Non-Linguistic Representations on Improving Iraqi Students' Metacognitive Thinking

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Abstract—In the English as a Foreign Language (EFL) classes, teaching English language strategies are essential to both teachers and students. New strategies help teachers to maximize students' cooperation and inspiration. Non-linguistic representations are one of many dominant strategies available to classroom teachers. When these strategies used well, they can have a positive effect on students' achievement and provide diversity in the method that students process new information. The current study aims to find out the effect of non-linguistic representations on evoking metacognitive thinking and to identify metacognitive thinking strategies which are used by Iraqi preparatory students. To conduct the study and fulfill its aims, the following hypotheses are set: 1. There is no statistically significant difference among the mean scores of the experimental group which is taught by non-linguistic representations strategy and control group which is taught by the conventional strategy in post-test achievement. 2. There is no statistically significant difference among the mean scores of the experimental group and the control group in metacognitive thinking strategies. To achieve the aims and confirm the hypotheses, the experimental design which is Non-Randomized experimental group pretest -posttest design has been designed. Lesson plans on how to teach according to non-linguistic representations and conventional method have been designed. A questionnaire on metacognitive thinking strategies and an achievement post-test is constructed to collect data. The questionnaire consists of 22 items, whereas the test includes 10 questions. Face and content validity have been ascertained. Reliability coefficient has been ascertained using two methods: -the spilt-half method and the Alpha-Cornbrash method. The items have been analyzed statistically, and the difficulty level and discrimination power for each item have been calculated. The post-test has applied and its results have been analyzed statistically using ANOVA and Scheffe test for post comparisons. The sample of the study consists of 78 female students in the fifth scientific stage at Al-Shaima' Preparatory School. The study required an experimental group and a control group. Both groups have been equalized in such variables: Educational level of parents, English grades achievement in the fourth stage, and the pre-test of both groups. Then, both groups are exposed to unified post-test and metacognitive thinking strategies. The experiment lasted 3 months, the researcher has taught the two groups during the academic year 2017–2018. After the statistically treatment of the data, the results reveal that: 1. There is a significant difference in the mean scores between experimental and control groups in favor of the experimental group who is taught using the non-linguistic representations strategy. 2. Teaching students using non-linguistic representations have proved its effectiveness in raising students' facilitative cognitive levels. Based on the results, the obtained conclusions in this study, the appropriate recommendations, and suggestions for further studies are put forward.

Index Terms— Non-Linguistic representation, Meta-Cognitive thinking strategies, ANOVA.

I. Introduction

Marzano et al. (2001, p. 13) stated that learners learn and store knowledge in two essential ways: Linguistic which means use words and non-linguistic representations (visual imagery) which help learners in the creation of non-linguistic representations and enable them to think about and recall what they have learned.

Non-linguistic representations start from the basic idea that students learn a language by creating image and stimulating the brain in new ways to increase understanding and develop memory. Engaging in drawing kinesthetic activity, physical modeling, and graphically organizing are forms of their own mental pictures (Hyerle, 2009, p. 12).

Based on the researcher's knowledge, most teachers expose learners to non-linguistic forms through pictures or physical sensations using language representations of information on four skills (reading, writing, speaking, and listening). Unfortunately, this leaves the learners stranded to make their own non-verbal form.

Teachers who use both verbal and non-verbal forms help them to improve better thinking, remembering, and reasoning because they need to achieve better understanding through curriculum. The teacher must follow new steps and techniques, to stimulate, motivate, and encourage their learners to practice well in learning a foreign language.

In most Iraqi classes, reading and writing lessons dominate instructions, managing students with the linguistic mode. Marzano et al. (2001, p. 73) emphasized that teacher who takes the advantage of all modes of learning will encourage students to make non-linguistic

representations to promote better understandings and deeper thinking.

A. Aims

This study aims at:

1. Investigating the effect of non-linguistic representations on evoking meta-cognitive thinking.
2. Identifying meta-cognitive thinking strategies which are used by Iraqi preparatory students.

B. Hypotheses

To fulfill the aims of the current study, it is hypothesized that:

1. There is no statistically significant difference among the mean scores of the experimental group which is taught by non-linguistic representations strategy and control group which is taught by the conventional strategy in post-test achievement.
2. There is no statistically significant difference among the mean scores of the experimental group and the control group in metacognitive thinking strategies.

C. Limits of the Study

The present study is limited to:

1. The use of non-linguistic representations on teaching English for Iraqi textbooks.
2. Fifth preparatory English as a Foreign Language (EFL) students.
3. The academic year 2017–2018.

D. Procedures

The procedures have been followed and conducted:

1. Choosing randomly two groups: One experimental and one control group.
2. Constructing a pre- and post-achievement test.
3. Applying the pre-test to the two groups for the sake of equalization among other variables such as academic level of mother and father's variable.
4. Applying the post-test on the two groups at the end of the experiment.
5. Analyzing data using suitable statistical means and then stating results, conclusions, suggestions, and recommendations.

E. The Concepts of Non-Linguistic Representations

Students learn information in two ways, linguistic and imagery style (Paivio, as cited in Marzano et al., 2001, p. 73).

The linguistic style is semantic in nature which means knowledge and the imagery form of representations is dealt with non-linguistic representations such as "mental pictures and physical sensations such as taste, smell, touch, and kinesthetic association" (Richardson, 1983, p. 3-42).

Students must use both forms of representations linguistic and non-linguistic form. Hence, they can think better and recall knowledge at the same time (Flanders, 1970, as cited in Marzano et al., 2001, p. 73).

Teacher learns students how to practice non-linguistic representations in the classroom and use language to argue

about them, so it is useful for students have opportunities to encode information in two ways, linguistic and non-linguistic forms. Hence, teachers teach students how to use non-linguistic representations in the class and use them to argue some language aspects (Gerlic and Jausovec, 1999, p. 73).

II. METACOGNITIVE

Metacognitive strategies help learners become more proficient and great in their learning. Metacognitive strategy helps learners to discovery material, evaluate when they want extra resources, and understand how to apply different approaches to problem so metacognitive enable learners to learn more successfully and intentionally (Brown and Campione, 1997, pp. 229, 270).

Brown (1980, pp. 453–481) refers to metacognitive skills as "self-awareness of progressive cognitive activity." He adds that metacognitive order learners to direct, plan, and monitor their cognitive activity.

Blakey and Spence (1990, pp. 3476) defined metacognitive as "the process of thinking about thinking and learning how to learn."

Flavell (1979, p. 15) argues that metacognitive practices that permit one to monitor and regulate one's cognition play the main role in the improvement and refinement of metacognitive information.

Hennessey (1999, p. 3) states that "Awareness of one's own thinking, awareness of the content of one's conceptions, an active monitoring of one's cognitive processes, an attempt to regulate one's cognitive processes in relation to further learning and an application of a set of heuristics as an effective device for helping people organize their methods of attack on problem in general."

Metacognition refers to "awareness and management of one's own thought" (Kuhn et al., 2004, p. 270).

Onovughe and Hanna's Study (2011)

The aim of this study is to examine the secondary school students' awareness and utilization of metacognitive strategies to comprehend academic materials.

The sample of this study consists of a group of 120 students.

A questionnaire is used as a tool to measure students' awareness and application of some reading strategies.

The results indicate that students are aware of metacognitive strategies to a large extent as over 60%. It reveals a high correlation between metacognitive awareness and utilization of metacognitive strategies.

Akyol and Garrison's Study (2011)

The aim of this study is to find how students demonstrate their metacognitive knowledge and skills in an online learning context.

The sample of the study consists of 16 undergraduate students; online discussion is used to assess students' metacognition.

The researcher concludes that metacognition is changed and increased overtime.

A. The Experimental Design

Concerning the current study, a quasi-experimental design, namely, the non-randomized experiment group pretest-posttest design is demanded. Consequently, the two groups (experiment and control groups) of the fifth scientific grade at Al-Shaima' preparatory school for girls have been selected. The experimental design of the study is illustrated in Table I.

The Population

Lehman and Mehrens (1971, p. 18) defined "a population refers to all of specified groups of objects usually persons." Richards and Richard (2010, p. 443) and Webster (2003, p. 966) referred to the population as some set of objects, persons…, etc., that segment some public and noticeable features. So, a representative sample can be selected. The population of the current study consists of EFL Iraqi preparatory students of the fifth scientific stage for girls in AL-Dour. The total number of the fifth class students' population is 148 of girls distributed into the two preparatory schools for girls in AL-Dour.

The Sample

Lehmann and Mehrens (1971, p. 18) described that "the sample is a smaller number of elements selected from a population and is hopefully representative of that population." Best (1981, p. 8) defines the sample as a small proportion of pupils chosen for analysis and observation. AL-Shaima Preparatory School for girls has been chosen the sample of the study. The sample consists of 78 students derived from two sections. The fifth scientific stage consists of four sections. Section A has randomly been chosen to be the experiment group and Section C as the control group. Each section consists of 39 pupils.

B. Construction of the Study Instruments

To achieve the aims of the study, two instruments have been constructed and applied. The first one is a questionnaire used to measure their metacognitive thinking strategies and the second one is a post-test used to measure students' achievement.

Achievement Post-test

The post-test instruction is used to discover the results. Hence, the researcher has constructed a test based on the subject that has been chosen at the beginning of this research to measure whether there are statistically significant differences between Co. and Ex. groups. The post-test contains 10 questions, each question consists of different items from others.

Metacognitive Thinking Strategies Questionnaire (MTSQ)

The second instrument is MTSQ attempts to identify metacognitive thinking strategies which are used by Iraqi preparatory students and their effects on evoking metacognitive thinking. These strategies are used for generating the student's ideas and inspiring their communicative and cognitive thinking abilities. MTS is often in the form of questionnaire which requires the students to react to a series of statements in relation to these strategies.

C. Experimental Application

The metacognitive thinking strategies questionnaire has employed before the experiment has been applied. The lesson has been organized for both groups as 2 h pre-week, the control group has been taught the same unit utilizing technique of teaching, whereas the experiment group has been taught the non-linguistic forms beside the linguistics. Non-linguistic representations are based on some of metacognitive thinking strategies which are important for students to involve several mental and communicative operations. The students notice the non-linguistic information by designing some graphic organizers to observe clear connections that the mind races to identify the linguistic forms that fit and name the connection that makes sense.

Students encourage to use English language in everyday class to evoke metacognitive thinking strategies and weed for impact and accuracy. The researcher uses graphic organizer to explain the subjects, using pictures, prepare color cards, and CD, and some lectures have been made out the class to motivate the students and encourage them to practice well.

D. Results Related to the Pupils' Post-test Achievement

The statistical treatment for the scores of the two groups of the study has shown that the mean score of the experimental group is 45.769 and 28.341 for the control group. The standard deviations are 6.196 and 5.918, respectively. Table II illustrates these values.

Analysis of variance (ANOVA) has been used to find out the significance statistical differences among the two groups as illustrated in Table II.

Table III shows that the computed F-ratio which is 25.81 is higher than the tabulated one which is 2.8 at 1 and 76 degrees of freedom and 0.05 level of significance. This illustrates that there are statistically significant differences between the two groups on the students' achievement.

Table IV illustrates that the computed Scheffe value for the difference between the mean scores of the experimental group and the control group is 17.427 which is higher than the critical Scheffe value which is 3.55 at 0.05 level of significance. This indicates that there is a statistically

TABLE I
THE EXPERIMENTAL DESIGN

Groups	Pre-test	Independent variable	Dependent variable	Post-test
Ex.		Non-linguistic representations (graphics organizer, pictograph, and pictures)	Achievement in English subject matter	
Co.		Traditional strategy		

TABLE II
THE MEAN SCORES AND STANDARD DEVIATIONS OF THE TWO GROUPS ON THE PUPILS' POST-TEST ACHIEVEMENT

Group	Sample size	Mean	Standard deviation
Experimental	39	45.769	6.19619
Control	39	28.341	3.91866
Total	78	117.52	16.5261

TABLE III
ANOVA Results of the Two Groups on the Pupils' Post-test Achievement

Source of variance	Sum of square	Degrees of freedom	Mean square	Calculated F-ratio	Tabulated F-ratio	Level of significance
Between groups	7567.7	1	2522.5	25.81	2.8	0.05
Within groups	8210.5	76	97.75			
Total	15778.3	78				

TABLE IV
Scheffe Values for the Comparison Between the Two Groups on the Students' Post-test Achievement

Group	Mean difference	Critical Scheffe
Experimental	17.427	3.55
Control	2.358	3.86

significant difference in favor of the experimental group which is taught by the non-linguistic representations. This justifies the effect of non-linguistic representations on Iraqi preparatory students' achievement in English subject matter. The results indicate that the first null hypothesis has been rejected and an alternative hypothesis has been stated that there are statistically significant differences between the mean scores of the experimental group which is taught by non-linguistic representation strategy and control group which is taught by the conventional strategy in post-test achievement.

Results related to the metacognitive thinking strategies questionnaire (MCTS)
Analysis and results

This chapter concerns with the analysis of the data collected from to know whether there are statistically significant differences among the two groups in the metacognitive thinking strategies questionnaire, Chi-square formula has been applied. Since the computed x^2 value is 748.29, and it is higher than the tabulated x^2 value which is 15.51 at 2 degree of freedom and 0.05 level of significance. Hence, there is a statistically significant difference between the two groups in metacognitive thinking strategies in favor of the experimental group. This indicates that the null hypothesis has been rejected and an alternative hypothesis has been stated which reads as follows: There is a statistically significant difference between the mean scores of the experimental group and the control group which is taught by the conventional strategy in metacognitive thinking strategies.

III. Discussion of Result

It is found that:
1. Non-linguistic representations have led to the improvement of pupils' achievement by creating independence activity and motivating pupils' mind to communicate creatively. This is done through the classroom environment and using many graphics to encourage students to creative their learning.
2. Pupils start enjoying through the non-linguistic representations.

3. Pupils develop their four skills and encourage engaging together for the sake of the common interest and sharing ideas in real-life situations.
4. The study has revealed that pupils' have improved their achievement after utilizing non-linguistic representations to evoke metacognitive thinking strategies in a sequential result of the improvement which happens at the cognitive level.
5. The pupils feel confident that deep, regular, and controlled thinking process leads to raised learning, solving problems, and discoveries. Metacognitive thinking strategies are thinking processes which pave the way to enhance the learning goals.
6. Using the metacognitive thinking strategies in the teaching-learning process boost pupils to be active, self-confident, and motivated when exploiting an activity as a result of the pupils' being enabled to create, monitor, and self-evaluate their learning. Thinking deeper and using inductive thinking are good strategies of the productive mind and essential to successful learning which includes learning EFL.
7. "As to self-organize strategy means that pupils specify a goal and sub-objectives. So, pupils do not work randomly or haphazardly, they are aware, deliberate, and conscious which means that they are practicing deep thinking process and they are capable of finding solution to creative problem."

IV. Conclusions

Building on the results of the current study, the following conclusions have been drawn:
1. To illustrate, metacognitive thinking strategies refer to self-organize, generating question, summarizing and taking notes, and generating and testing hypotheses. Each strategy is a thinking process which has its positive impact on students learning process.
2. Teachers should be aware of the importance of the non-linguistic representations on evoking the metacognitive thinking strategies. Moreover, they should be trained by educational supervisors on how to employ these strategies in teaching all English language skills including reading. This training is highly promising as it will enable them to, in turn, enable their students to make use of these metacognitive strategies, which ultimately will help create autonomous and self-regulated learners who are both initiative and responsible for their own learning.
3. Metacognitive thinking strategies help to decrease the gap between teachers and students when cooperating together. Training and teaching students require both gatherings to work closely together and this lessens the gap between students and their teacher.

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APPENDIX (1)

(The Post-Test)

Q1. The similarities and differences between the following circles:

Cats   Birds   Tiger   Panda
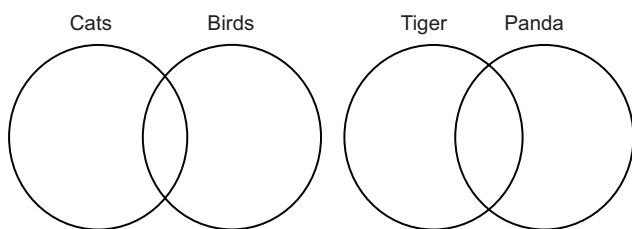
Q2. The cause and effect of the following:
(multiple causes leading to one effect)
(success, smoking, and obesity) (choose two)
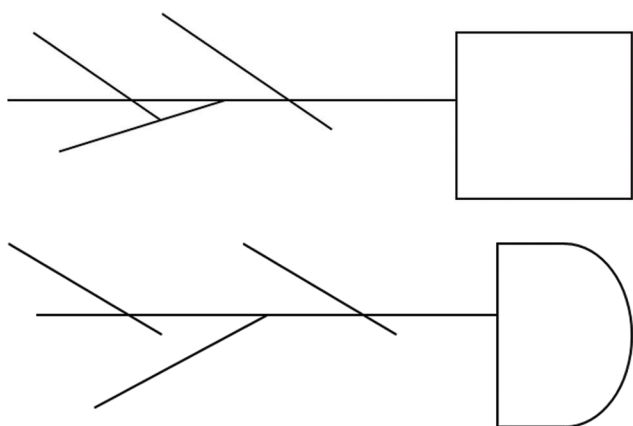
Q3. Four facts about pollution:

Pollution
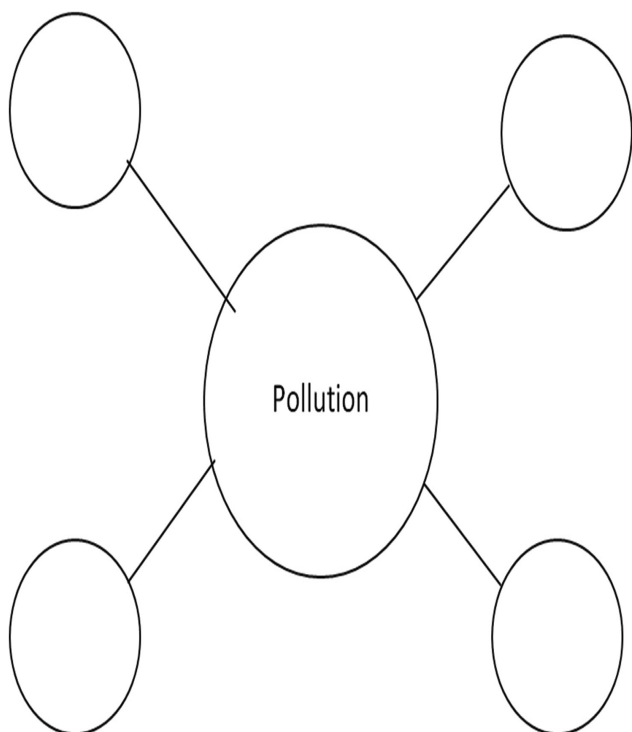
Q4. Write the suitable adjectives according to the linear arrays:

polite   impolite
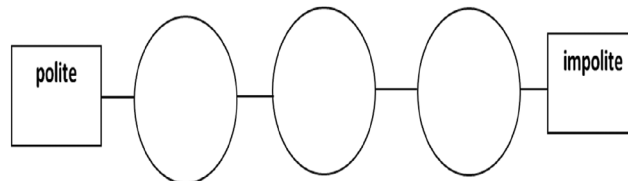
Q5. Complete the following sentences with the second conditional:

1. If I had a computer

2. If I had a tent

3. If I had air-conditioning, the house

Q6. What have they been doing?

Suha
Muna
Ali
Rafal
Samir

Q7. Match between the pictures and the sentences:
(Basketball player, hairdresser, flight attendant, weightlifter)
1. She has to wear a uniform.
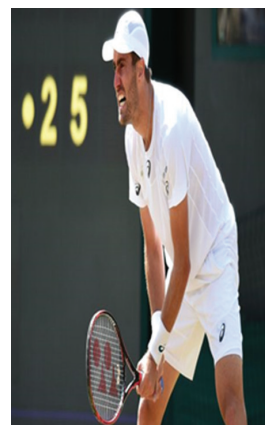
2. She has to be good with her hand.

3. He has to be very fit and healthy.
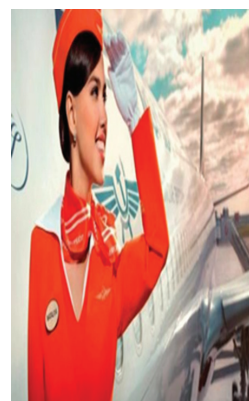
4. He has to have a healthy diet.

Q8. Put the word in a suitable situation.
    (Lazy, worried, generous, tired, bored)
    1. It's eleven o'clock in the morning and you're
    still in bed. Get up and stop being so ……………………….

    2. I was very …………… when grandmother was
in hospital past month.

3. Adel always helps people and gives to charity.
   He is a very ……………person.

4. I've been working in my uncle's shop all day.

5. I've been sitting at home surfing the net.

Q9. Some flowers are in the farm Suha collected five flowers,
    Muna collected seven flowers, and Suzanne collected four
    flowers, calculate how many flowers are collected:

Flowers collected

suha	🌹🌹🌹🌹🌹
Muna	🌹🌹🌹🌹🌹🌹🌹
suzanne	🌹🌹🌹🌹

Now answer the following questions:
1. Who collected flowers from the farm?
2. How many flowers did Muna collect?
3. How many flowers did Suha collect?
4. How many flowers did Suzanne collect?
5. How many flowers did the girls collect?
6. Who collected more flowers?
7. Who collected less flowers?