-'...where...' we have to understand 'whooping' because 'whooping' is about 'later [sic] case'.
- I'll reread from 'where' (Student reads aloud)...'where the public (02)... cell' .
-'public' if it is derived from 'publique', ok, but if it has another sense, we confirm it first. Is 'public' 'publique', or something else? Ok ...

-(The student reads aloud)...'where the public acceptance of wole [sic] cell'... 'wol[sic] cell' we know it.

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.

-'inactivated ...high'... that is...yes...ok.
-'Several advances' ...'several' (02). This 'several' I like it...
-'Several advances' What is 'advances'? We have to search it...
-'have contributed ...vaccines' I have to reread it. (Student reads aloud) ' Several   ... contributed' . This contributed I don't know.
-'to the new approach' being...' That is new discoveries? 'being adopted'...'adopted' too...' to produce more' ...to understand more? No, to produce more, to get more effect and 'safer' [sic] vaccine...'safter'[sic] too.   A lot of words are not clear; we have to use a dictionary.

Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).

-'knowledge' (03) ...'knowledge...scientists' ...This 'knowledge' I heard of it, but it's gone. I've got such a bad memory!!!
- I'll reread...maybe…………………………
 This 'knowledge'...maybe 'knowing about' toxin structure 'la structure de la toxine'...maybe...'in order to know the structure of the toxin'.
(Student reads aloud) 'has enabled...site' Ok, this is clear...'of intracellular toxin'... yes.

These can be changed with genetic engineering to produce aproetin thathas only one or two amino acids changes but is completely devoid of toxin activity.

-(The student reads aloud)... It says this genetic engineering...(SRA)...I'll reread...It says that we can change it with genetic engineering to obtain proteins...
(SRA) ...That is we change one or two?
-'but' is like a negation or...
-'devoid of toxin activity' It's clear and not clear.

Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.

-'Such a mutant protein' 'such as'...yes 'such as a mutant protein'...(SRA)
-'alteration' [sic]...Let's reread it.
-'likely' that is he comparing one or more.
-'for several reasons' ...It is derived from 'raison'?
-'to be...' To confirm, we have to consult a dictionary. It's better, and we wouldn't be just passing, right! 'to be effective...alteration' [sic] ...Well, even 'alteration' [sic] too is not very clear.

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

-'First...correctly'...First...structure'...'native'? No, I don't know what it is We look it up in the dictionary ...'and so'... I'll search it, and then I'll reread it. If it's clear ok; if it is not clear, I'll continue.
-'and so display' ...'display' too.
-'epitopic' we've read it before and I couldn't guess its meaning. Normally, I would have explained it and here I will understand it immediately and would not search it again.
-'and so display the epitopes' ...'epitopes' is not clear.
-'that will trigger'...'trigger' too.
-'an immune...toxin' ...'recognize' too is not clear. I have to search them all in the dictionary. This is first...

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-'Secondly' So what is he doing? I'll reread to see what he is doing. 'First and second'?
-'Such a mutant...alterations' No I have to use a dictionary (02) to explain the previous words in order to know why he is putting 'first' and 'secondly', ok.
-'Secondly...host' ...

Thirdly; in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

-'Thirdly, in the case...(SRA)...early' [sic].
I have to know the meaning of this 'carry'; I know it, but I have forgotten it. I'll search the meaning in order to know 'out of the first step' what happens to it 'in intoxication' (FP) ...Yes. Now, we start from 'secondly'. We'll reread it. 'Secondly, a correctly folded' We said we have to search what the word 'folded' means to see its relation with 'molecule'.

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

-'This enables the immune system' ...'enable' is the opposite of 'able', so it is not 'able'?
-'This enables...better' ...'This enables (02) the immune system...domain'. We will reread. ... This enables...efficiently' All the words are clear, but the meaning is a problem.
-'the protein more efficiently raised' This 'raised' I don't know what it is; I have to look it up in the dictionary.
-'is raised by vaccination' ...'by vaccination' Maybe...'with wole[sic] toxin' ... 'whole' or 'wole'... 'than just the active domain'...It is a problem...not clear.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

-'In this regard...adjuvant' This 'adjuvant' or I don't know is not clear; we have to explain it, but the rest is ok...clear.
- This text is tiresome. It's not clear. It irritates me; I'll stop here, but it's only because it's for the teacher that I'll finish it...sigh...Or, I'll reread it from the beginning and not finish the rest of the text because I don't even know what it is about. I know it is 'therapeutic' and all, but... I'll finish it.

This approach relies on fundamental knowledge about the toxins and other virulence determinants (e.g. adhesions) a bacterium makes.

...Ok.

It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.

...I'll reread the sentence...
-'avoid' I don't know what it is.
-'side' I have come across it before, so, normally I would have explained it. Normally, it would not affect the meaning.
-'effect [sic] of the other extra/neous'... 'extraneous' too I haven't understood it. So, 'extraneous', avoid' to be explained.

This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modifications was identified.

-'This is being applied'...'This is being'...'This is being applied...advantage' ...'advantage' I have come across it before, but it's gone.
-'of such an approach' Normally, I would have explained 'approach'.
-'over chemical modifications was identifié' [sic] We will reread...

-'This is being applied' (02) …'applied' I don't know what it is. It must be explained, or I'll ask someone…Would I explain all the time?

-' applied …advantage' So, we have to explain 'advantage' too? Well, we'll explain it.

-'of such…identified' Not clear at all…Now, I haven't understood it, but If there was a dictionary, I would have explained the words and probably understood the sense.

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein was more immunogenic than the chemically inactivated one.

-'Formaldehyde' This 'Formaldehyde' I don't know what it is…'forma'…'dehyde' I don't know…

-'inactivation…to cross-link'…'to cross-link the protein' This 'cross-link' we did it in … in second year genetics …'cross-link'; Yes…'cross-link protein'… But I don't know what 'cross-link' has to do here?

-'protein, was shown…'

-'immunogenic site' …'immunogenic' … 'immuno- genic'…'immunology'…'genetics site' and 'site' ………………………

- since the …immunogenic'…Ah! Maybe this 'therapeutic' is 'genetic immunologic?

-'than the chemically…one' We will reread it…Where does this start from?

-' Formaldyhide' We said we will explain it.

-'inactivation…protein' Clear and not clear!

-'was shown …site' (02) (The student reads word by word).

-'since the untreated protein' …'until we treat'?

-'was more …one' I don't know…Not clear…I haven't understood.

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems; using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

-'Genetic…genes'…Does it mean the genes of toxins?

-'is also…systems'…'delivery' is followed by 'system' …It seems that …'systems' …I don't know…

-'to a newer…system' It's clear; it's a system, but 'newer delivery' I don't know what it is. We have to explain it.

-'using …orally' …'orally' I don't know. We have to explain it, too.

-'example aro… Salmonella' …'aro strains' What is this 'aro'? …sigh…of 'Salmonella'? This 'Salmonella' is a bacterium; I know it.

-'that can only…host' It may be in a small quantity in a host?

-'Such...advantage'...'such system'...'such' I am not concentrating well.This is why I am rereading.

-'such...advantage' ...'advantage' I would have explained it by now and would know its meaning.

-'such system' This means he talking about that system of delivery.

-'such system...likelihool [sic]...world' ...'likely' we did it this morning (training). Well, this sentence is four lines long, we have to reread it.

-'such system...likely (02)' If it's 'likely, ok; if it's not 'likely' and should be read all at once 'likeliwood' [sic], or 'hood'?, so that is a problem. We have to explain it... 'of' ...Well, I'll repeat because I have talked too much.

-'such system (02)...a greater' ...'a greater' It is not clear...It's something big, or ...

-likelihood of inducing'...'inducing' is not clear.

-'protection...administration' Ok.

-'via' I don't know what it is; it has to be explained with 'inducing'.

-'the oral'...'oral' too...

-'route...world' Ok...

- since an orally...cheaper'...Ok...

-'and will ...refrigeration'...We will repeat from 'since'...

-'since...refrigeration' (The student reads aloud, word by word) ...

- 'require' I know it, but I have forgotten it...

- Well, I am tired...Well, I have got a general idea...very general. We can say I haven't assimilated anything because there are so many difficult words that must be explained in the dictionary firstly. Secondly, 'therapeuric' isn't it 'therapeutic'? That is 'therapeutic' has added to it...maybe 'therapeuric', not 'therapeutic'...I don't know what it is...No, I've just noticed it. Before, I have read it 'therapeutic'...Well... We said we have read it all, but it's like we haven't. We've got approximately a general idea. Normally, there should be a pen and paper to take notes , then I'll reread it completely and try to understand more. Now, I haven't got a dictionary and I haven't explained, but normally, if I had explained, I would have understood more. That is, although I have read once, I have grasped somehow. So now I'll read

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a second time in order to further (02) ...to confirm the information I have grasped and add new information. But I think (02) I am a microbiology student; this is biochemistry or something in ...in therapy. I am not good at it. This is why the words...ok; if it was about bacteria and 'how they get in and out' [sic] like we do study, maybe I would have understood. I have understood the scientific meaning without understanding word by word, maybe.... Well, we said we are going to reread it and that's all...What is this? ...This? ...Ok, now...

STUDENT 08

Therapeutic Uses of Toxins

First of all the title; it is very clear.

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with the advantage of a greater knowledge and the ability to manipulate their toxicity genetically.

I'll reread the sentence because I haven't understood it well... Now it is clear. This is the first sentence, then the comma. I am concentrating on 'advantage'. I have seen this word, but I don't understand it; I'll carry on... I don't understand it; I'll reread 'and this process...' ...Ok, I have understood it.

In addition, their potent actions have found widespread uses in other aspects of biology.

I'll reread the sentence...
-'potent action' I don't understand it; I'll carry on.
-'widespread' I know it, ok.
- I'll reread the whole paragraph to understand....
Here, I am thinking of the lesson we did in genetics, especially when I have reached 'toxicity genetically'...
I'll carry on with the second paragraph.

As the major effectors of bacterially induced host damage, toxins play a prominent part in both conventional empirical vaccines and the new generation of rationally designed vaccines.

....'damage' , easy; I understand it.
I'll reread it...I haven't understood the sentence 'conventional...' I'll carry on reading.

It was recognized early that inactivation of the toxic activity could produce

I haven't understood the sentence.Now I am going to read the table.I'll read the part about the' targets'

Common targets attacked by several toxins

I have to read the title of the table... I have understood it; I have understood it well. Now, I am going to read it step by step at targets. Let's first see 'membrane' and examples...clear. I'll carry on reading...
Although there are things I haven't understood like 'diphtheria' ... eh ...no, this (diphtheria toxin' I have understood it. It's very simple... ehm...I see. I understand that the function of ...er... the vaccine against everything found in bacteria...I'll carry on reading after the table.

highly effective immunogens because inactivation did not destroy epitopic structure.

-'high(t)ly [sic] effective immunogens' I haven't understood it.
I'll carry on reading... I'll reread it...
- 'destroy' ...er... 'destroy' I haven't understood it...'desrtoy'.

	-'epitopic structure' I haven't understood it; I'll carry on reading.
Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphteria).	*... I am reading the example they've given us, the explanation between parentheses... I'll reread. (SRA). Here, I remember the 'Parasitology' module, second year.* *I'll carry on reading...Clear.*
However, this has not been a universally successful approach, either because the induced immunity was poor and short lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.	*-' However...' I haven't understood 'approach' ... I'll reread the sentence.* *'However...approach'...I'll carry on reading.'...cholera'* *I am heavily relying on the examples to understand the text and I always refer back to the lessons we did in the second and third years ...'because the induced immunity' ...I'll reread before I finish... 'or'... Yes, I've understood. Now, I'll carry on ...'or because the vaccines are perceived...' This sentence is clear; I'll read the next sentence.*
A good example in this latter case is whooping cough, where the public acceptance of the whole cell inactivated vaccine has not always been high.	*'A good example...' I'm reading it...I haven't understood it well, but I'll carry on. This sentence is clear. Here, I remember a documentary (02) I have seen long ago. I'll carry on.*
Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.	*-'approach' once again...It's complex, I can't understand it, but I'll carry on reading the sentence... It seems to me that I have understood the general sense, but I haven't understood 'approach'...I'll carry on with the next paragraph.*
Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).	*-'knowledge...intracellular toxin' Here, I remember the lesson on toxins, last year. I'll reread the sentence...* *I am trying to see the relationship between 'amino acids' and 'toxination' [sic], I mean 'toxins' ...Now, I have understood it. I'll carry on.* *-'catalytically'?...I'll carry on with the next sentence.*
These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.	*...The sentence is clear; I'll carry on.*

Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.

Whenever I see the word 'mutant' I remember I remember   which means .I see what it means here.
...I haven't understood the sentence; I'll reread it.
...I haven't understood the sentence; I'll carry on. I don't want to understand it.

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.

-'First...' I haven't understood the sentence at all...No relation...
I'll reread it...
At last, I understand the meaning.
-'folded' (02) I haven't understood it.
-'native' I haven't understood it(02) ...I'll carry on with the next sentence.

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.

-'folded' I haven't understood it...Let's see...
'a correctly folded molecule' It seems like construction, or constitution...I'll reread the sentence because I have understood very little. I'll start from 'first'....
I'll carry on; I haven't understood; I'll carry on with the next...

Thirdly, in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.

...Now that I have read 'intoxication', it seems like 'into' a word before it...I'll search it...I am searching; I can't find it. It reminds me of a word that I have come across before and which I haven' t understood ... I am still searching...Let's wait until I finish; I will find it...I'll carry on...
-'Thirdly' Here it is ...'intracellular toxin' and 'into-xication' It seems to me they are opposites...
-'Thirdly, in the case of intracellular toxin' Yes, it is something like 'internal'...'in intoxication'. I have understood a little bit; I'll carry on reading...
-'binding and cellular entry'...'binding' I don't understand it...I'll carry on...I'll carry on reading (02)

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

...I don't understand the sentence; I'll reread...It seems difficult, complex...
I don't know how to understand well...The words are a bit difficult... I'll carry on reading. I haven't understood the sentence... I'll carry on.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

Here it is 'intracellular toxin'...
-'adjuvants' I haven't understood it; I will not reread. I'll carry on.

This approach relies on fundamental knowledge about the toxins and other virulence deteminants (e.g. adhesins) a bacterium makes.

-'approach' once again...I have read the first sentence; I haven't understood it...I want to understand it but I can't.
-'This approach' I want to find a relation, but I can't. I try to remember the lessons we did, but there no information related to the sentence I am reading.
-'This approach' I don't know...When I read 'knowledge', the word 'cloning' which we studied last year comes to my mind, but there is no relation (02) between them. I'll carry on...
-'a bacterium makes'...I haven't understood; I'll carry on.
-'about ...'adhesins' I haven't come across this word; I don't want to understand it...
-' a bacterium makes' I haven't understood this sentence too, but I'll carry on.

It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.

...I'll carry on reading...I won't go back; I've understood it.

This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modification was identified.

...I'll reread. 'This is being...pertussis' I haven't understood the word 'pertissus'. I don't understand it (02), but I'll carry on. I want to know what comes after it.
- This 'approach' is repeated many times, so it is important. It has a direct relation with the topic because it is repeated...I'll carry on.

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein was more immunogenic than the chemically inactivated one.

-'Formaldehyde'? I'll divide it because I can't understand it: 'form' 'aldehyde'. Now, I can understand it. I have to divide it first because it is long...'form-aldehyde inactivation of the toxin', yes. Here I remember the lesson in the 'Techniques de Contrôles' module (02) I'll carry on.
-'cross-link' I have seen this word, but I can't understand it...
'to crow-link the protein' I don't understand it. I'll carry on...because I have to carry on to understand what has come before.

-'untreated(02) protein' It sounds like 'treating the protein'
'treated'...'untreated protein'...I'll carry on.
-'inactivated one' (02)... I'll reread the paragraph to understand everything, not word by word...
-pathogenesis'...'patho/gen/sis'...'pathogène' I'll relate to 'pathogène'...I haven't well understood...I'll read the last paragraph.

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems, using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

...These examples like 'aro strains of Salmonella' make the meaning clearer.
-'for a few'? 'for a few generations in a host'...'host'   .
I'll reread from the beginning...I have understood the first sentence...the first line...
I haven't well understood 'using metabolically attenuated bacteria that can be given orally'...ah, I understand (02) from 'that can be Given orally'... I've understood it...I'll carry on with the example...I'll carry on.

Such systems have the potential advantage that they have a greater likelihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administered live vaccine will be cheaper and will not require continual refrigeration.

-'likelihood'...Ok...When it is a long word I try to divide it...I'll try to find a word that I know like this one: like/lihood (02)... Yes,
that is, I must see a bit by bit to understand the whole word like this
... 'likelihood' ...I understand it now.
-'mucosal' I have seen this word. It's in my mind, but I can't specify it... I'll carry on to understand.
-'via' (03) I don't understand it...'by administration via the oral route'...I'll carry on.
-'Third World' (02) ...
-'via' I don't understand it...'la vie'? ...'by administration via'? ...
It sounds like 'live', 'li fe'...'way of life'...
- 'route'? ...'Third World' It sounds like
. I'll carry on reading.
-'refrigeration continuelle' [sic] I don't understand it.
I'll reread the sentence from the beginning.
-'likely' I haven't understood it... 'like' that is 'comme'...
'likely'...It's like 'lucky'...'likely' I haven't understood it. I'll carry on...
-'cheaper' (02) ... 'and will'... It means something in the future. I have understood the meaning, but I haven't understood the words, like here, I have relied on the form of the verb. It says: 'orally administered   vaccine' I have

understood this 'will'. When it says 'will be cheaper and will not require continual refrigeration', I have understood the meaning from the word 'will'. That is something in the future. I have relied on grammar.

-will not require continual refrigeration'... that is we can preserve or continue with the preservation ...Yes, I understand it.

Now, I'll reread the text from beginning, from the title.

...The text is beneficial, a little bit difficult. I have t o reread it to put the ideas together. I'll reread rapidly, not slowly.

Here, I see the relationship between 'vaccines' and 'toxins' That is when you read you find how we can get rid of the toxins by vaccines...and the specificity of every vaccine against every toxin. They've relied a lot on bacteria because every bacterium has its own specificity. Here we rely on the background knowledge I have about every bacterium and use it to understand the text.   I haven't understood many words like 'highly effective'. No, this one I have understood it because the word 'effective' clarifies the word before it.

...mm... I have relied a lot on 'microbian microbiology' in order to understand this lesson [sic], and I have to reread sentence by sentence.

...I like when I find 'firstly'...

The expression 'amino acids' I like it very much. I like finding it.

'amino acids' reminds me of third year 'genetics' with Mr. Senator, especially of the lesson on 'molecular'[sic] because we studied all these things before...mm...

I am reading paragraph four (02). I am reading quickly to get a general idea, but until now, I haven't understood what is 'first',.

'secondly'...steps?

Even though I haven't understood, I have to carry on.

-'proteolytic'? Yes, I understand it...

Ok, the text is a bit difficult, but we can understand it. We can't understand word by word, but we can understand the general idea. We thank the teacher; Thank you. Bye.

STUDENT 09

Therapeutic Uses of Toxins

-I'll start with the title 'Therapeutic Uses of Toxins'...-'toxins' is clear; it means ....
- 'used'[sic] means ....
- 'therapeutic' I don't understand it, so I'll use a dictionary.

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with the advantage of a greater knowledge and the ability to manipulate their toxicity genetically.

...The sentence is long. I have to reread it to understand...
-'The powerful ...' There are words that I haven't understood like 'powerful' and 'search' and...and 'knowledge' which means I have to use a dictionary to understand them and the word 'genetically' too, but the word 'geneti' [sic] is derived from 'genetics', 'cally' I haven't understood it, but it must be related with 'genetics'. Now the second sentence.

In addition, their potent actions have found widespread uses in other aspects of biology.

...I have to reread it...
-'In addition' (02) I haven't understood it...'addition' ...
-'their potent action has found...'
- This 'widespread' I haven't understood it. So, I have to search it in the dictionary to understand it...'wide'- 'spread' (02) I don't understand it. Now the second sentence...

As the major effector of bacterially induced host damage, toxins play a prominent part in both conventional emperical vaccines and the new generation of rationally designed vaccines.

...It's long...I'll reread it in parts...
-'damage' I've come across it in the previous text.
-'bacterially' is 'something related to 'bacteria'. There are words that I have understood and words that I haven't. I'll read again.
...This 'induced', I haven't understood it. I have to look it up in the dictionary...
-'host damage'?....
This 'generation' ...'gene' means 'genetics' 'ration' something related to 'genetics', but I can't understand the sentence.
Now the second sentence...

It was recognized early that   inactivation of the toxic activity could produce highly effective immunogens because inactivation did not destroy epitopic structure.

'It was...produce' ....An easy sentence; I'll carry on...'highly /heatly/[sic]...structure' Everything is clear.
-'immunology' [sic] means   . The second sentence...

Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphteria).	*-This sentence[sic] between brackets, the example, he tells us about 'tetanus' and 'diphtheria'…* *… the inflammation of diphtheria…the diphtheria disease.* *-'tetanus' I haven't understood it. It reminds me of 'Titanic' (Film). I'll reread the sentence, maybe I will understand.* *-'chemically' …'chemical' maybe from 'chemistry'* *This 'attenuated'…'attenuated' maybe it is derived from 'attendez'…'slow down' .* *-'vaccin' [sic] clear...* *-'have served well against...' 'against' maybe 'the nucleus'…'some disease'…I'll read for a third time.* *-'disease' …maybe 'illness'…I've understood the third sentence.*
However, this has not been a universally successful approach, either because the induced immunity was poor and short lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.	*-'However…cholera' I'll stop here and reread the sentence because I haven't understood…* *-'However' I have come across this word…* *I haven't understood 'universally' and successful'/siksful/ [sic]…'universally successful', and 'approach' /ebrauθ/[sic]* *This means that I need a dictionary to understand these words.* *-'either because' These are clear...* *-'the induced immunity was poor and short lived' Its life may be short like 'cholera'. It affects the intestine as a result of intoxication.* *-or because the …effects' This sentence is clear.*
A good example in this latter case is whooping cough, where the public acceptance of the whole cell inactivated vaccine has not always been high.	*…'case' (02) I haven't understood it, so I have to carry on.* *-'whooping cough /gut/ [sic] I haven't understood it; I'll reread.* *-'A good example', clear…'in this latter', clear…'case' (02) I don't understand it; I have to use a dictionary to understand this word.* *-'is whooping cough' /guθ/ (02) …'whoop… cough' I don't understand; I'll carry on maybe I'll understand from the sentence.* *-'where / / [sic] the public' (02)* *…'publicity'?…'public' 'commercial'…* *-'acceptance' (02) /aseptens/ [sic] …'résistence'? No…'of the whole…' I'll reread the whole sentence…. I'll carry on.*

Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.	-'technology' ... - This 'produce' has been repeated many times... I'll read the sentence once again...It's not very difficult. -'several advances' I haven't understood this...the first and second word, so I need a dictionary to explain them. ...The word 'safer' /safter/ [sic]I haven't understood it which means I have to use the dictionary to explain it, but I have to carry on. Second paragraph...
Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).	*This 'knowledge' ...'knowledge about toxin structure has' ...'structure' reminds me of the 'Structures' module.* *The student reads word by word...The sentence between parentheses clarifies the other sentence.* *-'intracellular toxin'...'intra' ? ...'internal toxin'? maybe!!!* *I'll read the sentence once again, maybe I'll understand it.* *This 'knowledge' I haven't understood it.* *-'structure...involved' (02) I haven't understood it.* *-'at the catalytical' (02) [sic] I haven't understood it, but the sentence between parentheses is clear.*
These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.	*-'these can' ...'can' in the future' The sentence is clear except for the word 'devoid'. I haven't understood this word. That means I need a dictionary, and 'enigering' [sic] 'eni- ginee-ring' (02) But 'enigering' I don't understand it. I need a dictionary for these words... I'll carry on.*
Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.	*...The student reads word by word. Oh, I haven't understood this sentence; I'll reread it.* *-'Such a mutant protein', clear...* *-'is more likely' ...'likely'...'like'...Maybe it is derived from the word 'like'? ...'Likely for several' (02) 'rea...reasons...alterations' I haven't understood it; I need a dictionary to understand it.*
First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.	*This sentence starts with 'first' (02) . It is as if I am just starting.* *-'It is likely' ...Ah, this word is repeated again. I don't understand it.* *-'folded into the native structure' ...'stucture'*

...the 'Structures' module.
-'and so display...toxin'...I'll reread...
-'fold' [sic] I don't understand it; I need a dictionary to explain it.
-'display' ...'dis' I don't understand it... 'but 'play' maybe 'to have fun'...'display' I don't know.
-'the epitopes' I don't understand it...
-'that will trigger an immune'   'reaction that will recognize'
I don't understand 'recognize' /reconiz/ [sic]
...'the active toxin'.
That means the words which I haven't understood, I need a dictionary to explain them.

Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.	*-'Secondly (02) a correctly fold' [sic] The same word is repeated.* *-' molecule' ...ah, 'molecule' 'is more likely' (02) It's repeated again.* *-'to be stable and resistant'* *-'proteolytic attack in the host' This 'host' I have come across it in the previous text (training). I'll reread the sentence to understand.* *-'secondly /sekendlai/ [sic]... host' ...'resistente' [sic] reminds me of the 'Genetics' module when we did the experiment 'resistant and sensitive'. It remind me of the experiment...I'll carry on.*
Thirdly, in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.	*-...'intracellular toxin' This is the sentence that we have come across before. It was between parentheses...and 'case' I haven't understood it before and it is repeated.* *The sentence is long; I have to reread it.* *...There are words that I have understood and words that I haven't.* *-'This 'mutate' I haven't understood it.* *-'enzymatic' clear... -'function' clear...* *'enzymatic function' are scientific words...* *- 'intoxication' I haven't understood it.* *I'll read the sentence for third time, maybe I'll understand something.* *-This 'intoxication' maybe it is derived from 'toxin'...'into-toxication' ...'in' ...'in'* *...'intoxication'...'toxin' (02)* *...'toxication'...'in'... I don't know.* *-'binding and cellular entry' I don't understand; I'll read another time.* *... The first sentence is clear...* *'Thirdly...toxin'...I'll carry on. 'a toxin...' This 'i.e' I haven't understood it ...'example'? I don't know. I'll carry on.*

This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.

…This sentence is clear; I'll carry on.

In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.

… I'll reread; I haven't understood. There are thing that I have understood and things that I haven't.
- This 'interesting' I haven't understood it.
-'that intracellular' is clear…'toxin' is clear… When I read 'toxin' I remember the module of…of 'Biochemistry'…of 'toxo'..
The last word too I haven't understood it. I'll carry on.
…I'll reread maybe I'll understand.
-'In this regard, it is interesting'…'interesting' …The student reads word by word.
-'adjuvants' … This 'adjuvant' I haven't understood it. I'll carry on with the next paragraph.

This approach relies on fundamental knowledge about the toxins and other virulence deteminants (e.g. adhesins) a bactirium makes.

…'Fundamental' …This 'knowledge' I've come across it before and now…'knowledge' /knola:j/ [sic] Maybe it is 'clonage' that we studied with Mr. Senator…'knowledge /knola:j/ [sic] about' …(The student reads word by word)… 'adhesins'? I haven't understood it…'a bacterium makes'…I'll reread.
-'rivulence' [sic] I haven't understood it.
-'determinants…makes' …In this sentence, I haven't understood 'virulence'…'this approach' is also not clear. That means I need a dictionary to explain them. I'll carry on…

It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.

-'concentration' [sic] Maybe it is derived from 'concentration' (French pronunciation)   , possible.
-'pathogenesis' (02) …The title! …
-'avoid' It is repeated. I haven't understood it before. I'll read the sentence another time.
…I'll reread, maybe I'll understand.
…I'll carry on now.

This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modification was identified.

-'This is being applied to pertussis toxin' …eh…This sentence I haven't understood it…I'll carry on.
…'where the further…chemical'   , maybe… 'chimie'…

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*-'modification (02) was identified' I 'll reread...
...I'll reread,; I haven't understood...I'll reread again...
-'further' I haven't understood it...'the further'
...I need a dictionary to explain it. .
-'advantage (02) of such an approach (02) /aprauθ/ over chemical...identified' ...That is in this sentence I haven't understood 'further' and 'approach'; I need a dictionary to explain them. I'll carry on with the next sentence.*

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein was more immunigenic than the chemically inactivated one.

*Oh! The first word also upsets me.
-'Formaldehyde'...ah! 'Formaldehyde' we studied it in biochemistry ... right!
-'Formaldehyde inactivation of the toxin'
...'Formaldehyde'... Clear, I'll carry on.
-'essentially'...'which essentially /izenteli/ [sic] act to cross-link the protein'...I haven't understood 'essentially'; I need a dictionary.
-' shown' /∫uθ/ [sic] ...
-This 'proteyly' [sic] is not clear, but the first word 'potentially' /potenθi li/ [sic] ...'potent'?... I haven't understood ... I'll reread; it is very long.
-'Formaldehyde' we studied it in chemistry...in biochemistry...'-'Formaldehyde...toxin'
...Clear...The next sentence...
-'which essentially' ...'essentially' /izent li/[sic] is not clear... I'll carry on...
-'cross-like [sic] the protein'
...'mmuno/genic'...'immuno...genetic' ...
'immunology' or what? ...'immuno'   ,
'geni'   . It"s linked? 'Immunity' is linked with 'genetics'. Yes... linked with 'genetics'
-'than the chemical [sic] inactivated one'... I'll reread it; maybe I will understand.
-'Formaldehyde inactivation of the toxin' This is clear (02)
-'which essentially' /isentili/[sic] (02) not clear.*

*-This 'potentially' /potentili/ [sic] I need a dictionary to explain it.
-'immunogenic' It's the same as before...'immunogenic...state' [sic]...
-'since...one'...I'll carry on.*

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems, using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

…I'll reread the sentence; I haven't understood it. Student reads word by word.
-'Genetic…coupled' This 'coupled' I haven't understood it… 'coupled' …I need a dictionary to explain it.
-'to the newer delivery' I don't understand it...'system' clear'...
-'using metabolicated [sic]...metabolism' …clear.
-'attenuated...host' This sentence is clear; I'll carry on.

Such systems have the potential advantage that they have a greater likelihood of inducing protection and mucosal surfaces by administration via the oral route and also are more likely to be of use in the Third World, since an orally administered live vaccine will be cheaper and will not require continual refrigeration.

.… The sentence is very long; I have to divide, then read it. I'll stop at every comma. Let's start.
-'Such...likelihood' The word 'likelihood' is not clear...'like'...'lihood'...I don't know; I know 'like', but this 'lihood' I don't understand it. I need a dictionary to explain it.
-'mucosal' I don't understand it too.The student reads word by word
...'likely' It has been repeated many times...'world'
I'll reread from this comma.… I'll carry on…
-'orally'...'since an orally'...'l'oral'? (02) I don't know.
I'll reread this last sentence; it's not very clear.
-This 'cheaper' I need a dictionary to explain it.
-'refrigatory' [sic] too is not clear. I need a dictionary to explain it.

Now , I 'll reread the whole text to get a general idea.

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STUDENT 10

Therapeutic Uses of Toxins

The powerful nature of toxin action historically made them the first line of attack in the search of effective vaccines, and this process still goes on today but with the advantage of a greater knowledge and the ability to manipulate their toxicity genetically.

I'll read the first sentence, rather the title... I have a general idea, so...

...I'll reread the sentence...
I have understood; I'll pass to the second sentence.

In addition, their potent actions have found widespread uses in other aspects of biology.

I don't understand 'potent', but I'll continue.
- The word 'widespread' I've seen it before, but I don't know what it means exactly. I'll reread the sentence... I have understood a little bit, not really, but I'll carry on.

As the major effector of bacterially induced host damage, toxins play a prominent part in both conventional empirical vaccines and the new generation of rationally designed vaccines.

-'empirical' ...I don't understand it, but I'll carry on, always...I'll reread the sentence... I can't understand well, but I have a general idea. I'll carry on.

It was recognized early that inactivation of the toxic activity could produce highly effective immunogens because inactivation did not destroy epitopic structure.

... Well, I have understood the sentence... I'll finish it first... I'll reread it.
-'inactivation' means 'inactivation' French pronunciation); I relate it to the French word.
-'epitopic' I don't understand it, but I can skip it. Before I continue, I'll see what is in the table.

Membrane: Pore-forming toxins
      Phospholipases
      Superantigens
      E. Coli stable Toxin (ST)

I understand the title of the table ...Let's see..

-'Membrane'...' E. Coli' It's a bacterium; I already know it.
I don't know the first toxin...The second, I've got an idea because in French it's an enzyme, normally. I understand it...I don't know the third; I can't understand it. I'll continue with the second target.

Translation apparatus: Diphteria Toxin (DT)
      Ps. aeruginosa exotoxin A (ETA)
      Shiga Toxin

- I don't understand 'apparatus', but I understand 'translation'.
-'Diphtheria' I know it…I know these toxins…The third target…

GTP-binding proteins

I understand…I know (03) this target. Eh…I understand. These toxins are at the origin of bacteria, i.e. their origins are bacteria, so, I'll skip; I've got an idea.

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Synaptosomal proteins: Cl. Botulinum toxins 'except C2 and C3) Cl. tetani toxin	*-'Synaptosomal'…'synapse' in French. I'll relate it with French. I understand.* *-'Cl. Botulinum' I know these bacteria and their toxins. I've got an idea, so I'll carry on reading.*
Such chemically attenuated vaccines have served well in the protection against some diseases (e.g. tetanus and diphtheria).	*…Well, I've understood it…I am going to read the next sentence.*
However, this has not been a universally successful approach, either because the induced immunity was poor and short lived (e.g. cholera), or because the vaccines are perceived to cause unacceptable side effects.	*…Well, I've understood; I'll carry on…* *I am going to read the sentence for a second time…Ok, the next sentence.*
A good example in this latter case is whooping cough, where the public acceptance of the whole cell inactivated vaccine has not always been high.	*- I haven't understood 'whooping cough', but I'll carry on...* *-Well, I am going to reread the sentence because I haven't understood anything... I can't understand the sentence, but I am going to read the next sentence.*
Several advances in vaccine technology have contributed to the new approaches being adopted to produce more effective and safer vaccines.	*-'approches' I don't understand it; I'll finish the sentence first...* *I'll look up the word 'approaches' in the dictionary to better understand. I've got an idea, but I want to understand this word ...Next paragraph.*
Knowledge about toxin structure has enabled scientists to identify which amino acids are involved at the catalytically active site (of intracellular toxins).	*…'catalytically' ... I'll reread...In French, 'catalyse' I've got an idea. I'll carry on…ok…I'll reread…* *-'enabled'...'able'...'enable'...'enabled' ...ok, I understand. I guess the sense from a word that I know already...I've understood. I am going to read the next sentence.*
These can be changed by genetic engineering to produce a protein that has only one or two amino acid changes but is completely devoid of toxin activity.	*- I don't understand the word 'devoid', but the sense is clear, but I'll reread to confirm the sense...* *I've …I've got a probable sense for the word 'devoid'. I think it means or , eh…that is* *Ok, I've concluded a sense like that, but I've understood the sentence…The next sentence.*
Such a mutant protein is more likely for several reasons to be effective as a vaccine than a toxin with gross alterations.	*…I'll reread the sentence…I haven't understood 'alterations'...* *It's 'alterations' in French, and so I've understood; I'll carry on.*

First, it is likely to be correctly folded into the native structure, and so display the epitopes that will trigger an immune reaction that will recognize the active toxin.	-'folded' I haven't understood it, but I'll read the sentence till the end. -'the epitopes'...'epitopes' is always here, so I'll see it in the dictionary to better understand. I'll carry on my reading.
Secondly, a correctly folded molecule is more likely to be stable and resistant to proteolytic attack in the host.	-'Secondly...folded''...'folded' is always here, so I have to see its meaning in the dictionary. I'll rereadf the previous sentence to make sense of 'folded' -'First...structure' It's something like 'impliquer', or ... -'Secondly, a correctly folded molecule'...'folded' that is it penetrated (02) in its structure...that is ... I'll reread to relate the two parts...I've understood.
Thirdly, in the case of intracellular toxins, a toxin that is only mutated in its enzymatic function will be able to carry out the first steps in intoxication, i.e. binding and cellular entry.	-'mutilated' [sic]...It's the first time I see this word, but I'll carry on reading. -'i.e.' ...The English teacher told us that it means 'that is to say'. So, he will explain...I'll reread the sentence... I've got an idea, but I haven't understood very well... I'll carry on, and for 'mutated', I'll see the dictionary; I think it's a key word. I am going to read the next sentence.
This enables the immune system to process the protein more efficiently and better immunity is raised by vaccination with whole toxin than just the active domain.	...I understand it...I'll reread to confirm. -The word 'whole', "'ve seen it before, but I don't know the exact sense, but it does not affect the understanding.
In this regard, it is interesting that intracellular toxins as a group appear to be very effective adjuvants.	-'adjuvants' I already know this word...'adjuvants' in French, so I understand it, but the sense is not clear; I'll reread the sentence. . -'appear' I know this word...Well...eh...I can't assimilate this...this information. I'll read the next paragraph.
This approach relies on fundamental knowledge about the toxins and other virulence deteminants (e.g. adhesins) a bactirium makes.	-'This approach' I don't know this word, so a dictionary is necessary because it's the first time I meet it...so,...But, I'll carry on, maybe it will make sense. -'e.g.'...example?...'adhesins'...Because I can't understand 'approach'... -'fundamental' is 'fondamental' in French …mm….I need a dictionary because I can't

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It is therefore possible to concentrate on only those proteins important in pathogenesis and thus potentially avoid the side effects of other extraneous bacterial products.

-'therefore' means 'consequence'. (FP)
-'concentrate' means 'concentration' (French pronunciation),ok....
-'potentially' means 'potentièl' in French, ok....
-'avoid' (02) I can't understand it, but I'll carry on...
-'ext-ne-ous' [sic] I don't know this word.
As there are many words, I am going to use the dictionary and try to better understand with the help of the dictionary. But, I'll reread the sentence, maybe...
...No, I can't understand well; I am going to read the next sentence.

This is being applied to pertussis toxin, where the further advantage of such an approach over chemical modification was identified.

-'This is being' (02)...'pertussis'...ah, 'pertussis' ...'presi..' ...mm...
I don't know it. I thought it was 'persitant' , so, it isn't the word...
I'll carry on.
-'the further'...yes. So, this adjective 'further'...'further advantage'
... (laughter)...'approach' I don't know it... 'approchement'? ...'approach' This word is difficult for me, so I need a dictionary to better understand. I'll finish the sentence...
I'll reread the sentence...
-'of such...identified'...'identified'...'identifié' in French...But
'approach'? ...I'll read the next sentence.

Formaldehyde inactivation of the toxin, which essentially acts to cross-link the protein, was shown to affect its structure and potentially mask or inactivate immunogenic sites, since the untreated protein was more immunigenic than the chemically inactivated one.

-'Formaldehyde' (02) It's a scientific word; I know it. The sentence is long; I'll reread it to better understand it.
...I'll reread for a third time because I haven't well assimilated.
Well...Well, I have understood...Voilà...Ok ...(laughter) The next paragraph...

Genetic manipulation of toxin genes is also being coupled to the newer delivery systems, using metabolically attenuated bacteria that can be given orally, e.g. *aro* strains of *Salmonella* that can only survive for a few generations in a host.

-'Genetic' ...Yes, 'génétique'...So, 'Genetic manipulation'.
-'newer' ...'new'...'newer'
-'Example 'aro strains'...yes 'la souche'... yes ...Yes, I've understood(02). I've related it with some words...some information that I already have...The next sentence...

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-'likeli / hood' (02) I don't know this word, but I'll carry on...
-'mucosal' that is 'mucose'...Ok
-'via' I t reminds me of a teacher who told us that 'via' is an Italian word in principle...'via' means 'toward'...no... it's ...eh... 'la rue' (02)...rather, 'la rue'...that's it...
-'cheaper'...yes...
-'continual' ...yes...'continuer'...
Well, I'll reread the sentence; it's very long, but there are many difficult words, or...except 'likelihood'...I'll look it up in the dictionary. I'll carry on...
-'and mucosal surface by administration' ...No,

-'oral'...'orale' (French pronunciation)
-'likely to be used in the Third World'...eh, I'll reread from the beginning...
...Well, I've finished...mm...
'Such'...I'll read it aloud, but I can't understand well. (The student reads aloud)
  -'greater likelihood' What is this 'likelihood'? I have to use a dictionary to better understand.
-'inducing protection'...I must know the meaning of the word 'likelihood'...or, I will read the whole paragraph...
...'survive' (02) the same as in French, ok...
-'Such system' means 'like these systems'...mm...
-'have a big advantage' ...'likelihood' is important for a better comprehension.
  -'administration' here, what is the sense?
...'administration' ... Normally, 'administration' (French pronunciation) ... Well, I've related with 'administraion, but this sense is not possible ...'administration'?..-'of inducing...world'
-'an orally administered live vaccine will be ...cheaper'?
-'orally' means 'orale' (French pronunciation) isn't it? ...'oral'...
So, it means 'la voie vocale' [sic] It means the mouth...yes, normally, but I can't ...Maybe, this 'administration' does not have the same sense as in French, but I'll see it in the dictionary.
-'cheaper' I understand it...Voilà...
I'll reread the text and I think I'll understand it better.

مـلـخص

يتمثل هذا العمل في دراسة من الجانب الكمي و النوعي من شأنها أن تقدم صورة حقيقية للصعوبات التي تواجه في فهم النصوص المكتوبة وكذا الطرق و الإستراتيجيات التي يتبعها الطلبة أثناء القراءات التي يقومون بها في القسم .

لقد اعتمدنا في دراستنا هذه على أدوات البحث الثلاثة وهي: الرائز، الاستفسار و القراءة الموجهة .يرمي الرائز أساسا إلي تقويم مستوى الفهم عند الطلبة ثم التعرف على الصعوبات التي يلقونها في فهم النص.أما الاستفسار فهو يهدف إلى معرفة الاستراتيجيات و الطرق التي ينتهجها المتعلم خارج السياق.أما الهدف من وراء القراءة الجهرية هو معرفة الإستراتيجية التي يجب إتباعها من طرف الطالب في وضعية خاصة و إن كان حقيقة يطبقها أثناء قراءته .

لقد أثبتت الإحصائيات التي توصلنا إليها الفرضيات الأربعة التي تطرحها إشكالية البحث.تبين الفرضية الأولى أن الأشخاص الذين اكتسبوا قدرة كبيرة على القراءة (الطلبة المتقدمين) أكثر عزما و كفاءة من الطلبة الذين لديهم قدرة أقل (الطلبة أقل تقدما) بحيث أنهم يفهمون القصد من وراء النص دون التوقف على الإستراتيجية الملائمة .أما نتائج الفرضية الثانية فهي توافق تماما دراسات أخرى (Carrell 1989, Devine 1987) و تبين أن التحكم في الإستراتيجية مرتبط بقوة بأداء القراءة . و لهذا فان الطلبة المتقدمين يفضلون الطرق التقليدية و يعتمدون على المعلومات السابقة و الاستنباط و التأويل بينما الطلبة الآخرين يلجأون إلى طرق محصورة الوضع سيما معنى الكلمة و تفاصيل النص. و فضلا عن هذا فإنهم يقضون جل وقهم في محاولة فك شفرة الكلمات المكتوبة مما يشوه فهمهم للنص(الفرضية الثالثة) .و بالإضافة إلى هذا , و في غياب قدرة كبيرة على معرفة الكلمات و الاستراتيجيات الملائمة , فان هذه الشريحة من الطلبة تقوم بقراءات أقل جودة مقارنة بالطلبة المتقدمين حيث أنها تظهر على شكل متقطع بدلا من أن تكون عبارة جمل واضحة و متجانسة مع بعضها البعض. و نتيجة لهذا لا يتم فهم النص المكتوب كما ينبغي.

RESUME

Notre travail se propose d'être un examen d'un point de vue quantitatif et qualitatif conçu pour dresser un tableau fidèle des difficultés éprouvées en matière de compréhension de l'écrit ainsi que les procédés et stratégies utilisées par les étudiants lors de leurs lectures en classe.

Pour ce faire, nous avons fait appel dans notre approche à trois outils de recherche: le test, le questionnaire et la méthode 'think-aloud' qui consiste à lire un texte et réfléchir à haute voix pour ce qui est des stratégies de lecture utilisées. Le test vise en premier lieu à évaluer le niveau de compréhension des étudiants et par suite identifier leurs difficultés de compréhension. L'objectif recherché à travers le questionnaire est la connaissance des techniques et stratégies utilisées par l'apprenant hors contexte. Le but de la méthode 'think-aloud' est de connaître la stratégie à adopter par l'étudiant dans une situation particulière d'écrit et l'application réelle qu'il en fait lors de sa lecture.

Les quatre hypothèses soulevées par notre problématique de recherche ont été confirmées par les statistiques obtenues. En effet, la première hypothèse a confirmé que les sujets ayant acquis une plus grande capacité de lecture (étudiants avancés) sont plus résolus et plus compétents que ceux ayant une capacité moindre (étudiants moins avancés) en sens que leur lecture est telle qu'ils comprennent le message de l'auteur sans même s'attarder à chercher la stratégie adéquate à suivre. Les résultats de la second hypothèse corroborent avec d'autre études (Carrell, 1989, Devine, 1987) et montrent que la maîtrise de la stratégie est étroitement liée à la lecture. Aussi, les étudiants avancés ont tendances à préférer les procèdes conventionnels et s'appuient entre autre sur leur culture générale, le déduction et l'anticipation. Tandis que ceux moins avancés utilisent des méthodes plus terre-à-terre notamment le sens des mots et les détails du texte. Par ailleurs, beaucoup de leur attention est absorbée par le décodage des mots écrits, ce qui perturbe leur compréhension du texte (Hypothèse trois). De plus, faute d'une grande capacité de reconnaissance des mots et des stratégies adéquates, cette catégorie d'étudiants lit moins biens que ceux avancés d'autant que leur lecture se présente sous forme de bribes plutôt que des phrases claires et précises. Par conséquent, le sens du texte n'est pas convenablement assimilé (Hypothèse quatre).