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Suggestions for further research:
   The following areas are suggested for further research:

1. A study using memory strategies- based activities to enhance EFL Students' vocabulary learning with different samples and settings. For example, primary stage and secondary stage.

2. A study using memory strategies - based activities program to enhance students' speaking skills.

3. Examine the use of Word Chain Game in other samples, such as the students in junior high school or senior high school who still need to study and master more deeply about the English vocabulary.

different information processing strategies- encoding, retrieval, visual imagery and generation.

The result of present study also revealed that the students made and achieved different degrees of progress in the vocabulary knowledge and depth of this knowledge and the breadth at the same time. This was reflected in their response to the test items related to vocabulary knowledge. These results may be attributed to the fact that the training program in one of its dimension focused on raising students morphological awareness during reading texts for vocabulary acquisition. This was centered around word recognition which involves decoding and language comprehension of words. At the same time, language comprehension in the training sessions involved vocabulary background knowledge, language structure, verbal reading and literacy knowledge. How to acquire vocabulary and use it at the same time. The morphological awareness in the texts used in the sessions increasingly took the form of multisyllabic words. Approximately, the students were exposed to 4.000 – 10.000 new words in the texts which were multisyllabic words. The students stored their words in the working memory and used them- retrieved them in the time of need. This result is consistent with Perry and Lauden (2019)

Recommendations of the study:

In the light of the findings of the study the following recommendations may be presented:

1. Vocabulary learning should be a major concern in teaching EFL in our classes as the lack of vocabulary knowledge affects all other elements of EFL negatively.
2. The program based on memory strategies should be included in the
   EFL courses writing to supplement vocabulary instruction.
3. It is recommended that the program based on memory strategies complement the textbooks of EFL in schools.
4. It is recommended that EFL teachers may design and develop their own program based on memory strategies that suit their students' needs and educational levels.

**Table (3): The mean scores, standard deviations, t-value
and level of significance of the experimental group in the pre and
post assessment in the meaning aspect of EFL vocabulary learning.**

Aspects	Application	N	Mean	S.D	T-value	D.F	Sig.
Meaning Aspect	Pre-	40	8.7750	2.35870	34.357	39	0.01
	Post-	40	21.7000	2.84830			

Table (4) presents the students' mean scores, standard deviations, t-value and level of significance of the experimental group in the pre- and post-assessment in the use aspect of EFL vocabulary learning where t-value is (25.298) which is significant at the (0.01) level of significance. Therefore, this hypothesis was assured.

**Table (4): The mean scores, standard deviations, t-value
and level of significance of the experimental group in the pre and
post assessment in the use aspect of EFL vocabulary learning**

Aspects	Application	N	Mean	S.D	T-value	D.F	Sig.
Use Aspect	Pre-	40	8.3250	3.20566	25.298	39	0.01
	Post-	40	22.9250	4.50861			

Results of the present study confirmed that there is a statistically significant difference between the mean scores of the participants of the present study in the pre- post assessment of EFL vocabulary learning in favor of post assessment".

The discussion and interpretation of the results of the study:

Based on the statistical analysis of the results, it is clear that the students performed and acquired different degrees of vocabulary, form, meaning and use which may be due to the fact that the memory strategies which the students were exposed to these strategies addressed the students' aptitude – the students need to take responsibility for learning, awareness- the need of the students as learners to be conscious of what approaches are being taken to acquire vocabulary including goals, content and sequence, monitoring and assessment this result is consistent with Khadmally (2019).This indicates that memory strategies focused on

**Table (1): The mean scores, standard deviations, t-value
and level of significance of the experimental group in the pre and
post
assessment in the overall EFL vocabulary learning aspects.**

Skill	Application	N	Mean	S.D	T-value	D.F	Sig.
EFL vocabulary learning	Pre-	40	28.9250	7.09781	65.611	39	0.01
	Post-	40	77.9500	10.07396			

Table (2) presents the students' mean scores, standard deviations, t-value and level of significance of the experimental group in the pre- and post-assessment in the form aspect of EFL vocabulary learning where t-value is (42.144) which is significant at the (0.01) level of significance. Therefore, this hypothesis was verified.

**Table (2): The mean scores, standard deviations, t-value
and level of significance of the experimental group in the pre and
post assessment in the form aspect of EFL vocabulary learning.**

Skill	Application	N	Mean	S.D	T-value	D.F	Sig.
Form Aspect	Pre-	40	11.8250	3.85565	42.144	39	0.01
	Post-	40	33.3250	4.76304			

Table (3) presents the students' mean scores, standard deviations, t-value and level of significance of the experimental group in the pre- and post-assessment in the meaning aspect of EFL vocabulary learning where t-value is (34.357) which is significant at the (0.01) level of significance. Therefore, this hypothesis was verified.

acquisition of vocabulary. The training focused on the morphemes of the words which may be strategically used and manipulated to support their word learning. The instruction includes highly utilized academic word meaning, scaffolding word manipulation in instructional contexts and explicit instruction for breaking words apart using morphemes to build words as well as meaning of roots and affixes. Both of which the students used to build the needed skills for supporting academic vocabulary development.

Evaluation techniques

The students' progress was evaluated through the implementation of using encoding strategy using both formative and summative evaluation.

Formative evaluation:

Students were given some activities to perform at the end of each session to make sure that the students achieved the objectives of the sessions. Moreover, two sessions (6 and 11) were assigned as evaluative sessions through which the students performed some activities to make sure that the students acquired the intended skills.

Summative evaluation:

This was conducted at the end of using encoding strategy as a learning tool implementation. It included the administration of EFL vocabulary learning post-test. The major type of this type is to measure the achievement of the intended outcomes by using encoding strategy as a learning strategy. It also aimed at investigating using encoding strategy as a learning strategy to improve some EFL vocabulary learning aspects for the prospective teacher of English.

Results of the study:

The results of the present study are presented in the light of the hypotheses of the study using the Statistical Package for Social Sciences (SPSS) program version (18). The present study contains four main hypotheses related to the EFL vocabulary learning test. Findings are stated as follows:

Table (1) presents the students' mean scores, standard deviations, t-value and level of significance of the experimental group in the pre- and post-assessment in the overall EFL vocabulary learning aspects. It is clear from table (1) t-value is (65.61) which is significant at the (0.01) level of significance. Therefore, this hypothesis was verified.

- The teacher asks the students to think aloud while performing the task to be aware of what they do.
- The teacher provides the opportunities for the students to perform the task under normal condition and then when they have finished, they are asked to think back and describe what they did and what they were not able to do.
- This recall is ended by video tape of the task performance.

3- The monitoring stage:

The teacher monitors the students' learning of vocabulary through guiding them to:

- Spend more time on vocabulary learning inside and outside classroom.
- Select the words to learn from class texts rather than from a range of sources of interest and value to them.
- Select the words simply because they are unknown rather than considering frequency, area of specialization (academic or non-academic vocabulary) personal goals or previous meetings with the words.
- Be aware that the words they selected are of limited use to them.
- Focus on the meaning of the words in the copied sentences rather than also exploring the range of collocation and uses and creating their own sentences
- Use note learning and the working memory strategy they were taught and use the words in speaking, reading, and writing.
- Do not limit their learning to the short-term goal.
- Revise the words periodically.
- Leave that they are learning to be efficient vocabulary uses and do not alter their selection of words a learning procedure.
- Feel satisfied with their vocabulary learning.
- Retain many of the words they studied.
- Check their progress from time to time.
- Make a proportion of the words to be guessed from context.

These results are consistent with previous research that proved the effect of the using encoding strategy on improving EFL vocabulary learning skills. For example, Prime (2016). found that applying encoding strategy as a memory strategy increased the students'

the students are working with familiar material. The encouragement is in a form of time pressure, competition with other previous performance or with others or the opportunity to repeat the task.

4- The activities should involve a large quantity of language processing. That is, the students should read or write texts several hundred words long and learning for several minutes.

The present study program applied the four major strategies of memory instruction in a form of planning, finding information, establishing knowledge and presenting wide range of activities and practice as follows:

1- The planning stage:

Before starting to teach the working memory strategy, the teacher put a schema for planning which involves:

a. Deciding how much time to spend on training and learning in working memory strategy.

b. Working out a text for working memory strategy and a text for sub- strategy that covers the required knowledge and providing a plenty of opportunities for increasingly independent practice.

c. Monitoring and providing feedback on the students' control of the strategy.

2- The practice stage:

The teacher and the students participate in this stage as follows:

- The teacher models the strategy for the students.
- The steps of the strategy are practiced separately.
- The students apply the strategy in pairs supporting each other.
- The students report back on the application of the steps in the strategy.
- The students report on their difficulties and success in the use of the strategy.
- The teacher systematically tests the students and gives the feedback.
- The students consult the teacher on their use of the strategy seeking advice when needed.
- The teacher observes the students when using the strategy by giving them written questions from time to time.

be able to use the encoding strategy to develop their EFL vocabulary learning skills.

The Experimental Treatment

The experiment was carried out during the first semester of the academic year 2020/2021 and lasted for six weeks with about three sessions per week and each session lasted for about two hours. The present study program consists of a variety of extensive reading texts including all types of vocabulary. These texts are distributed in proportion to 16 sessions. Every texts reflects different type of vocabulary learning as follows:

1- **Grammatical Function-** different parts of speech are taught separately become they occur in different sentences pattern and need to be sequenced.

2- **Links between areas of meaning-** the overlapping features between two different areas of meaning and the features of conceptual range for extension into other meanings.

3- **Positive interfere between areas of meaning-** it is used as a kind of association to solve misunderstanding.

4- **Usefulness-** the degree to which the vocabulary can be defined and used in different contexts.

5- **Frequency-** high frequency words and low frequency words.

6- **Definition-** either by:
   - **Demonstration:** abstraction (analytical definition)
   - **Contextual definition**

Criteria for selecting the context

Every text contains different activities to help students acquire vocabulary with its broader sense. To achieve this, the following criteria are applied:

1- The vocabulary activities should involve only known words- and preferably familiar content knowledge. This is achieved by working with material that has already been studied in the previous classes, by choosing very simple material, by allowing the students to control the task and by helping them to plan.

2- The activities should be meaning-focused, that is the students should be interested in and focused on the message they are sending or receiving.

3- There should be some encouragement to do the activity at a speed faster than the students' normal speed. This is possible to become

To ensure face validity of the EFL Vocabulary learning post-test, it was developed through reviewing previous literature and related studies on the field of EFL Vocabulary learning assessment. This review was, to a large extent, accurate, comprehensive and systematic to determine the general form and items of the test. Consequently, the test can be interpreted as being valid and has face validity.

Content Validity

Concerning content validity of the EFL Vocabulary learning post-test, it was measured through submitting the test to a jury of specialists in EFL curricula and instruction (N=40), (Appendix, 6), to identify its validity. Some of the jury members (N=7) accepted the test as it was suggesting that it does not need any modifications either by adding or omitting any of the test items. However, the rest of the jury members suggested rearranging the order of some questions. Except for this, the jury members indicated that the test has clear instructions and is appropriate for measuring what it is intended to measure. Accordingly, it could be said that the EFL Vocabulary learning test has content validity.

- **Reliability of the post-test:**
  - **Inter-rater method:**

Inter-rater reliability means two or more raters/observers give consistent estimate of the same test and this method is used to avoid the subjectivity factors in grading. Accordingly, the researcher gave an English language instructor a copy of students' answers to the EFL vocabulary learning post-test to score the students' answers. Comparing the results of the two raters, it was found that the Pearson correlation was (0.994) which is significant at the 0.001 level.

The EFL Vocabulary learning post-Test in its final version

Based on the suggestions of the jury members, the EFL Vocabulary learning post-test was modified in its final form (Appendix, 4); the EFL Vocabulary learning post-test consists of eleven questions: five questions were devoted to measuring form aspects, four questions were aimed at measuring Meaning aspects. Four questions were devoted to measure students' Use aspects.

Aim of the Study

The study aimed at developing some of the EFL vocabulary learning skills for fourth year students, enrolled in English section at Benha Faculty of Education. The researcher uses encoding strategy to accomplish the study aims, so by the end of the treatment students will

(0.994) which is significant at the 0.00 level. This means that the EFL Vocabulary learning test is reliable.

Inter-rater method:

Inter-rater reliability means two or more raters/observers give consistent estimate of the same test and this method is used to avoid the subjectivity factors in grading. Accordingly, the researcher gave an English language instructor [*] a copy of students' answers to the EFL vocabulary learning pre-test to score the students' answers. Calculating between the two scores of the two raters, it was found that the Pearson correlation was (0.994) which is significant at the 0.001 level.

Description of the EFL Vocabulary learning post-test

The EFL Vocabulary learning post-test consisted of eleven questions: five questions were devoted to measuring form aspects, four questions were aimed at measuring Meaning aspects. Four questions were devoted to measure students' Use aspects.

➢ **Form aspects**

The researcher sets five questions in the test to measure the students' Form aspects (Spoken Form- Written Form- Word Parts- Form-Meaning connection). These five questions included one multiple choice question, one pronunciation question, question for writing a paragraph, and two questions for providing word family

➢ **Meaning aspects**

Four questions were devoted to measure the meaning aspects (Concept and referents- Associations). The questions asked the students to write a definition for word parts. The questions also included multiple choices about the meaning of words that have more than one meaning.

➢ **Use aspects**

The researcher set some question to test students' use of vocabulary. Some questions ask them to use correct word form to complete the sentence and use words in different contexts

Validity of the post-test

Two methods were used to ensure the validity of the EFL Vocabulary learning post-test: content validity and face validity.

Face Validity

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[*] Ghada Elsadek Abdallah -ESP English Language Instructor at Faculty of Education, Benha University

it is intended to measure. Accordingly, it could be said that the EFL Vocabulary learning test has content validity.

The EFL Vocabulary learning Pre-Test in its final version

Based on the suggestions of the jury members, the EFL Vocabulary learning pre-test was modified in its final form; the EFL Vocabulary learning pre-test consists of eleven questions: five questions were devoted to measuring form aspects, four questions were aimed at measuring Meaning aspects. Four questions were devoted to measure students' Use aspects.

Validity of the test

Two methods were used to ensure the validity of the EFL Vocabulary learning test: content validity and face validity.

4) Face Validity

To ensure face validity of the EFL Vocabulary learning pre-test, it was developed through reviewing previous literature and related studies on the field of EFL Vocabulary learning assessment. This review was, to a large extent, accurate, comprehensive and systematic to determine the general form and items of the test. Consequently, the test can be interpreted as being valid and has face validity.

5) Content Validity

Concerning content validity of the EFL Vocabulary learning pre-test, it was measured through submitting the test to a jury of specialists in EFL curricula and instruction (N=14), to identify its validity. Some of the jury members (N=7) accepted the test as it was suggesting that it does not need any modifications either by adding or omitting any of the test items. However, the rest of the jury members suggested rearranging the order of some questions. Except for this, the jury members indicated that the test has clear instructions and is appropriate for measuring what it is intended to measure. Accordingly, it could be said that the EFL Vocabulary learning test has content validity.

Reliability of the pre-test:

The reliability of the test was measured by using the following:

The test-retest method:

The test in its final form was administered to a group of 4th year English section students at the Faculty of Education, Benha University (N=40) during the first semester of the academic year 2020-2021. Then it was administered to the same group again after two weeks. The Pearson correlation coefficient between the two administrations was

aimed at measuring Meaning aspects. Four questions were devoted to measure students' Use aspects.

➢ **Form aspects**

The researcher sets five questions in the test to measure the students' Form aspects (Spoken Form- Written Form- Word Parts- Form-Meaning connection). These five questions included one multiple choice question, one pronunciation question, question for writing a paragraph, and two questions for providing word family

➢ **Meaning aspects**

Four questions were devoted to measure the meaning aspects (Concept and referents- Associations). The questions asked the students to write a definition for word parts. The questions also included multiple choices about the meaning of words that have more than one meaning.

➢ **Use aspects**

The researcher set some question to test students' use of vocabulary. Some questions asks them to use correct word form to complete the sentence and use words in different contexts

Validity of the test

Two methods were used to ensure the validity of the EFL Vocabulary learning test: content validity and face validity.

Face Validity

To ensure face validity of the EFL Vocabulary learning pre-test, it was developed through reviewing previous literature and related studies on the field of EFL Vocabulary learning assessment. This review was, to a large extent, accurate, comprehensive and systematic to determine the general form and items of the test. Consequently, the test can be interpreted as being valid and has face validity.

Content Validity

Concerning content validity of the EFL Vocabulary learning pre-test, it was measured through submitting the test to a jury of specialists in EFL curricula and instruction (N=14), to identify its validity. Some of the jury members (N=7) accepted the test as it was suggesting that it does not need any modifications either by adding or omitting any of the test items. However, the rest of the jury members suggested rearranging the order of some questions. Except for this, the jury members indicated that the test has clear instructions and is appropriate for measuring what

word parts and provide the meaning of the word parts as productive aspects.

5) The " Form-meaning connection" sub aspect should include recognize the meaning and relate it with the word form as a receptive aspect and express the word meaning as a productive aspect.

6) The second main aspect "Meaning" suggesting that summarizing its sub aspects into two sub- aspect "Concept and referents" which includes only two performance indicators: recognizing the multiple definition of a word as a receptive aspect and using the multiple definition of a word as a productive aspect. The second sub- aspect is "Association" that include two performance indicators which are recognize the words that have same pronunciation but different spelling as a receptive aspect and produce suitable synonyms and antonyms of a word as a productive aspect.

7) The third main aspect "Use" suggesting that omitting the third sub-aspect in it "constraint on use". Arguing that it is inappropriate and remain the two sub- aspect "Grammar" and collocates.

8) Omitting the fourth main aspect "Frequency" Arguing that it is difficult to measure this aspect.

9) Omitting the fifth and sixth main aspect "Position" and "size". Arguing that they are difficult to measure.

The EFL Vocabulary Learning check aspects in its final form

Based on the suggestions of the jury's members, the EFL Vocabulary Learning check aspects, was modified. In its final form, the EFL Vocabulary Learning check aspects, consists of three main skill2s:

1) Form aspect: include four sub aspects (Spoken Form- Written Form- Word Parts- Form-meaning connection).

2) Meaning aspect: including two sub aspects (Concept and referents- Associations)

3) Use aspects: including two sub aspects (Grammar- Collocates)

Description of the EFL Vocabulary pre-test

The EFL Vocabulary pre-test consisted of eleven questions: five questions were devoted to measuring form aspects, four questions were

Description of the EFL Vocabulary Learning check aspects

The EFL Vocabulary Learning check aspects consisted of three main aspects: Form, Meaning and Use. Each of these aspects was divided into sub-aspects.

Validity of the EFL Vocabulary Learning check aspects

Face Validity

To ensure the face validity of the EFL Vocabulary Learning check aspects, it was developed through reviewing the previous literature and related studies to the field of EFL vocabulary. This review was to a great extent; thorough, intensive, accurate, and systematic to determine the general form of the check aspect; its items; the types of these items; and how they should be graded. Accordingly, it could be said that the check aspect is comprehensive and representative of the EFL vocabulary learning aspects required for prospective teachers English section students. Consequently, the check aspect could be interpreted as being valid and having face validity.

Content Validity

In order to determine the content validity of the EFL Vocabulary Learning check aspects, it was submitted to a jury of specialists in curriculum and instruction (EFL) (N=14) to identify its validity. Six jury members accepted the checklist suggesting that it does not need any modifications either by adding or omitting any of the aspects or sub- aspects. However, the rest of the jury members suggested the following modifications:

1) Some of the jury members suggested that the check aspect should focus more clearly on both receptive and productive aspect of EFL vocabulary Learning.

2) The first sub aspect "Spoken form" under the main aspect "Form" was including "pronounce the word" and "read aloud" suggesting that changing into recognizing the stress and intonation of a word as a receptive aspect and produce suitable stress and intonation of a word as a productive aspect.

3) The sub aspect "Written Form" should include spelling the word correctly as a productive aspect and recognizing the correct spelling of a word as a receptive aspect.

4) The third sub-aspect "Word Parts" suggesting that it should refers to recognize the parts of a word (i.e. suffix, affix) and know the meaning of the word parts as receptive aspects and use the correct

Statement of the problem

The problem of this study is that there is a lack of EFL vocabulary and language performance among fourth year students in the Faculty of Education. The study therefore aimed to use working memory strategy to develop EFL vocabulary learning.

Questions of the study

The present study tried to answer the following questions: -

1. How can working memory strategy be used for developing vocabulary learning required for fourth year students at the Faculty of Education?

2. What is the effectiveness of using working memory strategy for developing EFL vocabulary learning among fourth year students at the Faculty of Education?

Delimitations of the study

The present study was delimited to the following: -

1- A sample of fourth year students enrolled in the English section at the Faculty of Education, Benha University.

2- Some EFL vocabulary learning strategies that were required for fourth year students at the Faculty of Education.

Participants of the study

The participants of the present study were selected from Prospective Teachers (Fourth year, English Section students) at Faculty of Education, Benha University during the first semester of the academic year 2020-2021. The total number of students was (40). The sessions were divided into virtual sessions and physical session due to Covid-19 pandemic. They attended almost all the sessions of the implementation and the pre- and post- administration of the instruments of the study.

Instrument and material of the study

In order to fulfill the aim of the study, the researcher designed and applied three main instruments:

1) An EFL Vocabulary Learning check list of aspects required for the fourth-year prospective teachers.

2) An EFL Vocabulary Learning pre and post Tests to measure prospective teachers' EFL Vocabulary Learning

3) An EFL Vocabulary Learning rubric to score students' performance of the EFL Vocabulary Learning.

followed by decreased oscillating capacity in theta, alpha, and beta bands (Bonhage et al., 2017), frequencies all contributed to working memory load (Jensen and Tesche, 2002), and in the case of theta oscillations, rehearsal techniques were applied (Meltzer et al., 2017). Some electrophysiological experiments used event-related potentials (ERPs) to examine the preservation of verbal information either in tasks of working memory or in tasks of sentencing. Studies using working memory tasks recorded long-lasting frontal negative effects on the expense of verbal retention as opposed to non-verbal information (Lang et al., 1992; Ruchkin et al., 1992). Although some researchers specifically linked the frontal slow waves to phonological rehearsal processes (Lang et al., 1992; Ruchkin et al., 1992), others, who recorded similar slow waves for non-verbalizable situations, interpreted it as being linked to careful regulation of the quality of working memory (Bosch et al., 2001; Murphy et al., 2006). Studies measuring the cost of working memory during sentence processing identified similar cortical negative changes for sentences or sentence sections that were assumed to place enhanced processing loads on working memory (King and Kutas, 1995).

Context of the problem

Although it is important to learn EFL vocabulary as a foreign language for fourth-year students in the Faculty of Education, it does not receive the necessary attention in the educational process, and many studies have indicated that there is a deficiency in learning vocabulary, such as Abdelrahman, 2013; Ahmadi, 2017; Al-Dagel, 2009; Al-Darayseh, 2014; Khalafi, and Oroji 2016.

The researcher conducted a pilot study during the second semester 2018/2019 to investigate the problem of EFL fourth year students in English language section in the learning of vocabulary, the sample consisted of 20 students in the fourth year in the Faculty of Education, Benha University and she used a vocabulary test prepared by Deighton (1979). The results showed that 70% of students scored less than 40% of the final score while 30% of students scored from 40% to 50% of the final score. This confirms that there is a lack of EFL language vocabulary among the fourth-year students in the Faculty of Education.

According to the previous studies and the pilot study, fourth-year students were found to have a problem in learning and using EFL vocabulary, which in turn affects learning English language skills and language performance.

been improved by training in working memory. Working memory should be treated in turn, rather than in tandem with other executive function capabilities, for more successful outcomes. There were further changes in short-term memory by teaching the short-term memory alone (Rapport et al., 2013). Working memory training is often seen as a safer choice for schools compared to other current work memory treatments. Central Executive Training (CET), for example, is equivalent to Behavioral Parent Training (BPT) to enhance working memory (Kofler et al., 2018).

Practice in working memory is an evidentiary approach to help individuals with ADHD and working memory deficits. There are also several teaching styles for working memory, such as lecture, computer-based, or individual teaching. School psychologists need to study several models to decide which ones can be applied in the classroom setting for best practices. Teachers in the classroom can change the rhythm of the classroom by recognizing working memory problems, breaking down details and developing long-term skills (Alloway & Copello, 2013). Knowledge breaking down avoids challenges to finish the task. If a task exceeds the working memory ability of a student, so the student cannot complete the task (Alloway & Copello, 2013). Long-term information building avoids overloading of the working memory. Cognitive burden control successfully facilitates working class memory processing (Dehn, 2014a, 2014b). When teachers recognize the cognitive load variables (e.g., the number, order, and structure of materials, whether knowledge should be stored or remembered), they will carefully plan curriculum and teach students how to control their cognitive load (Dehn, 2014b). Memory mates is another example of a classroom-based memory technique, developed with a teacher's encouragement for individual student use (Colmar & Double, 2017).

A recent research has shown that working memory for sentences, relative to unstructured word sets, includes a broadly spread network of brain areas linked to semantic processing during encoding, and reduced stimulation of sub-vocal rehearsal-associated areas during maintenance (Bonhage et al., 2014). This and other research indicate that the benefits of working memory during maintenance (consisting of a smaller amount of rehearsal-related behavior and improvement in performance) can depend on increased processing costs during the encoding phase (Bor et al., 2003, 2004; Bonhage et al., 2014). In a study on memorizing sentences vs. unstructured word sequences, sentence preservation was

executive self-regulation functions that communicate at all these levels. (McCloskey & Perkins, 2013).

Working Memory Functioning and Academic Performance

Working memory influences learning of know-how through subject fields. Working memory is associated with the growth of a student's capacity to read, measure math, reason, comprehend reading, write, and gain vocabulary (Alloway, Banner, & Smith, 2010; Dehn, 2014b; Hitch, 2002).Working memory capacity is highly related to academic learning, as it relates to encoding information for long-term memory. Additionally, language impaired children experience deficits in the phonological loop, which impacts native and nonnative vocabulary acquisition (Hitch, 2002).

According to a new longitudinal study (Ahmed et al., 2019), memory is so critical that it was found to be the best indicator of academic success in high school. He observed that "after testing factors in early achievement, gender, and home setting, only working memory at age 54 significantly predicted working memory at age 15 and that working memory was the only meaningful EFL predictor of achievement at age 15". Working memory is an important factor in language development which facilitates or inhibits the learning of foreign languages. Bilingual people have a greater ability for working memory. Short term phonological memory is used for learning a foreign language. For example, participant success on a backward digit period test was measured in some studies. Digit period success was strongly associated with overall English language skills as well as reading, listening, speaking and using English test scores (vocabulary and grammar) (Kormos & Safar, 2008). School psychologists can share this knowledge while developing plans for high school teachers, as well as with foreign language educators to intervene for students with memory problems.

Working Memory Training

Studies have shown that teaching semantic working memory has improved efficiency in working memory (Ackermann et al., 2018). Working memory training stimulates the brain's front parietal network and is thought to be responsible for controlling the working memory (Thompson et al., 2016). Training of working memory is considered to improve dimensions of working memory of adults with learning disabilities and ADHD (Gray et al., 2012). Schwarb et al. (2016) revealed that the capacity to resist reactions to irrelevant information has

complex cognitive activities (Baddeley, 2003). Working memory theory at the beginning of the 20th century was of interest to psychologists, with most of them contrasting the memory cycle within the human brain with the information processing inside a computer (computer metaphor; this is also the start of a new area in cognitive sciences). During the 1960s, a wider definition of memory was adopted where it was believed that information from the world was first processed by our senses (auditory, verbal, visual) before being transmitted to a temporary short-term memory and eventually preserved in long-term memory. Therefore, it was believed to consist of a series of separate but interconnected subsystem for processing information (Abd Ghani, 2013).

Working memory can be defined as an active memory system which is responsible for retaining information temporarily while interpreting and processing the input simultaneously before any cognitive decisions are made (e.g., Bayliss, Jarrold, Baddeley, Gunn, & Leigh 2005). This is often referred to as a perceptual workspace for manipulating activated forms of long-term memory (Stoltzfus, Hasher, & Zacks 1996).

Pershelli, (2007) stated that Active Working Memory retains the data accessible in the first sentence until the end of the reading portion, so that the brain can decide whether to retain or erase the data in Long Term Memory. Everybody knows early in this computer world that if data is not saved regularly, they will get lost. Sending data to the Memory Depot Long Term is equivalent to clicking on the "delete" icon in word processing.

To truly understand how one learns best, first the mental mechanisms that underlie how learners can establish learning strategies and associations have been understood. Although many of cognitive processes relate to what learners know, the executive processes in the brains control and coordinate what should be planned to do and how we do it (Lezak, Howieson, Loring, Hannay, & Fischer, 2004). That is, executive functions are used as the 'how' we strategize to encode the 'what' we need to understand. There are several theories of the nature of our executive functioning capacities, some of which are as basic as one "central executive" who guides and supervises working memory (Baddeley, 1996) to McCloskey's Holarchical Model of Executive Functions, which involves multiple levels, territories, levels, and 32

Introduction

Vocabulary is commonly considered as the basic communication device and is often classified by language teachers as the most challenging field (Celik & Toptas, 2010). It is the key to master all the language skills; listening, speaking, reading, and writing. A person who has limited amount of vocabulary will find a great difficulty to speak, write, read or understand other persons' language effectively. In foreign language learning in particular, vocabulary plays a significant role that serves as the prerequisite for communication, for both receptive and productive skills. A receptive skill means a form of communication which focuses on vocabulary inputs via listing and reading. In other words, learners need to have sufficient amount of vocabulary to understand the input. On the other hand, a productive skill is when learners use words to convey meaning. (Mutalib, Abdul Kadir, Robani and Majid 2014).

There are a number of factors, both cognitive and affective, that engage in the language learning process, and can play a relevant role in how successfully this process is accomplished; one of these is, with no doubt, memory. Memory is that complicated mental workplace where knowledge of all kinds and origins is stored, processed, and retrieved for an infinite number of tasks to be carried out. There are three basic types of memory: long-term, short-term, and working memory (WM); each of them is responsible for specific functions, but it is the last type that has been shown to be particularly associated with how effectively a language is learnt (Santacruz & Ortega, 2018). Memory strategies (traditionally known as mnemonics) were found to improve memory by connecting new information to familiar words and images (Levin, 1983).

A large body of research (Atkins & Baddeley, 1998; Daneman & Hannon, 2007; Ellis & Sinclair, 1996; Engel de Abreu & Gathercole, 2012; Martin & Ellis, 2012) has shown that WM capacity is crucial to completing classroom activities, and it is also evident that such capacity varies from person to person, accounting for learning achievement differences. Similarly, there are different views that support the belief that WM can actually be trained; therefore, it enhances its capacity to retain and process the knowledge needed for successful language learning (Chein & Morrison, 2010; McNamara & Scott, 2001).

Working memory includes the temporary storage and processing of information, which is considered necessary for a wide range of

ملخص البحث باللغة العربية:

يهدف البحث إلى تعزيز وتنمية تعلم المفردات باللغة الانجليزية كلغة أجنبية لدى طلاب الفرقة الرابعة شعبة اللغة الانجليزية بكلية التربية جامعة بنها وذلك باستخدام استراتيجية الذاكرة العاملة. ولقد تم استخدام التصميم التجريبي ذو المجموعة الواحدة (قياس قبلي بعدى) ولقد بلغت عينة الدراسة أربعون طالب من طلاب الفرقة الرابعة شعبة اللغة الانجليزية وتم تصميم قائمة بالمهارات اللازمة لهؤلاء الطلاب لمعرفة مدى أهميتها النسبة لهم؛ كما تم تحكيمها بواسطة عدد من المحكمين الخبراء في مجال المناهج وطرق تدريس اللغة الإنجليزية. وتم تصميم اختبار قبلي بعدى لقياس مهارات تعلم المفردات لدى العينة. تم اختبار الطلاب قبليا لتحديد مستوى أدائهم القبلي وتدريبهم من خلال استخدام استراتيجية الذاكرة العاملة على كيفية تنمية وتعزيز مهارات تعلم المفردات. ولقد تم إعادة تطبيق الاختبار على الطلاب لقياس مدى التقدم في مستوى أدائهم ولقد أثبتت النتائج وجود فرق في أداء الطلاب قبل وبعد تطبيق الاختبار وذلك لصالح الاختبار البعدي مما يدل على مدى فاعلية استخدام الذاكرة العاملة لتعزيز وتنمية مهارات تعلم المفردات باللغة الانجليزية.

كلمات مفتاحية: *المفردات، مهارات تعلم المفردات، استراتيجية الذاكرة العاملة*

Developing EFL Vocabulary Learning Among Faculty of Education Students Thorough Using Working Memory Strategy

ABSTRACT

The present study aimed at developing some EFL vocabulary learning among prospective teachers of English through using working memory strategy. The participants of the study consisted of fourth year English section students enrolled in Faculty of Education, Benha University (N=40) during the first semester of the academic year 2020/ 2021. The study followed the one-group pre-post test design. Four main tools used were: An EFL vocabulary learning checklist required for fourth year students, an EFL pre vocabulary learning test to measure some of students' vocabulary learning skills, an EFL post vocabulary learning test to measure some of students' vocabulary learning skills, an EFL vocabulary learning skills rubric to score students' performance on the EFL vocabulary learning skills tests. In addition, the study used quantitative method for collecting and analyzing the data. t-test was used to compare the mean scores of pre and post test of the study participants. Working Memory Strategy was applied on the participants during the first semester of the academic year 2020/2021. Results of the quantitative analysis revealed that the participants' EFL vocabulary learning skills were improved significantly as a result of using Working Memory Strategy. Therefore, it can be concluded that using Working Memory Strategy is effective in improving EFL prospective teachers' vocabulary learning.

Keywords: *EFL vocabulary learning skills- working memory strategy*

Developing EFL Vocabulary Learning Among Faculty of Education Students thorough Using Working Memory Strategy

A research Submitted by

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