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THE EFFICACY OF MEMORY MATRIX STRATEGY ON DEVELOPING EFL READING COMPREHENSION ACROSS EDUCATIONAL LEVELS: A COMPARATIVE STUDY

Wafaa Sharrad Hassani[1]*, Mais Flaieh Al Jabbawi[2]

[1,2] University of Babylon/ College of Basic Education/ Department of English.

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Corresponding author: Wafaa Sharrad Hassani
(bas312.wafaa.shrad@student.uobabylon.edu.iq)

ABSTRACT

This study examines how the matrix strategy, which is related to memory, affects reading comprehension instruction. It extends previous research on the memory matrix to examine the effectiveness of the strategy across different educational levels, conducted by the same authors. The goal of this paper is to present actual data on how contemporary, cognitive- based techniques can promote text comprehension in EFL settings. Eighty-two students were used in the experiment, split equally between experimental and control groups. The control group was instructed using traditional techniques; the experimental group was taught utilizing the memory matrix. The researcher conducted two tests before and after the intervention. According to the findings, the intervention group's improvement in reading comprehension was noticeably greater than that of the comparison group. According to the results, students who used the memory matrix strategy were more engaged with reading. The study highlights how crucial it is to incorporate cognitive-oriented techniques into EFL reading instruction, especially in contexts like Iraq, where traditional methods still dominate. It identified the use of a memory matrix as a powerful instructional method that promotes deeper comprehension in reading comprehension tasks. Moreover, the structured visual organization facilitates systematic information processing and supports learners' cognitive engagement during reading activities, thus enabling more effective integration of new information with prior knowledge.

KEYWORDS: Matrix Strategy, Comprehension, Visual Organization, Prior Knowledge, Reading Instruction, Cognitive-Oriented, Traditional Method, Improvement.

1. INTRODUCTION

Reading is a crucial skill. Students read for various reasons, including knowledge acquisition and amusement (Gilakjani & Sabouri, 2016). Consequently, understanding what learners read has become the main aim of the reading process, which transcends the simple decoding of words (Oakhill et al., 2015). Moreover, reading is fundamental to any English language program, even though it can be difficult. Because it makes use of their past knowledge and links it to the present reading tasks, it is effectively involving the students in the educational system (Hezam et al., 2022).

In addition to defining reading itself, comprehension elucidates the procedure that makes it possible to successfully extract meaning from a written material; Therefore, it is considered the essential element of reading (Alghonaim, 2020). For example, according to Israel and Duffy (2009), Understanding a paragraph entails analytical processes akin to those used in problem-solving. Especially, it involves choosing the appropriate components for the circumstance and arranging them in the proper sequence.

"Reading comprehension is a complex task, which requires the orchestration of many different cognitive skills and abilities. Readers cannot understand a whole text if they cannot identify (decode) the words in that text" (De Ocampo & Tosino, 2024, p.161). Studies have shown that reading comprehension among Iraqi students tends to be weak due to the overuse of teacher-centered strategies. These difficulties in Iraqi EFL courses give rise to the current study. Previous research conducted to investigate the successful teaching strategies that integrate memory and cognitive processes. These strategies are very helpful for evaluating students' knowledge retention and comprehension. The results of the previous study demonstrate that the memory matrix strategy can improve the students' ability to understand and retain information from texts by facilitating the organization of main ideas, as compared to conventional methods. Although the previous study proves the advantages of the memory matrix strategy, studies examining the generalizability of such effects across a variety of educational levels remain limited. This disparity highlights the need for more research to ascertain whether favorable results seen in one educational setting can be repeated and maintained in another, reinforcing the strategy's theoretical and practical underpinnings.

The current study intends to provide evidence-based understanding that aids teachers in adopting cognitive techniques that are clearly beneficial across a variety of EFL classrooms by empirically evaluating a strategy's effectiveness as well as its possibility for broader use. In addition, it extends prior work and presents a comparative perspective by investigating whether the differences in students' educational levels influence the effectiveness of the memory matrix strategy.

1.1 Problem Statement and Its Importance

Many EFL students still show poor reading comprehension skills despite years of formal English instruction. The prevalence of conventional instruction methods, which prioritize rote memorization, literal translation, and superficial text analysis, is the main cause of this persistent problem. The cognitive and inferential reading abilities needed for a meaningful comprehension of English texts are frequently not developed by these approaches (Grabe & Stoller, 2011).

The problem is not confined to the Arab world. Wallace (2001) indicated that most language learners cannot be fully comprehend what they read in English. Researchers have highlighted the significance of reading strategies that improve comprehension and help address such challenges. Al-Jubouri (2017) observed that EFL students in Iraq read 'word by word' and, as a result, have low reading comprehension skills. Many educators falsely think that translation is the sole way to teach reading comprehension; they emphasize translating foreign terms rather than fostering more comprehensive comprehension skills.

According to Brown (2004), to improve comprehension, students who are having trouble understanding content must learn reading techniques. Without these techniques, students might comprehend certain words but still be unable to fully understand a text's overall meaning. especially at the discourse level. Despite several research and empirical studies demonstrating the value of employing different strategies, including the memory matrix strategy, to improve reading comprehension, such strategies are rarely employed in the EFL classroom. This gap emphasizes how essential it is to implement efficient teaching strategies that improve students' reading comprehension while simultaneously advancing their general language proficiency. The study's main goal is to examine how the memory matrix strategy affects students' reading comprehension growth and assess how well they work in comparison to traditional teaching techniques.

1.2 Research Objective

This research aims to:

Examine whether the effectiveness of the memory matrix strategy varies among learners at different educational levels.

1.3 Hypotheses of the Study

The aims of the study are supposed to be achieved through verifying the following hypotheses:

1. Using a memory matrix strategy with Iraqi EFL learners leads to improved reading comprehension compared to traditional methods.
2. There will be no difference in scores of reading comprehension between EFL learners of different educational levels when using the memory matrix strategy.

2. THEORETICAL BACKGROUND

2.1 The Nature of the Memory Matrix Strategy

Memory is typically a fundamental element of both modern computers and the brain (Rose & Favela, 2019). Specifically, working memory refers to the ability to retain knowledge while simultaneously performing processing activities. It has been shown that individual differences in skills in reading comprehension can be estimated by working memory. It primarily encompasses verbal or non-verbal processing (such as recalling visual patterns and spatial traces), elucidating the variability in reading comprehension (Nouwens et al., 2016).

Matrix visual organizing design approaches the requirements for effective visual presentations. A visual display might encourage students to consider the information that is being presented. Matrices, or tables, are one of many kinds of graphic organizers (Hendel, 2020).

The memory matrix is a widely utilized method for assessing subject matter comprehension. It assesses students' recollection and capacity to rapidly categorize important course information into well-known groups using a matrix that the instructor prepared (Lakshmi & Majid, 2019). Memory matrix supplies the row and column headings, but leaves the cells empty. This two-dimensional is used to display relationships and arrange information (Angelo & Cross, 1993).

	Concept	**Concept**	**Concept**
Category			

Figure 1: Structure of the Memory Matrix Strategy

2.2 Importance of Integrating Memory Matrix Strategy into Educational Materials

When teaching reading in EFL, the memory matrix has substantial pedagogical usefulness. Here is an illustration of this:

1. The memory matrix is an effective tool for assessing learners' basic understanding and recall of facts and concepts in classes that involve a large amount of information (Angelo & Cross, 1993).
2. It is particularly effective in introductory courses, including foreign languages, history and the natural sciences (Angelo & Cross, 1993).
3. The construction of a memory matrix supports the connection of ideas by enabling learners to visualize relationships among concepts through a tabular format structure (Shingler & Wehr, 2021).
4. The matrix format limits the total amount of required information while clearly delineating significant categories, similarities, and differences (Graney, 1992).
5. The two-dimensional horizontal and hierarchical representation of information facilitates easier extraction and comprehension of ideas (Olszak, 2014).

2.3 Challenges in Teaching Memory Matrix Strategy

Despite their benefits, several challenges hinder the widespread adoption of memory matrix strategy in Iraqi EFL classrooms.

1. If learners are unfamiliar with the memory matrix structure, they should begin with simple matrices, no larger than two-by-two or three-by-three, in information-rich courses (Angelo & Cross, 1993).
2. Not all types of information can be arranged neatly into matrices cells, there is a distinction between categorical data and sequential data, which is recognized in statistical organization (Angelo & Cross, 1993).
3. It is important to focus on and clarify unclear category boundaries during subsequent feedback

sessions, especially when differences are a matter of degree rather than kind (Angelo & Cross, 1993).

4. When fewer categories are initially introduced, learners tend to acquire the memory matrix strategy more rapidly (Angelo & Cross, 1993).

2.4 Foundations of Reading Comprehension

Comprehension is demonstrated when a reader connects the text to prior knowledge (Campoverde Lopez & Lopez Lopez, 2022).), The ability to comprehend a written work after reading it is known as reading comprehension. The material, expectation, and previous information are interconnected. Cognitive processes in reading comprehension include two groups: higher and lower order. The former worked in tandem to create meaning, while the latter transformed written codes into understandable language elements. The process includes creating meaning for textual stuff. Thinking before, during and after reading is regarded (Alreshoud & Abdelhalim, 2022; Hoque, 2013).

2.5 Key Determinants of Reading Comprehension in Learners

Reading comprehension depends on the students' ability to derive the meaning from texts. Therefore, a variety of interconnected linguistic, contextual, and cognitive elements, such as the ability to make inferences, decode meaning, the complexity of the material, and the reader's level of linguistic proficiency, affect reading comprehension and students' performance. In addition, environmental conditions also matter quietly; structured as competent settings support sustained focus, whereas distractions impede it. Psychological states such as reading anxiety can overwhelm cognitive resources and reduce comprehension accuracy. Interest and motivation influence engagement with texts. Students can focus their cognitive energy on understanding instead of pronunciation when they are proficient in word recognition and decoding. Moreover, texts containing many unfamiliar words and topics can make comprehension difficult for readers (Dennis, 2008; Kirby, 2007). Furthermore, Sadeghi (2007) distinguished

between internal and external elements affecting reading comprehension, where internal elements are connected to the reader and include strategies, prior knowledge, while external elements refer to aspects such as the modality, time, and location of reading (Sattarpour & Ajideh, 2014).

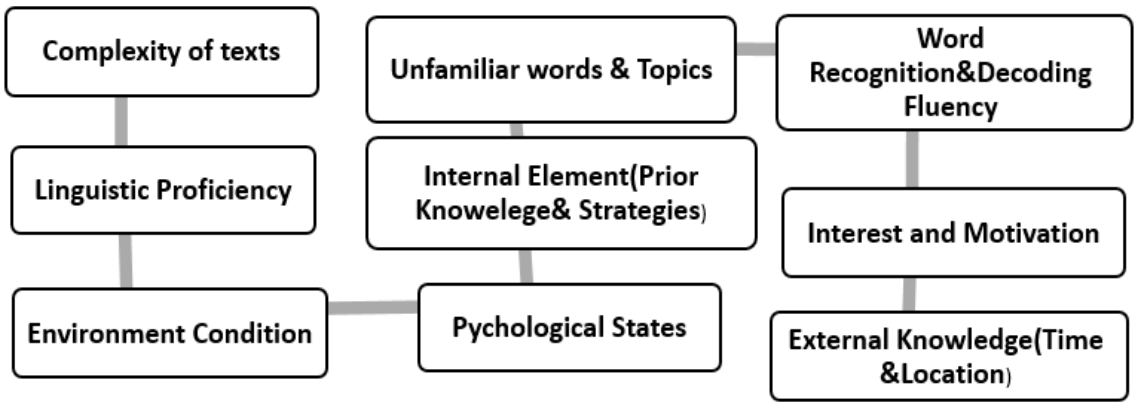

Figure 2: Key Determinants of Reading Comprehension in Learners

3. METHODOLOGY AND PROCEDURES

The research design and instruments used in this study were adapted from a previous study conducted by the same authors, with modifications to suit the present sample.

3.1 Research Design

The present research adopts a randomized controlled experimental approach to examine the effectiveness of the memory matrix strategy on students' reading comprehension. The researcher uses control and experimental groups and random assignment of participants to ensure equivalence between groups. In this study, an intervention group is taught utilizing the memory matrix method, while a control group is taught using the traditional method. Two tests are administered, a pre-test and a post-test, to evaluate the differences between the two groups in reading comprehension performance.

Table 1: Experimental Design

Group	Test	No. of Students	Method used	Test
Experimental	Pretest	40	Memory matrix strategy	Posttest
Control	Pretest	42	Traditional method	Posttest

3.2 Population and Sample

The target population of this research was selected from Ukaz preparatory school for girls in Karbala. The participants were fifth-grade preparatory students during the academic year (2025-2026). The sample was selected using simple random sampling, in which every student in the target population had an equal chance of being chosen. It represents the population and minimizes selection bias and generalizability of the findings. The sample included 82 students divided into an experimental group (40 students) and a control group (42 students). Both groups were similar in age (17-18 years), English proficiency level, and academic background, ensuring comparability.

3.3 Research Instrument

In the present study, the researcher uses pre-test and post-test as tools to measure the changes in learners' ability in reading comprehension. The test included reading passages followed by comprehension, vocabulary, and inference questions based on the Iraqi EFL curriculum standards. A pre-test was carried out to assess the baseline reading comprehension of two groups before the treatment, while a post-test was utilized to measure the advancement in learners' text comprehension following the implementation of the educational treatments.

3.4 Validity and Reliability of the Instrument

The researcher evaluated the test based on several kinds of validity, involving face validity, construct validity, and content validity. This approach to validation aligns with best practices in pedagogical measurement. Reliability is the instrument's measure of something consistently. For the pre-test, the researcher used a Kuder-Richardson (20) reliability coefficient, which was 0.842, and for the post-test, which was 0.863, indicating that the test items demonstrated that the pre-test is a reliable instrument and has very good internal consistency. The researcher submitted the initial test version to a panel of expert jurors specializing in curriculum design and educational measurement to enhance the tests' reliability and content validity. The jurors carefully reviewed the content and language clarity. Revisions were made, especially to items that were ambiguous or too difficult.

3.5 Pilot Study One

Before giving the final versions of pre- and post-tests to the intervention group and control group, a pilot test was carried out with a small group of students to find ambiguities and evaluate the items' dependability and difficulty. This pilot test's objective was to evaluate the assessment's general structure, time appropriateness, and test instructions' clarity. To assure impartiality and prevent bias, the researcher conducted a pilot study with 20 EFL preparatory school students. Each participant in the study was chosen from outside the experimental and control groups.

3.6 Pilot Study Two

Pilot Study Two refined the reading comprehension exam derived from Pilot Study One's findings. A different sample of 100 EFL female students was given the updated exam, aiming to ensure consistent results across diverse groups. Changes were made based on difficulty and discrimination ratings, and statistical indicators were calculated using answer sheets.

3.7 Data Analysis

3.7.1 Data Collection Procedures

The data gathering process was composed of three phases to assess the impact of the instructional strategy. A pre-test was initially conducted for both groups to measure the baseline reading comprehension. After that, the experimental group received the memory matrix intervention, which was applied over a specified course. A post-test was conducted for both groups after the instructional intervention using standardized measures to evaluate improvements in learners' reading comprehension.

3.7.2 Data Analysis Methods

Following data collection, the score was input into SPSS, a statistical analysis application. To evaluate the learners' performance in both groups, the researcher calculated descriptive statistics, such as the mean and standard deviation. To ascertain the extent to which the independent variable affected pupils' reading comprehension, the effect size was then calculated. Additionally, the researcher compared the means of the two groups before and after the intervention using the T-test to see if there was a significant difference. The chance of error is decreased when employing ANOVA in a study to ascertain whether any statistically significant difference exists without performing numerous t-tests.

4. PRESENTATION OF THE RESULTS

Results from data analysed by SPSS showed the following:

Table 2: Independent Samples t-Test Results for Post-Test Reading Comprehension Performance

Group Statistics							
Experimental Group (Pre/Post)							
	Groups	**N**	**Mean**	**Std. Deviation**	**Calculated t.**	**df**	**Sig. (2-tailed)**
Gain of Scores	EC	40	1.20	0.68	5.07	80	.000
	CC	42	0.43	0.70			

This result supports the first hypothesis, which assumes that 'using a memory matrix strategy with Iraqi EFL learners leads to improved reading comprehension compared to traditional methods.' The result shows a statistically significant difference between the experimental and control groups in favor of the experimental group. The experimental group obtained a higher mean score (1.20) compared to the control group (0.43). This suggests an observable improvement in the achievement of the intervention group prior to conducting inferential statistical analysis. Furthermore, the result rejects the second hypothesis that indicates there will be no difference in reading comprehension between EFL learners of different educational levels when using the memory matrix strategy.

4.1 Effect Size Using Cohen's Formula

Calculating the effect size helps determine the relative impact of the independent variable on the dependent variables of the study. To measure the level of effect, Cohen's formula was applied. There is a standard criterion for interpreting effect size. After applying Cohen's formula, the calculated effect size was 1.13, which is considered a large effect. Therefore, the use of correlation-based strategies had a strong impact on the experimental group's reading skills.

5. DISCUSSION

While the previous research by the same authors, "Graphic Memory Matrix as a Pedagogical Tool for Enhancing Iraqi EFL Learners' Reading Comprehension", demonstrated the effectiveness of the memory matrix strategy among intermediate learners, the present study extends this work by examining its applicability among preparatory students, allowing for a comparative analysis across educational levels.

The findings of the current study are consistent with previous research conducted by the same authors, although differences were observed due to variation in educational level and learner characteristics. Unlike previous study, which focused on the intermediate stage, the present study provides a comparative dimension by examining the impact of the memory strategy across different learner groups. This extension and variation allow for a deeper understanding of how the instructional strategy, such as the memory matrix may vary in impact depending on learners' developmental and educational characteristics. To make a statistical comparison between the two studies, the results of the previous study will be presented and analyzed.

Table 3: Independent Samples t-Test Results for Post-Test Reading Comprehension Performance

Group Statistics							
Experimental Group (Pre/Post)							
	Groups	**N**	**Mean**	**Std. Deviation**	**Calculated t.**	**df**	**Sig. (2-tailed)**
Gain of Scores	EC	40	1.10	.709	4.58	78	.000
	CC	40	.38	.705			

Note. Reprinted from the Graphic memory matrix as a pedagogical tool for enhancing Iraqi EFL learners' reading comprehension, by Hassani & Aljabbawi (2026), Al Bahith Journal for Social Sciences, 45 (1).

Both the present study (Table 2) and the previous study (Table 4) show a clear beneficial effect of the memory matrix strategy on reading comprehension; however, the pattern and the magnitude of this impact differ across educational levels.

In the current study, the intervention group achieved a mean score of 1.20 (SD = 0.68), in comparison with the control group, which obtained a mean of 0.43 (SD = 0.70). The calculated t- value (t =5.07) exceeds the tabulated value (t =1.99) at df = 80 and a=0.05, indicating a significant difference in favor of the experimental group, demonstrating the strong effectiveness of the memory matrix method on improving reading comprehension among fifth-grade preparatory students. In the previous study, the comparison was based on gain scores. The experimental group obtained a mean gain of 1.10 (SD = 0.709), whereas the control group achieved a lower mean gain of 0.38 (SD = 0.705). The calculated t-value (t = 4.58) at df= 78 is also statistically significant (p =.000). This confirms that the same strategy was effective with second intermediate students, though the magnitude of improvement appears smaller compared to the present study.It becomes evident that the current study demonstrates a stronger statistical effect (t =5.07) in versus (t =4.58) and a

larger mean difference between groups. This assumes the impact of the memory matrix strategy is more pronounced among the preparatory stage than the intermediate stage students.

6. CONCLUSION

The current study can be considered more effective in terms of the extent of reading comprehension development. Furthermore, the result implies that factors like age and educational attainment affect the memory matrix strategy's efficacy. Although the strategy is advantageous in both situations, its influence increases as students go to more advanced educational levels. In addition, the findings suggest the possibility of generalizing the memory matrix strategy to other comparable educational levels outside of the context of both these studies. Therefore, to promote students' reading comprehension efficiency across a range of levels and instructional situations, educators and curriculum creators may benefit from its generalizability to adopt and modify this strategy in a variety of instructional contexts and skill levels.

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