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The Impact of Teaching Procedural Metamemory Strategies on EFL Learners' Reading Comprehension

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ABSTRACT

Metamemory refers to a person's knowledge about the contents and regulation of memory. It plays an important role in planning, allocation of cognitive resources, strategy selection, comprehension monitoring, and evaluation of performance. These are two main structural components of metamemory-declarative knowledge, which enables a person to evaluate the contents of memory, and procedural knowledge, which enables a person to monitor and regulate memory performance. The concern of this study was to investigate whether teaching procedural metamemory strategies has any effect on reading comprehension of EFL learners. Sixty female intermediate Iranian EFL students, chosen from among 100 students based on their scores on an English proficiency test were randomly assigned to an experimental and a control group. In an instructional period, the experimental group received the treatment; that was instruction and practice on procedural metamemory strategies, and the control group received a placebo, that was a routine practice of reading comprehension. Finally the two groups' performances on a reading comprehension posttest were compared using a t-test, the result of which revealed that the treatment had a significant effect on the learners' reading comprehension. The proposed null hypothesis of the study was, thus, rejected.

Keywords: Metamemory, Metamemory strategies, Procedural metamemory strategies, Reading comprehension,

Introduction

The major aim of teaching a second or forign language is communication. This goal is achieved through listening, speaking, writing, and reading skills (Chamot, 2005).

One of the most important skills learned in schools, as a means of communication, is reading because it is an interactive process which depends on multiple sub skills and an enormous amount of coded information (Mclaughlin, 1987, as cited in Celce-Murcia, 1991). It is also affected by relevant background knowledge and reading strategies (Cohen, 1998). Snow (2002) defines reading comprehension as a process of simultaneously extracting and constructing meaning through interaction and involvement with the written language"(p. 11). Nuttal (1996) defines reading as a process of communication. Reading is defined as "transfer of meaning from mind to mind, writer to reader" (p.3). According to Johnston (1983, as cited in Carrell, 1985), reading comprehension is a complex behavior involving conscious and unconscious use of various strategies to build a model of the meaning which the writer is assumed to have intended. Most of this model must be inferred, since text can never be fully explicit.

Researchers and educators have taken time to address difficulties with reading and have sug-

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gested a variety of awareness to develop efficient reading skills (Meece, 2002). Englert (2001) confirms that one area of difficulty in reading is lack of awareness of appropriate strategies due to limited metacognitive knowledge. Skilled readers are more sophisticated in their use of cognitive strategies than their less skilled peers (Pressley & Afflerbach, 1995). Feng and Mokhtari (1998) state that: "reading is a complex process in which competent readers orchestrate a number of knowledge sources using a variety of strategies to comprehend what they read"(p .19). The ability

to regulate the use of such strategies is due to metacognitive abilies. It has also been argued that the awareness of strategies and other variables in learning might have positive influence on learners' performance (Cohen, 1998).

Recent research suggests a potential link between metacognitive strategies, and reading performance (Devine, 1993). In fact, the majority of the studies conducted on reading focus on the product of reading, that is, the decoding of words or the comprehension of texts rather than its process (Carpenter, 1987). However, a number of researchers have more recently focused their attention on the underlying aspect of reading, namely its process (e.g, Carpenter, 1987; Hasselhorn, 1991; Whitney, 1991).

Metacognition is an active process of knowing, or being acutely aware of one's cognitive state with the ability to make appropriate adjustments to performance when needed (Linvingston, 1997). And, metamemory, as one of the subcategories of metacognition, has gained a particular, and at the same time, controversial status. Originally, Flavell (1971) used the term metamemory to denote knowledge of memory. It is cognitively interwoven with reflection-the "active process of exploring events or issues and accompanying thoughts and emotions" (Kerka, 2002, p. 2). Given that reflection plays an important role in determining the effectiveness of learning (Daniels, 2002), EFL teachers should incorporate into their teaching those activities that promote reflective practices along with the development of language per se.

Metamemory refers to the learner's awareness of strategies which are used and should be used for certain tasks. It includes knowledge about memory systems and memory strategies. It is an active process of knowing, or being acutely aware of one's cognitive state with the ability to make appropriate adjustments to performance learning, monitoring of comprehension or production while it is taking place and self-evaluation of learning after the language activity is completed (p.560). Declarative knowledge includes knowledge about oneself as a learner and about factors influencing one's performance. For example, research investigating metamemory (i.e., knowledge about memorial processes) indicates that adults have more knowledge than children about the cognitive processes associated with memory (Baker, 1989).

Research indicates that young students and novice learners have difficulty accurately estimating their comprehension and that metamemory strategy instruction should focus on specific strategic knowledge. This may include knowing when, where, and how to use strategies (Chamot, 2005).

Metamemory plays an important role in reading comprehension. Research on metamemory has revealed that less proficient learners do not recognize the purpose of reading and tend to focus on word-by-word reading rather than reading for meaning (Di Vesta, Hayward, & Orlando, 1979). Pressley, Borkowski, and Schneider (1987) concluded that since metamemory strategies are potentially conscious and potentially controllable, learners with good meta-cognition are able to monitor and direct their own learning processes quite efficiently. In particular, skilled readers are more sophisticated in their use of cognitive strategies than their less skilled peers (Pressley & Afflerbach, 1995).

Richards (1999) suggests that the goal for learning metamemory strategies in reading should be to increase automaticity of skills and the use of specific strategies, and metamemory deals with cognitive self-knowledge, that is, what individuals know about their own thinking (Kellogg, 1994). Metamemory skills in reading require students to think reflectively about their own thinking in relation to a given reading passage. Devine (1993) points out that there are data that suggest "metamemory variables play an even more important role than linguistic competence in successful reading" (p.116).

With regard to the importance of teaching metamemory strategies, it has been suggested that somewhere in the curriculum, teachers model the effective use of metamemory strategies, especially procedural metamemory strategies, and their usefulness in the process of EFL reading comprehension (Chamot, 2005). Hence, the purpose

of the current study was to examine the effect of teaching procedural metamemory strategies on reading comprehension of intermediate Iranian EFL learners.

Research Question To fulfill the above-mentioned purpose of this study, the following question was raised:

Q: Does teaching procedural metamemory strategies have any significant impact on EFL learners' reading comprehension?

Method

Participants

The study was carried out on 60 female intermediate Iranian EFL learners selected from among 100 participants, at the age of 22-28 in Kish language institute. All of the students were already considered as intermediate learners as they had all passed the elementary level of the institute.

To come up with a homogeneous group of participants, 100 female intermediate English language learners at Kish Language School took an IELTS proficiency test, consisting of reading comprehension and writing parts. Among the participants those who scored one standard deviation above and below the estimated mean were selected as the participants of the study. The 60 selected participants were divided randomly into two different groups of control and experimental, each consisting of 30 students.

Also 30 participants, with similar characteristics to the target sample, were given the IELTS test to run an item analysis and estimate the reliability of the test at the pilot stage.

Instrumentation

In order to come up with a satisfactory answer to the research question, the researchers applied two sets of materials (tests, and instructional materials); firstly, for the purpose of measuring participants' general reading proficiency prior to the instructions and secondly, for the instruction procedure. The descriptions of both are as follows:

Tests

In order to realize if teaching procedural metamemory strategies had any significant effect on participants' reading comprehension, the researcher applied two sets of tests. IELTS Test (General Module) and PET test (post-test)

The IELTS Proficiency Test was used in this study to come up with a homogeneous group of participants regarding their general language proficiency including their reading comprehension, which was the dependent variable of the study and writing. The test as used in this investigation consisted of two subtests; reading comprehension including 40 items and writing including 2 tasks.

Following the item analysis after piloting the test and omitting the malfunctioning items, the reading comprehension part remained consisted of 36 items. The allotted time for the test was 90 minutes.

Moreover, the reliability of the aforementioned test was calculated using KR-21 before and after the item analysis. The reliability indices were 0.77 and 0.82 respectively.

A PET reading comprehension test was also administered to the participants of both control and experimental groups to measure their reading comprehension at the end of the instructional period.

Prior to the main administration, the test was piloted on 30 students to make sure about the reliability and appropriate item characteristics thereof. The reliability turned out to be 0.71.

Instructional Materials

In this study, the researchers designed some procedural metamemory instructions and implemented them throughout the whole semester and infused the instruction along with covering the text book.

The researchers taught procedural metamemory strategies to the experimental group while the main purpose was still following and teaching the materials in the course book. It is worth mentioning that the book Total English-Intermediate with communicative based approach to language learning was used as the material for this study. The book has 10 units each consisting of 3 lessons on the four skills.

Procedure

To conduct the research and verify the research hypothesis, the following steps were taken:

After having homogenized students explained above, they were divided into two different groups of control and experimental on a random basis, each containing 30 participants. The control group received no treatment, but the experimental group received instructions on the use of

procedural metamemory strategies in 10 sessions each lasting for 1 hour and 30 minutes. In each session 20-30 minutes was devoted to the treatment.

The treatment was explicit instruction of procedural metamemory strategies including not only drawing students' attention solely to learning the language, but also to procedural metamemory strategies to help students plan, control, and evaluate their learning.

In the first session of the treatment, the researchers talked about metamemory strategies in details and explained to the students that these strategies were going to be covered during the term. In the second session, the researchers modeled and explained the first strategy (preparing and planning for learning) for 30 minutes with practicing the strategy.

According to the experience of the researchers it was difficult for students to become self-directed when learning was planned and monitored by someone else. Therefore, students must assume increasing responsibility for planning and regulating their own learning. Therefore students were taught to set up their learning goals and make plans for learning tasks. For example, they had to know that they were going to understand the text in terms of the component linguistic elements to become able to comprehend the general message of the text.

They practiced planning their time and their needs in learning. For example, they read the passage in a limited amount of time (15 minutes), and they were supposed to make plans for their reading comprehension and consider the points which would help them to improve their reading ability. (e.g.: read the text, paragraph by paragraph, focusing on keywords in the passage, underlining, focusing on the topic sentences, reading the questions before the text,….)

The next session, the focus was on the second strategy (selecting and using learning strategies). Students were asked to think and make conscious decisions about the appropriate learning strategies to be used when solving learning tasks.

They were provided with clear explanation (explicit instructions) about these strategies (meaning guessing, skimming, and scanning, as well as inferential and referential clues in reading passages) and when to use them. However, the researchers had to make it clear to students that no single strategy could work in every instance; hence, students had to know how to choose the strategy that had the best chance of success in a given situation.there fore they were taught about the strategies and learned to choose the best answer according to their learning strategies. Also the researchers modeled the strategies.

The fourth session was dedicated to practicing the first and the second strategies for 20 minutes. The fifth session was dedicated to the third strategy (monitoring strategy use). Once students had begun using the selected strategies, they had to ask themselves whether or not they were really using the strategies. They had to learn to monitor their use of these strategies by pausing occasionally while reading and asking themselves questions about what they were doing. Hence, they were provided with opportunities of practice and self-evaluation. For example, they were asked to pause while reading and review what they had read. Also they asked themselves questions about their comprehension.Like: what happened until here in the text?, Who has said that?, Where did the text happen?, Who is the doer?, What is the main idea of the passage?, etc., The next session, students practiced the first, second, and the third strategies all together with the help of the teacher. The students practiced for 20 minutes, and the researchers collected the answers and the students were provided with feedbacks.

In the seventh session, the fourth strategy (evaluating ones own learning) was presented to the students and they practiced the strategy. They were encouraged to evaluate whether or not what they were doing was really effective. By so doing, they were actively engaged in metamemory strategies.

To evaluate the outcome of their learning, Anderson (2002, p. 3) suggested that teachers have students respond thoughtfully to the following questions: "(1) what am I trying to accomplish? (2) What strategies am I using? (3) How well am I using them? (4) What is the outcome? (5) What else could I do?" this , the following question were answered by the students.

-Before reading question: what am I trying to accomplish?

-While-reading question: what strategies am I using?

-After reading question: how well am I using the strategies? What is the outcome? What else could I do?

For the last three sessions, they repeated the strategies and practiced them on different given

passages for 30 minutes. They were also provided with the teacher's feedback.

Meanwhile, the typical method of teaching reading was followed in the control group. The focus was just on the language, as the routine approach toward reading comprehension, with no attention to metamemory strategies. The passage was taught to them by brain storming and eliciting the new vocabulary and then they answered the reading comprehension questions. Based on a communicative approach to language learning, the reading practice started with a warm-up on the related topic with the collaboration of the learners, and gradually was narrowed down to the details of the topic of the specific reading text. Then, each paragraph was read and paraphrased by the teacher before going to the next paragraph. As post reading activities, they answered the comprehension check questions following the text.

Prior to the end of the semester, the researchers developed a PET reading comprehension test with 35 items. Before the main administration of the test and for the purpose of determining its suitability, the researchers tried out the newly developed test with a sample of 30 participants at Kish Language School. Subsequently, the test's internal consistency (0.71), IF, and ID were calculated.

At the end of the treatment period, the participants in the experimental as well as control group were given the modified reading comprehension posttest. At the end, the obtained data was analyzed to test the proposed null hypothesis of the study.

Results

Piloting the IELTS test

The purpose behind piloting was to examine the test's reliability and discarding the malfunctioning items. There fore, descriptive statistics for the proficiency test was calculated. In order to check the reliability of the reading subtest, the KR-21 was used and for the writing tasks, the inter-rater reliability of the items were calculated. Two raters scored the papers. In order to calculate the correlation between the two raters' scores, hence the inter-rater reliability, the researchers had to check the normality of the distributions of each set of scores. Table1 below shows the result.

Table 1: Descriptive Statistics of Scores Given by the Two Raters

Test	M	Median	Mode	SD	Variance	Skewness	Standard error of skewness	Skewness ratio
Writing rater 1	6.0	6.00	6.00	.655	.430	-.229	.427	-.53
Writing rater 2	6.10	6.50	6.50	.674	.455	-.661	.427	-.1.54

As the table shows, the ratios of the skewness (statistic divided by their respective standard errors) are both within the range of plus and minus 1.96. Thus, both sets of scores enjoy a normal distribution. Figures1 and 2 show the distributions of the two raters' scores in writing.

As it is visually demonstrated in figures 1 and 2, the two raters' writing scores enjoyed a normal distribution. In order to check the reliability of the writing parts or the internal consistency between the two raters, Pearson correlation was calculated on the scores given by the raters. Table 2 below shows the result.

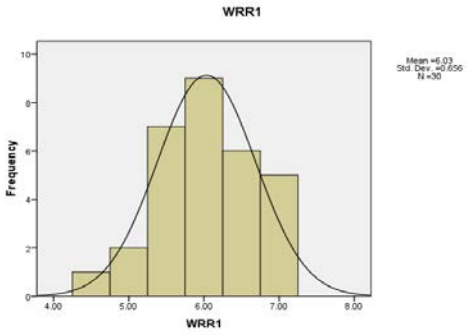

Figure 1: Histogram Representing the Distribution of the Writing Scores (Rater 1)

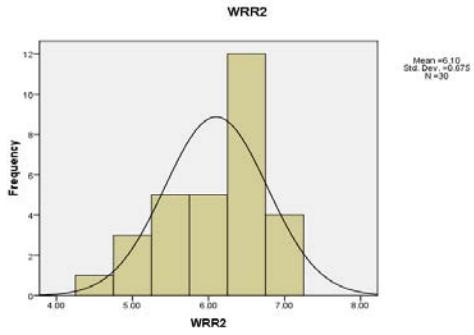

Figure 2: Histogram Representing the Distribution of the Writing Scores (Rater 2)

As the table depicts, the correlation between the scores given by the two raters turned out to be significant (r= 0.713,p=.000< 0.05). Therefore, the researchers felt safe to use an average of the scores as the final writing scores. For the purpose of checking the reliability of the English proficiency test at the piloting stage, descriptive statistics were run and the reliability coefficient was estimated. Table 3 below demonstrates the output.

As shown in Table, the reliability coefficient turned out to be 0.82 which ensured the researchers that they could use the test safely for screening the participants. After performing item analysis on the test, it was administered to 100 students to select the target sample from. Table 4 presents the descriptive statistics of the scores.

Then, 60 students who scored one standard deviation below and above the mean (26.7) were selected. Figure 3 represents the distribution of scores of the main administration of the proficiency test.

The Results of Piloting the Reading Comprehension Posttest

A PET reading comprehension test, intended to be used as the post test, was piloted on 30 participants.

Table 5 below displays the descriptive statistics for the test at the pilot stage.

As it is shown in the above Table5, the descriptive statistics and the reliability (r=0.71) of the test were calculated and it was concluded that the test was a reliable one.Then the post-test was administered to both control and experimental groups in order to explore the probable differences between the mean scores of the two groups. However, prior to running the t-test, the normality of the distribution of scores obtained by participants in both experimental and control groups was checked. Tables 6 shows in the descriptive statistics of the control and experimental groups in the post test.

Table 2: Inter-Rater Reliability

		WRR2
WRR1	*Pearson Correlation*	*.713***
	Sig. (2-tailed)	*.000*
	N	*30*

***. Correlation is significant at the 0.01 level (2-tailed).*

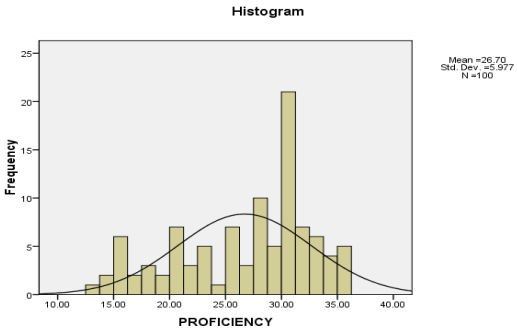

Figure 3: Histogram Representing the Scores of Proficiency Test (Main Administration)

Table 3:Descriptive Statistics and Reliability of the Proficiency Test (Pilot Stage)

Test	Mean	Median	Mode	SD	Variance	KR-21	skweness	Standard error of skewness	N
Proficiency	26.9500	28.0000	29.00	3.60590	13.003	.82	-1.325	.241	30

Table4: Descriptive Statistics of Proficiency Test (Main Administration)

Test	Mean	Median	Mode	SD	Variance	KR-21	skweness	Standard error of skewness	N
Proficiency	26.7000	28.0000	28.00	5.97723	35.727	.77	-.650	.241	100

Table5: Descriptive Statistics of the Post Test, Piloting Stage

Test	Mean	Median	Mode	SD	Variance	KR-21	skweness	SD of skewness	N
Post test	25.53	25.00	25.00[a]	5.513	30.39	.71	-.054	.427	30

Table6: Descriptive Statistics of Post Test Scores (Experimental Group)

Post Test	Mean	SD	Variance	SEM	Skweness statistic	SD of skewness	N
Experimental group	30.76	1.794	10.168	.327	-.726	.427	30

As the skewness ratio (0.726/ 0.427=1.70) is within the normality range of plus and minus 1.96, the normal distribution of the scores obtained by the experimental group is guaranteed.The following figure shows the normal distribution of scores of the experimental group on the post test.

Table 7 shows the descriptive statistics of the scores obtained by the control group.

The skewness ratio (0.736 /0.427= 1.72) also fell within the normality range (+/- 1.96), hence, the normal distribution of the scores obtained by the control group. Figure 5 demonstrates visually the distribution of scores of the control group on the post test.

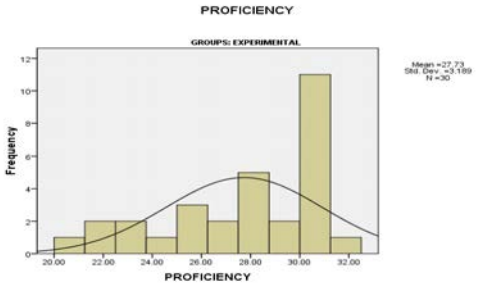

Figure 4: Histogram of the Distribution of Experimental Group's Scores (PostTtest)

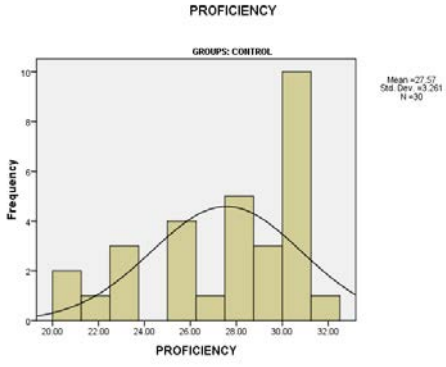

Figure 5: Histogram of the Normal Distribution of Control Group Scores (Post Test)

In order to check whether metamemory strategies had any significant impact on the reading comprehension of the learners, a post test on reading comprehension was administered to the experimental and the control groups. Table 8 shows the descriptive statistics thereof:

As shown in Table 8, the mean scores for the experimental and control groups turned out to be 30.76 and 28.60 respectively. The following bar graph offers a visual comparison between the mean scores of the two groups on the post test.

As the graph above shows, the experimental group obtained a higher mean score compared with the control group. However, to see if the difference was significant or not and to test the proposed null hypothesis stating that instruction of procedural metamemory strategies does not have any significant effect on EFL learners' reading comprehension, a t-test was run.

As the first assumption for a t-test was met, the second assumption had to be checked to legitimize running a t-test. Table 9 reports the Levene's test for homogeneity of variances, as well as the result of the t-test.

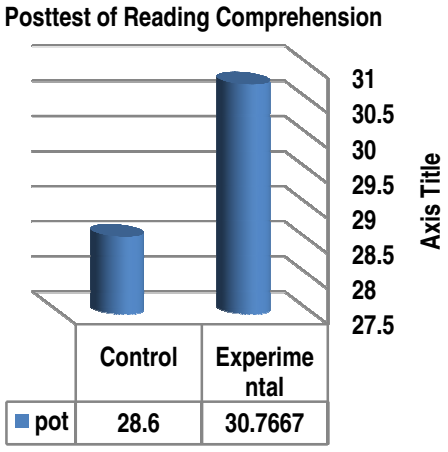

Figure 6: Bar Graph Representing the Mean Scores of the Two Groups on the Post Test

Table7:Descriptive Statistics of Post Test (Control Group)

Post Test	Mean	SD	Variance	SEM	Skweness statistic	Standard error of skewness	N
Control group	28.60	1.476	10.63	.26952	-.736	.427	30

Table 8: Descriptive Statistics of Post Test (Exp & Con groups)

Group	N	Mean	SD	Std. Error Mean
Experimental	30	30.76	1.794	.327
Control	30	28.60	1.476	.269

Table 9:T-Test for Experimental and Control Group

	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	1.4	.231	5.1	58	.000	2.16	.42	1.31	3.01
Equal variances not assumed			5.1	55.9	.000	2.16	.42	1.31	3.01

As shown in the above Table 2, the variances of the two sets of scores were homogeneous (F= 1.46, *p*= 0.231> 0.05). Hence, the second assumption for a t-test was also met. The data above illustrate also that the difference between the means of scores is significant (t= 5.107, *p*= 0.000 <0.05).

Based on these results, it can be concluded that there was a significant difference between the mean scores of the experimental and control groups on the posttest of reading comprehension. Thus, the null-hypothesis stating that teaching procedural meta-memory strategies does not have any significant impact on EFL learners' reading comprehension is rejected.

Conclusion and Discussion

Rivers (1981) considers reading as the most important activity in any language class. But the problem is that a deep comprehension of a written text always brings up some challenges on the readers. As Snow (2002) puts it, writers cannot possibly make all the information explicit in the text and it is much relied on the readers to make necessary inferences in each case. This means that different strategies for reading should have important application in the reading process.

The purpose of this study was to investigate the effect of teaching procedural metamemory strategies on reading comprehension of intermediate EFL learners.

After assigning 60 students to experimental and control groups, and providing them with the treatment and placebo, respectively, their mean scores on a reading comprehension post test were compared via a t-test. By virtue of their mean scores on the post test (the experimental group outperforming the control group) and the fact that they were checked to be homogenized regarding their reading comprehension ability before the intervention, the researchers could conclude that the independent variable (instruction of procedural metamemory strategies), had a significant effect on the reading comprehension of the students. In other words, it seemed logical to conclude that the treatment caused the difference between the two groups on the post test.

The finding of this study has revealed that EFL learners' reading comprehension ability increases with implementing procedural metamemory strategies.

Researchers have shown that metamemory affects learning in many ways especially with respect to the efficient use of limited cognitive resources, strategy use, and comprehension monitoring. They reveal that procedural knowledge enables learners to use available resources more efficiently because they are better able to plan, sequence, and monitor learning tasks (Cross & Paris, 1988; Brown & Palincsar, 1989).

The present researchers speculate that the outcome of the study is due to the fact that metamemory strategies changed the learners from passive learners to active ones collaborating with their teacher in the process of comprehending a reading passage. The instructions also helped learners to be aware of the strategies that they used in their reading comprehension as well as their memory process of reading comprehension, and this may explain the outperformance of the experimental group. The instructions led the learners to choose the best strategy to benefit from their time limit and to use the available resources more efficiently and to monitor themselves through the reading comprehension process, as Brown et al. (1983) argue that metamemory monitoring and regulation processes play a large role in complex cognitive tasks such as comprehending

and memorizing text materials.

Teacher trainers should make teachers aware of procedural metamemory instructions and provide them with enough information for their usefulness in EFL domain. Also, it is recommended to design a teacher's guide with the focus on the instruction of procedural metamemory strategies.

The findings of this research can also help syllabus designers and textbook writers to design more effective textbooks for the use of procedural metamemory strategies. Based on the present finding, it is recommended that effective reading instruction be based on an understanding of students' metamemory knowledge and be directed toward helping students to develop their cognitive models.

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