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The Role of Rhetorical Functions for Effective Reading Comprehension: EST Perspectives. The Case of First-Year Chemistry Master Students, University of Constantine.

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Dedication

I dedicate this work to:

The soul of my father and my tender mother.

My eldest sister or second mother, Rofia, and my twin Fatima E-zahra and her husband and beloved son Mahdi.

My dearest brothers: Abed alhamid, Boubakar, Khalil and Houssam.

All my cousins particularly Nour El Houda for her utmost help.

All my friends without exception.

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I am also grateful to the English teachers in the department of chemistry and first year chemistry Master students for their great help.

Finally, I must acknowledge the debt I owe to my mother, my eldest sister and all my family.

Abstract

The present study, which consists of three chapters, is conducted to investigate the role of rhetorical functions to overcome chemistry Master students difficulties when reading scientific English. Our main concern is to uncover the whole teaching situation of English at the department of chemistry. On the other hand, we want to shed light on the reasons behind students' problems with reading comprehension trying to propose some helpful means to solve such problems. Therefore, we hypothesize that if students of first year chemistry Master students are equipped with EST rhetorical functions, they will comprehend any scientific text. In an attempt to do so, we used a questionnaire handled to teachers with a test for students. The literature reviewed and the analysis of the findings obtained have shown students' problems with General English in the first place and by extension with EST in which the identification of functions requires undoubtedly students' good level in GE as this knowledge is expressed via the use of the English language.

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Table of Abbreviations

EFL: English as a foreign language.

ELT: English Language Teaching.

ESP: English for Specific Purposes.

EST: English for Science and Technology.

GE: General English.

N.N.S.: Non- native students.

Ns: Number of students.

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Chapter Three: Fieldwork

General Introduction

Introduction

Modern linguistics has maintained that no one language is better than one another. But, because of some economic factors, English comes first in terms of importance. That is why, it is the language of science where some knowledge of which is necessary to have access to the specialised literature which is almost in English. This prominence of English as a language of science makes or obliges foreign learners read scientific English, an area which requires a lot of research.

1. Rationale

The concern of this study is to highlight the role and the importance of rhetorical functions of the scientific text for effective reading comprehension. There are some reasons behind choosing such a specific factor (rhetorical knowledge) over other variables that affect the process of comprehending a scientific text. I asked some chemistry students about understanding a text in English and all consider it a difficult task to do. They state that looking at technical vocabulary prevents them from getting the text's message. It is worth noting that technical terminology is one feature of the scientific text, what about the terminology of rhetoric? In other words, the scientific text has a specific rhetorical organisation which asserts its nature and purpose. For that reason, Chemistry students are supposed to be aware of such knowledge as it is closely related to the language of science than to the English language. Undeniably, the language of science with which the structure is organised is achieved by the use of the language itself. This indicates a lot about the difficulties foreign learners face when dealing with subjects of science. In short, this study is a guideline of how chemistry students extract and construct meaning relying on the rhetorical knowledge.

2. Research Questions and Hypothesis

This piece of research aims at raising the following questions:

1) During the process of text comprehension, how do first year chemistry Master students proceed?

2) On what aspect do they rely in order to comprehend a text?

3) Do they succeed in extracting the text's main points?

4) Are they equipped with the knowledge of how a scientific text is structured in terms of functions and techniques?

5) What do they think about the usefulness of the rhetorical knowledge of the scientific text?

6) How do they apply such knowledge to text comprehending?

Taking into account the above questions and considering the relation between the rhetorical knowledge of the scientific text and text comprehension, we set up the following research hypothesis:

If first year chemistry Master students are well equipped with the knowledge of how to deal with rhetorical functions of the scientific text, they will be able to extract the gist of any scientific text.

3. Review of Literature

The increasing demand for English to match particular needs gives birth to English for Specific Purposes (ESP). Practitioners have included other sub-areas within the general study of ESP, among which English for Science and Technology (EST) is one. It is concerned with the discourse of scientific and technical English. The facts that English is an international language and is therefore the language of science have made the area of English for Science and Technology a "driving force" (Flowerdew, 1990, p.328). Hence many countries, in order

to keep pace with scientific developments, have integrated English courses within learners' subject matter.

On the behalf of the Algerian higher educational system and particularly at the University of Constantine, English is taught for almost all scientific fields. In such a setting, learning English is not for the sake of the language itself, but rather for the learner's purpose for learning the language. That is to say, chemistry students' purpose for learning English is to construct meaning while reading texts since the chemistry literature is mostly written in English. Basically, there are many variables that contribute to effective reading comprehension, and for the purpose of this study, the focus will be on the importance of   rhetorical organization knowledge for overall understanding

During the seventies, as a result of harsh criticism levelled at the linguistic approach to the description of EST texts, a discourse-based approach started to emerge. The pioneering contribution of that emerging field of discourse or rhetorical analysis was by so-called Washington school (J Lackstrom, L Selinker, and L Trimble). According to Trimble (1985, p. 69), taking into account the organisation of EST discourse, some rhetorical functions and structures are more observable in the scientific discourse. The rhetorical functions include the rhetoric of description, the rhetoric of definition, the rhetoric of classification, the rhetoric of instruction and the rhetoric of verbal –visual relationships. Trimble (1985, p.12) states that the rhetorical approach of English for Science and Technology, mainly the knowledge of rhetorical functions, reveals its usefulness to solve reading problems for non-native students.

4. Methodology

4.1. Materials and Procedures

Concerning data collection, a questionnaire and a test will be used.

The questionnaire will be given to teachers of chemistry which aims at investigating the teaching situation of English at the department of chemistry and knowing whether teachers are aware of what and how to teach chemistry students.

The test will be given to First year chemistry Master students which aims to uncover students' problems with reading comprehension and the areas that create for them difficulties. Furthermore, the test seeks to testify the role of the knowledge of rhetoric as a strategy to overcome such problems with reading comprehension.

4.2. Subjects

First year chemistry Master students –Mentouri University - have been studying General English for six years and two years at the department of chemistry. That is why, they are supposed to acquire the basic knowledge of English that enables them understand a text. More specifically, there are three groups of chemistry students of which a group of twenty students will be chosen randomly.

4.3. Structure of the Study

This piece of research is divided into two main parts; a descriptive part which includes two chapters about the review of the related literature, and an empirical part.

Chapter One will deal with a general review about EST as branch of ESP with some important issues that reflect EST content and main interest. In addition, the chapter will further describe EST as a discourse where the rhetorical aspect of the scientific text is stressed.

Chapter Two will provide an overview of the nature of reading comprehension and the specificity of reading science in English. Furthermore, this chapter will shed light on the problems foreign students face when reading scientific English and provide some supportive research about the role of the knowledge of rhetoric as a strategy to solve such difficulties.

Chapter Three will deal with data analysis of both teachers' questionnaire and students' test. The results obtained by these tools will be tabulated, analysed, and discussed.

Chapter One: English for Specific Purposes, a Review of Issues

Outline:

Chapter One: English for Specific Purposes: a Review of Issues

Introduction

The flourishing era of English as the first international language is a fertile topic that deserves a great deal of research. The area of teaching/learning English receives, thus, a remarkable attention and a continuous investigation. Learning English is no more considered an end in itself, but rather a means to fulfil specific needs and expectations. In view of that, new trends and different approaches have been applied to cater for the learners' specific aims and purposes for learning English. Accordingly, English for Specific Purposes (ESP) and, almost at the same time, English for Science and Technology emerge as new branches in English language teaching (ELT).

1.1. Historical Backgrounds

The 1950s and 1960s witnessed a growing dissatisfaction with the traditional English teaching practices in which "all learners were served up with literature regardless of their aims, needs or interests" (Mc Donough, 1984, p. 4). Learners' reactions against such practices and repeated calls for a new trend that considers their aims and purposes for learning English gave birth to English for specific purposes (ESP). Hence, the general English course was replaced by functional Englishes (Strevens, 1980), or ESP.

The movement of ESP as a new approach has seen a growing spread and has achieved, indeed, an international scope. According to Hutchinson and Waters (1980), the emergence of ESP was influenced by the development of other interconnected trends. For them, "ESP is a phenomenon that grew out of a number of converging trends" (p.6). More specifically, there are three reasons that urge the offspring of ESP, which are explained below.

The first of these factors is the demands of a brave world that need also a brave language. There were two important historical periods that breathed life into ESP, namely the Second World

War and the Oil Crisis period. The former witnessed a remarkable expansion of science, economy and international relations that strongly required an international language. The choice, then, fell into English because of the American great economic power. The latter has seen not only a massive flow of funds, but also the English language.

The second reason of the widespread of ESP is related to an expansion in linguistics. The main interest of the traditional linguistics was to describe the features of the language and set out rules of usage. But, with the massive demands of English all over the world, learners were not only satisfied with the rules of correctness, but they were also in need of rules of appropriateness where they interact with language. Thus, linguists start to account for the different ways language is used in real communication. They realize that a particular context dictates a specific kind of language. Hence, these ideas maintain and "determine the features of specific situations and then make these features the basis of the learners' course" (p.7).

The new development in educational psychology is the third factor for the rise of ESP. The attention shifts from the properties of the language as such to the centre of the whole cycle of teaching/learning: the learner. Learners seem to use different skills, different strategies and are motivated by different needs and interests. Accordingly, designing specific teaching materials are meant to help the learner and, thus, the entire learning process.

So, the demands of a brave new world, a revolution in linguistics and a focus on the learner led to the emergence of ESP as a new approach in language teaching/learning.

1.2. Definition of ESP

English for specific purposes (ESP) is an approach to English teaching chiefly based on the specific needs of a group of learners. Strevens (1977) has defined ESP courses as "those in which the aims and the content are determined, principally or wholly, not by criteria of general education, but by functional and practical English needs of the learner"(p.90).

Strevens' definition reflects the essence of ESP courses in identifying the learners' specific needs in that the ESP course is "purposeful and is aimed at the successful performance of the occupational educational roles...for a clearly utilitarian purpose for which there is no doubt"(Robinson, 1980, p.13). In other words, learners require English in order to perform a social or a working role. More specifically, El – Minyawi (1984) states that "ESP courses are based solidly upon the need to express the facts and the ideas of some special subjects areas after which the student should be able to read the specialized subjects confidently and speak them fluently" (p.2). Thus, the basis of ESP courses is to enable students obtain information from their subject areas, read confidently and speak fluently. Therefore, ESP is "an approach to language teaching which all methods are based on the learners' reasons for learning" (Hutchinson and Waters, 1987, p.19).

So, all these definitions highlight the learners' purpose for learning as the central element of ESP. Moreover, teaching materials are designed to cope with the learners' specific needs and reasons for learning English.

The "S" in ESP used to refer to the word "special" before it was replaced by "specific" as "special" was thought to be much more linked to the language while "specific" holds the meaning of learners' specific purposes (Robinson, 1980). The phrase "specific purposes" expresses, then, "a special aim which may determine the precise area of language required, skills needed and the range of functions to which language is to be put, but need not imply a special language"(ibid, p. 4). That is to say, ESP learners do not need a special language, but rather a specific repertoire within their specialist fields that meets their specific purposes. Therefore, "the focus of the word special in ESP should be firmly placed upon the learner for learning the language, not on the language he is learning" (Mackay et al, 1978, pp. 5-6).

As a matter of fact, learners have specific but different purposes that led to a myriad of sub-areas within ESP. Strevens (1977) proposed three areas within the umbrella term of ESP as the following diagram shows:

Figure 1: The Taxonomy of ESP (Strevens, 1977)
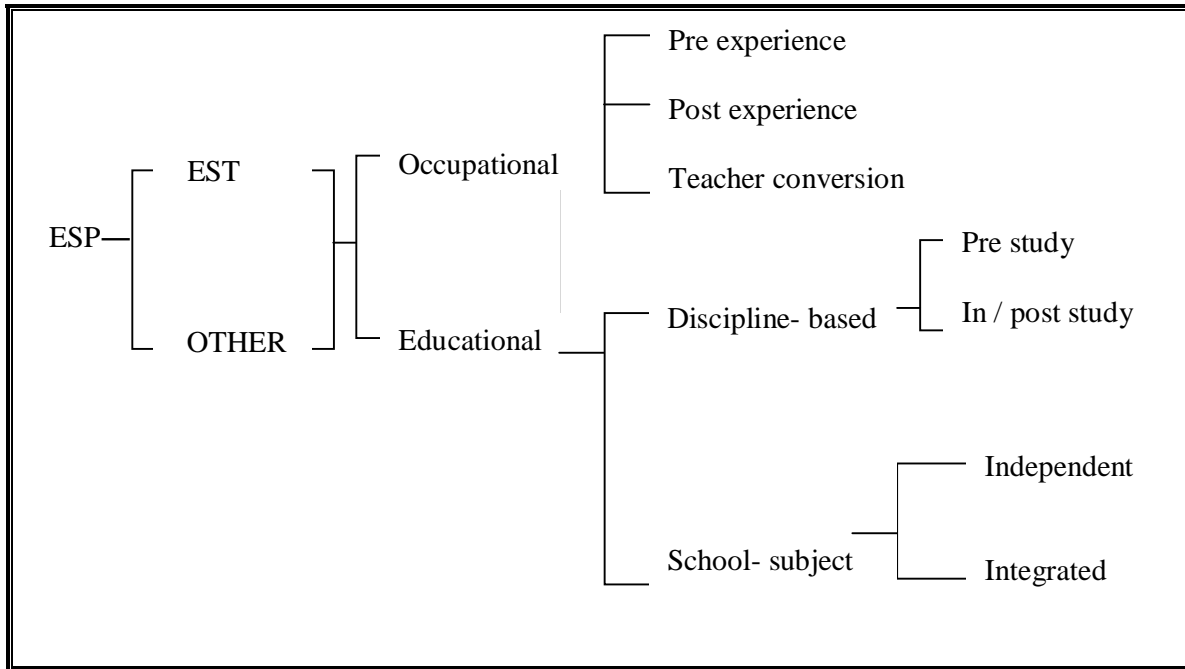
English for academic purposes (EAP) is related to educational institutions where students need English for their studies in order to read relevant books, take notes and write reports. English for occupational purposes (EOP) is the kind of the English taught for learners who require it for their work, primarily to communicate and secondarily to read. The other but an important branch is English for Science and Technology (EST), which covers the area of scientific and technical writing.

We will further down highlight more the issue of EST, of interest of the present study.

2.1. Definition of EST

English for Science and Technology is an approach to English teaching for students of science and technology. Kennedy and Bolitho (1984, p. 4) pinpoint that "much of the demand for ESP has come from scientists and technologists who need to learn English for a number of purposes connected with their specialism. It is natural, therefore, that English for science and technology should be an important aspect proposed by Strevens (1977)". This makes it clear that the emergence of ESP has mainly resulted from scientists' great demands. Indeed, for a long time, ESP was considered the English devoted to science and scientific purposes. In the same vein, the facts that English is an international language and is therefore the language of science have made the area of English for Science and Technology a "driving force"(Flowerdew, 1990, p. 328). Widdowson (1979) defines EST as "not as a separate operation but as a development from an alternative realization of what has already been learnt, that is to say, of existing knowledge" (p.45). In other words, EST knowledge can be obtained from the students' previous background about science with the knowledge of English usage. Furthermore, the EST approach has established theoretical issues with the kind of the language being analysed and the various teaching materials being designed and suggested (Swales, 1980). From their stands, Dudley- Evans and St. John state that "English for specific purposes, and consequently (EST) which is a branch of the former, is centred on the language appropriate to the activities of the discipline it serves in terms of grammar, lexis, register, study skills, discourse and genre" (1988, p.297).

Hence, there is no a clear-cut line between ESP and EST, but rather a meeting point being the satisfaction of the learners' specific needs. Moreover, the new trend of English for science and technology serves up EST learners with the aspects (grammar, lexis, discourse) that mainly characterize the language of science.

2.2. Description of EST Discourse

Describing EST discourse is a heated topic of a great debate among linguists. But, two schools are more prominent, that of Widdowson et al (1978-79) in Great Britain, and that of Trimble et al (1985) in U.S.A

2.2.1. Widdowson's Universal View of Scientific Discourse

Widdowson (1978) is one of many linguists who criticized the register view that considers EST a specific discourse, which can be taught and learnt through the identification of the most frequent structures. He takes the position that such an analysis does not entirely satisfy learners' needs. So, he proposes a rather universal view in which he mentions the consideration of the deep structure along with the surface structure.

According to Widdowson (1978), the deep structure is strongly linked to the nature of the scientific text with which a secondary universal code of communication is shared by all scientists in which "the scientific discourse is a universal mode of communicating, or universal rhetoric which is realized by scientific texts in different languages by the process of textualization" (p.52). Textualization refers to the whole notions, concepts and procedures that characterize the scientific discourse, among which the modes of communication are one. There are various, Widdowson explains, types of communication as charts, diagrams, and formulae and are called the non-verbal modes, which as Widdowson indicates, "bear witness of the universality of the scientific discourse and the independence of science from primary culture systems as reflected in different languages" (p.45). In other words, the non- verbal modes are one type of modes of communication unique to the scientific discourse and, thus, independent from other languages and cultures. Indeed, they reflect the quality of universality of the scientific discourse.

Widdowson (1979) has further refined his theory and has brought the concept of schemata. He defines as "cognitive constructs which allow for the organization of information in long-term memory and which provides a basis for prediction" (1983, p. 34). According to Widdowson (1979), the knowledge of the scientific language consists of two levels: the systemic level, purely related to the language as a system including phonology and syntactico-semantics, and schematic level including universal frames and rhetorical routines, purely linked to the language of science. Accordingly, Widdowson considers the scientific discourse a composite of two but related elements: the deep structure that holds the feature of textualization which is realized by means of language or the surface structure.

2.2.2. Trimble's View of the Scientific Discourse

Trimble's (1985) view of scientific discourse is based on the concept of rhetoric, which is "the process a writer uses to produce a desired piece of text. This process is basically one of choosing and organising information for a specific set of purposes" (p.52). In other words, EST rhetoric is the way a writer organises a set of information of a given type of texts for a specific objective. More specifically, EST rhetoric is not concerned with isolated sets of information but with the larger discourse units in which these sets are found. These discourse units exist in several levels and have been developed by Trimble (1985) in what he calls EST Rhetorical Chart (p.11).

A. The objectives of the total discourse

      Examples: 1. Detailing an experiment
                2. Making a recommendation
                3. Presenting new hypotheses or theory
                4. Presenting other types of EST information

B. The general rhetorical functions that develop the objectives of level (A)

      Examples: 1. Stating purpose
                2. Reporting past research
                3. Stating the problem
                4. Presenting information on apparatus used in an experiment-
                  a) Description
                  b) Operation
                5. Presenting information on experimental procedures

C. The specific rhetorical functions that develop the general rhetorical functions of Level B

      Examples: 1. Description: physical, function, and process.
                2. Definition
                3. Classification
                4. Instruction
                5. Visual-verbal relation

D. The Rhetorical techniques that provide relationships within and between the rhetorical units of level c.

      Examples: I. Orders
                  1. Time orders
                  2. Space orders
                  3. Causality
                 II. Patterns
                  1. Causality and result
                  2. Order of importance
                  3. Comparison and contrast
                  4. Analogy
                  5. Exemplification
                  6. Illustration

Figure 2:   EST Rhetorical Process Chart (Trimble, 1985, p.11)

Trimble (1985) divides the total discourse into four rhetorical levels as it is shown in the chart. Level (A) highlights the objectives of the total discourse in presenting information since "EST writing is the type of discourse that has as its purpose the transmission of information (facts or hypothesis) from a writer to a reader (p.14)". Level (B) consists of the general functions that elaborate the objectives of level (A). Level (C) is about the specific rhetorical functions commonly used in EST: description, definition, classification, instruction and visual- verbal relationships. Level (D) constitutes of techniques that relate and explain the relations of and between units of level (C). They are divided into natural orders such as time and space orders, logical patterns like causality and result and order of importance as comparison and contrast. Accordingly, EST discourse is presented through the rhetorical levels that constitute a coherent framework. Consequently, Trimble (1985) states that the scientific discourse is a variety of discourse fulfilling particular functions that assert its nature and purpose. In fact, Trimble rhetorical functions are compatible with Widdowson's deep structure, mainly with rhetorical routines. Indeed, rhetorical functions, as indicated by Trimble, belong to a knowledge shared by all scientists whatever their different fields are.

So, both views (of Trimble and Widdowson) emphasize the specificity of the scientific discourse in possessing a universal framework that stresses the rhetorical functional approach of EST discourse.

2.3. The Scientific Text

The scientific text is composed of three aspects; the linguistic, the conceptual and the rhetorical component (Walsh, 1982).

The linguistic component is concerned with vocabulary and syntax. Walsh (1982) explains that the scientific text contains regularly- used terms specific to each special subject area, sub-technical vocabulary specific to none, and general English vocabulary. Moreover, Walsh indicates that there is no a specific scientific syntax since it is similar to that of GE, but there are more frequent used structures in the scientific discourse than in others.

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The conceptual component is about the knowledge the reader brings to the text relying on the writer ideas. Furthermore, Walsh (1982) thinks that linguistic and conceptual assumptions are strongly related as concepts are expressed via linguistic means.

The rhetorical component refers to the way language is presented and structured in accordance with some predetermined objectives and functions. The most prominent work on the rhetorical organisation of the scientific text is Trimble (1985). Another aspect of EST rhetoric is about the reader's competence and proficiency in the language because the latter dictate on the writer one way of choosing and organizing the text.

In sum, the scientific text is composed of three complementary components or aspects that are compatible with the purpose and the objective of the scientific discourse in presenting information.

2.4. Conclusion

In this chapter, we have reviewed the main theoretical issues about ESP. We have seen some historical indicators of the birth of ESP as a new trend in English teaching and the reasons behind its tremendous spread. Furthermore, all the provided definitions highlight the learners' specific aims as the core of ESP approach. These specific purposes develop to create sub-areas within ESP where EST emerges as an important branch, which is mainly concerned with the description of the scientific discourse.

Widdowson (1979) and Trimble (1985) are prominent figures in describing EST and have contributed, indeed, in giving a comprehensive image about the nature of EST discourse.

As a matter of fact, both views stress the specificity of the scientific discourse in holding a universal framework, specific to the scientific texts and shared by all scientists.

Chapter Two: Reading Comprehension and the Knowledge of Rhetoric

Outline:

Chapter Two: Reading Comprehension and the Knowledge of Rhetoric

Introduction

Reading is one of the four language skills that was for a long time of minor importance in comparison to speaking and writing. The latter have often been considered as active skills while reading and listening as passive. Many linguists, however, do not agree with that dichotomy of active/passive and rather regard reading as an active and creative mental activity. Goodman (1971, p.135) argues that "reading can be understood as an active, purposeful and creative mental process where the reader engages in the construction of meaning from a text". The works of Grellet (1981) and Nuttal (1982) and many other reflections and research consider reading an important skill to teach.

The focus on reading is, then, a relatively new trend in language teaching and is partly in line with the grown field of ESP in which Mc Donough (1984) points that "it will come as no surprise to most people to discover that in E.S.P terms, by far, the most significant skill is that of reading" (p.70). Furthermore, due to the prominence of the English language as an international means of communicating scientific information, reading in English acts as a satellite to receive the published information. That is probably why Alderson (1984) believes that reading in English is a pre-requisite to all graduate programs. In spite of such an importance, foreign students face many problems in understanding scientific texts

In this chapter, we will shed light on the nature of reading and the different variables that affect reading comprehension. We will also uncover the nature of reading comprehension science and the difficulties foreign students face in such a setting. Then, we will provide readers with the knowledge of rhetoric that helps them understand better EST discourse.

1. The Nature of Reading

Research on the nature of reading has been subject to a mammoth debate and is often described as "an incredibly confused and inclusive one" (Smith, 1973, p.5). For instance, defining the nature of reading has always been a source of controversy. The debate was between two reading theories.

For the first theory, reading refers basically to the ability to decode written words. In other words, learning how to read requires learning what symbols are represented by which graphic symbols. According to Davies (1995), reading is a matter of visual processing that involves eye-movement, perceptual spam, letter shapes, etc.

While for the second theory, reading is a matter of understanding and getting meaning. It was Throndike (1917) who issued that reading is "understanding the meaning of printed words" and that understanding a paragraph is like solving a problem in mathematics"(p. 326). In other words, understanding a paragraph is a mathematical operation that requires searching for the significance of its symbols (printed words) in order to end up with a logical result (getting meaning).

Thus, one can conclude that reading is a complex activity of constructing meaning by means of visual aids. What happens is that "readers understand what they read because they are able to take the stimulus beyond its graphic representation and assign it to an appropriate group of concepts" (Clarke and Silberstein, 1979, p.48).

2. Reading Comprehension

Understanding is a very complicated process that entails many definitions as does reading. Persson (1994, p.14) indicates that comprehension has been defined through:

a- Theories based on text structure.

b- Theories base on the reader.

c- Theories based on metacognition.

2.1. Text –Based Theories

For the advocates of this theory, the structure and the features of the text are the salient factors for successful understanding. According to Brown (1986), comprehension depends to a large extent on text characteristics. Persson (1994, p.16) gives some theories of which the text is the basic holder of meaning as story grammar, case grammar, propositional analysis, cohesion and structural analysis of prose. All of which claim that the structure or the organisational pattern of the text (causation, comparison, description) is the key to understand the writer's ideas. In other words, when the text has a lucid structure, coherent ideas, a clear message and the like, comprehension is but guaranteed. Here, lies the weakness of this theory as comprehension does not only require the familiarity with the language and text aspects, but does also involve other factors like the reader. Consequently, the reader becomes the centre of interest that has led to new considerations and variables that affect comprehension.

2.2. Reader-Based Theories

The reader is the heart or the active processor of the comprehension circle. Assumptions based on the readers' knowledge structure are called "schema theory". The latter entails the knowledge of the world as a whole to realize effective comprehension (Persson, 1994). With reference to this theory, comprehension occurs through bridging new situations and information in the text to those already existing in the brain. The criticism levelled at this theory is its over-reliance on the reader's past knowledge and its ignorance of the text role. However, it is worth mentioning that comprehension is a "co-operative task that stands halfway between the text and the reader" (Nuttall, 1982, p.10). Allen and corder (1975) share the same view of as of Nuttall's, and further argue that understanding results

from an interaction between various features of the text, reader and context. Indeed, this combination of text and cognitive activities has led to new factors that may uncover some of the secrets of this complex process.

2.3. Theories- Based on Metacognition

For the success of understanding, one has to know everything about the process of such a complicated activity. As a matter of fact, according to Persson (1994), a skilled reader is someone who is acquainted with linguistic means as well as with reading strategies. This is so mainly as reading comprehension is both"search for meaning (on the page) and construction of meaning in the reader's brain" (Persson, 1994, pp.10-19). In the same vein, Snow (2003, p.11) agrees with such a view and states that understanding is "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language". Accordingly, this interpretation entails three elements (Snow, ibid):

- The reader: who is doing the comprehension; here we include the abilities, knowledge, and experience that a person brings to the act of reading.

- The text: what is to be comprehended; it includes any printed material in which comprehension is a part.

- The activity: in which comprehension is a part; it involves the purposes, processes, and consequences pertinent to the act of reading.

So, reading comprehension is a complex activity that involves three factors: the reader (his knowledge, abilities, and experiences), the text (grammar, organisation, and structure) and the activity (purposes, processes, and consequences).

3. Reading Comprehension in a Foreign Language

Reading comprehension in a foreign language is different from in a mother language. Benfakeh (2009) explains that certain reasons can be mentioned to explain such a situation: "Firstly, there is our

knowledge of the code and the fact certain combination of items are more likely to occur. Secondly, there is our knowledge of the topic. Finally, there is our knowledge of the lexical, syntactic and rhetorical devices that guides us in comprehension a written text as efficiently as possible"(Para 3). On the other hand, Grabe (2005) thinks that understanding the nature of reading comprehension in a foreign language requires the understanding of certain issues among which the purpose of reading is one.

The reader's purpose is a significant factor in determining the nature of reading in a foreign language. Davies (1995) suggests five categories of reading purpose: 1. reading for pleasure, 2. reading for a general impression, 3. reading for organising reading and study, 4.reading for learning content or procedures, and 5. reading for language learning.

1. Reading for pleasure: is one purpose of reading where people read not to look for information, but rather to enjoy.

2. Reading for a general impression: aims at gaining a general idea of the writer's point of view, having a global impression of the tone of a text, and deciding whether or not to read.

3..Reading for organising reading and study: in this category, the reader identifies the important content of a text, answers specific questions, and decides which sections of the text to start with.

4. Reading for learning content or procedures: the reader tries to gain comprehension of a new concept, to get information from the text and to follow instruction.

5. Reading for language learning: the reader tries to interpret the text literally and morphologically, to learn new vocabulary, to identify useful structures or collocations and use the text as a model for writing.

On his stand, Marinak (1997, p.3) suggests another classification in which three main purposes are distinguished:

1. Reading for literary experience: it involves reading literary works such as novels, short stories; poems, etc. This type of reading requires the reader's knowledge of the literary style used for every literary genre.

2. Reading for information: it includes reading articles in newspapers and magazines, and specialized books on particular topics. It requires the reader's awareness and interpretation of charts, footnotes, diagrams, subheading, and tables, etc.

3. Reading to perform a task: it involves reading bus or train schedules, television programmes, direction for games, recipes, etc. It requires the understanding of the purpose and structure of documents that guide the selection of the application of information.

In sum, reading in a foreign language is a specific situation which encompasses specific reasons and motives for reading that characterize a foreign language reading.

4. Reading Science in a Foreign Language

There are levels of comprehension that indicates how a piece of discourse is read. Gray (2000) differentiates between three levels: 1.reading the lines, 2. reading between the lines. 3. reading beyond the lines (cited in Alderson, 2000). Reading the lines refers to the literal meaning of a given text. In other words, such a level implies the recognition of the syntactic and lexical patterns in order to get the text's message. While reading between the lines is to get the writer's message relying on some contextual and pragmatic clues of the text. Reading beyond the lines refers to the personal appreciation of text in accordance with his understanding of writer's intended meaning. Vacca (1996), on his part, suggests the following diagram that illustrates the levels:

	Levels of Comprehension	
Getting information explicitly from the text	Literal	Reading the lines
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
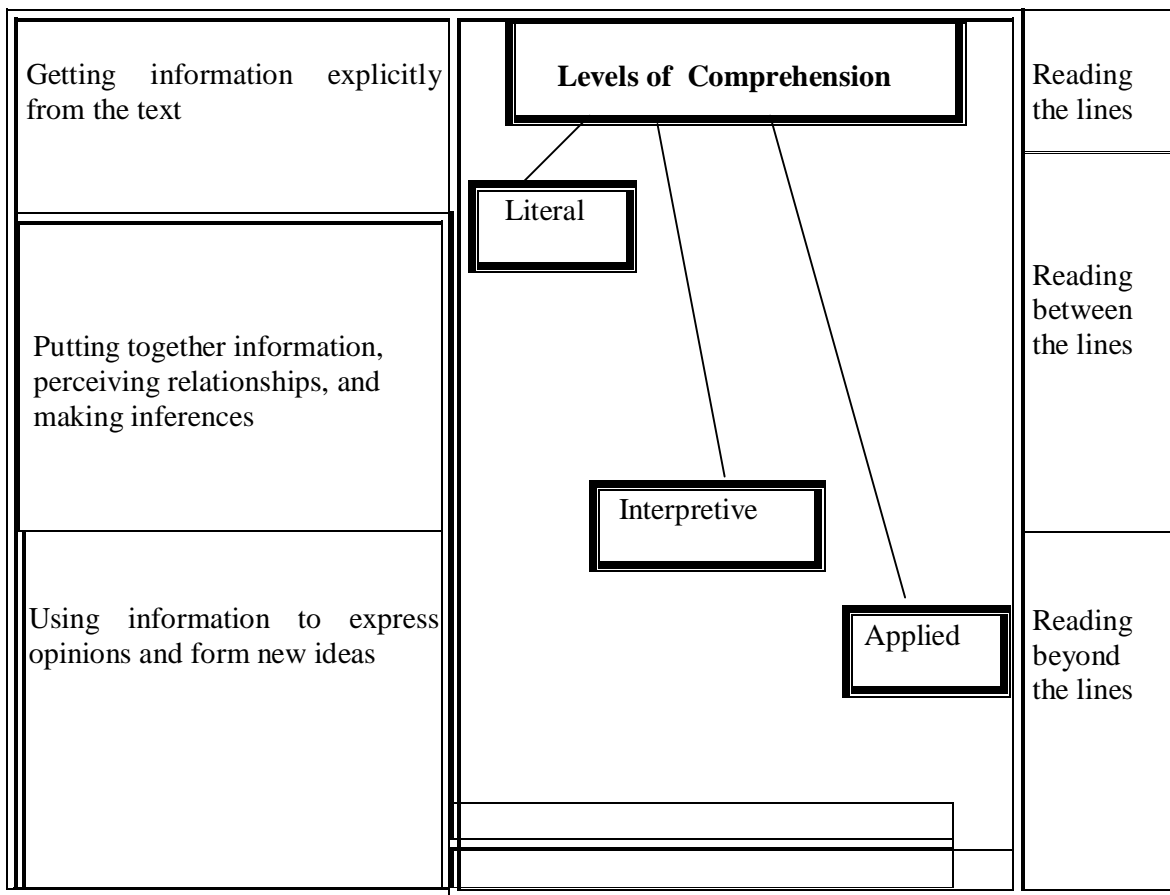
Figure 3, Levels of understanding. (Cited in Mebarki, 2008, p16)

As it is mentioned in Chapter One, the scientific discourse is structured in specific linguistic, conceptual and rhetorical patterns that make it different from other kinds of discourse. Moreover, the language of the scientific text is a direct one since its purpose is to convey information. So, there is no reading between or beyond the lines. Basically, students are asked to read the lines, i.e., the literal meaning to have the main idea of the text without any inference or interpretation. This seems an easy task for students of science, however it is not particularly so if the medium of instruction is English. Therefore, Chandler-Burns (1995) emphasizes the fact that "EST reading comprehension should be based on three corpora; a basic core of language that is universal to all reading, regardless of field of

specialization; a fundamental layer that can be called the language of the researcher, lastly, the specialized layer that is particular to each field of and/or specialized area of EST" (p.10).

One can notice the specificity of reading science in a foreign language where the language of instruction is, in many cases, the means to successful understanding if not the source of difficulty and problems.

5. Difficulties in Reading Science in a Foreign Language

The complicated process, the interference of various variables and the specificity of the setting of reading science in a foreign language create difficulties and problems that hinder successful understanding. According to Allen and Widdowson (1997), "the difficulties which the students encounter arise not so much from a defective knowledge of the systems of English, but from an unfamiliarity of English use" (p.177). This view refers to the context of learning as the source of difficulty. In other words, foreign students are not acquainted with the real setting where the language is used in real communication. On his part, Wiggin (1977) reports that "according to Selinker many foreign students lack the ability or training to understand the implicit messages that result from an interaction of syntax and rhetoric" (p.4). Such a view refers to the unawareness of the rhetorical and syntactic patterns of the language as the reason behind foreign learners' problems. More specifically, Trimble (1985) states that there are two areas of problems concerning English for science and technology discourse for N. N. S. The first being the rhetorical relationships and the second being the lexical elements of sub-technical vocabulary and the noun-compounds.

Hence, it is apparent that the various problems foreign students face when dealing with the scientific discourse range from problems with language components (lexis, syntax) to rhetorical relationships and patterns that characterize the scientific text. In this study, we try to lay more emphasis on the awareness of rhetorical knowledge for successful understanding of EST.

6. Rhetorical Knowledge and Effective Reading Comprehension

Among components contributing to reading comprehension, knowledge of the text structure has received considerable attention. There is convincing evidence that knowing how a text is organised influences the understanding of the text. Carrel (1985, p.727) reports that "a number of research studies have provided empirical evidence that (…) readers' background knowledge of an experience with textual organization affects reading comprehension". For example, Carrel (1984) has shown that texts with specific logical patterns, such as cause-effect, comparison, contrast, and problem-solving, improve recall and comprehension. Alderson (1984) states further that research into the difficulty with understanding a text has shown that certain principles of text organization such as cause- effect affect the recall of information.Therefore,"some researchers have suggested that teaching various aspects of text structure ought to facilitate ESL reading(Carrel, 1985, p.734). Furthermore, Carrel (1991) claims that the awareness of text structure is analogous to awareness of reading strategies. More specifically, text structure provides the reader with two elementary information which are 1. foregrounding main information and backgrounding supporting information, 2. Placing important information in the first position (Grabe, 1997). More specifically, Trimble (1985) states that the scientific text is structured in terms of rhetorical functions, the knowledge of which help N. N. S. students better comprehend a piece of discourse. Trimble (1985) presents a rhetorical approach to EST discourse in an exhaustive way trying to explain EST discourse in a coherent image

7. Trimble's Rhetorical Knowledge

7.1. The Concept of the Paragraph

Trimble (1985) differentiates between two types of paragraphs, the physical and the conceptual paragraph. The organisation and the arrangement of sentences on a page with an indentation and a space between each paragraph are what characterize the physical paragraph. On the other hand, the

conceptual paragraph "consists of all information chosen by the writer to develop a generalization"(1985, p.15). In other words, the conceptual paragraph holds the general idea and gathers the presented information. This notion of the conceptual paragraph has brought other concepts namely "correspondence" and "generalization". The notion of correspondence relates the physical paragraph to the conceptual paragraph. According to Trimble, when a conceptual paragraph is sufficiently elaborated in one paragraph, then it is one-to-one correspondence. When a conceptual paragraph requires more than one, it is one-to-more-than-one correspondence. The concept of generalization is basic to the rhetorical approach to analysing EST discourse "as this concept of core is of major importance to the underlying of the idea of paragraph" (Trimble, p.17).

7.2. Rhetorical Techniques:

The rhetorical functions are realized by various techniques as Trimble calls them. He divides them into natural and logical orders or patterns

7.2.1. Natural patterns are "so called because the nature of the material determines the framework that material is to be put" (p.18).

7.2.1.1. Time Order: both chronological and process time orders are found commonly in EST discourse. Chronological time order is shown by markers as: already, during the 13 century, in 1985. Process time order is shown by markers like: first, second, then, finally, lastly, etc.

7.2.1.2. Space Order: is categorized into general and specific orders. General space order includes terms as: inside, between, surroundings, .etc. Specific space order includes terms such as: 2 ft 6 in long, ⅓ in thick, etc.

7.2.1.3. Causality and Result: expresses a relation of cause and effect and is both found in natural and logical orders. It is marked by lexical items: as a result, therefore, thus, hence, so that, since, if clause (conditionality) and by juxtaposition of information.

7.2.2. Logical Patterns: indicate how a given idea is appreciated and the kind of the relationships between the sets of information. For instance, the information of a given text may be developed by 1.Order of importance, 2. Comparison and contrast, 3. Illustration, or by a combination of all these ways.

Trimble (1985) explains that rhetorical techniques are strongly connected with rhetorical functions, even without the writer's choice. If the writer deals with process description, he will indefinitely respect time order, If he deals with physical description, he will inevitably apply space order to develop and support the main generalisation.

7.3. Rhetorical Functions

All the examples given are from Trimble (1985), except the last which is mine.

7.3.1. The Rhetoric of Description

Description is one of the most frequent rhetorical functions in EST. It is subdivided into physical, function and process description.

7.3.1.1. Physical Description: is concerned with the physical properties and characteristics of an object like dimension, shape, weight, material, volume, colour and texture. It may be general or specific and is often determined by terms such as: under, above, below, in the centre.

    E.g.:   The total weight of the Peterson dredge is 55 pounds.

    E.g.:   The test section was conducted of a pure copper cylinder 2 ft 6 in long

                                                       (p. 73)

7.3.1.2. Function Description: usually gives the use or the purpose of a given object or device and the functioning of each of the main part.

        E.g.:   The purpose of the device is to collect bottom

        E.g.:   Pushing level A contracts the spring.

<div align="right">(p. 74)</div>

7.3.1.3. Process Description: deals with describing the different steps of a process stating what should be done first, what should come next and linking each step to the following until the goal of the process is reached.

 E.g.: process description in instructions (list form):
The procedure for checking the operation of the current limit range is as follows:

1. Set current limit range to 0.02A.
2. Set the meter range switch to A.
3. Set the decade controls to zero (000000).
4. Connect an 8.2K, 10 % 1W register across the output

<div align="right">(p. 74)</div>

E.g.: Process description in paragraph form:

By turning on the current teeth, or vanes, on the timer core pass by the teeth on the pole piece so that a magnetic path is established causing a voltage pulse to be induced in the pickup coil. This voltage pulse causes TR-3 in the amplifier to conduct. This action t and TR-2 off, which which interrupts the current flowing through the primary winding of the ignition coil. Thus, a high voltage surge in the coil secondary, causing the firing of the proper spark plug.

<div align="right">(p. 74)</div>

7.3.2. The Rhetoric of Definition is a function universally used in the scientific discourse. It is classified into simple and complex. Simple, in turn, is subdivided into formal, semi-formal and non-formal. Trimble (pp.79-80) elucidates and explains these types of definitions as follow:

7.3.2.1. Formal Definition: gives the reader three kinds of information:

1. The name of the term being defined.
2. The class to which the term belongs (i.e., the set of which the term is a subset).

3. The difference (s) between the term and all other members of the class: these differences are essential characteristics of the term (essential in respect to the subject under discussion).

E.g.: An arachnid is an invertebrate animal having eight legs extending at equal intervals   . from a central body.

7.3.2.2. Semi-Formal Definition: gives the reader two kinds of information:

1. The name of the term being defined

2. The difference (s) between the term and the other members of the class. (This class is often assumed by the writer either to be obvious or to be of no importance to the discussion).

 E.g.:   An arachnid has eight legs extending at equal intervals from a central body

7.3.2.3. Non-Formal Definition: gives the reader two kinds of information:

1.   The name of the term being defined

2.   Another word or phrase having the approximate meaning of the term, or giving an outstanding characteristic of the term. (This word or phrase can be stated positively, as synonym, or negatively, as an antonym; in either case, it does not carry defining   information as precise as that of the other two types of simple definition).

 E.g.: An arachnid is a spider.

 E.g.:   The opposite of indigenous is foreign.

7.3.2.4. Complex Definition: contains these special types of definition more often used in EST discourse. These are definitions 1. By stipulation, 2. By operation, and 3. By explication.

7.3.2.4.1. A Stipulatory Definition: sets limits in meaning to the identified word in terms of time, place, field, etc.

 E.g.: In information theory, "entropy" means information or freedom of information source.

7.3.2.4.2. An Operational Definition: tells the reader how to experience something physically/or mentally.

 E.g.: Torque, in motor, is a means of how much load the motor can turn or lift.

<div align="center">(p. 82)</div>

7.3.2.4.3. An Explicated Definition: gives the reader "new information about the keys terms in the original definition" (p.82).

E.g.: Agronomy is a science which seeks improved methods of soil management. By improved soil management, we mean the use of fertilizers which contain the necessary nutrients needed for the crops.

<div align="center">(p.83)</div>

7.3.3. The Rhetoric of Classification: is an essential function in EST discourse. It is categorized into complete and partial classification.

7.3.3.1. Complete Classification*: consists of three kinds of information; the class, its members and the basis of classification.

E.g.: All crystalline solids can be classified as members of one of fourteen crystal systems. The number of ways in which atomic arrangements can be repeated to form a solid is limited to fourteen by the geometrics of space division.

<div align="center">(p. 87)</div>

7.3.3.2. Partial Classification: lacks the basis of classification.
E.g.: A triode is a standard vacuum tube which contains three electrodes: an anode, a cathode,   and a control electrode called the grid.

<div align="center">(p. 89)</div>

7.3.4. The Rhetoric of Instruction: tells the reader to do (or not) to do something. IT can be direct or indirect:

7.3.4. 1 Direct Instructions: use the imperative forms and are usually presented in the form of a numbered list.

7.3.4..2. Indirect Instructions*: use non-imperative forms. The most frequent forms used with indirect instruction are passive verbs and models.

<div align="center">32</div>

E.g.: The 382A calibrator may be used to regulate the voltage of another power supply having higher output voltage, but proper regulation, than the 382A. This is performed as follow:

1. Connect the 382A and the other supply at the + and ─ sens and out terminals.
2. The rating of the fuse should be equal to, or slightly higher than, the rated full load of the other power supply.
3. Install a diode capable of conducting the maximum short circuit of the other power supply until the fuse opens the circuit.

<div align="right">(p. 96)</div>

7.3.5. The Rhetoric of Visual- Verbal Relationships cannot stand alone, but with other functions. It consists of relationships between a text and a correspondent visual as drawings, graphs, tables, charts, etc. What is important in using this function is this relation between the visual and the verbal component and the fact that they are translatable into each other.

E.g.   Table: Students' needs in English.

Answer exam questions	Listen and understand	Read documents	total
03	07	10	20
15%	35%	50%	100%

It can be read from the table that 50% of the total respondents (N=20) said that their needs in English are to read documents, 35% said That their learning needs in English are to listen and understand, and the remaining 15% said that they need English to answer exam questions.

In sum, one can notice that there is ample evidence that the knowledge of discourse structure has a significant effect on reading comprehension. Furthermore, the knowledge of rhetoric, rhetorical functions in Trimble's terms, is strongly related to the nature and the objective of the scientific discourse. Hence, non-native students should be aware of and acquainted with it in order to overcome the difficulties and problems they face when reading EST discourse.

Conclusion

In this chapter, some important points that are closely related to reading comprehension and the knowledge of rhetoric have been raised. First of all, reading comprehension is the process of extracting and constructing meaning. We have further seen the specificity of reading science in English in which the language is the means for success or for difficulties and problems. These problems foreign learners face range from problems with language components to rhetorical organisation of the scientific discourse. For that reason, we have showed that rhetorical knowledge help learners comprehend better what they read. Last, a detailed explanation and illustration of Trimble's rhetorical functions and techniques have been given.

Chapter Three: Fieldwork.

Outline:

Chapter Three: Fieldwork

Introduction

This chapter provides the reader with information about the situation and the circumstances under which this study took place. In addition, the chapter presents the means of research used in this investigation: a questionnaire (for teachers) and a test (for first year chemistry Master students). The questionnaire is used to investigate the teaching situation at the department of chemistry and teachers' knowledge about what and how to teach. Besides, , the test is designed in order to uncover the difficulties students of our interest face when reading in English and to assess the role of rhetorical functions for better understanding.

Furthermore, this chapter provides an analysis of the obtained data which are presented and discussed quantitatively and qualitatively.

1.1. Population, Sampling, and Randomization

The study is conducted in the department of chemistry at the University of Constantine. Among the students of the department, we have chosen first year Master students of chemistry. This research has been confined with this population mainly for two reasons:

1. They have been studying General English for six years and two years at the department of chemistry.

2. They are, thus, supposed to be sufficiently proficient in GE in which they can understand a text in English.

First year Master students are divided into three main groups where each group studies a specific speciality/option in chemistry. We have:

Group (1) consists of twenty five students in "chimie pharmaceutique".

Group (2) consists of twenty students in "chimie organique".

Group (3) consists of thirteen students in "chimie analytique".

The whole population is fifty eight students who are more or less homogeneous as far as students' reading comprehension problems are concerned.

For sampling, a group of twenty students has been chosen randomly from the option of "chimie pharmaceutique" and any other group could have been chosen.

1.2. Tools of Research

For this research, a questionnaire and a test have been used. The questionnaire has been administrated to teachers of chemistry (only two teachers).

1.2.1. Teachers' Questionnaire

1.2.1.1. Description of the Questionnaire

The questionnaire is designed to spotlight on the situation under which English is taught to chemistry students. This includes the teachers' profile and, more specifically, their approach for teaching. In other words, the questionnaire aims at giving an idea about the type of English taught (what to teach) and methods used in the class (how to teach).

The questionnaire consists of (10) questions of the yes/no and of a multiple choice type where teachers just put (x) in the correspondent answer(s), (Cf. Appendix A).

The purpose of the questionnaire is to investigate the teaching situation of English to chemistry students and the EST teacher knowledge about how and what to teach in such a setting.

1.2.1.2. Administration of the questionnaire

The questionnaire has been administered to the teachers at the end of the second term of the academic year.

1.2.1.3. Analysis of the Results

Question 1-3:

To identify the teachers' profile, some background information about their degree, their status and the number of years of teaching English have been asked (Table 1, Table2).

Table1: Teachers' Status

	BA		Magister		PhD	
Full -Time	00	00%	00	00%	00	00%
Part -Time	02	100%	00	00%	00	00%
Total	02	100%	02	100%	02	100%

Table2: Teachers' Experience

Departments	Four years		Five years	
Department of Chemistry	01	25%	01	50%
Department of English	00	00%	00	00%
Other Departments	01	25%	00	00%
Total	02	100%	02	100%

As it can be read from these tables, both respondents have a BA degree and they are part-time teachers. Besides they are experienced teachers (4-5 years).

Question 4:

This question seeks to know whether the respondents had any specific training in English teaching as a foreign language. Table 3 shows the results:

Table 3: Training in Teaching English

Yes	No	Total
00	02	02
00%	100%	100%

Both teachers did not have any specific training in teaching English as a foreign language

Question 5:

This question is about the kind of English taught in the chemistry classes.

Table 4: The Type of English Taught

General English	Scientific English	Chemistry English	Total
00	02	02	02
00%	100%	100%	100%

Concerning the type of English actually taught in class, both respondents said that they teach scientific English and chemistry English.

Question 6:

Table (5) illustrates the results concerning the materials used in teaching.

Table 5: Materials Used in Teaching

Both	General English textbooks	EST textbooks	Chemistry English textbooks	Total
	00	02	02	02
	00%	100%	100%	100%

Teachers indicate that they use EST textbooks and chemistry English textbooks.

Question7:

This question is designed purposefully to know the skills teachers lay more emphasis on

Table 6: The Most Important Skills in Teaching

N	Listening	Speaking	Writing	Reading
01	3	1	2	4
01	4	1	2	3

The table shows that both teachers focus on speaking and writing while reading is in the last rank.

Question8:

This question aims at knowing the aspect teachers concentrate on while dealing with reading comprehension.

Table7: Reading Comprehension

N	Terminology	Ideas	The whole text
01	00	00	100
01	00%	00%	100%

The table indicates that both respondents deal with the whole text when teaching reading.

Question9:

This question seeks to know whether teaches are satisfied with their achievements in teaching chemistry students.

Table 8: Teachers' Satisfaction

Yes	No	Total
00	02	02
100%	00%	100%

Both teachers are not satisfied with their achievements in the chemistry class.

Question 10:

This question aims to know the cause behind teachers' unsatisfaction of their achievements in order of importance. Table 9 provides the following answer.

Table 9: Reasons of Low Achievements

N	Experience	Not aware of students' needs	No collaboration between GE and EST teachers
1	2	1	3
1	3	2	1

Both teachers agree that experience is not the first cause of low achievements, but it is either the unawareness of students needs or the absent of collaboration between GE and EST teachers.

1.2.2. Students' Test

1.2.2.1. Description of the Test

The test is used to investigate the difficulties with comprehension in which we try to uncover the areas and the sources of problems when reading a scientific text in English. Then, we testify or evaluate the knowledge of rhetoric as a strategy for overcoming such reading problems. In accordance with this, the test consists of two reading comprehension Activities, each of which contains three texts and two parts.

Reading Comprehension Activity One contains three texts from a book of Medicinal Chemistry by Symour Berkman. All the passages are relevant to students as they deal with the main focus of their studies, medicaments. Moreover, the three texts are accompanied by two questions. Part (A) is a composite of six comprehension questions in which some of the questions are direct while others are not, while (B) is about students' areas of difficulty. (Cf. Appendix B, C, D)

Thus, Activity One is a starting point where obtain two sets of information can be obtained. The first being students' level of understanding, and the second being the areas and the aspects of problems with reading comprehension.

Reading Comprehension Activity Two contains the same three texts with the same reading questions of Activity One, but as part (B). In Part (A), students are asked to identify the function of some extracted sentences from the texts of which comprehension questions are about, (Cf. Appendix E, F, G). Thus, Activity Two aims to testify the role of rhetorical functions for better understanding by comparing students' level of achievements (understanding) before and after they have been aware of the knowledge of rhetoric. That is why, Activity Two contains the same texts and comprehension questions of Activity One.

1.2.2.2. Administration of the Test

Because of the difference between reading comprehension Activity One and Activity Two in terms of purpose and content, the two activities were given at different periods of time and in different situations.

Activity One was given directly to students of interest in the middle of the second term of the academic year. Besides, the students were asked to answer in an hour and a half in their free time in the morning. I explained to them what to do and made sure they did not discuss with one another.

Unlike Activity One, Activity Two was given around the end of the academic year. But because students of our interest did not have any background knowledge on rhetorical functions, I explained to them during five lectures the most important issues about the topic with some examples and documents. Then, students were asked to answer in one hour and a half and the same instructions as of Activity One were given.

1.2.2.3. Analysis of the Results

For the analysis of the results, each task is analysed separately, but in the same manner. we should also mention that the "no answers" are included with the wrong answers for the purpose of the whole study. At the end, everything is put together so to compare students' achievements and end up with some conclusive results.

1.3.2.3.1. Reading Comprehension Activity One

1.2.2.3.1.1. Text # 01

A. Comprehension questions

To assess students' comprehension level, six questions are asked in which each question receives 3 points (or 3.5 if the answer requires two sets of information).

Table 10: Comprehension Questions

Students	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right answer	5	4	3	5	5	6	2	6	5	2	5	5	4	1	2	3	5	4	5	4
Wrong answer	1	2	3	1	1	0	4	0	1	4	1	1	2	5	4	3	1	2	1	2
Scores	16.5	13.5	10	16.5	16.5	20	6.5	20	16.5	6.5	16.5	16.5	13.5	3.5	3.5	10	16.5	13.5	16.5	13.5

Average/ Above average	Ns	16																		
	%	80%																		
Below average	Ns	4																		
	%	20%																		

Out of the total number of students (N=20), 80% got the average in which the highest mark is (20) obtained by 10% and the remaining scores range between (10-16.5) obtained by 70% while 20% got below average in which the scores range between (3.5) as the lowest mark obtained by 5% and 15% obtained (6.5).

B. Areas of Text Difficulty

Part B questions are about students' areas of problems. Thus, it is not marked.

Table 11: Areas of [Text] Problems

Students	English vocabulary	Terminology	The meaning of the whole sentence	Not difficult	Total
Ns	5	0	0	15	20
%	25%	00%	00%	75%	100%

25% of the respondents indicated that English vocabulary was the most problematic area, while 75% regarded the text easy.

1.2.2.3.1.2. Text # 02

A. Comprehension Questions

Table12: Reading Comprehension Questions

Students	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right Answer	3	2	1	3	3	4	1	5	3	5	3	3	2	3	1	2	1	3	2	1
Wrong answer	3	4	5	3	3	2	5	1	3	1	3	3	4	3	5	4	5	3	4	5
Scores	10	6.5	3.5	10	10	13.5	3.5	16.5	10	16.5	10	9.5	6.5	9.5	3.5	6.5	3.5	9.5	6.5	3.5
Average/ Above average	Ns	**8**																		
	%	**40%**																		
Below average	Ns	**12**																		
	%	**60%**																		

40% from the total number of respondents got the average in which the highest score is (16.5) obtained by 10% and the remaining scores range between (10-13.5) obtained by 30% while 60% got below the average in which the lowest score is (3.5) obtained by 25% and the remaining scores range between (6.5-9.5) obtained by 35%.

B. Areas of Text Difficulty

Table 13: Areas of Text Difficulty

Students	English vocabulary	Terminology	The meaning of the whole sentence	Not difficult	Total
Ns	7	2	3	8	20
%	35%	10%	15 %	40%	100%

35% of the respondents (N=12) indicated that the English vocabulary was the most problematic area. 15% regarded the meaning of the whole sentence as the source of difficulty, and only 10% considered terminology as the difficult area.

1.2.2.3.1.3. Text # o3

A. Comprehension Questions

Table 14: Comprehension Questions

Students	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right Answer	3	5	2	1	3	3	2	5	2	1	3	2	1	2	5	3	2	1	2	3
Wrong answer	3	1	4	5	3	3	4	1	4	5	3	4	5	4	1	3	4	5	4	3
Scores	10	16.5	6	3.5	9.5	10	6	16.5	6	3.5	9	6	3.5	6	16.5	6.5	6	3.5	6.5	9.5

Average/ Above average	Ns	5
	%	25%

Below average	Ns	15
	%	75%

It is apparent that out of the total number of respondents (N=20), 25% got the average or above the average in which the highest score is (16.5) obtained by 15% and 10% obtained (10) while 75% got below the average in which the lowest mark is (3.5) obtained by 20% and the remaining scores range between (6 – 9.5) obtained by 55%.

B. Areas of text Difficulty

Table 15:   Areas of Text Difficulty

Students	English vocabulary	Terminology	The meaning of the whole sentence	Not difficult	Total
Ns	10	2	4	4	20
%	50%	10%	20 %	20%	100%

Out of the total number of respondents (N= 20), 50% considered English vocabulary as the source of problems, 20% considered the meaning of the whole sentence as the most problematic area, and only 10% regarded terminology as the difficult area.

1.2.2.3.2. Reading Comprehension Activity two

For the sake of comparison, Activity Two consisted of the same three texts of Activity One within two parts. Part (A) was about rhetorical functions where students were asked to identify the function of some sentences, while part (B) was about reading comprehension questions which were the same as of Activity One. All the texts were marked separately, yet in the same manner and the results will be, then, analysed and compared.

1.2.2.3.2.1. Text # 01

A. Rhetorical Functions

Students were asked to identify the function of four sentences from the text. It was marked out of (08) points, i.e., (02) points for each correct answer. The results are in table 16.

Table16: The Rhetorical Functions

Students		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right answer		1	0	1	2	3	2	1	3	0	2	3	0	1	1	1	1	2	0	3	1
Wrong answer		3	4	3	2	1	2	3	1	4	2	1	4	3	3	3	3	2	0	1	3
Scors/08		2	0	2	4	6	4	2	6	0	4	6	0	2	2	2	2	4	0	6	2
Average/ Above average	Ns	8																			
	%	40%																			
Below average	Ns	12																			
	%	60%																			

We can see 40% got the average or above the average in which the scores range between (6 out of 8) obtained by 20% and (4 out of 8) obtained by 20% while 60% got below the average in which the lowest score is (0 out of 8) obtained by 20% and the remaining scores range between (0-2) obtained by 40%.

B. Comprehension Questions

Students were asked to answer six comprehension questions about the text. Each correct answer receives (02) points, so the whole section was marked out of (12) points. The results are presented in table 17.

Table 17: Comprehension Questions

Students		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right		6	2	4	5	4	3	2	5	4	4	5	6	5	4	5	4	0	5	4	0
Wrong		0	4	2	1	2	3	4	1	2	2	1	0	1	2	0	2	0	1	2	0
Scors/12		12	4	8	10	8	6	4	10	8	8	10	12	10	8	10	12	0	10	8	0
Average/ Above average	Ns	16																			
	%	80%																			
Below average	Ns	4																			
	%	20%																			

Out of the total number of respondents (N=20), 80% got above the average (out of 12) in which the highest mark is (12) obtained by 10% and the remaining scores range between (6- 10) obtained by 70% while 20% got below the average in which the scores range between (0 out of 12) as the lowest mark obtained by 10% and (4out of 12) obtained by 10%.

1.2.2.3.2.2. Text   # 02

A.   Rhetorical Functions

Table 18: The Rhetorical Functions

Students		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right		2	1	3	1	1	1	3	1	2	3	1	1	0	1	0	2	1	0	0	1
Wrong		2	3	1	3	3	3	1	3	2	1	3	3	4	3	4	3	3	4	4	3
Scors/08		4	2	6	2	2	2	6	2	4	6	2	2	0	2	0	4	2	0	0	2
Average/ Above average	Ns	6																			
	%	30%																			
Below average	Ns	14																			
	%	70%																			

We can see that 30% got the average in which the highest mark is (6) obtained by 15% and the remaining scores range between (4 to 6) obtained by 15% while 70% got below the average in which the lowest mark is (0 out of 8) obtained by 20% and 40% obtained (2 out of 8).

B. Comprehension Questions

Table 19: Comprehension Questions

Students		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right		3	1	4	0	5	2	1	2	3	1	2	4	0	2	5	1	2	1	4	5
Wrong		3	5	2	0	1	4	5	4	3	5	4	2	6	4	1	5	4	5	2	1
Scors/12		6	2	8	0	10	4	2	4	6	2	4	8	0	4	10	2	4	2	8	10
Average/ Above average	Ns	8																			
	%	40%																			
Below average	Ns	12																			
	%	60%																			

We can see that 40% got the average in which the highest mark is (10 out of 12) obtained by 10% and the remaining scores range between (6-8) obtained by 30% while 60% got below average in which the scores range between (o) as the lowest mark got by 20%, and (4) obtained by 40%.

1.2.2.3.2.3. Text # 03

A.   Rhetorical Functions

Table 20:   Rhetorical Functions

Students		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right		4	2	1	0	1	0	3	1	1	0	3	1	0	1	1	3	0	1	1	1
Wrong		0	2	3	4	3	4	1	3	3	4	1	3	4	3	3	1	4	3	3	3
Scors/12		8	4	2	0	2	0	6	2	2	0	6	2	0	2	2	6	0	2	2	2
Average/ Above average	Ns	4																			
	%	20%																			
Below average	Ns	16																			
	%	80%																			

We can see that 20% got the average or above the average in which the highest mark is (8out of 8) obtained by 5%, and (6out of 8) obtained by 15% while 80% got below the average in which the

lowest score is (0 out of 8) obtained by 25% and the remaining scores range between (4 - 6) obtained by 55%.

B. Comprehension Questions

Table 21: Comprehension Questions

Students		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right answer		4	3	1	2	1	2	1	0	1	2	0	1	2	3	1	1	4	2	0	1
Wrong answer		2	3	5	4	5	4	5	6	5	4	6	5	4	3	5	5	2	4	6	5
Scors/12		8	6	2	4	2	4	2	0	2	4	0	2	4	6	2	2	8	4	0	2
Average/ Above average	Ns	4																			
	%	20%																			
Below average	Ns	16																			
	%	80%																			

We can see that 20% obtained the average or above the average in which the scores range between (8 out of 12) as the highest mark obtained by 10% and (6 out of 12) obtained by 10% while 80% got below the average in which the lowest score is (0) obtained by 15% and the remaining scores range between (2 - 4) obtained by 65%.

1.2.2.4. Putting It All Together

After analysing Activity One and Two separately, we will compare students' achievements in both activities of the three texts.

Students' scores concerning comprehension questions of Activity One of the three texts are shown in figure 4.

Figure 4: Students' Scores in the Three Texts (Activity One, A)
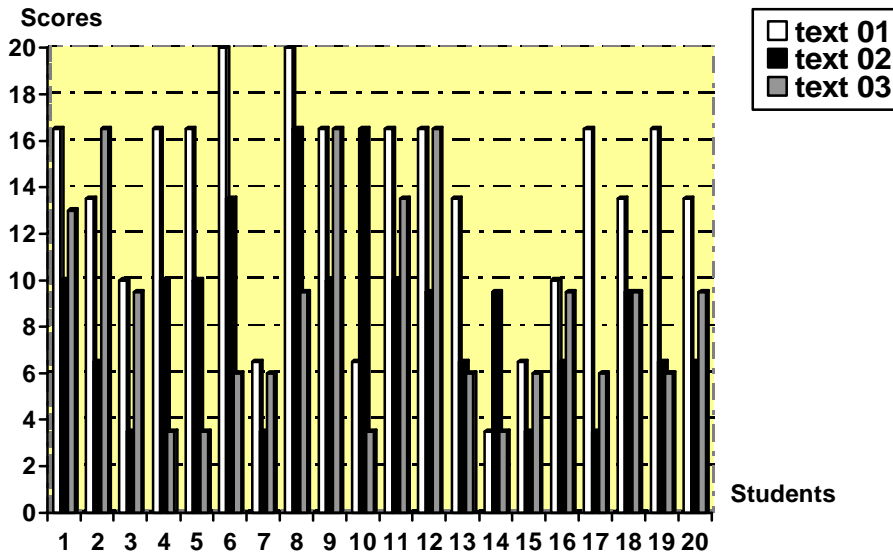
Figure 4 shows that students' achievements in each text are different. To be more specific, the white columns are most of the time the tallest and the scores most of the time are average or above average. Whereas black columns are most of the time taller than the grey and are between average and below average. Grey columns are most of the time the shortest columns compared to the others and are most of the time below average.

Students' achievements in both parts (A) and (B) of activity Two concerning the relationship between identifying the rhetorical functions and answering comprehension questions of Text # 01 , Text # 02 and Text # 03 are summarized in tables 22, 23 and 24 respectively.

Table 22: The Scores of A& B (Activity Two, Text# 01)

Activity Two	A		B		
Score/20	Average/above average	Below average	Average/above average	Below average	Total
Ns	8	12	16	4	20
%	40%	60%	80%	20%	100%

It is apparent that 40% got the average or above the average in (A) while 80% got the average in (B). In addition, 60% got below the average in (A) and 20% got below the average in (B) .

Table 23: The Scores of A &B (Activity Two, Text # 02)

Activity Two	A		B		
Score/20	Average/above average	Below average	Average/above average	Below average	Total
Ns	6	14	8	12	20
%	30%	70%	40%	60%	100%

30% got the average or above average in question (A) and 40% got the average or above the average in (B) while 70% got below average in (A) and 60% got below the average in (B).

Table 24: The Scores in A& B (Activity Two, Text# 03)

Activity Two	A		B		
Score/20	Average/above average	Below average	Average/above average	Below average	Total
Ns	4	16	5	15	20
%	20%	80%	25%	75%	100%

We can see that 20% got the average or the average in (A) and 25% in (B) while 80% got below average in (A) and 75% got below average in (B).

Students' achievements in the three texts in Activity Two (B) concerning their scores in the three texts after being aware of the knowledge of rhetoric are shown in figure 5:

Figure 5: Students' Scores in the Three Texts (Activity Two, B)
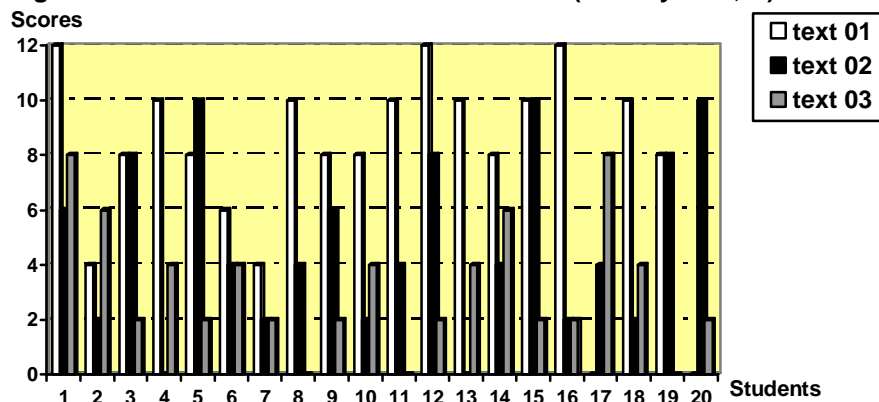
It is apparent that white columns are the tallest and are most of the time above average. While black columns are taller than the grey ones and are between average and above average and below average, whereas grey columns are most of the time the shortest and are below average.

1.2.2.5. Discussion of the Results of Activity One &Two

As stated earlier on, the three texts of the test differ in their degree of difficulty. Indeed, text # 01 has a lucid structure and a simple language which might explain students' high performance in reading comprehension Activity One (Table 10). Another explanation might be the easiness and the directness of the questions where students just caught the answer directly from the text. The other reason may be linked to students' good level, but which can not be judged from the first text. However, both Texts # 02 and # 03 have a more difficult structure and a complicated language which might explain students' weak performance (Tables 12 &14). Furthermore, the questions of which are of the indirect type that may also create problems for the students.

Accordingly, we can say that the majority of chemistry students have problems with understanding a text in English. In particular, these problems appear if the questions are indirect. For instance, when the questions held words as "descriptive features", no one provided the right answer.

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Furthermore, the students could not even activate or use any cognitive strategy in which they can deduce that "descriptive" comes from "to describe" or rely on the "French word". In other words, the chemistry students deal with English in a systematic manner as they are dealing with symbols in mathematics. Yet, it is time to make them know that unlike mathematics, English use symbols which are all meaningful.

After knowing that students of our interest face problems with reading comprehension, we sought to know the areas and the sources of such problems.

Because of the high percentage of good results in Text # 01, only 20% indicated that the text was difficult Moreover, all 20% considered English vocabulary as the source of difficulty (Table 11). In Text # 02, 35% considered English vocabulary as the most problematic area, 15% who considered the meaning of the whole sentence, and only 10% regarded terminology the area that created for them problems (Table 13). In Text # 03, 30% of the respondents considered English vocabulary as the source of problems, 20% considered the meaning of the whole sentence as the most problematic aspect and only 10% regarded terminology as the difficult area. (Table 15).

So, it is apparent that "terminology does not pose a problem for students in which technical terms are (…) likely to pose the least problems for learning that are often internationally used or can be worked out from a knowledge of the subject and common world roots" (Hutchinson and Waters, 1987, p.166). However, English vocabulary is the most problematic area for most of respondents which indicates a lot about their level in GE.

As previously stated, reading comprehension Activity Two consisted of the same Three Texts, but with different questions (A) and (B).

In Text # 01, only 40% provided right answers in (A) (Table 16) ,while 80% answered correctly in (B). The comparison between the results of the two questions reflects the incompatibility between them in the sense that students worked better in (A) than in (B) (Table 22).

Taking into account the result of Activity One (A), students obtained the same percentage (Table 10), i.e., before being aware of the knowledge of rhetoric. Yet, it is early to state any relationship between the knowledge of rhetoric and reading comprehension. But, we might say that students dealt with each task separately.

With regard to Text #02, 30% succeeded in identifying the functions of (A) as (Table18) shows, while 40% got the average or above the average concerning comprehension questions. Hence, the comparison between the results of both questions reflects compatibility in terms of low achievement (Table 23).

Concerning Text # 03, 20% succeeded in identifying the text rhetorical functions of question (A), while 25% got the average concerning comprehension questions of (B). Hence, there seems compatibility between the results of the two questions (Table 24).

So, it is apparent that student (in all texts) in Activity Two answered in the same manner of Activity One about reading comprehension (Figure 5). In other words, there is no a radical change in both negative and positive answers about students' level of understanding before and after being aware of rhetorical functions.

However, the results of (B) of Activity two in identifying the functions are different. In Text #01, the percentage is higher 40% compared to Text #02 and Text # 03 (30% and 20% respectively). One possible explanation is that students considered the text easy as (Table 11) showed, that is why they more or less succeeded in identifying the functions of Text # 01. Indeed, most of students in Activity One considered Text # 02 and # 03 difficult. Thus, the percentage of identifying the functions is lower than in Text # 01. These possible interpretations might be more valid if we consider the areas of difficulty in Activity One.

To explain more, the majority of the students regarded English vocabulary as the most problematic area which might explain students' weak performance in identifying the rhetorical function. In other words, to identify the function of a given sentence, the students should know first the lexical components of the sentence, i.e., the rhetorical techniques.

So, when students understand the text, they succeed in identifying the rhetorical functions. Therefore, if our hypothesis has been not confirmed, it nevertheless proves that the problem is elsewhere, i.e., it is with GE per se and not with EST. This could be a subject of further research.Therefore, Trimble (1985) has stated that students should first master the rhetorical techniques without which the identification of rhetorical functions will be problematic.

Hence, we can not be decisive in identifying the effect of rhetorical functions on reading comprehension in such a specific situation. The specificity of the situation of the whole test entails two important sets of information. The first is students' level in GE or their proficiency in English that affects certainly on their success when identifying the rhetorical function. The second information is the insufficient time (only five lectures) for explaining and illustrating rhetorical functions which undoubtedly affect students' achievements.

Conclusion

In so far, this chapter has described the tools used for this research (a questionnaire for chemistry teachers and a test for first year chemistry Master students) and provided an analysis with a discussion of the obtained results.

The questionnaire has uncovered the teaching situation of English to chemistry students in which there should be a reconsideration of the type of English taught and the designed materials that suit the specific needs of chemistry students.

The test has uncovered students' problems with text reading comprehension because of their

problems with General English, not with English for science and technology, which, in turn, affects their achievements when identifying the rhetorical function. In other words, identifying the rhetorical function of a given sentence requires basically the understanding of its lexical components.

In sum, the role of rhetorical functions, which is basically related to EST cannot be guaranteed without taking into account students' level in GE

General Conclusion and Recommendations

Our study is devoted to investigate how chemistry Master students overcome difficulties when reading scientific texts in English. In attempt to find out some strategies that help students better comprehend a text, we question whether learners of science in our case are aware of the knowledge of rhetoric that promotes successful understanding. To answer this question, we have hypothesized that if Master students of chemistry are aware of rhetorical functions, they will overcome problems when reading and, hence, understand better.

Before putting our hypothesis in practice, we have presented a theoretical background about the most important issues that support the purpose of the study.

In Chapter One, we have reviewed some important issues about EST as a branch of ESP. We have also put emphasis on describing the EST discourse where the two prominent schools (Widdowson and Trimble) stress the rhetorical approach towards EST.

In Chapter Two, we have discussed the nature of reading comprehension and the specificity of reading science in English which create problems and difficulties for N.N.S. We have seen that such problems range from problems with language components to problems with the rhetorical functions of the scientific text. Then, we have presented Trimble's rhetorical functions and revealed the role of such knowledge for effective reading comprehension with relevance to some studies.

In Chapter Three, our fieldwork, we have provided a thorough description of the questionnaire (for chemistry teachers) and a test (for first year Master students of chemistry). Then, we have analyzed the results and combined things together to end up with some conclusive points.

The majority of science students face problems and difficulties when reading scientific English. It is their poor level in general English that creates such obstacles and, consequently, deprives them from reading scientific English. Thus, teachers should reconsider the type of English taught in such a specific setting.

It is difficult and insufficient to assess the role of rhetorical functions in a short period of time. In other words, students need time and practice to understand the essence of the rhetorical aspect of EST discourse, the rhetorical functions and the differences between these functions. More importantly, the students' poor level in English affects the identification of functions as such knowledge (rhetorical functions) is expressed via the English language (rhetorical techniques).

In the light of these results obtained and their analysis, we recommend the following:

- A reconsideration of general English teaching to students of science by designing an appropriate course that satiates their specific needs.

- Training EST teachers so that they acquire a sound knowledge of how and what to teach in such a specific setting.

- An emphasis on reading for comprehension, not for the sake of pronunciation or grammar. For instance, students should know how to extract meaning by the help of some cognitive and linguistic clues.

So, we hope that our conclusions and observations will help students overcome difficulties when they read scientific English and raise teacher' awareness of the whole situation of teaching English to science students. We also hope that Trimble's rhetorical approach will be one day included within the English Curriculum of Chemistry students in our university and by extension in other Algerian universities.

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Appendices

Appendix A

Teachers' Questionnaire

Q1. Which degree do you have:

    a. Licence ☐   b Magister ☐   c.   PhD ☐

Q2. What is your status as a teacher:

    a. full- time   ☐   b. part- time ☐

Q3. How many years have you been teaching English

Department	Years of experience
Department of chemistry	
Department of English	
Other department	

Q4. Have you had any specific training in the teaching of English as a foreign language

   -Yes ☐   -No ☐

Q5. In the course of your present teaching, do you teach more often:

  a. general English ☐   b. English related to science and technology ☐

  c. English more specifically related to chemistry ☐

Q6. In the course of yours present teaching, do you use:

    a. textbooks related to general English   ☐ b. textbooks related to scientific English☐

    c. textbooks specifically related to chemistry ☐

Q7. While teaching, which of the following skills do you tend to emphasize: (please classify in order of emphasis, going from I for the most important to 4 for the least important)

     a. listening ☐   b. speaking ☐   c. writing ☐ d. reading ☐

Q8. During text reading comprehension, on what aspect do you concentrate:

    a. Technical items ☐   B.The most important ideas ☐   c.The whole text ☐

Q9: Are you satisfied about your achievements as a teacher of English

    - Yes   ☐   - No ☐

Q10. Classify, according to the degree of importance (1 for the most important down to 4   for the least important), the reasons which make the fact that your work as an English language teacher does not correspond to the level of achievement expected mostly because:

a. you do not have any particular experience in English related to chemistry ☐
b. you do not really understand the needs of the students imposed by the specific field ☐
c. there is no collaboration between the language teacher and the teachers of specific field ☐

Appendix B

Reading Comprehension: Activity One

Text One: Digoxin

Digoxin is a cardiac glycoside extracted from the foxglove plant, digitalis. It is widely used in the treatment of various heart conditions, and heart failure that cannot be treated by other medication. Cardiac glycosides are composed of two features: the sugar (glycoside) and the non-sugar (aglycone-steroid).

Digoxin is usually given by mouth and is widely distributed to tissues including the central nervous system, but can also be given by IV injection in urgent situations. The half life is about 36 hours, digoxin is given once daily, usually 125 μg dosing. Because the safety margin of cardiac glycoside is very narrow. a minor variation in bioavailability can cause major toxicity or loss of effect.

Digoxin and other cardiac glycoside inhibit the sodium –potassium ATPase pump located in the membrane of myocytes (heart muscle cells). The cardiac glycosides bind to a site on the extracellular of the Na+/K+ ATPase pump in the membranes of heart cells then inhibit the membrane bound Na+-K+- ATPase pump responsible for Na+-K+ exchange. This causes an increase in the level of intracellular sodium ions in the myocytes, which then also leads to an increase in the level of calcium. Inhibition of this removes the regulation of a low intracellular sodium ion concentration and a high potassium concentration. The increase in intracellular concentration activates cascade of intracellular biochemical actions that ultimately result in an increase in the force of the myocardial concentration or a positive inotropic effect for the most heart failure patients.

Adapted from, *Medicinal Chemistry* by Symour Berkman, p.14

A: Comprehension questions

Read the text carefully and answer the following questions:

1) What is the medical function of digoxin?

…………………………………………………………………………………………….
………………………………………………………………………………………………………
…………………………………………………………………………………………

2) From what digoxin is obtained?

………………………………………………………………………………………………………
……………………………………………………………………………………………

3) How is digoxin generally taken?

………………………………………………………………………………………………………
………………………………………………………………………………………………

4) What is the structure of digoxin?

………………………………………………………………………………………………………
………………………………………………………………………………………………

5) How does digoxin work?

………………………………………………………………………………………………………
………………………………………………………………………………………………

6) What is the main idea of the text?

………………………………………………………………………………………………………
………………………………………………………………………………………………

B: Areas of Text Difficulty

Indicate the difficult area of the text:

1. English lexical vocabulary.

2. Chemistry technical terms (terminology)

3. The function or meaning of the whole sentence.

Appendix C

Reading comprehension: Activity One

Text Two: Phenergan

Phenergan (promethazine hydrocholoride) is a phenothiazine derivative and a first generation H_1 receptor antagonist (antihistamine) that is used in the treatment of allergic conditions, motion sickness, and relief of post operative nausea and vomiting. Promethazine was also found to have anti-psychotic properties, although it was not intended to function as a neuroleptic. Like other H_1 receptors, promethazine has anticholinergic and antillergic, as well as sedative and antiemetic effects, and also some local anesthetic properties. Like many H_1 antagonist, promethazine does not prevent the release of histamine, as do cromolyn and nedocromil, but competes with free histamine for binding at H receptors sites. So, histamine receptors in the gastrointestinal tract, uterus, large blood vessels, and bronchial muscle are blocked. The relief of motion of sickness and nausea or vomiting appears to be related to dosages. Mild antitussive activity has been attributed to promethazine, but this effect probably results from anticholinergic and sedative actions Promethazine is well absorbed from the gastrointestinal tract after oral dosing, but undergoes considerable first-pass-metabolism leading to a variable bioavailability.

Promethazine is metabolized by the liver to a variety of compounds; the sulfoxides of promethazine and N- dimethylpromethazine are the predominant metabolites appearing in the urine. Lastly, drug interactions have been reported when some monoamine oxidase inhibitors (MAOI) and phenothiazines are used concomitantly and also when phenothiazine is taken with epinephrine that can decrease blood pressure. However, neither of these drug reactions has been reported with promethazine.

Adapted from *Medicinal Chemistry* by Symour Berkman, 22.

A: Answer the following questions:

1) What is the medical use of phenergan?

…………………………………………………………………………………………………..

2) What are the characteristics of H₁ receptors?

………………………………………………………………………………………………….

3) What does Promethazine do? And what this result in?

…………………………………………………………………………………………………

4) How is promethazine metabolized?

………………………………………………………………………………………………….

5) Does promethazine undergo drug interactions?

…………………………………………………………………………………………………..

6) What is the main idea of the text?

……………………………………………………………

B: Areas of Text Difficulty

Indicate the difficult area in the text:

1. English lexical vocabulary.

2. Chemistry technical terms (terminology)

3. The function or meaning of the whole sentence.

Appendix D

Reading Comprehension: Activity One

Text Three: Diazepam

Diazepam (Valium) is derived from benzodiazepine, which belongs to a group of psychotropic drugs with potent hypnotic and sedative action; used predominantly as antianxiety and sleep-inducing drugs. Side effects of Diazepam and these drugs may include impairment of psychomotor performance, amnesia, euphoria and dependence. Diazepam is classified under the ATC index as a psycholeptic and anxiolytic. The target organ is the nervous system, causing depression of respiration and consciousness.

Diazepam can be injected for the relief of acute anxiety when rapid action is required in acute alcohol withdrawal and surgical procedures . It is commonly used for skeletal muscle spam, cerebral palsy, atherosis, insomnia, tetanus and severe recurrent convulsive seizures. Diazepam can also be used as a premedication, or a preanesthetic to enhance thetherapeutic effect and safety of a surgical procedures . It has a colorless crystalline compound and is insoluble in water.

The toxic and therapeutic effects of diazepam are a result of its effect on CNS GABA activity (gamma-aminobutyric acid) is an important inhibitory neurotransmitter which mediates pre-and- post synaptic inhibition in all regions of the central nervous system. Diazepam and the other benzodiazepines appear to either enhance or facilitate GABA activity by binding to the benzodiazepine receptor. Binding at this complex results in increased CNS inhibition by GABA. The anticonvulsant and other effects of diazepam are believed to be produced by a similar mechanism

Adapted from *Medicinal Chemistry* by Symour Berkman, 18.

Part One: Comprehension Questions

    Read the text carefully and answer the following questions:

1) What is the property of benzodiazepine?

……
……………………………………………………………………………………………………

2) What are the unwanted effects of diazepam?

……
……………………………………………………………………………………………………

3) What are the medical functions of diazepam?

……
…………………………………………………………………………………………………..

4) What are the descriptive features of diazepam?
……
…………………………………………………………………………………………………..

5) How does diazepam improve GABA activity?

……
……………………………………………………………………………………………………

6) What is the main idea of the text?

……
…………………………………………………………………………………………………..

B: Areas of Text Difficulty

   Indicate the area of difficulty:

1. English lexical words.

2. Chemistry technical vocabulary.

3. The function or meaning of the whole sentence

Appendix E

Reading Comprehension Activity Two:

Text One: Digoxin

Digoxin is a cardiac glycoside extracted from the foxglove plant, digitalis. It is widely used in the treatment of various heart conditions, and heart failure that cannot be treated by other medication. Cardiac glycosides are composed of two features: the sugar (glycoside) and the non-sugar (glycogen-steroid). Digoxin is usually given by mouth and is widely distributed to tissues including the central nervous system, but can also be given by IV injection in urgent situations. The half life is about 36 hours, digoxin is given once daily, usually 125 μg dosing. Because the safety margin of cardiac glycoside is very narrow. a minor variation in bioavailability can cause major toxicity or loss of effect.

Digoxin and other cardiac glycoside inhibit the sodium –potassium ATPase pump located in the membrane of myocytes (heart muscle cells). The cardiac glycosides bind to a site on the extracellular of the $Na+/K+$ ATPase pump in the membranes of heart cells then inhibit the membrane bound $Na+-K+-$ ATPase pump responsible for $Na+-K+$ exchange. This causes an increase in the level of intracellular sodium ions in the myocytes, which then also leads to an increase in the level of calcium. Inhibition of this removes the regulation of a low intracellular sodium concentration and a high potassium concentration. The increase in intracellular concentration activates cascade of intracellular biochemical actions that ultimately result in an increase in the force of the myocardial concentration or a positive inotropic effect for the most heart failure patient.

Adapted from, *Medicinal Chemistry*, by Symour Berkman, 14.

A: Relying on the knowledge of rhetorical functions, identify the function of these sentences,

even in general terms.

The sentence	The function
Digoxin is a cardiac glycoside extracted from the foxglove plant.	
It is widely used in the treatment of various heart conditions, heart failure that ca not be treated by other medication.	
Cardiac glycosides is composed ……………………….(aglycone-steroid).	
Digoxin and other cardiac glycoside inhibit the sodium- potassium ATPase pump.	

B: Answer the following questions

1) What is the medical function of digoxin ?

…………………………………………………………………………………………………

2) From what digoxin is obtained?

………………………………………………………………………………………………..

3) How is digoxin generally taken?

………………………………………………………………………………………………….

4) What is the structure of digoxin?

………………………………………………………………………………………………..

5) How does digoxin work?

………………………………………………………………………………………………...

6 What is the main idea of the text?

………………………………………………………………………………

Appendix F

Reading comprehension Activity Two:

Text Two: Phenergan

Phenergan (promethazine hydrocholoride) is a phenothiazine derivative and a first generation H_1 receptor antagonist (antihistamine) that is used in the treatment of allergic conditions, motion sickness, and relief of post operative nausea and vomiting. Promethazine was also found to have anti-psychotic properties, although it was not intended to function as a neuroleptic. Like other H_1 receptors, promethazine has anticholinergic and antillergic, as well as sedative and antiemetic effects, and also some local anesthetic properties. Like many H_1 antagonist, promethazine does not prevent the release of histamine, as do cromolyn and nedocromil, but competes with free histamine for binding at H receptors sites. So, histamine receptors in the gastrointestinal tract, uterus, large blood vessels, and bronchial muscle are blocked. The relief of motion of sickness and nausea or vomiting appears to be related to dosages. Mild antitussive activity has been attributed to promethazine, but this effect probably results from anticholinergic and sedative actions Promethazine is well absorbed from the gastrointestinal tract after oral dosing, but undergoes considerable first-pass-metabolism leading to a variable bioavailability.

Promethazine is metabolized by the liver to a variety of compounds; the sulfoxides of promethazine and N- dimethylpromethazine are the predominant metabolites appearing in the urine. Lastly, drug interactions have been reported when some monoamine oxidase inhibitors (MAOI) and phenothiazines are used concomitantly and also when phenothiazine is taken with epinephrine that can decrease blood pressure. However, neither of these drug reactions has been reported with promethazine.

Adapted from *Medicinal Chemistry* by Symour Berkman , 22.

A: Relying on the knowledge of rhetorical functions, identify the function of

these sentences, even in general terms.

The Sentence	The Function
Phenergan is used in the treatment of allergic conditions, motion sickness, ……….vomiting.	
Promethazine has anticholinergic and …………………properties.	
Promethazine competes with free histamine for binding at H_1 receptor sites.	
However, neither of these drug reactions has been reported with promethazine.	

B: Answer the following questions:

1) What is the medical use of phenergan?

…………………………………………………………………………………………...

2) What are the characteristics of H_1 receptors?

………………………………………………………………………………………….

3) What does Promethazine do? And what this result in?

…………………………………………………………………………………………

4) How is promethazine metabolized?

…………………………………………………………………………………………

5) Does promethazine undergo drug interactions?

………………………………………………………………………………………..

6) What is the main idea of the text?

…………………………………………………………………………………………

Appendix G

Reading Comprehension Activity Two

Text Three: Diazepam

Diazepam (Valium) is derived from benzodiazepine, which belongs to a group of psychotropic drugs with potent hypnotic and sedative action; used predominantly as antianxiety and sleep-inducing drugs. Side effects of Diazepam and these drugs may include impairment of psychomotor performance, amnesia, euphoria and dependence. Diazepam is classified under the ATC index as a psycholeptic and anxiolytic. The target organ is the nervous system, causing depression of respiration and consciousness.

Diazepam can be injected for the relief of acute anxiety when rapid action is required in acute alcohol withdrawal and surgical procedures . It is commonly used for skeletal muscle spam, cerebral palsy, atherosis, insomnia, tetanus and severe recurrent convulsive seizures. Diazepam can also be used as a premedication, or a preanesthetic to enhance thetherapeutic effect and safety of a surgical procedures . It has a colorless crystalline compound and is insoluble in water.

The toxic and therapeutic effects of diazepam are a result of its effect on CNS GABA activity (gamma-aminobutyric acid) is an important inhibitory neurotransmitter which mediates pre-and- post synaptic inhibition in all regions of the central nervous system. Diazepam and the other benzodiazepines appear to either enhance or facilitate GABA activity by binding to the benzodiazepine receptor. Binding at this complex results in increased CNS inhibition by GABA. The anticonvulsant and other effects of diazepam are believed to be produced by a similar mechanism.

Adapted from *Medicinal Chemistry* by Symour Berkman, 18..

Part One: Relying on the knowledge of rhetorical functions, identify the function of these

sentences, even in general terms.

The Sentence	The Function
…, which belongs to a group of psychotropic drugs with potent hypnotic and sedative action.	
It is commonly used for skeletal muscle spam, cerebral palsy, atherosis, insomnia, tetanus and severe recurrent convulsive seizures .	
It has a colorless crystalline compound and is insoluble in water.	
Diazepam and other benzodiazepines appear to either enhance or facilitate GABA activity.	

Part Two: Answer the following questions:

1) What is the property of benzodiazepines?

……………………………………………………………………………………………

2) What are the unwanted effects of diazepam?

…………………………………………………………………………………………….

3) What are the medical functions of diazepam?

……………………………………………………………………………………………

4) What are the descriptive features of diazepam?

……………………………………………………………………………………………

5) How does diazepam improve GABA activity?

……………………………………………………………………………………………

6) What is the main idea of the text?

…………………………………………………………………………………………