The Effect of Cognitive and Metacognitive Strategy-based Grammar Instruction on Intermediate Iranian EFL Learners' Development of Structural Knowledge

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The Effect of Cognitive and Metacognitive Strategy-based Grammar Instruction on Intermediate Iranian EFL Learners' Development of Structural Knowledge

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Abstract

This research focuses on explicit instruction of cognitive and metacognitive strategies while teaching grammar to reveal how effective strategy instruction is in the development of structural knowledge. Through the cluster sampling, 66 participants, who met the expected score, took part in this study. Before and after receiving instruction lasting 10 sessions each with the duration of 1.30 hours, the two cognitive and metacognitive groups received Purpura's (1999) cognitive and metacognitive questionnaires respectively. The results of data analysis indicated that cognitive instruction does not affect the learners' development of structural knowledge while metacognitive one makes a significantly progress in the development of structural knowledge. The analysis of the questionnaires revealed that both cognitive and metacognitive instruction is effective in the learners' strategy use.

Introduction

According to many researches (e.g. Swan, 2002; Larsen-Freeman, 2001a; Frodesen, 2001; Fotos, 2001; Achard, 2008), it seems that the answer to the question "Should teachers instruct grammar" is "Yes". Because it seems that "grammar is an integral part of language use; it is a resource to be accessed for effective communication, nor just an isolated body of knowledge" Frodesen (2001, p. 234). Of course, it should not be rejected that the system of teaching grammar requires some changes (Larsen-Freeman, 2001b). In other words, any way of teaching grammar is not welcomed, but a way which has any connection with neither the memorization of a tedious set of rules, nor only the focus on correcting the grammatical errors in a sentence (Frodesen, 2001). Therefore, grammar should be taught in a way that students find it more interesting and useful so that it leads learners to the development of their structural knowledge.

Williams and Burden (1997) suggested that EFL learners should be aware of the process of their learning, that is, the comprehension of both what is learned and why it should be learned. Cohen (1998) also pointed out that knowledge of how to learn a foreign language is enhanced if instruction of content is accompanied with strategy training. Then, the answer to the question "How do we go about teaching grammar items in the most effective way?" can be "Through teaching different strategies." Larsen-Freeman (2001a, p. 40) also pointed out that "since grammar is complex, and students' learning styles vary, learning grammar is not likely to be accomplished through a single means." It seems that learning different strategies can affect learning grammar so that Fotos (2001, p. 280) stated that "no cognitive model of second/foreign language grammar learning would be complete without considering strategies."

The purpose of this study was to investigate the effect of cognitive and metacognitive strategy-based grammar instruction on the development of structural knowledge of intermediate EFL learners. In other words, whether or not both cognitive and metacognitive strategy-based grammar instruction can affect the development of structural knowledge of intermediate EFL learners. Also, another concern of this research was to indicate how effective cognitive and metacognitive strategy-based instruction was, after the treatment was completed. That is, whether or not cognitive and metacognitive strategy-based instruction can lead the learners to strategy use.

Method

Participants

90 learners were randomly chosen from among the freshmen of Islamic Azad University of South Tehran Branch, who were studying English Translation Studies. The participants were either male or female learners who had registered for the "grammar" course at university and they were between the ages of 18 and 34. The cluster sampling was used to select and specify the number of students required to carry out the experiment, that is, the procedure of selection of participants started with randomizing the larger groups and moved toward smaller ones. Sixty six participants, who met the expected score in both TOEFL (2003) and the grammar sub-test of the same TOEFL, took part in this study. They were divided into three groups. Each group consisted of twenty two learners.

Instruments

The instruments used in this study included the 2003 and 2005 versions of TOEFL both in a Paper-based format, a 1999 English version of Cognitive Strategy Questionnaire by Item Type (CSQIT), a 1999 English version of Metacognitive Strategy Questionnaire by Item Type

(MSQIT), and a Persian translation of each questionnaire. Furthermore, these two questionnaires were drown from Purpura's (1999) work on pages 219-221 for the cognitive questionnaire and on pages 224-226 for the metacognitive questionnaire. The validity and the reliability of both questionnaires were also estimated by Purpura (1999).

Design and Procedure

This quasi-scientific research was performed during twelve weeks; therefore students of three classes of Islamic Azad University of South Tehran Branch participated in this research for twelve sessions.

In the first session, the 2003 version of the TOEFL for eighty minutes was administered. On the one hand, the cognitive strategy-based grammar in one class during ten sessions was taught and on the other hand, metacognitive strategy-based grammar instruction of the same grammatical points in the second class during the remaining ten sessions was applied.

After the administration of the 2003 version of TOEFL, learners who gained one standard deviation above and below the mean were selected. The performance of the learners on the *"structure and written expression"* section of the same TOEFL was also evaluated separately.

When the sample was selected, the 66 learners of these three classes were divided randomly into 3 groups in terms of the class that they had registered for. One of the groups, as the control group, received non-strategy-based instruction i.e. was taught in the traditional way, and two others, as the experimental groups, recieved strategy-based instruction. The difference between these two experimental groups was in cognitive strategy-based grammar instruction and the metacognitive strategy-based one. Meanwhile, all three groups encountered the grammatical points either through the conversations inserted in their textbook or through the conversations that the lecturer herself provided for the learners.

This research was based on the practical and common aspects of O'Malley's and Chamot's (1990) learning strategy classification. Therefore, to teach cognitive strategies, the present researcher chose repetition, recombination, deduction, elaboration, translation, and transfer. On the other hand, to teach metacognitive strategies, the emphasis was on the functional planning, self-management, self-monitoring, and self-evaluating. Meanwhile, the technique of 'thinking aloud' was instructed for the metacognitive group in order to enable them to reflect the process of their own learning.

The definition of all chosen cognitive strategies from O'Malley's and Chamot's (1990) viewpoints is as follows:

1. Repetition: imitating or repeating a sample in order to learn it,

2. Recombination: combining the existing data in a new context in order to make a meaningful sentence,

3. Deduction: applying the rules to make correct examples,

4. Elaboration: "relating new information to prior knowledge, relating different parts of new information to each other, or making meaningful personal associations with the new information." (O'Malley & Chamot, 1990, p. 120)

5. Translation: translating the material from the second language to the first one to avoid misunderstanding, and

6. Transfer: "using previous linguistic knowledge or prior skills to assist comprehension or production." (O'Malley & Chamot, 1990, p. 120)

Metacognitive strategies are divided into three groups: planning, monitoring, and evaluation (O'Malley & Chamot, 1990). In O'Malley's and Chamot's (1990) classification,

planning includes advance organizers, directed attention, functional planning, selective attention, and self-management. In this study only functional planning and self-management were taught to the learners. The functional planning and self-management were done before teaching the grammatical points. The instructor asked participants to do the followings at their home:

1. To think about the new structure and features in the text and sentences,

2. To find the known structures through thinking,

3. To think about the relationship between new and old structures, and

4. To think about the ways the sentence may be organized.

The monitoring engaged the learners' minds before and during teaching. According to O'Malley and Chamot (1985, cited in Brown, 2000, p.125), self-monitoring is the process of "correcting one's speech for accuracy in pronunciation, grammar, vocabulary, or for appropriateness related to the setting to the people who are present". Therefore, the instructor encouraged the learners:

1. To use their findings in sentences,

2. To monitor their comprehension by themselves (self-monitoring) through thinking aloud; that is to reflect and express what was happening in their minds through engaging with the problem,

3. To ask themselves "Do I understand the grammatical points of the sentences?"

4. To make connections,

5. To make predictions,

6. To make inferences, and

7. To find what part of the sentences prevents them from understanding?

The evaluating was carried out during and after teaching the grammatical points in the following manner:

1. The instructor teaches the grammatical points in the classroom.

2. Students evaluate their findings (self-evaluating).

3. Students ask themselves how well did I understand?

4. What strategies worked well for me? e.g., thinking before teaching, monitoring and thinking aloud or evaluating the findings after teaching the grammatical points, and etc.

5. What strategies did not work well for me?

6. Do I need some help for the next time?

Before teaching the grammatical point in the first session, the instructor administered the English version of the Cognitive Strategy Questionnaires by Item Type (Purpura, 1999) for the first experimental group who received cognitive strategy-based instruction and the English version of the Metacognitive Strategy Questionnaires by Item Type (Purpura, 1999) for the second experimental group who received metacognitive instruction.

The result of the administration of these questionnaires before instruction was very useful for the instructor. It assisted the instructor to find a basis for initiating teaching different strategies. In other words, instruction could be built on the learners' knowledge of strategies. As Cohen (1998, p. 69) stated, the first step in strategy training is "to help learners recognize which strategies they already use, and then to develop a wide range of strategies, so that they

can select appropriate and effective strategies within the context of particular language tasks." The Persian translation of each questionnaire was also administered in each class.

The second session of all three classes was allocated to teaching *coordinating conjunctions* (and, yet, but, so, for, or, and nor). In the first class, the instructor taught the *coordinating conjunctions* through cognitive strategies, that is, she indicated the grammatical points of these coordinating conjunctions through repetition, recombination, deduction, elaboration, translation, and transfer. To teach this coordination type in the second class, the instructor applied metacognitive strategies: functional planning, self-management, self-monitoring, self-evaluation, and thinking aloud. The rest of the time of the classes was allotted to more exercise in this field.

In the third session she taught how to make use of cognitive strategies (repetition, recombination, deduction, elaboration, translation, and transfer) for learning *correlative conjunctions* (neither/nor, either/or, not only/but also, and both/and) in the first class and of metacognitive strategies (functional planning, self-management, self-monitoring, self-evaluation, and thinking aloud) in the second class. In the fourth session, the instructor corrected the learner's problem with the *coordinating* and *correlative conjunctions*. She encouraged learners to put into practice the cognitive or metacognitive strategies appropriate in each exercise.

In the fifth and sixth sessions the instructor explained how to apply the same cognitive and metacognitive strategies in order to facilitate the learning of *conjunctive adverbs* (however, nevertheless, still, on the contrary, moreover, furthermore, also, besides, in fact, hence, therefore, consequently, thus as a result, otherwise, then, afterward, and later (on)) in the first and second classes respectively and then they checked the related examples. In all sessions in the second class, at first the instructor worked as a model, then she encouraged the students

to practice thinking aloud and reflected whatever happened in their minds verbally, that is, the instructor studied the sentences containing the grammatical point loudly and when it was needed she explained and analyzed the strategies as appropriate in that moment. She would also mention how she tackled the problems. In fact, she encouraged the metacognitive group to think aloud, monitor and evaluate their findings.

In the seventh, eighth, ninth, tenth, and eleventh sessions, the instructor taught *indirect speech*, *subordinations*, that is, *adverb clause* (as long as, as soon as, after, as, since, until, when, while, where, so that, such that, although) and *adjective clause* (who, whom, which, that, whose, when, where, why), and all three types of *conditionals* respectively. During these sessions, all effort of the instructor was to encourage students to practice the cognitive strategies in the first class and the metacognitive strategies in the second one in different contexts. This was because the aim of this research was to teach students 'when' and 'where' these strategies should be applied.

In the third class (the control group), teaching of the same grammatical points was done according to the traditional way, that is, one of the learners read the conversation containing the grammatical point (rule) and gave some examples. Next, the instructor taught the rule followed by some examples. Then the learners were asked to answer the questions related to the same grammatical points at their homes. The next session was devoted to correcting the problems of the learners in answering the questions.

The major difference between the cognitive and control groups was in the instructor's emphasis on the role of thinking in the cognitive group's process of learning. That is, not only the instructor taught different types of cognitive strategies explicitly, referring to their names (for instance repetition, recombination, deduction, elaboration, translation, and transfer), and indicating how, when, and why these strategies ware appropriate in approaching a problem

for cognitive group, but she also encouraged the learners to think and then to select the appropriate strategies to assist themselves in engaging with the problems successfully. Whereas background knowledge of the learners about the nature of the language was different (Rubin, 1987), some strategies were effective for some learners while the same strategies maybe did not work for others. Therefore, each learner by himself or herself was responsible for his or her own learning.

After the treatment was given to the experimental groups and the grammatical points were practiced sufficiently, the twelfths session was devoted to the evaluation of the experimental and control groups by with the 2005 version of TOEFL's structure and written expression parts for 25 minutes. Next, on one hand, the 1999 English version of Cognitive Strategy Questionnaires by Item Type (CSQIT) was administered to the cognitive strategy-based instructed learners during10 minutes and on the other hand, the 1999 English version of Metacognitive Strategy Questionnaires by Item Type (MSQIT) to the metacognitive strategy-based instructed students during 10 minutes in order to reveal how effective learning strategy instruction was and whether or not the participants learned how to apply these strategies.

Results

In order to make sure that the participants are homogenous in regards to their EFL knowledge, prior to the treatment, the TOEFL (2003) was administered. The data are presented in Figure 1. To do so, those learners whose scores lied ± 1 SD were selected. Moreover, they were also screened on the basis of their performance on the grammar sub-test of the same proficiency test. Similarly, those whose scores lied ± 1 SD were further selected. Therefore, the grammar sub-test was used as the pretest. The data are shown in Figure 2. As a result, the learners were twice homogenized. The homogeneity of the students indicated that

from among 90 learners, only 66 learners could take part in this study. This finding is indicated in Figure 3.

One-way ANOVA was applied to ensure that there was not a significant difference between the learners in pretest at 2 degrees of freedom. The descriptive statistics is shown in Table 1 and the inferential one in Tables 2, 3, and 4.

Table 2 shows that *P*-value is 0.608. Whereas the amount of *P*-value is more than the level of significance, i.e., 0.608 > 0.05, and the observed *F* is less than the critical *F*, i.e., 0.50 < 3.14 at 2 degrees of freedom, therefore the three groups were at the same level of structural knowledge and there was not a significant difference between the groups at the beginning of instruction. However, this data by itself does not compare each group's performance with that of the two other groups on the pretest. This data is provided in Table 3.

Table 3 determines the multiple comparisons of groups through Scheffe test. Therefore, it reveals that there was not a significant difference between the control and cognitive groups, since 0.740 > 0.05. In addition, there was not a significant difference between the control and metacognitive groups, since 0.648 > 0.05. Also, there was not a significant difference between the cognitive and metacognitive groups as well, since 0.988 > 0.05. The amount of the groups' means on the pretest is indicated in Table 4.

The post test was also administered to reveal the differences between groups after the treatment. That is, it measures the degree of achievement of the control, cognitive, and metacognitive groups in development of structural knowledge. Table 5 gives the descriptive statistics on the post test. One-way ANOVA was applied to indicate whether there was a significant difference between groups after the treatment or not. This data is shown in Table 6. The data concerning comparisons of the control group's, cognitive group's, and metacognitive group's means simultaneously and the level of the significance as well are

provided in Table 7 through Scheffe test multiple comparisons. Table 8 also indicates the amount of groups' means on the post test.

Table 6 reveals that there was a treatment effect on the groups' performance, since the amount of *P*-value is less than the level of significance, that is, 0.00 < 0.05, and the amount of observed *F* is more than the critical *F* at 2 degrees of freedom, i.e., 8.227 > 3.14 .

Interestingly, since there was instruction for all three groups, all groups had a kind of progress in development of their structural knowledge. Scheffe test multiple comparisons of the groups are one of the best procedures to indicate the amount of differences between groups in order to confirm or reject the null hypotheses. In fact, these comparisons show that how effective the treatments was for the experimental groups in comparison to that of the control group and that of each other as well. Table 7 provides the appropriate data through Scheffe test multiple comparisons.

According to Table 7, there is not a significant difference between the control and cognitive groups. This is because the amount of *P*-value is more than the level of significance, i.e., 0.610 > 0.05. Although the amount of the mean of the cognitive group is more than that of the control group on the post test, there is not a significant difference between the control and cognitive groups. This data is shown in Table 8. Therefore, cognitive strategy-based grammar instruction does not affect intermediate Iranian EFL learners' development of structural knowledge significantly.

On the other hand, the comparison of the control and metacognitive groups' means in Table 8 indicates that the metacognitive group worked better than the control one. Table 7 also shows that the difference between the control and metacognitive groups is significant, since the amount of *P*-value is less than the level of the significance, i.e., 0.001 < 0.05.

Therefore, metacognitive strategy-based grammar instruction affects intermediate Iranian EFL learners' development of structural knowledge significantly.

Table 7 also indicates that the difference between the cognitive and metacognitive groups is significant, since the amount of the *P*-value is less than the level of significance, that is, $0.01 < 0.05$. Moreover, the amount of the means in Table 8 indicates that the metacognitive group worked better than the cognitive one. Therefore, there is a significant difference between the cognitively and metacognitively trained EFL learners in the development of structural knowledge.

The cognitive and metacognitive questionnaires were also administered both at the first and last sessions to find out how effective strategy instruction was and whether or no the participants learned how to apply these strategies as well. A Wilcoxon signed-rank test is applied to compare the amount of strategy use of the cognitive group before and after cognitive strategy-based instruction. The descriptive statistics is shown in Table 9. The Wilcoxon signed-rank test is also indicated in Table 10. The amount of level of significance is provided in Table 11.

Table 9 refers to descriptive statistics including the amount of means, standard deviations, minimums, and maximums of scores before and after strategy-based instruction. According to Purpura 's analysis of(1999) of the cognitive questionnaire, since the amount of mean of the cognitive group before instruction was 1.4545, it is concluded that the cognitive group before strategy instruction was low cognitive strategy users. Since the amount of mean after strategy instruction changes to 2.3636, it is concluded that the cognitive group after instruction became tmedium cognitive strategy users. Therefore, instruction of cognitive strategies enables the learners to apply these strategies more than before and strategy instruction was effective in encouraging the participants to learn cognitive strategies.

Table 10 provides the data about ative ranks, positive ranks, and ties through the Wilcoxon signed-rank test. Negative ranks indicate that none of the learners retrogresses in strategy use after cognitive strategy-base instruction, since the negative rank is 0. On the other hand, the positive ranks reveal that seventeen learners progress in cognitive strategy use. The ties also indicate that five learners had neither progress nor retrogression in cognitive strategy use after cognitive strategy-based instruction.

The analysis of the Wilcoxon signed rank test in Table 10 and the amount of *P* value in Table 11 indicate that there is a significant difference between the strategy use before and after cognitive strategy instruction, since the amount of the *P* value is less than 0.05. That is, $0.00 < 0.05$. It means that there is a significant difference between the strategy use of cognitively trained EFL learners before and after cognitive strategy-based instruction, according to their answers to the questionnaires. As a result, cognitive strategy instruction was effective in encouraging the learners to apply cognitive strategies while encountering a problem. Meanwhile, at the end of instruction, the learners have changed to the medium cognitive strategy users.

On the other hand, Table 12 shows that there was a progress in mean scores of the metacognitive learners before and after metacognitive strategy instruction. Before instruction, their mean scores was 1.5455 and after instruction, it changes to 3.0909. According to Purpura's (1999) analysis of strategy use, there was a movement from a low metacognitive strategy use to a high one. Therefore, metacognitive strategy-based instruction changed the learners to the strong strategy users.

The analysis of the Wilcoxon signed-rank test in Table 13 reveals that none of the learners had regression in the metacognitive strategy use before and after metacognitive strategy-based instruction, since the negative rank is 0. The positive ranks also indicate that twenty one learners had progress in metacognitive strategy use and the ties show that only one of the

learners had neither progress nor regression in metacognitive strategy use before and after metacognitive strategy-based instruction.

Table 14 demonstrates that there is a significant difference in the metacognitive strategy use before and after metacognitive strategy-based instruction, since the amount of *P* value is less than 0.05. That is, $0.00 < 0.05$. It means that there is a significant difference between the strategy use of metacognitively trained EFL learners before and after metacognitive strategy-based instruction. Therefore, metacognitive strategy instruction was effective in encouraging the learners to apply metacognitive strategies while encountering a problem. Meanwhile, at the end of instruction, the learners have become high metacognitive strategy users.

Discussion

A shift from teacher-centered classroom to learner-centered ones has induced learners to be more responsible of their own learning and it leads learners to a kind of effort for becoming more autonomous (Rubin, 1987). Therefore, learners are no longer considered as sponges but they can rely on their own thinking ability and apply different mental strategies in order to tackle their learning problems.

The major finding of this study was that cognitive strategy-based grammar instruction did not affect intermediate Iranian EFL learners' development of structural knowledge statistically significant while the metacognitive counterpart made a positive significant difference in the development of this type of knowledge. On the other, the analysis of the learners' answers to the questionnaires revealed that both cognitive and metacognitive strategy-based instruction was effective in the improvement of learners' strategy use, although cognitive strategy-based instruction did not lead the cognitively trained EFL learners to the development of structural knowledge.

The most important pedagogical implication of the findings of this research may pertain to the issue of strategy training especially for learners, teachers, and educators in the realm of

TEFL in particular and education in general. It can help teachers in accomplishing their challenging task of teaching English grammar in EFL contexts where teaching grammar seems to be as a norm in classrooms. Grammar instruction through teaching different metacognitive strategies explicitly can make the boring task of learning grammar more interesting and result in the development of learners' structural knowledge as well.

A need for the inclusion of and emphasis on learning strategies in the EFL educational system is obvious. This research revealed that through instruction of teachers, learners become more aware of the effectiveness, purpose, and value of learning strategies and, in addition, become more responsible for meeting their own goals. Therefore, teachers are no longer considered as a provider of learning.

A skilful teacher should introduce different strategies in such a way that all learners become convinced that strategy learning is not an extra and useless effort but it is so worthwhile that it triggers and facilitates their learning. Before teaching, a teacher should be aware of not only the concept of different strategies but also of what strategies, what combinations of strategies regarding to any content (here grammar) can better work in learners' learning processes. Also, teachers should know how, when, and why strategy use is appropriate in challenging with one task while not with others. Only in this situation, a teacher can translate his or her knowledge into these strategies.

Teachers can lighten the problem of learners in strategy use by adding some practices relevant to taught strategies in order to help learners become more proficient in strategy use in different contexts so that it prepares the transfer of strategy use form one situation to another more easily.

However, when learners know why they learn a language, they are more cautious about the ways that can facilitate this process. Teachers should provide rich opportunities for

learners to engage in active learning while coping with their learning problems with different strategies according to their style preferences. Therefore, teachers should not restrict strategy instruction to one or two strategies but multiple strategy training is suggested in order to smooth the way for learners' choice.

Findings of this research indicated that strategies can be taught explicitly for EFL learners. The strategy training can also be embedded in regular classroom teaching. Therefore, this research can be see as a guideline for syllabus designers to incorporate sufficient practices in the scope of language learning strategies in EFL syllabuses in order to encourage learners in the development of their strategic competence while learning a specific skill in a language. As O'Malley and Chamot (1990) suggested, the exercises should be designed in such a way that they elicit and induce learners in the use of the taught strategies. All of these issues can be fulfilled if an educational system takes into consideration enough time for the implementation of different learning strategies inside the classroom.

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Table 1. Descriptive statistics on the pretest

	N	Range	Minimum	Maximum	Mean	Std.	Variance	Skewness	
		Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Pretest	66	8.00	10.00	18.00	14.0303	1.92130	3.691	-.286	.295
Valid N	66								

Table 2. One-way ANOVA on the pretest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.758	2	1.879	.501	.608
Within Groups	236.182	63	3.749		
Total	239.939	65			

*p < .05.

Table 3. Scheffe test multiple comparisons of groups on the pretest

students' groups		Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
control	cognitive	.45455	.58379	.740	-1.0091	1.9182
	metacognitive	.54545	.58379	.648	-.9182	2.0091
cognitive	control	-.45455	.58379	.740	-1.9182	1.0091
	metacognitive	.09091	.58379	.988	-1.3727	1.5545
metacognitive	control	-.54545	.58379	.648	-2.0091	.9182
	cognitive	-.09091	.58379	.988	-1.5545	1.3727

Table 4. Means of three groups on the pretest

students‘ groups	N	Subset for alpha = 0.05
		1
Control	22	14.3636
Cognitive	22	13.9091
Metacognitive	22	13.8182
Sig.		.648

Table 5. Descriptive statistics on the post test

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Post test	66	13.00	14.00	27.00	19.8485	3.18768	10.161	.501	.295
Valid N	66								

Table 6. One-way ANOVA on the post test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	142.212	2	71.106	8.227	.000
Within Groups	518.273	63	8.227		
Total	660.485	65			

*p < .05.

Table 7. Scheffe test multiple comparisons of groups on the post test

students' groups		Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
control	cognitive	-.86364	.86479	.610	-3.0318	1.3045
	metacognitive	-3.45455	.86479	.001	-5.6227	-1.2864
cognitive	control	.86364	.86479	.610	-1.3045	3.0318
	metacognitive	-2.59091	.86479	.015	-4.7590	-.4228
metacognitive	control	3.45455	.86479	.001	1.2864	5.6227
	cognitive	2.59091	.86479	.015	.4228	4.7590

Table 8. Means of three groups on the post test

students' groups	N	Subset for alpha = 0.05	
		1	2
Control	22	18.4091	
Cognitive	22	19.2727	
Metacognitive	22		21.8636
Sig.		.610	1.000

Table 9. Descriptive Statistics of Cognitive Group's Strategy Use before and after Instruction

	N	Mean	Std. Deviation	Minimum	Maximum
Pre-questionnaire	22	1.4545	.50965	1.00	2.00
Post-questionnaire	22	2.3636	.49237	2.00	3.00

Table10. The Wilcoxon Signed-rank Test

		N	Mean Rank	Sum of Ranks
Post-questionnaire & pre-questionnaire	Negative Ranks	0	.00	.00
	Positive Ranks	17	9.00	153.00
	Ties	5		
	Total	22		

Table 11. The Amount of Level of Significance of Cognitive Questionnaires before and after Instruction

	Post-questionnair & prequestionnaire
Z	-3.879
Asymp. Sig. (2-tailed)	.000

Table 12. Descriptive Statistics of Metacognitive Group's Strategy Use before and after Instruction

	N	Mean	Std. Deviation	Minimum	Maximum
Pre-questionnaire	22	1.5455	.50965	1.00	2.00
Post-questionnaire	22	3.0909	.61016	2.00	4.00

Table 13. The Wilcoxon Signed-rank Test

		N	Mean Rank	Sum of Ranks
Post-questionnaire & pre-questionnaire	Negative Ranks	0	.00	.00
	Positive Ranks	21	11.00	231.00
	Ties	1		
	Total	22		

Table 14. Amount of Level of Significance of Metacognitive Questionnaires before and after Instruction

	Post-questionnair & prequestionnaire
Z	-4.104
Asymp. Sig. (2-tailed)	.000

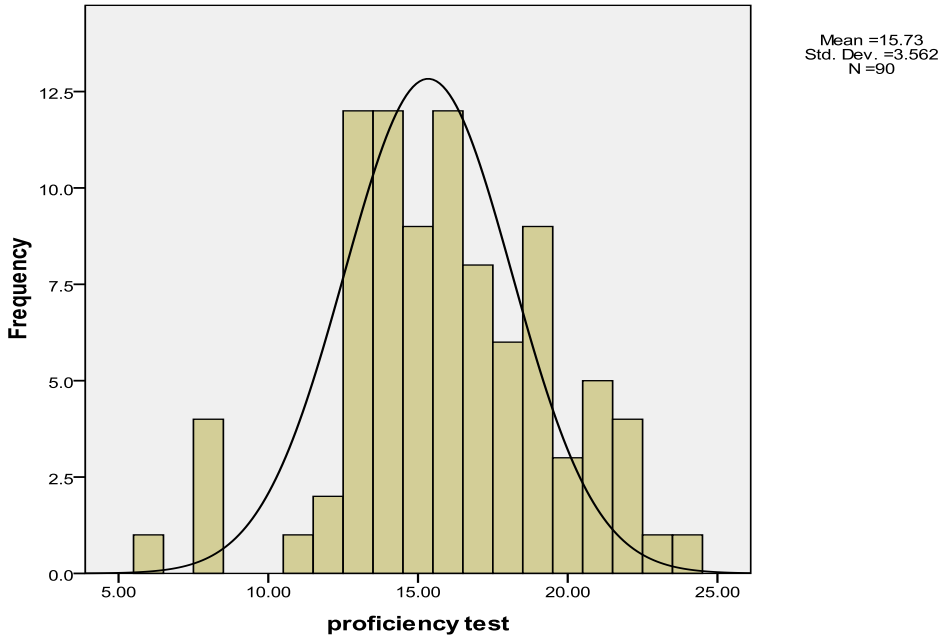

Figure 1. Participants' performance on the TOEFL (2003).

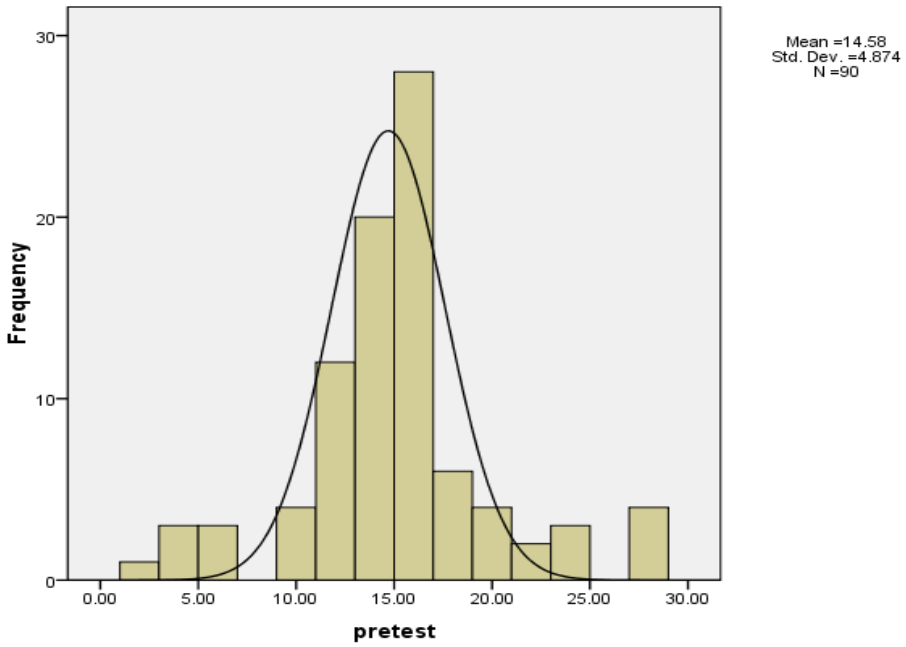

Figure 2. Participants' performance on the grammar sub-test (pretest).

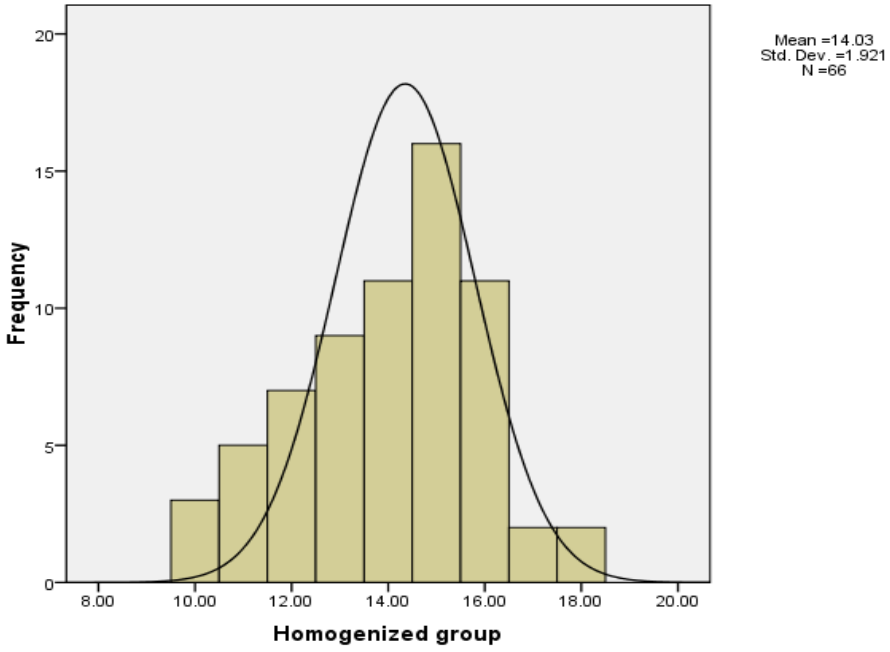

Figure 3. Homogenized participants.