

# The Effect of Familiarity with Content Knowledge on Iranian Medical Students' Performance in Reading Comprehension Texts: A Comparative Study of Medical and TEFL Students

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**Abstract**—This study considers the effect of relevant background knowledge (schema) on reading comprehension in a group of Iranian medical students. The participants were selected using random sampling from two different groups: thirty students enrolled in an MA course in TEFL, and thirty medical students in years 4 to 7 of a seven year medical course. The selection requirement for all participants was an IELTS score of between 6 and 7. All participants were asked to respond to two texts. The first was an academic text with a tendency towards using sub-technical medical terms (e.g. asthma, air ventilation), and which was part of a sample text for an IELTS reading skill test. The second text contained highly technical or subject-specific medical terms from neurology as a specific area of medicine. Both texts were selected by a medical specialist who had also taught English for Medical Purposes (EMP) for several years in medical colleges in Iran. After reading each text, students were asked to answer questions based on the text. The results obtained from an analysis of the scores using SPSS indicated that background knowledge plays an important role in text reading comprehension for medical students in Iran ( $p < 0.05$ ). The study also considered the three phases of reading (pre-reading, reading, and post-reading) and ways to build and activate background knowledge (schema) to achieve better reading comprehension.

**Index Terms**—schema, reading comprehension, English for academic purposes, medical students, TEFL students

## I. INTRODUCTION

English has, for several decades, been the major language of higher education in many countries where English is a second or foreign language. This increasing use of English is reflected in the development of courses in English for medicine, law, and business, and also English for Specific Purposes (ESP).

Reading has long been considered a crucial component in the learning of any subject. The ability to read relevant texts is the most useful skill students can have for obtaining the necessary information about their subject areas. Reading is a complex process involving several different skills, and it has an important place in acquiring both general and specific kinds of English. According to Hancock (1998), the process of reading “comprehension involves understanding the vocabulary, seeing relationships among the words and concepts, organizing ideas, recognizing the author’s purpose, evaluating the context, and making judgments” (p. 69). This complexity, together with the development of new teaching approaches which recognize the important role played by comprehension, has encouraged researchers to carry out studies on different areas of reading. These studies include Johnson’s (1982) study on prior vocabulary, Nassaji’s (2003) study on the role of higher-level syntactic and semantic processes and lower-level word recognition and graphophonic processes in adult English as a second language (ESL) reading comprehension, and Brantmeier’s (2005) study on the relation between subject knowledge and reading comprehension.

Background knowledge has also been the focus of attention as a top-down tool for text comprehension, bringing in relevant information not contained in the text itself (Donin & Silva, 1993), such as general knowledge about people, culture and the universe, or information about the discourse structure itself. Chen and Donin (1997) found evidence for the bottom-up influence (retrieving data first from the letters of the text) of linguistic proficiency as opposed to prior

knowledge in reading comprehension, but pointed to the compensatory role of background knowledge in the case of participants who had a high level of knowledge about the texts but a lower level of proficiency in their L2.

Although, the role of background knowledge in reading comprehension has already been investigated widely by researchers, but there are few empirical studies on the role of schema (background knowledge) in reading comprehension in medicine. This is the main topic of this paper - the role of background knowledge in reading comprehension in Iranian medical students. In addition this paper seeks to identify the ways in which this background knowledge is activated. This is a significant issue for researchers both in medicine and EAP.

## II. STATEMENT OF THE PROBLEM

It is not clear to what extent background knowledge, as opposed to familiarity with the subject matter, plays a role in reading comprehension in medical texts.

Clapham (2001) studied three groups of students: students of Business Studies and Social Sciences (BSS), students of Life and Medical Sciences (LMS), and students of Physical Science and Technology (PST). She found that, although students generally achieved higher scores on texts in their subject areas, this was not always the case. In fact, they sometimes did better on texts outside their area. Clapham concluded that students vary widely in terms of their background knowledge as the texts varied in terms of their specifications. She also found that although they had obtained a pass on general English tests, many medical students were not well prepared for the academic activities they had to tackle, including reading and writing journal articles, collaborating on research projects, attending conferences and lectures, and participating in discussions. Although many of these tasks are limited to the training period, all physicians are in fact required to be lifelong learners, especially those choosing careers in the academic areas of medicine. In any case, the reading skill is tied to their careers and to their academic lives.

## III. REVIEW OF THE LITERATURE

### A. Reading and Background Knowledge

It has long been recognized that reading is an interactive process, in which readers draw on existing background knowledge to construct the meaning of texts. Attempts to formalize the notion of background knowledge have centered on the concept of schema, a term derived from the Greek *σχῆμα* 'shape, form' and introduced by von Ehrenfels (1890) in the context of Gestalt psychology. The widespread use of the term in psychology and education is attributed to Bartlett (1932), who in a study of the recall of Native American folktales observed that many recalls were inaccurate, and included the introduction of extraneous information. The recalls also included retrieved inferences which went beyond the information given in the original text. From his observations on recall, Bartlett (1932) concluded that there is an unconscious mental structure or schema which models general knowledge about the world. He defined a schema as the prior knowledge stored in the human mind for reading a text (Bartlett, 1932).

We deal here first with schema theory in general, and then more specifically with its application to reading.

### B. Schema Theory

According to Nassaji (2002) schema theory has produced new developments in the field of cognitive psychology. For example, a group of cognitive processes, like inferencing, remembering, and problem solving, has been explained by this theory. Schema theory has also been considered the motivation for a lot of the empirical research related to learning, comprehension and memory (*Ibid*). At the same time, the important role of schema theory in describing the structure of knowledge of ordinary events in a variety of domains has been considered using a number of different terms. Nassaji (2002) cites terms such as "frames" (Minsky, 1975), "scripts" (Schank & Abelson, 1977), and "plans" (Schank, 1982). In linguistics, the concept of schema theory has been used in the terms "sentence schemata" (Winograd, 1983), "story schemata" (Johnson & Mandler, 1980; Mandler, 1978), "formal/ rhetorical schemata," "content schemata" (Carrell, 1984), "textual schemata" (Swaffar, 1988), and "symbolic schemata" (Oller, 1995).

Although, in practice, schema theory is often associated with reading comprehension, in principle it is concerned with comprehension and cognition in general, and has no specific connection with reading. According to Anderson et al. (1977; cited in Carrell & Eisterhold, 1983, p. 73) "every act of comprehension involves one's knowledge of the world". Rumelhart (1982) calls schemata "the building blocks of cognition", a definition that suggests how schemata build a network of information to make sense of new events, situations, and stimuli (Al-Issa, 2006). Widdowson (1983) took the view that it is the organized information in our long-term memory that creates schemata as cognitive constructs. The connection with reading is that schemata "reflect the experiences, conceptual understanding, attitudes, values, skills, and strategies ... [we] bring to a text situation" (Vacca & Vacca, 1999, p. 15). The critical role of the reader and the interaction between the background knowledge of the reader and the text has also been considered one of the major insights of schema theory. These developments have affected research in the area of L2 comprehension considerably (Nassaji, 2002).

### C. Schema Theory and Reading Comprehension

Brown (2001) points to the prominent role of schemata in reading skills, and suggests that meaning is not conveyed

by the text alone, because readers bring their own schemata consisting of information, knowledge, emotion, and culture to the printed words. Brown cites Clark and Silberstein (1977), who suggested that reading is incidentally visual, and requires the reader to contribute more information to supplement the words on the page. Readers (both native and non-native) will have poor reading comprehension if they lack the appropriate schemata to infer the meanings of the words on the page.

Similarly, Al-Issa (2006) suggests that readers use their schemata to build up a meaningful image of the text. Drawing on earlier work including that of Anderson and Pearson (1984), Carrell et al. (1988), and Hudson (2007), Al-Issa (2006) defines a schema as a collection of default ideas, principles and judgments about events and locations. The collection contains different folders which store specific information about a topic, and play a major role in guiding the reader to the meaning of the text. An important condition, of course, is that the reader must be able to refer to the appropriate mental folder for a particular text topic. Nguyen (2012) suggests that schemata can be seen as abstract bodies of 'pre-owned' information which have an essential role in the reading process. Other studies which demonstrate the impact of prior cultural or content knowledge on reading comprehension include Brantmeier, 2005; Carrell, 1983; Hammadou, 1990, 2000; and Johnson, 1982. Carrell (1984b) investigated the influence of descriptive passages (English expository text) on non-native readers, and found a significant difference between the recall of strongly organized structures and a collection of English expository texts a finding later confirmed by Tian (1990).

What is obvious in the literature is that there are two recognised types of schema, content schemata and formal schemata. Brown (2001) defines content schemata as those schemata which contain information about people, culture, the world, and the universe, while formal schemata include knowledge about discourse structure. In other words, content schemata involve general knowledge of life, including culture, history, and society (Carrell & Eisterhold, 1983; Fisher & Frey, 2009), while formal schemata involve language knowledge, including syntax, semantics, and phonology. Most research has concentrated on content schemata, but in the special case of reading comprehension, due attention also needs to be paid to formal schemata.

Carrell (1984) investigated the impact of formal schemata, and in particular the impact of story structure, on reading recall by ESL subjects. She found conventionally ordered stories were recalled significantly better than stories that were ordered in an unconventional manner. In a study of the impact of both content and formal schemata, Johnson (1981) found that cultural information has more effect on reading comprehension than the syntactic structure of the text. Carrell (1987) investigated the concurrent effects of content and formal schemata and other potential interactions between them. She studied two high intermediate ESL learner groups, one containing Muslims and the other Catholics, and gave them two texts to read, one with culturally familiar content and the other with culturally unfamiliar content. She found that both kinds of schemata had a significant impact on reading comprehension, and that both brought about better reading comprehension.

#### *D. Topic Familiarity*

Brantmeier (2003) also emphasizes the role of topic familiarity as a significant factor in L2 comprehension, following Afflerbach's (1986) claim that topic familiarity obtained by reading a text enhances the rebuilding of the main idea. Swaffer (1988) considered schemata plays a priority role in applying world knowledge to reading comprehension. An important contribution (p. 126) was his emphasis on topic familiarity as the facilitator of "language recognition", "inferential reasoning", and the recall of concepts. Liu, Schedl, Malloy, and Kong (2009) refer to Bartlett's (1932) study, which adduced evidence of the impact of cultural schema or topic familiarity on the comprehension of texts, as a seminal work in L1 studies.

Moreover, the effect of background knowledge on reading comprehension in L1 and L2 reading has been the topic of a number of investigations. Floyd and Carrell (1987) studied ESL students with intermediate level proficiency. They divided students into two groups, the treatment group and the control group. The treatment group was given two training sessions on cultural knowledge. Both groups took pre- and post-tests to measure their performance in reading comprehension. The results showed a significantly better performance for the treatment group. This possibly explains in part why some students fail to comprehend the main purpose of a text.

Spiro, Bruce, and Brewer (1980) suggested that text comprehension is brought about by the application of the reader's knowledge of the world and language to the interpretation of meaning. According to others, including Anderson (1982), Read and Rosson (1982), and Reutzel and Hollingsworth (1991), text comprehension is only possible when there is an interaction between prior world knowledge and language and the content of the text. This confirms the view of Barnitz (1985) that if readers do not have sufficient familiarity with a text, more effort is required to construct reading comprehension. On the other hand, Freire and Macedo (1987) found that it is the interaction between text content and the reader's background knowledge that builds comprehension through the process of reading.

In summary, many studies involving schema theory show that comprehension is more effective when the reader's content schema is closely matched to the text. As Fisher and Frey (2009) and Hudson (2007) point out, text comprehension depends very much on the way readers apply their schema. While some researchers (Carrell & Eisterhold (1983); Fisher & Frey (2009)) take the view that schemata are arranged hierarchically, from the most general information at the top to the most specific information at the bottom, Carrel and Eisterhol (1983) and others claim that the different levels of schema are connected through bottom-up and top-down processing. (The concepts of bottom-up and top-down processing are considered further below).

As noted earlier, schema theory shows how the prior information a reader has about a text activates the information required to solve reading problems (Rumelhart, 1983; Nassaji, 2002). In other words, it is the combination of information retrieved from the written text and the reader's schema which enables the comprehension of the text. Conversely, according to Hudson (1982), problems in reading in L2 are not caused by a lack of schemata to activate, but from activation of the wrong schemata. This was later contradicted by Bransford et al. (1986) who found that readers' problems with reading comprehension are caused by a lack of necessary background knowledge (schema), so readers are unable to fill in the missing information gaps.

According to Aebbersold and Field (1997), "If the topic ... is outside [students'] experience or base of knowledge, they are adrift on an unknown sea" (p. 41). The importance of content schemata has led some researchers to assert the need for further research to identify ways to activate the schemata (Al-Issa, 2006).

There is also a general agreement in studies of background knowledge that familiarity with the text topic puts students in a better position to understand what they read (Al-Issa, 2006). This confirms the earlier view of Carrell (1988 p.245), that "students' apparent reading problems may be problems of insufficient background knowledge [content, formal, and linguistic]". However, she added that students with proper schemata might still be unable to comprehend a text if their schemata has not been activated appropriately (Ibid). According to Fisher and Frey (2009), readers know when and where to use their own schemata to construct a more comprehensible reading.

Bartlett (1932) emphasized the importance of both bottom-up and top-down processing in reading comprehension, and suggested that information is first retrieved from the letters of the text using bottom-up knowledge, and then a meaningful representation of the text content is constructed using top-down knowledge. It has generally been accepted that top-down processing affects information retrieved from bottom-up processing (Williams & Lombrozo, 2010). According to Bacon (1992), while top-down processing includes paying attention to the topic, guessing "from context", hypothesizing, using "schemata", making inferences, "global processing" and avoiding translation, bottom-up processing involves concentrating on "text-based aspects", including "structure" focus, "structure" segmentation, and attention to "known words" (p.165). Nuttall (1998) agrees that it is the combination of top-down and bottom-up processing that enables reading comprehension. She includes understanding "the overall purpose of the text", and making "a reasoned guess" (p.16) in top-down processing, and understanding the meanings of words and the structure of sentences in bottom-up processing.

According to Al-Issa (2006), bottom-up processing handles and rearranges visual data to enable the reader to make a decision on the raw data. When there is a clash in background knowledge and viewpoint between the reader and writer, the reader is left confused. In this situation, the reader's attention focuses on the syntax, words and vocabulary in order to reconstruct the text meaning. On the other hand, in the case of top-down processing, readers interpret the writer's intention, make inferences, try to work out the overall point of the text, and may predict the next part of the text and what it might contain (Ibid).

### E. Reading Skills

The focus of interest in this paper is on L2 reading comprehension. In Iran as elsewhere, an immense amount of effort is devoted to the development of reading skills in L2 learners. This being so, it is reasonable to predict that *ceteris paribus* successful language learners will be particularly skilled in comprehending texts. In the present case, MA ELT students, who have not only developed reading skills for themselves but who are being trained to develop reading skills in their own students, can be expected to be more successful than, say, medical students, who have no special linguistic expertise beyond what they have learnt in developing general proficiency.

However, if the comprehension process begins bottom up, it can easily be blocked if the reader does not know a sufficient proportion of the words. We can expect medical students to comprehend a technical medical text better than ELT students, even if they have poorer reading skills. But the medical students should lose this advantage given a text – even a medical text – containing words familiar to the ELT students.

On the other hand, such a prediction is based on the conventional bottom-up approach to reading skills. If comprehension also involves schemata, topic familiarity and schema activation, then the medical students should have an advantage with any medical text. The main goal of the present study is, therefore, to answer the question: To what extent does background knowledge play a role in reading comprehension in the case of Iranian medical students?

## IV. METHOD

### A. Participants

The participants included 60 students selected from two groups: MA TEFL students (N=30), and medical students (N=30). The TEFL students were in their second or third semester at the University of Tehran, Kish International campus. They were aged between 24 and 29 (average 25.5), and included 16 males and 14 females. The medical students were from the Azad Medical University of Mashhad. They were aged between 22 and 37 (average 24.5), and included 14 males and 16 females, and they were selected from students who were at the clinical stage, i.e. years 4 to 7 of a 7 year course. Tables 1 and 2 summarize the details of the participants.

TABLE 1  
PARTICIPANTS' GENDER

		Group							
		Medicine			English			Total	
		Count	Column N %	Count	Column N %	Count	Column N %		
Sex	Female	16	53.3%	14	46.7%	30	50.0%		
	Male	14	46.7%	16	53.3%	30	50.0%		
	Total	30	100.0%	30	100.0%	60	100.0%		

TABLE 2  
PARTICIPANTS' AGE

			Minimum	Maximum	Mean	Standard Deviation
Group	Medicine	Age	22	37	24.5	3.4
	English	Age	24	29	25.4	1.2
	Total	Age	22	37	24.9	2.6

### B. Procedure

The research was carried out in two stages. Participants were matched for English proficiency, having IELTS scores between 6 and 7 (intermediate level). Thirty TEFL students, all having IELTS scores of over 6, which is the minimum for MA TEFL students in Iran, were selected using random sampling, while thirty of seventy medical students were similarly selected. These students also had an IELTS score of more than 6.

Participants in both groups were asked to read two texts. The first contained general medical knowledge, and consisted of about 280 words including sub-technical medical terms (e.g. *asthma*, *air ventilation*). It was taken from part of an IELTS reading test. The other text was about 350 words, and included highly technical medical terms relating to neurology, e.g. neurological terms such as *corticonuclear fibers* and *ipsilateral*, and required specialist medical knowledge. This second text was taken from an authentic medical textbook, namely *Gray's Clinical Neuroanatomy: The Anatomic Basis for Clinical Neuroscience*. The comprehension questions were devised by a medical specialist in general surgery from Azad Medical University who had taught English for Medical Purposes (EMP) for several years. The texts and comprehension questions are included in the Appendix.

After reading each text, participants were given fifteen minutes to answer the questions devised by the medical specialist. To ensure validity, different formats were used, including cloze-tests, blank tests, short answers, and open-ended questions. The Mann-Whitney test was used in SPSS to process the data and to ascertain any significant differences between the two groups.

### C. Results

The medical students obtained a higher mean score in comprehending both texts, i.e. the text with sub-technical words ( $M=8.4$ ,  $SD=1.0$ ), and the text with high-technical words ( $M=5.0$ ,  $SD=1.5$ ). The difference was significant ( $p < 0.05$ ). However, the mean scores for the TEFL students in comprehending the text with sub-technical words ( $M=5.7$ ,  $SD=1.7$ ), and the text with high-technical words ( $M=3.4$ ,  $SD=1.1$ ) were significantly different ( $p < 0.05$ ), and lower for the more technical text. Tables 3 and 4 show the details.

TABLE 3  
THE INDEPENDENT SAMPLES TEST

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	4.325	.042	-1.426	58	.159	-.933	.654	-2.243	.377
Equal variances not assumed			-1.426	36.09	.162	-.933	.654	-2.261	.394

Figures 1 and 2 give the mean scores for correct answers following reading sub-technical and highly technical medical texts.

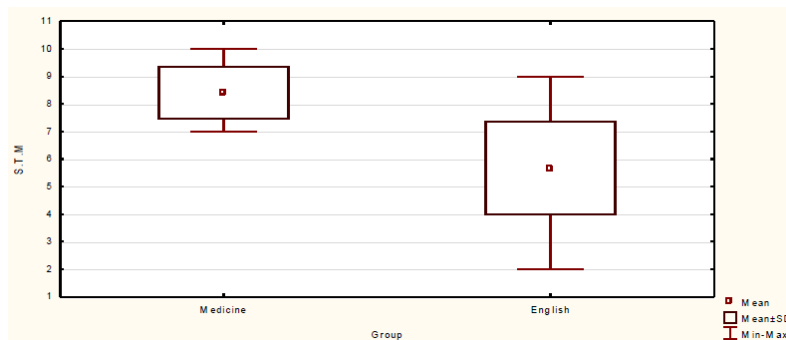


Figure 1: The students’ mean score in reading sub-technical medical text

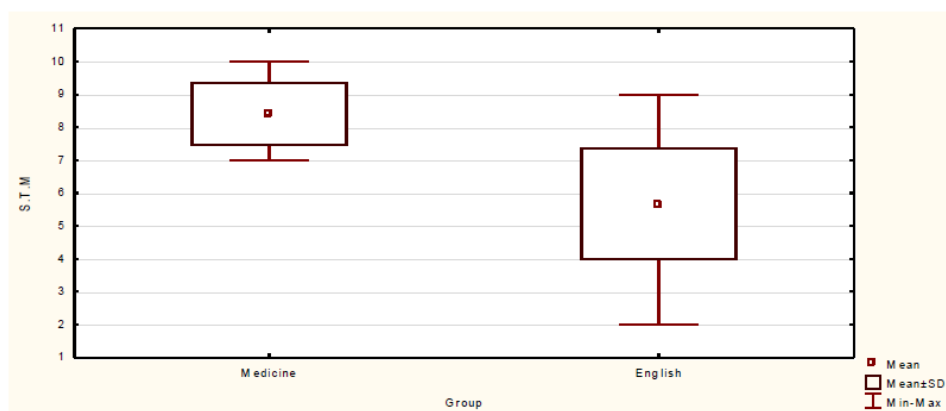


Figure 2: The students’ mean score in reading high-technical medical text

Table 4 summarizes the findings and computed mean scores

TABLE 4  
DEPENDENT VARIABLE SCORE

	English	Medicine	P-Value
Age*	25.4±1.2	24.5±3.4	0.162
Sex(Male/Female)	16/14	14/16	0.606
S.T.M.	5.7±1.7	8.4±1.0	0.0001S
H.T.M.	3.4±1.1	5.0±1.5	0.0001S
*Mean±SD			
s :significant level is p<0.05			

V. DISCUSSION AND CONCLUSION

The results of the study confirmed the high impact background knowledge has on comprehending medical texts. This study also confirms the studies of Johnson (1982); Lee (1986); Hammadou (1991, 2000); and other researchers who have concluded that background knowledge helps readers better understand the relevant texts.

According to Nassaji (2002), while there is no doubt about the important role of background knowledge in L2 reading comprehension, it has been schema theory which has led our attention to the role of knowledge.

This study was designed to assess the role of background knowledge in the comprehension of medical texts by Iranian medical students. To do this, we compared a group of medical students with MA TEFL students. At the beginning of the study, it was supposed that TEFL students, as MA students of English and having studied English academically for several years, would be familiar with general topics in English, including medicine. At this point it is appropriate to take note of a distinction made by Chou (2011) between topic familiarity and background knowledge. Background knowledge consists of different kinds of information, such as information about terminology, vocabulary, and information which enables members of a group to make inferences (Chou, 2011). Familiarity with the topic or knowledge about the topic is not sufficient on its own to comprehend a specific text. In other words, as researchers such as Al-Issa (2006) claim, if readers are absolutely unfamiliar with the subject matter or the text content, no matter how well they may know the language, they will not achieve good comprehension. However good the TEFL students were at handling general English topics, they needed to activate their background knowledge before doing the tests in order to achieve better reading comprehension. Krashen (1993) makes two suggestions on how to activate the students’ schemata, namely free voluntary reading and reading in the first language. Ways of activating students’ schemata are discussed further in section 6 below.

The other way in which the process of reading comprehension can be improved is by employing the pre-teaching

vocabulary technique, which is used as a method for improving reading comprehension in native speakers. This method has been supported recently by researchers in literature (Maghsoudi, 2012). The researchers believe that, in an L2 setting, teachers can also benefit from pre-teaching the relevant vocabulary through pre-reading activities (Taglieber *et al.*, 1988; Kameenui *et al.*, 1982).

Finally, what is obvious in all these activities is the importance of the role of the teacher in an EFL class. Guiding students to relate the new schema to their background knowledge (existing schema) could be a basic step in the reading comprehension process. Encouraging them to pay more attention to all parts of a written text including titles, tables, pictures, contextual clues, etc., is another way to teach them how to take advantage of the text in order to improve their comprehension, which is the ultimate goal of reading a text. It is worth remembering Stevens' (1982) claim about the vital role of reading teachers, "a teacher of reading might thus be viewed as a teacher of relevant information as well as a teacher of reading skill" (Stevens, 1982, p.328). Thus, one of the basic roles of the reading teacher could be to offer practical tools to students to enable them to process different kinds of texts (Daniels and Zimelman, 2004). As noted earlier, the role of the teacher in guiding students to relate new schema to existing schema is vital in reading comprehension and also needs to be considered (Maghsoudi, 2012).

## VI. PEDAGOGICAL IMPLICATIONS

All studies dealing with background knowledge point to the value of schemata in teaching, especially content schemata. Regarding EFL readers (in the current study, the students of TEFL), having the proper background knowledge is important for readers encountering scientific texts (Maghsoudi, 2012).

As Williams (1987) argues, there are three phases in the reading comprehension process that need to be reflected on in teaching, namely pre-reading, reading, and post-reading. Building up background knowledge needs special attention during the first phase, and it is during this phase that the instructor can make use of audio-visual devices such as pictures, slides, and movies to construct and activate the students' schemata. This can be done by asking students to write about their knowledge of different topics, then discussing these topics with each other. The second phase requires students to read a lot of relevant material to build up their schemata and to make these schemata accessible for activation, as well as enrich their knowledge of the subject. In the third phase, background knowledge is integrated into the new schema structure (Al-Issa, 2006). Since relevant background knowledge determines the ease with which students comprehend a particular text, it is important for teachers to select appropriate materials to construct this background knowledge and schema. Teachers can improve the reading comprehension process for students by teaching them how to use their background knowledge to fill information gaps in the context (Elbro & Buch-Iversen, 2013). It is also helpful to take note of other factors, including whether students find the materials interesting or relevant to developing their English proficiency, selecting appropriate materials for all phases of reading (pre-reading, reading, and post-reading), activating students' hidden schemata, or recognizing their hidden comprehension problems (Al-Issa, 2006). In some cases teachers are faced with the problem that students lack the background knowledge and schemata to understand the texts, in which case teachers have to create this for them using appropriately designed activities (Floyd and Carrell, 1987). This can be as simple as providing mini-lesson teaching sessions (Floyd and Carrell's own example), showing an audio-visual clip related to the topic and discussing it with the students, or even giving students a diagram or illustration.

These methods not only minimize irrelevant prior knowledge (which could distract students from creating relevant schemata), but also help teachers and students alike to use schemata actively in the process of reading comprehension. In the longer term, it could help students become more independent L2 readers.

## APPENDIX A. THE TEXTS

### *a. The general medical text*

#### Exercise

Exercise is a very common precipitant of accurate episodes of asthma. This stimulus differs from other naturally occurring provocations, such as antigens, viral infections, and air pollutants, in that it does not evoke any long-term sequel, nor does it increase airway reactivity. Typically, the attacks follow exertion and do not occur during it. The critical variables that determine the severity of the postexertional airway obstruction are the levels of ventilation achieved and the temperature and humidity of the inspired air. The higher the ventilation and the lower the heat content of the air, the greater the response. For the same inspired air conditions, running produces a severer attack of asthma than walking because of its greater ventilator cost. Conversely, for a given task, the inhalation of cold air markedly enhances the response, while warm, humid air blunts or abolishes it. Consequently, activities such as ice hockey, cross country skiing, and ice skating (high ventilation of cold air) are more provocative than is swimming in an indoor, heated pool (relatively) low ventilation of humid air). The mechanism by which exercise produces obstruction may be related to a thermally produced hyperemia and capillary leakage in the airway wall.

Emotional Stress Psychological factors can worsen or ameliorate asthma. Changes in airway caliber seem to be mediated through modification of vagal efferent activity, but endorphins may also play a role. The extent to which

psychological factors participate in the induction and/or continuation of any given accurate exacerbation is not established but probably varies from patient to patient and in the same patient from episode to episode.

The questions:

- 1) Exercise rarely causes acute bouts of acute asthma.
  - A) True
  - B) False
- 2) Emotional status exacerbates asthma exclusively through endorphins.
  - A) True
  - B) False
- 3) The degree of participation of emotional factor is constant in the same patient.
  - A) True
  - B) False
- 4) Alterations in the blood circulation in the airway may be related to exercise-induced asthma.
  - A) True
  - B) False
- 5) Increased airway reaction to exercise is followed by..... .
  - A) heart attack
  - B) disabilities
  - C) apnea
  - D) acute attacks of asthma
  - E) heart failure
- 6) Exercise-induced asthma is followed by..... in the patient.
 

A) long term disabilities	C) heart attack
B) short term disabilities	D) asthma attack
E) apnea attack	
- 7) Ice-skating has the same provocative role for asthma as.....
 

A) exercise test	C) ice hockey
B) running	D) walking
E) swimming	
- 8) Lower ventilatory effort during walking precipitates ....., compared with running.  
.....
- 9) There is no marked difference in the airway response to cold or..... .  
.....
- 10) Usually exercise-induced attacks of asthma occur during.....  
.....

**b. The technical medical text**

Transverse section of the medulla at the level of the decussating of the medial lemniscus

The medullary white matter is rearranged above the level of the pyramid decussating. The pyramids contain ipsilateral corticospinal and corticonuclear fibers, the latter distributed to nuclei of cranial nerves and other medullary nuclei. At this level, they form two large ventral bundles flanking the ventral median fissure. The accessory olivary nuclei and lemniscal decussation are dorsal.

The nucleus gracilis is broader at this level and the fibers of its fasciculus are located on its dorsal, medial and lateral surfaces. The nucleus cutaneous is well developed. Both, nuclei retain continuity with the central grey matter at this level, but this is subsequently lost. First-order gracile and cuneate fascicular fibers, which have ascended ipsilaterally and uninterrupted from their origin in the spinal cord, synapse upon neurons in their respective nuclei. Second-order axons emerge from the nuclei as internal arcuate fibers, at first curving ventrolaterally around the central grey matter and then ventromedially between the trigeminal spinal tract and the central grey matter. They decussate to form an ascending contralateral tract, the medial lemniscus. The lemniscal decussation is located dorsal to the pyramids and ventral to the central grey matter. The latter is, therefore, more dorsally displaced than in the previous section.

The medial lemniscus ascends from the lemniscal decussation on each side as a flattened tract near the median raphe. As the tracts ascend, they increase in size because fibers join from upper levels of the decussation. Corticospinal fibers are ventral, and the medial longitudinal fasciculus and tectospinal tract are dorsal. Fibers are rearranged in the decussation, so that those from the nucleus gracilis come to lie ventral to those from the nucleus cuneatus. Above this, the medial lemniscus is also rearranged, ventral (gracile) fibers becoming lateral, and dorsal (cuneate) fibers medial. At this level, medial lemniscal fibers show a laminar somatotopy on a segmental basis, in that fibers from C1 to S4 spinal segments are segregated sequentially from medial to lateral, respectively.

(Gray's Clinical Neuroanatomy: The Anatomic Basis for Clinical Neuroscience, p. 158)



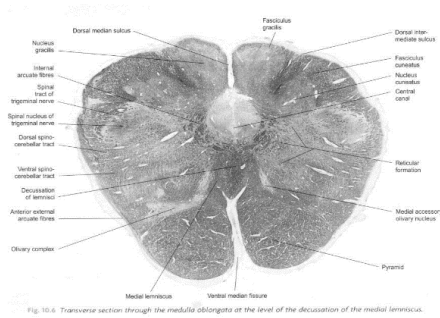


Figure 3. Gray's Clinical Neuroanatomy: The Anatomic Basis for Clinical Neuroscience, p. 161)

- 1) Tectospinal tract are located opposite to medial longitudinal fasciculus and ipsilateral to corticospinal fibers.
  - A) True
  - B) False
- 2) The continuity of nucleus gracilis is lost at the level of pyramids.
  - A) True
  - B) False
- 3) Above the decussation, the gracile fibers are rearranged medially.
  - A) True
  - B) False
- 4) The dorsal median fissure is partly formed by.....
  - A) nucleus gracilis
  - B) fasciculus fibers
  - C) craniospinal fibers
  - D) cranial nerves
  - E) S4 spinal fibers
- 5) .....are located in the most lateral somatotopic lamina in the medial lemniscus.
  - A) S4 spinal fibers
  - B) Fasciculus fibers
  - C) Gracile fibers
  - D) Nucleus gracilis
  - E) Craniospinal fibers
- 6) Internal arcuate fibers:
  - A) are located in the grey matter of medulla
  - B) cross to form the lateral lemniscus
  - C) forming the lateral lemniscus, it is ventral to pyramids
  - D) are located dorsal to pyramids
  - E) are located lateral to pyramids
- 7) The ventral aspect of pyramids contains the fasciculus fibers of:
 

.....
- 8) Which fibers are distribute to cranial nerves at the pyramid level?
 

.....
- 9) Where does cuneate fibers synapse?
 

.....
- 10) Which fibers are rearranged at the decussation of pyramids?
 

.....

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