

Reading comprehension strategies used by Iranian university students while reading academic English texts

Esmail Zare Behtash, Akram Barabadi and Zahra Eskandari

Chabahar Maritime University, Iran

This study was conducted to identify the kinds and frequencies of comprehension strategies mathematics and psychology students employed while reading specialised and nonspecialised English texts. It also investigated whether the two groups differed in the amount and frequency of using the strategies. Ten graduate students (five majoring in mathematics and five in psychology) participated in the study. The kinds of strategies they used while reading English texts were elicited through a think-aloud technique, in which sessions were recorded and transcribed for analyses that identified fifteen comprehension strategies. Both groups relied mostly on a relation strategy while reading their own specialised English text; however, for a nonspecialised and unfamiliar English text, they mostly used linguistic level strategies including dictionary use, analysing words, enunciation, similarity and parts of speech. This study revealed that overall maths students used a greater number of comprehension strategies than psychology students; however, both groups did not differ in the kinds of strategies they used. Keywords, summarising, skipping and general idea were the least frequent strategies used by both groups. The results of this study can give English for specific purposes (ESP) teachers a broader perspective on the use of reading comprehension strategies.

Introduction

Reading does not merely involve a receptive process of picking up information from the page, word by word (Grabe, 1991), but it is a selective process featured by an active process of comprehending. Reading is an interactive, meaning-making process (Anderson, 2005) in which readers capitalise on various available sources and utilise a multitude of strategies such as skimming, adjusting pace, making sense of titles, rereading, predicting, drawing conclusions and using prior knowledge to achieve the goal of comprehension (Shmais, 2002). The use of reading strategies is regarded as being conducive to successful reading comprehension (e.g. Bernhardt, 2005). Therefore, second language (L2) researchers have made attempts at identifying a variety of reading strategies (e.g., Block, 1986).

It has been shown that reading different types of materials necessitates the use of different reading strategies and places different demands on learners (Dhieb-Henia, 2006; Flavell, 1987). Moreover, Oxford and Nyikos (1989) and Widdowson (1984) believed that one's choice of language learning strategies is also affected by one's field of study. In their study, humanities, social sciences and education majors used resourceful independent strategies more often than did students with other majors. University major was a highly significant difference among the participants.

Keeping this explanation in mind, this study tries to investigate the types and frequency of reading strategies used by students of two different majors (mathematics and psychology)

while reading a specialised text related to their field of study at university and a specialised text of another major. In addition, this study aims to identify any difference that might exist in the types of reading strategies used by the two groups of the students. Therefore, the following research questions were formulated:

1. What are the types and frequency of reading strategies used by Iranian maths students while reading a specialised and a nonspecialised academic text in English?
2. What are the types and frequency of reading strategies used by Iranian psychology students while reading a specialised and a nonspecialised academic text in English?
3. Is there any difference in the strategies used among maths and psychology students while reading academic English texts? If so, what are the differences?

Theoretical grounding

Over the last two decades, most research on first language, second language (L2), and foreign language reading has focused on the strategies that readers deploy in processing written input. According to Cohen (1990), reading strategies are “those mental processes that readers consciously choose to use in accomplishing reading tasks” (p. 83). Garner (1987) saw it as an action, or a series of actions that a reader employs in order to construct meaning in the reading process. Hence, using reading strategies indicates how readers conceive a task, what they do to make meaning from texts, and what they do when comprehension breaks down (Block, 1986, 1992; Macaro & Erler, 2008).

Literature includes different classifications for reading strategies (e.g. Sheorey & Mokhtari, 2001; Block, 1986). Sheorey and Mokhtari (2001) grouped the reading strategies into problem solving, global, and support, each with its own purposes and goals. Block (1986) has classified strategies into two categories: general strategies and local strategies. She referred to general strategies as those that are used in “comprehension-gathering and comprehension-monitoring” (p.472) and local strategies as the ones that deal with “...attempts to understand specific linguistic units”(p.473). According to Block (1986), strategies like checking in a dictionary, analysing words, enunciating words and focusing on parts of speech are local strategies dealing with comprehension of words and sentences at the linguistic level. On the other hand, strategies like relation and knowledge of the world are general strategies that are used in comprehension gathering.

Many factors have been found to affect the choice of strategies like motivation, career/academic specialisation, gender, cultural background, nature of task, age, and stage of language learning (Oxford & Nyikos, 1989; Oxford, 2002). Career or academic orientation has found to be significant in strategy choice; for example, engineering students might choose learning strategies that are more analytic than those selected by humanities students (Oxford, 2002).

Adamson’s (1990, 1992) study revealed that ESL students from different academic and cultural backgrounds applied a wide range of academic strategies. The kinds of strategies students used to approach their academic tasks were influenced by their own academic

backgrounds and culture, their individual learning styles, and the nature of the tasks assigned. They varied their strategies depending on how well they understood the material.

Success in comprehending a text has also been associated with having background knowledge and being familiar with the topic of a text. The reading process is one in which a reader constructs his or her own meaning while reading. Existing knowledge, organised as schemas, influences the construction of these meanings or, in other words, comprehension (Wilson & Davis, 1994). Rosenblatt (1994), in particular, has shown how individuals construct their own interpretations based on their existing schemas or personal background knowledge. Therefore, taking this theory into account, background knowledge might affect one's strategy choice in a significant way.

According to Saville-Troike (2006), new information is interpreted in relation to the background knowledge. For example, when an academic reading text in L2 is related to the subject matter that L2 learners have already studied in their first language, "that prior content knowledge provides a "scaffold" for understanding new terms and integrating new information in a coherent conceptual framework" (p. 154). Thus, they will be able to make considerable sense of what they read despite the gaps in their comprehension of specific words and grammatical structures.

Afflerbach (1990a) examined the influence of prior knowledge and text genre on readers' use of prediction strategies. The researcher concluded that readers' prior knowledge might significantly affect the nature of readers' prediction strategies. In another study Afflerbach (1990b) examined the influence of prior knowledge on the strategies used by expert readers to identify and state the main idea of a text when the main idea was not explicit. Expert readers majoring in either anthropology or chemistry read texts from familiar and unfamiliar content domains, and gave verbal reports of the strategies they used in constructing a statement of the main idea. The results of the study showed that when readers had prior knowledge of the content domain of the text, they reported automatically constructing the main idea statement significantly more often. The author hypothesised that readers lacking knowledge of the content domain might have to rely on strategies rather than constructing the main idea automatically, due to the difficulty of the construction task, and possibly also due to the allocation of working memory to other necessary comprehension processes.

Think aloud protocols

Think aloud protocols are obtained by having participants report verbally what their thoughts are while performing a task. However, they are not expected to analyse their behaviour as in introspection (Cohen, 1987). It's a tool to systematically collect data about the unobservable processes, like inferencing or the use of prior knowledge, which occur during reading (Olson et al., 1984, p. 256 as cited in Katalin, 2002). Moreover, it is the closest way to get to the cognitive processes of learners. However, only the conscious processes are available for verbalisation, and the unconscious thoughts flowing in the mind might remain hidden. Another weakness of the method is that the learners' skills in

verbalising their thoughts may differ (Cohen & Scott, 1996, p. 97). Some respondents might be more competent at contributing the appropriate amount of data at the appropriate level of explicitness. Considering all the points regarding think aloud protocols, it can be stated that they require careful setting up and preparation on the part of the researcher. As Katalin (2002) emphasised, the purpose of the research should be in harmony with what can be retrieved through think aloud protocols.

Another point is related to the instructions that are given to the participants. They must be clearly worded and focused upon the research aims. The participants need to be carefully selected and trained with respect to the purpose of the study. Another issue, which is discussed extensively with respect to think aloud protocols, is the language of verbalisation. During the preparation stage the researcher should decide on the language the participants will use while doing the think aloud. Asking participants to read in the target language and report in the native language might encourage translation (Rankin, 1988, pp. 122-123, cited in Katalin, 2002). On the other hand, if participants are asked to use the target language while performing the task, they might worry more about speaking and concentrate less on the task itself. Furthermore, they might have limited oral production skills in the target language. In order to avoid these complications, Katalin (2002) suggested that subjects should be either "instructed to verbalise in their mother tongue" or allowed to "decide which language they would feel comfortable with when doing verbalization" (Katalin, 2002, p. 4).

Method

Design of the study

This study employed think-aloud protocol to gather verbal report data on reading comprehension strategies used by the senior students majoring in either maths or psychology, while reading specialised and nonspecialised texts in English. Therefore, it has an explanatory qualitative design relying on the verbal protocols of the participants. Data analysis aims to reveal both reading comprehension strategy types and their frequency.

Participants

The participants in this study were selected from two classes in a university in Iran. One class included senior students studying maths and the other involved senior psychology students. The researchers explained the purpose of the study to the students in each class. Sixteen subjects volunteered to participate in this study. Four of them, two males and two females, were employed in the form of a pilot study which was carried out a few days before the main study. Two of the participants, a male and a female, were senior students majoring in maths and the other two were majoring in psychology. They were given a psychology text and a maths text with the same elicitation technique. Of the twelve left, two were removed because they had low Nelson reading test scores in comparison to the others. Therefore, in fact, ten subjects remained for the main study. Five were senior mathematics students (three males, two females) and five were senior psychology (two males, three females) students. All the participants, at the time of the study, were senior

undergraduate students studying for their bachelor degrees and had just taken the final exams of the last term. They were aged between 23 to 27 and were native Persian speakers. As to their language learning experiences, they had learnt English during their school years and had passed two courses of English, a general English course and an English for specific purpose (ESP) course, at university. None of them had ever been to a foreign country or English language institutes.

Instruments

Nelson Standard Reading Test

The Nelson Standard Reading Test 1977 (adopted from Vaezi, 1995) consisting of 70 items was used to determine the homogeneity of the participants. Based on the test, students whose scores were one standard deviation below or above the mean score were included in the study.

Text

For the purpose of verbalising one's thoughts, one English passage, which was about stability theory, was chosen from Graduate Entrance Exam for mathematics students held in 2015 and the other English passage, which was about schizophrenia, was chosen from Graduate Entrance Exam for psychology students held in 2016. The exams are held by Sanjesh Organization in Iran every year for those who want to continue their education and enter university for masters degrees. Each group of participants was familiar with the topic of their specialised text because they had studied them in their specialised courses. The passages were approximately 400 to 450 words each. The readability of both texts was tested by Flesch/Flesch-Kincaid readability tests. The psychology passage had a readability score of about 23.2. The mathematics passage had a readability score of about 28.47. According to Flesch Reading Ease test categorisation, texts with readability score from 0.0 to 30.0 are best understood by university graduates; therefore, these two passages had almost the same level of difficulty. Moreover, two professors at the university who had taught general English and ESP courses for more than 12 years were asked to examine the texts. According to the reviewers the reading passage chosen was appropriate for the participants. The text on stability theory was specialised for the maths group (they had studied it in their specialised courses) but nonspecialised for the psychology group. Likewise, the text on schizophrenia was specialised for the psychology group but nonspecialised for the maths group.

Think aloud protocols

The cognitive processing and strategies needed to understand a text can be traced through verbalisation in a "think-aloud" session. In order to prompt the subjects to verbalise their thoughts while reading the texts, red dots were put after every sentence as an indication to start verbalising. The participants were told about the aim of the study and were given instructions on how to think aloud. The participants met with the researchers individually to produce the think-aloud protocols for both texts. There was no fixed order for presenting the texts. Some participants read the specialised text first and some read the nonspecialised one first. A mutual decision was made between the researchers and the participants on the date of the think-aloud sessions. All the participants in both groups

(mathematics and psychology) read the same texts (specialised and nonspecialised texts) and were asked to verbalise and say aloud anything that they were thinking about using Persian (their native language), English or both languages. The "think-aloud" reports were recorded. Each session for every participant took about 50-60 minutes.

Comprehension tests

A multiple-choice test was given following every reading comprehension passage in order to check the participants' understanding of the passages. Each reading passage was followed by four multiple-choice questions. These were the questions that appeared after each passage in the entrance exam.

Interview

An interview was conducted immediately after every "think-aloud" session. The purpose was to see to what extent the participants were familiar with the topics of the two texts, i.e. *schizophrenia* and *stability theory*; and to see if the students knew anything about reading strategies and their uses in different circumstances.

Procedure of the study

One week before the study, the participants sat for the Nelson test and those whose scores were one standard deviation below or above the mean were selected for the study. Four of them, two males and two females, participated in a pilot study that was conducted a few days before the main study. Some training sessions were held with the students to train them with regard to how to provide effective verbal reports. Moreover, the researchers themselves, conducted a sample think aloud protocol so that the students could see what was meant by a think aloud protocol. When it was decided that they were capable of reporting effectively, the actual protocols were conducted. Both groups (mathematics and psychology) read the same texts and were asked to verbalise and say aloud anything that they were thinking about using either Persian, English or both languages. The "think-aloud" reports were recorded. Then the protocols were transcribed verbatim by the researchers. The transcriptions were reviewed over and over to distinguish the strategies inherent of them. Since most of these strategies were not expressed directly, recognising them at the first time was difficult. Fifteen strategies were identified through think-aloud technique.

The coding system

Tentative categories were developed during the pilot study and refined during the study reported in this article. The researchers judged independently, coded and classified the data under fifteen categories based on Block's (1986) coding system. Intercoder reliabilities of 0.81 (for the pilot study) and 0.87 (for the main study) were obtained by calculating the ratio of the number of agreed segments to the total number of segments. Any discrepancies remaining in coding were resolved through discussion. Through examining and going through the data, the types and frequency of strategies used by Iranian maths and psychology students while reading a specialised and a nonspecialised

text in their L2 were identified. Finally, the frequency and percentage for each strategy were calculated.

In her study, Block (1986) identified fifteen comprehension strategies which she classified into two main groups: general strategies and local strategies. Likewise, the strategies used by the participants in this study were classified into two categories of general and local strategies (Table 1). General strategies involved comprehension-gathering and comprehension-monitoring strategies and local strategies included attempts to understand specific linguistic units (Block, 1986). These categories only describe the participants' responses, and as Block (1986) stated, are not intended to deal comprehensively with the domains of possible strategies. The categories were:

General strategies

1. *Guessing*
2. *Self-knowledge*: Readers realising whether they were understanding, or not understanding, what they were reading.
3. *Key words*
4. *Relation*: Participants' attempts in relating parts of the text together to make or confirm hypotheses about the text.
5. *Skipping*: Subjects skipping a word or a phrase while reading to make sense of the text.
6. *Knowledge of world*: Subjects' references to previous experiences, world knowledge and personal comments on the text; also subjects being reminded of other experiences or things
7. *General idea*: Subjects trying to understand the topic or main idea of the text.
8. *Summarising*

Local strategies

1. *Dictionary use*
2. *Paraphrasing*
3. *Analysing words*: Subjects trying to define the meaning of words according to the affixes or bases that made them up.
4. *Enunciation*: Subjects try to understand meaning by enunciating the words carefully or syllabus by syllabus.
5. *Similarity*: Subjects try to define the meanings of unknown words by relating them either correctly or by mistake to known words that were similar to the unknown words. The similarity might be either in graphics or meaning, or pronunciation. The transfers may be either intralingual or interlingual.
6. *Rereading*: Number of times the subjects endeavour to reread a certain word or sentence to comprehend it.
7. *Part of speech*: Sometimes readers resort to parts of the speech of unfamiliar words in attempts to make sense of them. Paying attention to the tenses of the verbs is also included in this category.

Categorisation of these strategies along with one or two examples of each strategy is presented in Table 1.

Table 1: Categories of strategy types used by students while reading a specialised text (ST) and a nonspecialised text (NST) along with the percentage of their frequency

Strategy type	Maths group		Psychology group		Examples	
	ST	NST	ST	NST		
General strategies	Guessing	8.85%	6.09%	7.36%	7.94%	I think it means that... It probably means...
	Self-knowledge	10.2%	8.30%	14.3%	10.3%	The text is really easy. I am just reading. I don't understand anything. Now I see what it means.
	Key words	0.98%	0%	1.52%	0.99%	I underline key words.
	Relation	26.9%	10.5%	16.8%	6.95%	On the first line, it is said that according to the traditional view, the disease is genetic. It refers to the comparison which has been made in the text.
	Skipping	0.65%	1.38%	1.52%	0.66%	I ignore this word here. I continue reading. I won't translate this part anymore. I continue reading.
	Knowledge of world	8.52%	4.15%	8.39%	4.30%	This physics theory about schizophrenia has been criticised for a long time.
	General idea	1.31%	0.55%	0%	0%	I first read the text to understand what it is all about. I must understand the general idea of the text first.
	Summarising	2.29%	0.83%	1.14%	1.32%	So far the text has been about Stability Theory and it compares it with another theory.
Local strategies	Dictionary use	8.52%	23.8%	13.4%	29.5%	I couldn't understand the text without dictionary. I will look this word up too.
	Paraphrasing	4.26%	2.77%	1.90%	0.99%	It means that it has problem with overloading the information. Brain is similar to a computer. Oh, yes, I got it! The brain of a schizophrenia is similar to a computer in terms of information load.
	Analysing words	2.29%	6.64%	2.29%	4.30%	'Congenital' is a combination of 'co' + 'genital' which means having the same genes.
	Enunciation	2.95%	8.86%	5.72%	8.60%	I made a wrong guess because I pronounced it wrong. At first, I thought it was "modern" but then I noticed it was 'modem'.
	Similarity	6.55%	11.8%	10.3%	8.27%	'Likely' is similar to 'like'. 'Psychiatrist' is something similar to 'psychology'.
	Rereading	13.8%	9.69%	14.5%	12.9%	I repeat it again. Well, I read this part again.
	Part of speech	1.96%	5.26%	0.76%	2.98%	'Advance' here is a verb. 'Concordance' is a noun.

Data analysis

The analysis of the think-aloud protocols based on Block's (1986) coding system revealed that the participants used fifteen strategies (Table 1). The think-aloud protocols were transcribed and 1230 propositions were generated. The raw data were coded and categorised into two main groups: general strategies and local strategies (Table 1).

The first and second research questions

The first and second research questions investigated the types and frequencies of comprehension strategies used by mathematics and psychology students while reading a specialised and a nonspecialised text in English. Table 2 shows a descending order of the types and percentage of reading comprehension strategies used by both groups while reading a specialised text of their own major and a specialised text of another major (the nonspecialised text).

Specialised text

As it could be seen in Table 2, both groups used the same kinds of strategies; however, their frequency and order varied depending on whether the text was specialised or nonspecialised. When the text was specialised, both groups mostly used relation, reading and self-knowledge strategies respectively. The next four strategies used in both groups while reading the specialised text were guessing, knowledge of word, dictionary use and similarity, though not exactly in the same order. Generally, almost 59.6% of the strategies used by math group while reading the specialised text were general strategies and about 40% were local strategies. Likewise, the sum of the general and local strategies used by psychology group for the specialised text was about 51.5% and 48.5% respectively. Therefore, both groups, on the whole, used general strategies like relation, self-knowledge and knowledge of world more than local strategies when the text was specialised and the students were familiar with in their own major. In this situation, part of speech, general idea, summarising, key word, skipping and analysing words were among the least used strategies in both groups.

Nonspecialised text

As Table 2 shows, while reading a nonspecialised text, both groups used a variety of strategies but in different orders and with different frequency. The first mostly used strategy in both groups was dictionary use, implying that they mostly focused on understanding the meaning of every single word to comprehend the text. After dictionary use, the maths group used similarity, relation, rereading, enunciation and self-knowledge more than other strategies. The psychology group also used these strategies after dictionary use but in a different order. They used rereading, self-knowledge, enunciation, similarity, guessing and relation. In both groups, key word, general idea, skipping, summarising, and paraphrasing were among the least used strategies, as it was almost the case while reading the specialised text.

Table 2: The order and percentage of strategies used by each group while reading the specialised and nonspecialised texts

Maths students				Psychology students			
Specialised text		Nonspecialised text		Specialised text		Nonspecialised text	
Relation	26.9%	Dictionary use	23.8%	Relation	16.8%	Dictionary use	29.5%
Rereading	13.8%	Similarity	11.8%	Rereading	14.5%	Rereading	12.9%
Self-knowledge	10.2%	Relation	10.5%	Self-knowledge	14.3%	Self-knowledge	10.3%
Guessing	8.85%	Rereading	9.69%	Dictionary use	13.4%	Enunciation	8.60%
Knowledge of world	8.52%	Enunciation	8.86%	Similarity	10.3%	Similarity	8.27%
Dictionary use	8.52%	Self-knowledge	8.30%	Knowledge of world	8.39%	Guessing	7.94%
Similarity	6.55%	Analysing word	6.64%	Guessing	7.36%	Relation	6.95%
Paraphrasing	4.26%	Guessing	6.09%	Enunciation	5.72%	Analysing words	4.30%
Enunciation	2.95%	Part of speech	5.26%	Analysing words	2.29%	Knowledge of world	4.30%
Summarising	2.29%	Knowledge of world	4.15%	Paraphrasing	1.90%	Part of speech	2.98%
Analysing words	2.29%	Paraphrasing	2.47%	Key word	1.52%	Summarising	1.32%
Part of speech	1.96%	Skipping	1.38%	Skipping	1.52%	Key word	0.99%
General idea	1.31%	Summarising	0.83%	Summarising	1.14%	Paraphrasing	0.99%
Key word	0.98%	General idea	0.55%	Part of speech	0.76%	Skipping	0.66%
Skipping	0.65%	Key word	0%	General idea	0%	General idea	0%
Sum of general strategies \approx 59.63%		Sum of general strategies \approx 31.82%		Sum of general strategies \approx 51.50%		Sum of general strategies \approx 32.5%	
Sum of local strategies \approx 40.30%		Sum of local strategies \approx 68.84%		Sum of local strategies \approx 48.5%		Sum of local strategies \approx 67.5%	

An interesting similar pattern found in both groups was that when the text was nonspecialised, the participants relied mostly on local strategies. The percentage of local strategies for maths and psychology groups were about 68.8% and 67.5% respectively, and they used 31.8% and 32.5% of general strategies respectively.

In order to develop a better understanding of the findings, the data were also manipulated and looked at from another perspective. The researchers examined the kinds and frequency of reading strategies used by the participants - regardless of their field of specialisation - while reading a specialised and a nonspecialised text. The results are shown in Table 3.

Table 3 shows a descending order of the frequency and percentage of the strategies used by the participants for reading a specialised and a nonspecialised text. When the text was specialised and the students were familiar with the topic of the text, relation was the strategy which was used the most. The other more frequent strategies for reading a

specialised text were reading, self-knowledge, dictionary use, knowledge of world, guessing and similarity. Overall, about 56% of the strategies used for a specialised text were general and about 44% were local.

Table 3: The order, frequency and percentage of strategies used by both groups whenever the text was specialised or nonspecialised

Specialised text			Nonspecialised text		
Strategy	Frequency	%	Strategy	Frequency	%
Relation	126	22.22%	Dictionary use	175	26.39%
Rereading	80	14.10%	Rereading	74	11.16%
Self-knowledge	68	11.99%	Similarity	65	9.80%
Dictionary use	61	10.75%	Self-knowledge	61	9.20%
Knowledge of world	48	8.46%	Relation	59	8.89%
Guessing	47	8.28%	Enunciation	58	8.74%
Similarity	47	8.28%	Guessing	46	6.93%
Enunciation	24	4.26%	Analysing words	37	5.58%
Paraphrasing	18	3.17%	Part of speech	28	4.22%
Analysing words	13	2.29%	World knowledge	28	4.22%
Summarising	10	1.76%	Paraphrasing	13	1.96%
Part of speech	8	1.41%	Summarising	7	1.05%
Keyword	7	1.23%	Skipping	7	1.05%
Skipping	6	1.05%	Keyword	3	0.45%
General idea	4	0.70%	General idea	2	0.30%
Total	567	100%	Total	663	100%

On the other hand, when the text was nonspecialised and the participants were not familiar with the topic, they relied mostly on dictionary use to find the meaning of every unfamiliar word. The other strategies after dictionary use were reread, similarity, self-knowledge, relation, enunciation, guessing and analysing words. Generally, of the strategies used when the text was nonspecialised, about 68% were local and 32% were general strategies.

In both circumstances, regardless of text specialisation, skipping, general idea, summarising and key word were among the least used strategies used by both groups

The third research question

Although the types of strategies used by both groups did not vary much, there were some differences in the way the participants used the strategies (Table 4). The maths group seemed to use greater number of strategies, although both groups did not differ in the kinds of strategies. In the maths group, relation was the strategy used the most, followed by dictionary use, rereading, similarity, guessing, knowledge of world and enunciation.

However, in the psychology group, dictionary use was much more frequent than other strategies followed by rereading, self-knowledge, relation, similarity, guessing, enunciation and knowledge of world. In fact, both groups used the same kinds of strategies in a similar

pattern, but they differed in the frequency with which they were used. In this study, general idea strategy was not used at all by psychology group. Moreover, the maths group used relation strategy much more than the psychology group. Dictionary use was among the most used strategies in both groups, and the least used strategies in both groups were key word, skipping, general idea and summarising.

Table 4: Total frequency and percentage of strategies used in each group while reading both specialised and nonspecialised texts

Maths group			Psychology group		
Strategy type	Frequency	%	Strategy type	Frequency	%
Relation	120	18.01%	Dictionary use	124	21.98%
Dictionary use	112	16.81%	Rereading	77	13.65%
Rereading	77	11.56%	Self-knowledge	68	12.05%
Self-knowledge	61	9.15%	Relation	65	11.52%
Similarity	60	9.00%	Similarity	52	9.21%
Guessing	49	7.35%	Guessing	44	7.80%
Knowledge of world	41	6.15%	Enunciation	41	7.26%
Enunciation	41	6.15%	Knowledge of world	35	6.20%
Analysing words	31	4.65%	Analysing words	19	3.36%
Part of speech	25	3.75%	Part of speech	11	1.95%
Paraphrasing	23	3.45%	Paraphrasing	8	1.41%
Summarising	10	1.50%	Summarising	7	1.24%
Skipping	7	1.05%	Keyword	7	1.24%
General idea	6	0.90%	Skipping	6	1.06%
Keyword	3	0.45%	General idea	0	0%
Total	666	100%	Total	564	100%

Interview analysis

In the interview conducted individually immediately after each think aloud session, maths students expressed that they had studied stability theory before in their specialised courses and that they were familiar with the topic and consequently could understand the text better; however, as to the nonspecialised topic, i.e. schizophrenia, they said that they had only heard the name and knew that it was a kind of mental disease, but they didn't know what exactly it was. In the same vein, psychology students were familiar with schizophrenia and had studied about it in their specialised courses, but they were not familiar with stability theory at all. Therefore, understanding the text on schizophrenia was much easier for them than understanding the text on stability theory.

Regarding the other question concerning the participants' familiarity with reading strategies and their uses in different circumstances, unfortunately none of the students knew what reading strategies were, let alone how to use them best and effectively in different circumstances. They said that, at school or university, they had never been explicitly taught about reading strategies and their uses, and the strategies they employed during think-aloud sessions had been developed through experience of learning English at school or university.

Comprehension tests analysis

Each reading passage was followed by four multiple choice questions. The questions tested text understanding, main idea, supporting details, logical relationships, author's intention and conclusion. As it was expected, although the "think-aloud" reports indicated that the subjects engaged in deep and complex thinking processes, the participants answered almost all the questions of their specialised major on the tests correctly, but about the unfamiliar text, they answered almost more than half of the questions wrongly.

Discussion

This study was designed to explore the strategies used by students majoring in two different fields of study, i.e. mathematics and psychology, while reading a specialised and a nonspecialised text. The data showed that the participants actively invoked a variety of strategies in order to understand academic materials. This study confirms the claim from the previous studies that L2 readers use a variety of strategies to facilitate their understanding of an L2 text.

The purpose of the first and second research questions was to determine the frequency and types of strategies used by mathematics and psychology students while reading a specialised and a nonspecialised text. The results revealed that strategies were used differently when the content was changed.

When the text was nonspecialised and unfamiliar, the participants focused on the meaning of words and they could hardly find the general meaning of the text as was evident from their poor performance on the questions following the nonspecialised text for each group. In fact, while reading a nonspecialised and unfamiliar text, the students tried to focus on the meaning of words by using strategies like dictionary use, analysing words and enunciation which according to Block (1986) are local strategies dealing with comprehension of words and sentences at the linguistic level, at the expense of contextual information and text analysis; they tried to check unfamiliar words in a dictionary or define the meaning of them according to the affixes or bases that had made them up, or tried to understand the meaning by enunciating the words either carefully or syllable by syllable.

On the other hand, when the text was specialised and familiar, the subjects related parts of the text more readily, paid less attention to the linguistic indicators of the text, and mostly relied on general strategies like relation, self-knowledge, knowledge of world and guessing, which according to Block (1986), are used in comprehension gathering. Therefore, they could understand the text better and as a result, answered almost all the follow-up questions correctly.

The results of this study are in line with the results of the studies conducted by Li and Munby (1996) and Adamson (1990, 1992) which concluded that academic strategies do not exist independently but that they relate to the particular content of reading. The participants were able to vary their reading strategies, especially the frequency of each

strategy in accordance with how well they understood their reading materials and how difficult the materials were. As Dhieb-Hania (2006) clearly stated, reading different types of materials calls for the use of different reading strategies.

The results of the present study showed that being familiar with the text, or in other words, having prior knowledge when reading a text, helped students to understand the text better and relate their prior knowledge to the text and consequently connect parts of the text together in a more effective manner. When subjects didn't have prior knowledge, they resorted mostly to a dictionary to understand the text, but what they were unaware of was that understanding every single word and finding its equivalent in their first language does not guarantee full comprehension (Ghavamnia et al., 2013). It might show that some other factors like background knowledge of the topic and being able to relate different parts of the text together may in effect have a vital role in comprehension. According to Brown (2001), having prior knowledge helps subjects to find relations in understanding parts of a text and consequently they will be able to anticipate what will come next. It was exactly the case in this study. When the participants read a text whose topic was familiar and had studied about before in their specialised courses, they mostly relied on relation to make sense of it.

In presenting the third research question, we were after more in-depth analysis and identification of similarities or differences among the two groups in regard to reading strategy use. The two groups in this study actively strove in trying to understand the texts by using a variety of different strategies but the way they used them was different. The maths group relied mostly on relation to understand the texts, but the psychology group relied mostly on dictionary use. So, the results are in line with Oxford and Nyiko's (1989) findings suggesting that field of specialisation is strongly related to language learners' choice of strategies. However, both groups did not use keyword, skipping, general idea and summarising extensively.

The two groups had some other features in common, as revealed through the interview. The students had never been introduced explicitly to what reading strategies are, and how they are to be used. Therefore, they couldn't use them systematically and effectively. The strategies they employed had been developed indirectly and unconsciously through their reading experience. This might be the reason why similar types of strategies were found in both groups. The similar types of strategies in both groups might also stem from the fact that the participants in the study had received similar literacy and foreign language education during school years and also at university.

Conclusion

The results of the current study revealed that L2 academic reading is a complex process in which readers actively apply a variety of strategies. The study also provided an account of the comprehension strategies employed by the participants in their L2 academic reading. In addition, the study confirmed Adamson's (1990, 1992) research findings that academic strategies do not exist independently, rather in relation to particular content reading. The

participants in this study varied their reading strategies according to how well they understood the material and how difficult the materials were.

According to Block (1986), in addition to knowledge of the product of reading, we need knowledge about the process of reading “if we are going to move from head-scratching to designing programs which truly meet the needs of the students” (p. 464). Strategies reveal the readers’ sources of comprehension, the way they approach a task, and the kinds of cues they attend to. They also reveal what the readers do when they cannot make sense of what they read (Block, 1986). Such knowledge and understanding can have implications for foreign language teaching. In order to train efficient and successful readers, teachers should teach strategies explicitly in a contextualised way and raise the students’ awareness of reading strategies and their applications. The results of the current study indicated what strategies the participants relied on more, and what strategies they used less. So based on the results, the teachers can decide in which areas of strategy use the students need more practice and instruction.

This study also revealed the importance of text familiarity and background knowledge in reading comprehension. The participants could understand the specialised English text of their field of study better. So, an important thing that teachers should pay attention to is the role of pre-reading activities. One of the activities that can be done before reading a text is introducing the text, to make it easier for students to understand it (Doff, 1988). This can serve two purposes: it helps “students in their reading by giving them some idea what to expect” and it increases “their interest and so make them want to read” (p.60). According to Doff (1988) this preparation could be in English or in the students’ own language. A more interesting way of introduction would be to have a short discussion on the topic to make students think about the topic (Doff, 1988).

No study is without limitations. Future research may examine the following to improve understanding of the importance of reading strategies. First, observing and recognising strategies is a challenging task, because strategic processing is driven by mental processes that do not often lend themselves to direct observation, consequently the researchers have to rely heavily on individuals’ own accounts (Tseng et al., 2006). Since none of the measurement methods is ideal (Chamot, 2005; Wigglesworth, 2005), we can only do the best we can for what we can get. There are many methods which can be used to elicit reading strategies (e.g., self-reports, behavioural protocols, interviews, questionnaires, comprehension tests, observing and think-aloud), but the decision to use a particular research instrument depends on the research budget, time frames and the purpose of a study. Considering these factors, in the present study, think-aloud, comprehension tests and interview were used to elicit information. Using more elicitation techniques simultaneously might enhance the validity of the study.

Second, the research was conducted on only two fields of study (mathematics and psychology). Future studies should include different fields of study in different branches (humanities, technical, engineering, art, for example). Third, both groups were at the same educational level. Further research may consider different levels of proficiency and education. Fourth, this study cannot be generalised to other educational settings as the

number of participants was relatively small. Moreover, the participants in the current study engaged in reading only one specialised and one nonspecialised English text. Giving multiple specialised and nonspecialised English texts to the participants would allow a more definite conclusion regarding the different reading strategies used while reading different English texts.

References

- Adamson, H. D. (1990). ESL students' use of academic skills in content courses. *English for Specific Purposes*, 9(1), 67-87. [https://doi.org/10.1016/0889-4906\(90\)90029-C](https://doi.org/10.1016/0889-4906(90)90029-C)
- Adamson, H. D. (1992). *Academic competence: Theory and classroom practice*. New York: Longman.
- Afflerbach, P. P. (1990a). The influence of prior knowledge and text genre on readers' prediction strategies. *Journal of Reading Behavior*, 22(2), 131-148. <https://doi.org/10.1080/10862969009547700>
- Afflerbach, P. P. (1990b). The influence of prior knowledge on expert readers' main idea construction strategies. *Reading Research Quarterly*, 25(1), 31-46. <https://doi.org/10.2307/747986>
- Anderson, N. J. (2005). L2 learning strategies. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 757-771). Mahwah, New Jersey: Lawrence Erlbaum.
- Bernhardt, E. B. (2005). Progress and procrastination in second language reading. *Annual Review of Applied Linguistics*, 25, 133-150. <https://doi.org/10.1017/S0267190505000073>
- Block, E. (1986). The comprehension strategies of second language readers. *TESOL Quarterly*, 20(3), 463-494. <https://doi.org/10.2307/3586295>
- Block, E. (1992). See how they read: Comprehension monitoring of LI and L2 readers. *TESOL Quarterly*, 26(2), 319-343. <https://doi.org/10.2307/3587008>
- Brown, H. D. (2001). *Teaching by principles: An interactive approach to language pedagogy*. New York: Longman.
- Chamot, A. U. (2005). Language learning strategy instruction: Current issues and research. *Annual Review of Applied Linguistics*, 25, 112-130. <https://doi.org/10.1017/S0267190505000061>
- Cohen, A. D. (1987). Using verbal reports in research on language learning. In C. Faerch & G. Kasper (Eds.), *Introspection in second language research* (pp. 82-95). Clevedon: Multilingual Matters.
- Cohen, A. D. (1990). *Language learning: Insights for learners, teachers, and researchers*. New York: Newbury House.
- Cohen, A. D. & Scott, K. (1996). A synthesis of approaches to assessing language learning strategies. In R. L. Oxford (Ed.), *Language learning strategies around the world: Cross cultural perspectives* (pp. 89-102). US: Second Language Teaching and Curriculum Center, University of Hawaii at Manoa. <http://nflrc.hawaii.edu/publications/view/TR13/>
- Dhieb-Hania, N. (2006). Applying metacognitive strategies to skimming research articles in an ESP context. *English Teaching Forum*, 44(1), 2-7. <https://eric.ed.gov/?id=EJ1107897>

- Doff, A. (1988). *Teach English: A training course for teachers*. New York: Cambridge University Press.
- Flavell, J. H. (1987). Speculations about the nature and development of metacognition. In F. E. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 21-29). Hillsdale, NJ: Lawrence Erlbaum.
- Garner, R. (1987). *Metacognition and reading comprehension*. Norwood, NJ: Ablex.
- Ghavamnia, M., Ketabi, S. & Tavakoli, M. (2013). L2 reading strategies used by Iranian EFL learners: a think-aloud study. *Reading Psychology*, 34(4), 355-378. <https://doi.org/10.1080/02702711.2011.640097>
- Grabe, W. (1991). Current developments in second language reading research. *TESOL Quarterly*, 25(3), 375-406. <https://doi.org/10.2307/3586977>
- Katalin, E. (2002) "Please keep talking!": The think aloud method in second language reading research. *Novelty*, 7(3). <http://deal.elte.hu/pages/novelty/htm2/vol73/elekes.htm>
- Li, S. & Munby, H. (1996). Metacognitive strategies in second language academic reading: A qualitative investigation. *English for Specific Purposes*, 15(3), 199-216. [https://doi.org/10.1016/0889-4906\(96\)00004-X](https://doi.org/10.1016/0889-4906(96)00004-X)
- Macaro, E. & Erler, L. (2008). Raising the achievement of young-beginner readers of French through strategy instruction. *Applied Linguistics*, 29(1), 90-119. <https://doi.org/10.1093/applin/amm023>
- Oxford, R. & Nyikos, M. (1989). Variables affecting choice of language learning strategies by university students. *The Modern Language Journal*, 73(2), 291-300. <https://doi.org/10.1111/j.1540-4781.1989.tb06367.x>
- Oxford, R. L. (2002). Language learning strategies in a nutshell, update and ESL suggestions. In J. C. Richards & W. A. Renandya (Eds.), *Methodology in language teaching: An anthology of current practice* (pp. 124-132). New York: Cambridge University Press.
- Rosenblatt, L. M. (1994). *The reader, the text, the poem: The transactional theory of literary work*. Carbondale: Southern Illinois University Press.
- Saville-Troike, M. (2006). Social contexts of second language acquisition: In *Introducing second language acquisition*, Ch 5, pp. 99-132. Cambridge, UK: Cambridge University Press. <https://doi.org/10.1017/CBO9780511808838.006>
- Shmais, W.A. (2002). Identifying the metacognitive reading strategies of Arab university students: A case study. *An-Najah University Journal for Research (Humanities)*, 16(2), 633-661. https://journals.najah.edu/media/journals/full_texts/identifying-metacognitive-reading-strategies-arab-university-students-case-study.pdf
- Sheorey, R. & Mokhtari, K. (2001). Differences in the metacognitive awareness of reading strategies among native and non-native readers. *System*, 29(4), 431-449. [https://doi.org/10.1016/S0346-251X\(01\)00039-2](https://doi.org/10.1016/S0346-251X(01)00039-2)
- Tseng, W., Dornyei, Z. & Schmitt, N. (2006). A new approach to assessing strategic learning: The case of self-regulation in vocabulary acquisition. *Applied Linguistics*, 27(1), 78-102. <https://doi.org/10.1093/applin/ami046>
- Vaezi, S. (1995). *The relationship between intelligence and EFL reading comprehension*. Unpublished MA thesis, Tehran University, Iran.
- Widdowson, H. G. (1984). *Explorations in applied linguistics*. Oxford: Oxford University Press.

- Wigglesworth, G. (2005). Current approaches to researching second language learner processes. *Annual Review of Applied Linguistics*, 25, 98-111.
<https://doi.org/10.1017/S026719050500005X>
- Wilson, K. & Davis, B. (1994). *Redesigning education*. New York: Henry Holt & Co.

Dr Esmail Zare Behtash is an associate professor in the Department of English, Chabahar Maritime University, Iran. His main research interests are teaching and learning English, translation and English literature.
Email: behtash@cmu.ac.ir

Akram Barabadi holds a Masters degree in TEFL. She is keenly interested in conducting research on reading strategies, especially cognitive and metacognitive strategies.
Email: akrambarabadi@yahoo.com

Zahra Eskandari (corresponding author) is an EFL teacher and a PhD candidate in TEFL at Chabahar Maritime university, Iran. Her research areas include language teaching and learning in general and teaching and learning vocabulary, in particular reading strategies and psycholinguistics.
Email: eskandari62@gmail.com

Please cite as: Behtash, E. Z., Barabadi, A. & Eskandari, Z. (2019). Reading comprehension strategies used by Iranian university students while reading academic English texts. *Issues in Educational Research*, 29(4), 1089-1106.
<http://www.iier.org.au/iier29/behtash.pdf>