



## **Graphic Memory Matrix as a Pedagogical Tool for Enhancing Iraqi EFL Learners' Reading Comprehension**

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### **Abstract in English**

#### **Abstract**

This study investigates the effectiveness of graphic memory matrix as a pedagogical tool for enhancing Iraqi EFL learners' reading comprehension. Using experimental design, the researcher selected 80 intermediate school students and divided them into experimental and control groups. The experimental group received instruction based on graphic memory matrix, which guided learners to organize text information visually in matrices and graphs, while control group was taught using conventional text methods. Both groups completed a pre-test and post- test to measure the reading comprehension gains. Statistical analysis revealed that the experimental group demonstrated significantly a higher improvement in reading comprehension compared to control group, indicating the effectiveness of graphic memory matrix in enhancing students' ability to understand written texts, organize and retain information. Moreover, the result showed that students in experimental group demonstrated more positive attitudes and great engagement in reading tasks, reflecting the benefits of integration of cognitive - based strategies that visually structure and organize information to facilitate deeper understanding. These results align with research on graphic organizer as effective tools in EFL reading instruction, which highlight that visual matrix facilitates the cognitive processing and comprehension development in reading comprehension contexts .

### **Paper Info**

#### **Keywords**

*Graphic Memory Matrix,  
Memory Matrix, Reading  
Comprehension, Iraqi  
EFL Learners,  
Cognitive- Based  
Strategies, Visual  
Organization.  
Instructional Tools*

doi: <https://doi.org/10.63797/bjh>.

## 1.Introduction

Reading is one of the four English skills that pupils should be able to master. Its importance stems from the part it plays in assisting students in gaining new information and understanding (Sari, 2017). For students, comprehending written material is a challenging task. It involves two interrelated processes: comprehension and word recognition. While comprehension is “the process of making sense of words, sentences, and connected text, word recognition is the process of recognizing how written symbols match to one’s spoken language. Through these two processes, readers must make use of their prior experience, grammatical knowledge, vocabulary, familiarity with the text, and other pertinent skills and strategies that might help them understand the written material (Pang et al., 2003).

Reading comprehension is one of the most crucial abilities that EFL teachers must develop so that students can handle increasingly complex texts and assignments effectively, skillfully, and correctly (Ur, 1996). Reading and comprehension are strongly associated because without comprehension and interpreting the written material, children are unable to identify and interpret text. Teachers’ primary goal in this regard is to assist students in understanding the text without using translation into their mother tongue (Rivers, 1981).

Graphic organizers are visual representations of information from text that depict the connections between notions, the text structure, and major notions of the text (Miranda, 2013). In this regard, they represent one adjunct display that was created to help students comprehend significant interconcept links, which display information spatially (Robinson, 1997).

Furthermore, when using memory matrix, this strategy serves as an important instructional tool for assessing learners' ability to understand essential facts, relationships, and recall information. In addition, this strategy enhances learners' reading comprehension and overall language proficiency in the context of English as a foreign language (EFL) instruction (Angelo & Cross, 1993).

### **1.1 The Problem and its Significance**

Learners in Iraq and Arab world at large frequently struggle to comprehend English texts, due to their poor language skills. In language education programs, reading comprehension has not gotten enough emphasis. EFL learners in Iraq exhibit a 'word by word' reading approach, which leads to limited reading comprehension ability (Al-Jubouri, 2003).

According to many teachers who teach this skill, the majority of our EFL students are passive readers who seldom use efficient reading comprehension strategies to become proficient readers. Furthermore, some teachers concentrate on translating new words based on false notions without providing additional instructional support to help students develop deeper understanding. Consequently, to improve students' ability to understand texts, it is essential that teachers encourage the use of various effective reading comprehension strategies (Abdul-Majeed & Muhammad, 2015).

"A picture is worth a thousand words" Through textbooks, films and computers, students are constantly exposed to visual images in a modern classroom. Students utilize these pictures as informational organizers while interpreting a text for primary concepts, facts and supporting details (Sam D & Raian, 2013). One useful tool for improving reading comprehension is the use of graphic organizers, according to the National Reading Panel (2000), graphic organizers were

identified as one of several instructional strategies that help readers make visual representations of text relationships and support comprehension during reading. Within this category of visual tools, memory matrix serves as a special form of organizer designed to support learners' memory and retrieval of texts. The present study aims to investigate the effectiveness of using a memory matrix to enhance Iraqi EFL learners' reading comprehension.

### **1.2 Aims**

This study aims empirically:

1. Investigating the effect of graphic memory structure (memory matrix) on reading comprehension of Iraqi EFL 2<sup>nd</sup> intermediate school learners.
2. Asking students to complete a memory matrix significantly improves their reading comprehension performance.
3. There is a significant positive effect on Iraqi EFL learners' reading comprehension when students are instructed to fill a memory matrix during reading activities, compared to conventional reading instruction.

### **1.3 Hypotheses**

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

1. The Iraqi EFL learners instructed using graphic memory demonstrate higher reading comprehension performance than those instructed through conventional reading comprehension.

2. There no difference in the reading comprehension performance of Iraqi EFL learners who are instructed using graphic memory structures (memory matrix) and those who are instructed through conventional methods.

## **2. Literature Review**

### **2.1 Theoretical Foundations of Graphic Organizers in Reading**

Graphic organizers are not merely instructional techniques; they are deeply rooted in cognitive learning theories that explain how learners process and internalize information. Graphic organizers align with major cognitive theories including dual coding theory, and schema theory.

#### ***2.1.1 Cognitive Load Theory and Visual Learning***

The implementation of graphic organizer in reading comprehension is fundamentally supported by cognitive principles. It is important to consider how learners process visual information. Cognitive load theory (CLT) is defined as the disparity between task requirements and an individual's capacity to fulfill them (Plass et al., 2010), while learning is defined by CLT as the act of integrating, choosing, and organizing information into memory; working memory constraints are governed in this process. This theory was developed by Sweller (1988). (CLT) was initially developed to solve working memory limitations for educational research. It assumes that the capacity of human working memory is finite. Hence, the theory is referred to as cognitive load theory. It emphasizes that a well-designed instructional plan optimizes

cognitive capacity to minimize cognitive overload and promote effective learning (Gkintoni et al., 2025).

There are three types of cognitive load which are intrinsic cognitive load, extraneous cognitive load, and germane cognitive load (Emory, 2019). In line with perspective, Van Merriënboer and Sweller (2005), argue that educators should strive to maximize intrinsic load, decrease extraneous load, and boost germane load. Within this framework, CLT suggests employing instructional effects such as the split attention effect, the redundancy effect, and the imagination effect to improve learners' outcomes. Indeed, no matter how it is taught, certain content is inherently challenging to comprehend and learn. Furthermore, element interactivity, or the quantity of parts that must be processed concurrently in working memory to comprehend and acquire the content being taught, is the crucial component (Plass et al., 2010).

### ***2.1.2 Schema Theory***

According to Bartlett (1932), schemas are cognitive frameworks that serve as the foundation for human memory processes and aid individuals in organizing, processing, and recalling current information. Schema theory has offered reading research two major advantages, highlighting the creative nature of understanding and crucial role that the reader's past knowledge in that creation (Sadoski et al., 1991). A reading model that sees reading as an interactive activity involving the text and the reader's past knowledge is based on the schema theory. The reader already processes background knowledge, or prior information, which is essential for learning new information. According to Xiao (2016), new information is learned when relevant past knowledge is present. From a schema standpoint, the memory matrix

technique uses structured prior information to assist activate and organize prior knowledge frameworks (schemata), which facilitates comprehension and recall.

**Figure 1**

*Structure of the Memory Matrix Strategy*


**2.2 Definition of the Memory Matrix Strategy**

It is a two-dimensional graphic that is used to arrange data and display relationships. The row and column headings are supplied by the activity, but the cells are left empty. As learners fill in the blank cell, it provides feedback on their understanding of the subject matter and assists teachers in assessing learners’ recall and comprehension (Angelo & Cross, 1993).

Memory matrices can be used by students in two different ways. First, they can use it only as a self-directed learning resource. Teachers can introduce and explain the memory matrix before asking students to finish it at the end of each class. Another use for the memory matrix is an assessment tool Ask students to fill in blank memory matrices with examples and descriptions of each subject; just the categories and concepts should be filled in (Columbia Center for Teaching and Learning, 2022).

### **2.2.1 Memory Matrix Strategy: Positive and Negative Aspect in EFL Learning**

The memory matrix enables more effective information retrieval by assisting students in organizing, classifying, and integrating vast volumes of content. This method's graphic aspects may be especially helpful for learners who learn best visually. To facilitate quick reading and assessment, it produces just the essential amount of textual material displayed in an understandable graphic style (Angelo & Cross, 1993). A straightforward and simple to use formative assessment tool is the memory matrix. Teachers can use the memory matrix to assess students' comprehension of these topics. Depending on the kind of work that needs to be completed, a teacher could even promote group collaboration among the students (Lakshmi & Majid, 2019). While these positive outcomes are important, it is also necessary to address the negative effect. Angelo and Cross (1993) stated that learners are unfamiliar with this structure. Since not all data can be arranged into matrix cells, Statisticians recognize the distinction between sequential and categorical data. Factors like a poor fit between the row and column headings, inadequate space in the blank cells, and confusing instructions to students to write only words or short sentences may incorrectly reflect the performance of both students and teachers.

### **2.3 Definition of Reading Comprehension**

Reading comprehension is complex and requires a wide range of cognitive talents. Additionally, understanding outcomes are influenced by the reader, the text, and the action. Deep understanding, which is still more difficult than decoding, is goal of reading instruction (Sweet & Snow, 2003). The development of children's reading skills and, subsequently, their ability to get an education depends on reading comprehension, which is regarded as the essence

of reading (National Reading Panel, 2000). Reading comprehension in a foreign language is essential for academic instruction (Saeedi et al., 1916). Reading comprehension requires a variety of cognitive skills to be integrated. Word recognition, the ability to read, syntactic abilities, memory and vocabulary are some of these skills (Oakill et al., 2015).

### ***2.3.1 Models of Reading Comprehension***

Reading comprehension is a complex process through which readers construct meaning from written text. Its complexity has led researchers to apply several models that explain how readers understand written texts. The prominent models are the bottom-up model, the top-down model, and the interactive model. The interactive model of reading comprehension is used in this study, which combines top-down and bottom-up cognitive processes to describe how readers derive meaning. Learners must be proficient in both bottom-up strategies for processing individual letters, words, and sentences as well as top-down strategies, which entail conceptually driven knowledge, to become proficient readers (Brown, 2004).

The interactive model highlights the importance of the reader's input as well as the content, to validate and improve their understanding, readers in this model blended top-down expectation with bottom-up decoding. Because it captures the intricate interactions between textual clues and reader knowledge that promote comprehension, this model helps EFL students increase their comprehension. It offers a strong framework for enhancing reading comprehension (Rumelhart, 2022).

### ***2.3.2 Graphic Memory Matrix and Its Impact on Reading Comprehension***

The novelty of this strategy within the Iraqi educational context lies in the fact graphic organizers such as the memory matrix have not been widely applied in instruction and are

considered an innovative approach to enhance students' cognitive processing during reading. Matrices are a particular kind of graphic organizers. They help students to arrange and integrate information during reading. They can be used to enhance learners' understanding before, during and after reading (Manoli & Papadopoulos, 2012). The positive relationships between matrix instruction and improved reading comprehension among EFL learners is supported by empirical evidence, which also indicates that the application of memory matrix strategy is linked to improvements in EFL learners' reading comprehension of narrative texts (Sarimah, 2014).

### 3. Research Methodology

#### 3.1 Research Design

This study used an experimental design with two groups: a control group that received instruction using conventional ways and an experimental group that received instruction using the memory matrix strategy. The approach was chosen to give the researcher control over unrelated variables while measuring the effect of graphic memory matrix on reading comprehension (Fraenkel et al., 2012). As indicated in table (1), pre-tests and post-tests were given to both groups to assess the memory matrix's efficacy.

**Table (1)**

*The Experimental Design of this Study*

Group	Test	No. of Students	Method used	Test
Experimental	Pretest	40	Graphic memory matrix	Posttest
Control	Pretest	40	Traditional method	Posttest

### **3.2 Population and Sample**

The population of this study comprised second-grade intermediate school students in Karbala Province, from this population, a purposive sample of 80 students was selected from two comparable classes at the same school in Karbala (Cohen et al., 2018), and the sample was divided into: the experimental group (n = 40): taught using graphic memory matrix, and the control group (n = 40): taught using traditional reading methods.

### **3.3 Instrument of Data Collection**

The primary instrument used for data collection was a reading comprehension test designed by the researcher. The test consisted of two parts: pre-test, to assess the initial reading comprehension level of both groups before the intervention and post-test, to measure the progress after the implementation of the instructional treatments. The test was designed to align with cognitive levels of Blooms' Taxonomy of educational objectives (remembering, understanding, application and analysis). The test consisted of matrix tasks, multiple-choice questions and questions requiring students to respond. The instructional intervention was implemented over two months.

### **3.4 Validity of the Instrument**

Face Validity: A panel of EFL experts and English language teaching professors from universities evaluated the test to guarantee face validity. They assessed the content's appropriateness for Iraqi EFL students as well as its clarity and language proficiency.

Content Validity: By matching the test items to the EFL curriculum objectives of the Iraqi Ministry of Education, content validity was verified. Reading comprehension abilities like

inferences, vocabulary, main concept identification, and understanding were all included in the test. Before final administration, changes were made in response to expert input.

### 3.5 Test Reliability

Because this approach is based on the inter-item correlation inside the test, the researcher used it to assess the test's reliability. One of the most used formulas for assessing the internal consistency of objective exams is KR. Using this strategy, dependability was determined by applying the KR-20 formula to a sample of 100 female students' scores. The outcome produced a reliability coefficient of pre-test ( $KR_{20} = 0.76$  &  $KR_{post-test} = 0.79$ ), indicating a good degree of dependability.

## 4. Presentation of the Results

**Table (2)**

*Independent Sample t-test – Post-test Scores*

Group	N.	Mean	S.D.	Group Statistics		DF	Level of Sig.
				T-Value	Calculated		
Posttest	40	1.10	0.709	4.587		78	0.000
Pretest	40	0.38	0.705				

**Interpretation:** When compared to the control group, the experimental group's reading comprehension skills improved statistically significantly ( $p < 0.05$ ). This suggests that reading comprehension was improved by the memory matrix technique. Important information about the efficacy of instructional strategies is revealed by the data analysis pertaining to the first hypothesis. To determine whether there was a statistically significant difference in post-test

scores between the experimental group-which used association techniques-and the control group which used conventional teaching methods.

The null hypothesis is rejected because of this statistical result, indicating that the two groups' academic performance differs significantly. When compared to conventional approaches, the experimental group's higher mean score suggests that the memory matrix used in their instruction was more successful in improving learning outcomes. This result is consistent with previous research that frequently promotes interactive and captivating teaching methods. The findings imply that the experimental group performed more consistently, suggesting that the association strategies might have helped students grasp the subject matter more uniformly.

## **5. Conclusions**

The result of this study clearly demonstrate that the graphic memory matrix strategy significantly improves the reading comprehension of Iraqi EFL learners in comparison to conventional methods. In the Iraqi EFL environment, where English is instructed through conventional, teacher-centered methodologies emphasizing grammar and translation, the results are especially important. They indicate that a transition to learner-centered, cognitively stimulating practices can enhance language proficiency and positively influence students' perceptions toward reading comprehension in English. Furthermore, the significant statistical changes between pre-test and post-test in the experimental group corroborate the idea that instructional innovation, particularly through cognitive approaches, might mitigate the deficiencies in resources and curriculum design prevalent in numerous Iraqi schools.



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#### الملخص باللغة العربية

تسعى هذه الدراسة الى استكشاف فاعلية المصفوفة البصرية للذاكرة وتهدف الى تعزيز فهم القراءة لدى طلبة اللغة الإنكليزية كلغة اجنبية في العراق. اعتمدت الباحثة في تصميم هذه الدراسة على المنهج التجريبي، حيث اختارت (80) طالبا من المرحلة المتوسطة، وقسمتهم الى مجموعة تجريبية ومجموعة ضابطة. تلقت المجموعة التجريبية تعليما يستند الى استخدام المصفوفة البصرية للذاكرة، والتي وجهت المتعلمين لتنظيم المعلومات النصية بصورة بصرية ضمن مصفوفات ورسوم بيانية، في حين درست المجموعة الضابطة باستخدام الطرق التقليدية المعتمدة على النصوص فقط. أجرت المجموعتان اختبارا قليا واختبارا بعديا لقياس مستوى التحسن في فهم القراءة. أظهرت التحليلات الإحصائية ان المجموعة التجريبية حققت تحسنا ذا دلالة إحصائية أكبر في فهم القراءة مقارنة بالمجموعة الضابطة، مما يشير الى فاعلية المصفوفة البصرية للذاكرة في تعزيز قدرة الطلبة على استيعاب النصوص المكتوبة وتنظيم المعلومات والاحتفاظ بها. كما أظهرت النتائج ان الطلبة في المجموعة التجريبية أبدوا مواقف أكثر إيجابية وتفاعلا اعلى مع مهام القراءة، وهوما يعكس فوائد دمج استراتيجيات معرفية تعتمد على ترتيب المعلومات بصريا لتسهيل الوصول الى فهم أعمق. تتوافق هذه النتائج مع الأبحاث التي تناولت المنظمات البصرية كأدوات فعالة في تعليم القراءة في سياقات تعليم اللغة الإنكليزية، كلغة أجنبية، حيث تؤكد ان المصفوفة البصرية تسهم في تسهيل المعالجة المعرفية وتطوير مهارات الفهم القرائي.