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Description automatically generatedEducational Administration: Theory and Practice**

2024, 30(5), 627–638

ISSN: 2148-2403

[**https://kuey.net/**](https://kuey.net/) **Research Article**

**The Effectiveness Of A Program Based On Brain-Based Learning And Emotional Intelligence To Develop Secondary Language School Students' EFL Vocabulary Use, Reflective Reading And Their Self-Regulation**

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Citation: Muhammad Essam Mahmoud Muhammadet al. (2024) The Effectiveness Of A Program Based On Brain-Based Learning And Emotional Intelligence To Develop Secondary Language School Students' EFL Vocabulary Use, Reflective Reading And Their Self-Regulation, Educational Administration: Theory And Practice, 3(5), 627–638

Doi: 10.53555/Kuey.V30i5.2920

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| **ARTICLE INFO** | **ABSTRACT** |
|  | This study aimed to develop secondary language school students’ EFL vocabulary use, reflective reading, and self-regulation via a proposed program based on brain-based learning and emotional intelligence. No previous studies dealt with this program, which is based on brain-based learning and emotional intelligence, so this is the novelty point of the current study. There are thirty-two participants for the experimental group and the same for the control group. Questionnaires on vocabulary use and reflective reading were designed and juried. The self-regulation scale was designed and juried. Then, the vocabulary use and, reflective reading tests and self-regulation scale were juried and administered to the participants of the two groups. The program was designed and administered in the second term of 2024, the academic year, and lasted for the entire term with two sessions per week for the experimental group. The study results revealed that the experimental group’s post-results exceeded its pre-results in the post-administration of the instructions. Furthermore, it could be determined that the proposed program substantially enhanced the stated variables.  **Keywords:** Vocabulary use, reflective reading, self-regulation, brain-based learning, emotional intelligence. |

1. **Introduction**

Vocabulary is an inseparable part of any language-learning process, and it would be impossible to learn a language without vocabulary. Vocabulary is one of the important elements to master in order to be able to learn in English. Th is that it has been emphasized in all different methods of language teaching. Vocabulary is the first thing that should be taught because the lack of vocabulary causes someone to learn nothing. The students‟ capability to use them in written and spoken (Rahmawati, 2021).

Reflective reading is one of the effective strategies for reading comprehension. Bressoud (2008) has suggested reading reflection to enable learners to overcome their reading tasks. Through this practice, learners assert their reflections about the reading text after accomplishing each reading task and before attending class. Therefore, learners summarize the main ideas of the reading and write about their understanding and feeling about the reading text. It has been mentioned that reflective reading practice motivates learners to read regularly, improves understanding of the content, and boosts learners’ development of monitoring, reflection skills, and self-evaluation. Learners’ examination, revision, and evaluation of their beliefs and experiences throughout the texts are required in reflective reading. So doing, learners evaluate their beliefs and experiences, which lead to certain understandings of texts.

Self-regulation is a psychological construct that encompasses a range of important competencies, including the capacity to control one's emotions, the ability to have positive interactions with others, the capacity to avoid inappropriate or aggressive actions, and the ability to carry out self-directed learning (Bronson, 2000). Cognitive processes contributing to self-regulation are often referred to as executive functions, and they include the ability to direct or focus attention, shift perspective, and adapt flexibly to changes (cognitive flexibility); retain information (working memory); and inhibit automatic or impulsive responses to achieve a goal, such as a problem solving (impulse control). Self-regulation can be seen as the volitional administration of executive functions in the enactment of goal-related behavior (Hughes, 2011).

Duman (2010) investigated the approaches and techniques related to how brain-based learning was used in a classroom atmosphere. This general purpose was answered by the following questions: What is the aim of brain-based learning? What are the general approaches and techniques that brain-based learning used? How should the brain be used based on the learning-teaching process in a classroom atmosphere? The study found that understanding of the human brain is continually evolving. The brain is not only the control center of the entire human body, organizing our behaviors, emotions, movements, and biological functions, but it is also the seat of our humanity. Brain defines who we are, how we act, and the very nature of our species.

Emotional intelligence has a direct effect on leadership because of the impact of administration on the behavior of their employee and their working lives; it is a more important variable in leadership quality of successful management as the success of the manager depends on his skills in dealing with emotions and feelings of his employee. This ability helps him to have good communication with employees, understand their needs, solve their problems, and motivate them to have better performance (Alston and Dastoor, 2010).

* 1. **Delimitations of the Study**

**The present research will be delimited to:**

1. Sixty students enrolled in the first year of Hehia language secondary school, Sharkia Governorate, Egypt,
2. Some EFL vocabulary use skills the jury members approved.
3. Some EFL reflective reading skills the jury members approved.
4. EFL self-regulation.
5. The brain-based learning and emotional intelligence-based program.
6. The duration of the academic year is 2023/2024.
   1. **Context of the Problem**

The problem of the present research has been emphasized through the following ways:

1. Working as an EFL teacher at Hehia Educational Directorate, Sharkia Governorate in Egypt, the researcher observed a gross lack of EFL vocabulary use and a low level of reflective reading as well as self-regulation among secondary language school students.
2. Reviewing the previous studies that tackled vocabulary use (Mohamed, 2016; Hassan, 2006), reflective reading (Abdul Aziz, 2021; Aspari,2018; Nourdad, N., & Asghari, R. 2017), and self-regulation (Peverly et al., 2003; Peel, 2020). These studies revealed that there is a profound weakness in vocabulary use and a low level of reflective reading as well as self-regulation skills among EFL students among EFL students.
3. Conducting interviews with EFL teachers in some secondary schools. They confirmed that most students have a low level of vocabulary use and reflective reading in English among secondary stage students.
   1. **Statement of the Problem (Criteria for Selecting the Researcher Object)**

The problem of the current research is that students enrolled in the first year of Hehia secondary language school, Sharkia Governorate, have poor low levels of EFL vocabulary use, reflective reading and self-regulation skills. Addressing such a problem, the current research investigates the effectiveness of a program based on brain-based learning and emotional intelligence in developing secondary-stage students’ EFL vocabulary use, reflective reading and self-regulation.

* 1. **Questions of the Study**

The present research attempts to answer the following main question:

**What is the effectiveness of a brain-based learning and emotional intelligence-based program on developing secondary language school stage students’ EFL vocabulary use, reflective reading and self-regulation?**

This main question branches out into the following sub-questions:

1**.** What vocabulary use skills are targeted for (1st year) secondary stage students?

2. What are the reflective reading skills targeted for (1st year) secondary stage students?

3. What is the actual level of students in vocabulary use of (1st year) secondary stage students?

4. What is the actual level of students in reflective reading of (1st year) secondary stage students?

5. What is the actual level of students in self-regulation of (1st year) secondary stage students?

6.What are the features of the brain-based learning and emotional intelligence-based program for developing secondary-stage students’ EFL vocabulary use, reflective reading and self-regulation?

7.To what extent does brain-based learning and emotional intelligence-based program affect development of secondary-stage students’ EFL vocabulary use skills?

8**.** To what extent are a brain-based learning and emotional intelligence-based programs affect the development of secondary-stage students’ EFL reflective reading skills?

9.To what extent does a brain-based learning and emotional intelligence-based program affect development of secondary stage students’ EFL self-regulation?

1. **Literature Review**

**2.1. Vocabulary Use**

Learning words does not occur in separation; learners do not obtain the meanings of words in isolation. All learning, both academic and personal-occurs within a sociocultural environment of the community, home, and classroom. Effective EFL teachers provide practice that excites rich uses of language, scheming their instructional programs in a social context that encourages literacy learning (Cutting, Materek, Cole, Levine, & Mahone, 2009).

According to Lightbown and Spada (2021), vocabulary learning is related to several language learning theories, including behaviorism, universal grammar, Krashen's Monitor Theory, and cognitive information processing. Acquisition of vocabulary in EFL is crucial for successful language performance in communication. Additionally, without a sufficient vocabulary, communication is impossible (González Fernández & Schmitt, 2017).

Fisher (2004) added many theories concerning FL language acquisition. First, behaviorism, for Skinner, is when children imitate adults. Their correct utterances are reinforced when they get what they want or are praised. Second, Innateness for Chomsky, where the child's brain contains special language-learning mechanisms at birth. Third, Bruner's Cognitive Language theory researches one aspect of a child's overall intellectual development. Piaget's Interaction theory emphasizes the interaction between children and their caregivers.

**2.2. Reflective Reading**

Reflective reading and thought processes are closely related to each other. Learners who read reflectively go through activities including connecting previous and current incidents, interpreting symbols, analyzing 'characters' behaviors, discovering new relationships, and making inquiries. This indicates that they consider the entire reading situation. Thus, teaching reflective reading should emphasize encouraging readers and learners to use thinking skills (Nourdad and Asghari, 2017).

Barnard and Ryan (2017) highlighted the deep connection between reading and reflecting. Some sub-reflective thinking techniques, like journal writing, exploratory talk, questioning, self-questioning, drawing connections, visualizing, and retrospective reflective sessions, can improve non-specialized university learners' reading comprehension.

Cranton (2006) noted that questions help student-readers develop critical and reflective thinking. He indicated that new perspectives become available through responding to and thinking about questions. Student-readers can look for unique, significant answers to problems when they respond to questions.

**2.3. Self-Regulation**

Early understanding and practice of self-regulated learning may assist all parties involved in experiencing less stress and frustration than is now observed at the university level. Furthermore, the importance of directing self-regulation in this age group is highlighted by the changes in the body, mind, and education during adolescence (Cleary & Chen, 2009; Wigfield & Eccles, 2000). The problem is that even if they might not be attracted to assignments that support their learning styles, they still require them to appreciate learning.

Boekaerts and Corno (2005) distinguished between two forms of self-regulation, bottom-up and top-down self-regulation, which are associated with voluntary techniques. Self-selected learning objectives by learners result in top-down self-regulation. It is a characteristic of self-regulated learners. Environmental considerations, such as gaining excellent grades or pleasing others, promote bottom-up self-regulation. The majority of learners make an effort to achieve a balance between these external objectives, which include maintaining their emotional health and enhancing their learning, social, and cognitive abilities. Feedback from the task and classroom reward structures helps direct the learners’ goal orientation and generate changes in work styles. However, there is also the risk that learners disengage. If tasks cause learners to feel, for example, bored or anxious, entertainment or well-being priorities may be more important than learning. This situation is dynamic and depends on learning environments.

**2.4. Brain-Based Learning**

Cercone (2006) indicated that the brain is a very dynamic and complicated organ. It serves as the primary controller of the entire body, much like the central processing unit of a computer. It works as the human body's information processor and is multitasking. To Jones (2013), the brain can receive, store, perceive, analyze, and modify a constant stream of information. Regarding the brain's amazing function, Caine & Caine (2011) reported that the brain’s natural function is the search for meaning in experience. Brain-based learning is confluent with the brain’s natural rules for meaningful learning.

According to Goswami (2004), neuroscience is a relatively recent field of science focusing on the role of the brain in learning. It investigates the inner functioning of the brain. It makes connections between learning and the way the brain functions. Zull (2002) reported that learning is the skill of altering the brain because of the strong correlation between learning and the brain.

The human brain plays a central role in acquiring knowledge. Brain-based learning emphasizes forming neural connections and linking new information with existing experiences and previously acquired knowledge in learners. As a result, it serves as a fundamental approach, aiding learners in recalling classroom learning and retaining and applying this knowledge effectively when required (Zidan, 2019).

**2.5. Emotional Intelligence**

Emotional intelligence complements an individual's cognitive intelligence, with psychologists and sociologists acknowledging its significance as a distinct and powerful tool (James, 2017). The effective management of emotions is recognized as an independent form of intelligence, encompassing an individual's capacity to navigate internal pain, sadness, and anger while engaging in meaningful communication and understanding the emotional nuances of oneself and others (Dumitrascu, 2017).

The ability to empathize with others and comprehend their emotions fosters a sense of connection and affection for the individual (Schmidt, 2016). Contrary to common misconceptions, having low emotional intelligence does not equate to having low cognitive intelligence, emphasizing that these are distinct but interconnected aspects of an individual's mental faculties (Richards, 2016).

Emotional intelligence is characterized by the skill to regulate the expression of emotions, enabling individuals to comprehend and manage the reasons behind emotional restraint. Through controlled expression, individuals can convey their emotions and feelings in a manner that is both suitable and rational. Moreover, it involves the adept use, management, and positive understanding of emotions to alleviate stress, facilitate effective communication, and navigate interpersonal relationships and challenges, preventing them from escalating into significant obstacles and problems (Smith, 2016).

1. **Methodology**

**3.1. Study Design**

The present study adopted the quasi-experimental design. Two classes were selected to represent the experimental group and the control group. The experimental group was instructed on the integrative strategy. The control one received regular instruction. A pre-post vocabulary use test, a pre-post reflective reading and a pre-post self-regulation scale were administered to the two groups before and after the experiment.

**3.2. Participants**

The participants in the present study were first-year secondary students in Hehia formal secondary school in the second semester of the academic year 2023-2024. They were selected to develop their vocabulary use, reflective reading, and self-regulation skills. They were divided into two groups: the experimental group (N=32) “taught through integrative strategy,” and the control group (N=32) “taught regularly” (32 students in each group). Some variables were controlled to ensure that the improvement of the participants’ vocabulary use, reflective reading, and self-regulation in the experimental group was attributed to the use of the integrated strategy based on brain-based learning and emotional intelligence. These variables included the participants’ ages, which ranged from 16 to 18 years old, economic level both belonged to the same economic level.

**3.3. Instruments**

After reviewing the related literature and the previous studies related to vocabulary use, reflective reading and self-regulation. The researcherresearcher designed the following instruments designed the following instruments in light of the study's independent variable:

1. For vocabulary use skills “Variable:

1. Vocabulary use skills questionnaire.

2. Vocabulary use test.

1. For reflective reading skills “Variable:

1. Reflective reading questionnaire.

2. Reflective reading test.

1. For Self-regulation “Variable:
2. Self-regulation scale.

**3.4. Verifying the Hypotheses of the Study**

**The first hypothesis was stated as follows:**

“There is a statistically significant difference between the mean scores of the experimental and control groups in their performance of the post-EFL vocabulary test results, in favor of experimental group students.”

To investigate the change fostered by the implementation of brain-based learning and emotional intelligence-based program on the experimental participants' performance in vocabulary use and to compare their post-level of skill performance developed by the proposed strategy, a t-test for the independent sample was used to determine any statistical differences between the experimental participants' mean scores on the post-test results. These results are presented in Table (1).

**Table (1): T-test results of the experimental and control groups on the post-vocabulary use test**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **skills** | **Group** | **N** | **Mean** | **Std. Deviation** | **t** | **df** | **Sig.** |
| **Basic Vocabulary and Reading comprehension** | Experimental | 32 | 5.219 | 0.941 | 4.360 | 62 | 0.01 |
| Control | 32 | 3.688 | 1.749 |
| **Vocabulary Acquisition and Retention** | Experimental | 32 | 5.156 | 1.081 | 5.068 | 62 | 0.01 |
| Control | 32 | 3.436 | 1.585 |
| **Vocabulary Application and Production** | Experimental | 32 | 5.531 | 0.803 | 6.108 | 62 | 0.01 |
| Control | 32 | 3.781 | 1.408 |
| **Synonyms, Antonyms, and Word Relationships** | Experimental | 32 | 5.375 | 1.070 | 11.739 | 62 | 0.01 |
| Control | 32 | 1.781 | 1.362 |
| **Contextual Understanding and Translation** | Experimental | 32 | 4.156 | 1.273 | 7.808 | 62 | 0.01 |
| Control | 32 | 1.719 | 1.224 |
| **Vocabulary Development** | Experimental | 32 | 5.188 | 1.091 | 10.942 | 62 | 0.01 |
| Control | 32 | 1.969 | 1.256 |
| **Critical Thinking and Analysis in Language Use** | Experimental | 32 | 5.406 | 1.132 | 10.853 | 62 | 0.01 |
| Control | 32 | 2.000 | 1.368 |
| **Total** | **Experimental** | **32** | **36.156** | **3.743** | **19.942** | **62** | **0.01** |
| **Control** | **32** | **18.344** | **3.395** |

It’s clear from Table (13) that there is a statistically significant difference between the mean scores of the experimental and control group at (0.01) level in favor of the experimental group. This means that brain-based learning and emotional intelligence-based programs was effective in enhancing students’ vocabulary use skills. Thus, the first hypothesis can be confirmed. The researcher attributes these differences to the proposed strategy.

**The second hypothesis was stated as follows:**

“There is a statistically significant difference between the mean scores of the experimental group in their performance of the pre-post administrations of the EFL vocabulary use test results, in favor of the post-administration.”

**Table (2) t-test results of the experimental group in reading skills on the pre/post creative understanding test**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Skills** | **Group** | **N** | **Mean** | **Std. Deviation** | **t** | **df** | **Sig.** |
| **Basic Vocabulary and Reading comprehension** | Pre | 32 | 3.219 | 2.075 | -5.612 | 31 | 0.01 |
| Post | 32 | 5.219 | 0.941 |
| **Vocabulary Acquisition and Retention** | Pre | 32 | 2.906 | 1.940 | -7.388 | 31 | 0.01 |
| Post | 32 | 5.156 | 1.081 |
| **Vocabulary Application and Production** | Pre | 32 | 2.969 | 1.840 | -8.158 | 31 | 0.01 |
| Post | 32 | 5.531 | 0.803 |
| **Synonyms, Antonyms, and Word Relationships** | Pre | 32 | 2.219 | 1.679 | -10.031 | 31 | 0.01 |
| Post | 32 | 5.375 | 1.070 |
| **Contextual Understanding and Translation** | Pre | 32 | 1.031 | 1.149 | -12.161 | 31 | 0.01 |
| Post | 32 | 4.156 | 1.273 |
| **Vocabulary Development** | Pre | 32 | 1.688 | 1.632 | -10.707 | 31 | 0.01 |
| Post | 32 | 5.188 | 1.091 |
| **Critical Thinking and Analysis in Language Use** | Pre | 32 | 1.875 | 1.661 | -10.418 | 31 | 0.01 |
| Post | 32 | 5.406 | 1.132 |
| **Total** | **Pre** | **32** | **15.906** | **4.794** | **-17.397** | **31** | **0.01** |
| **Post** | **32** | **36.156** | **3.743** |

Table (2) indicates that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental group in the pre- and the post-administration of the vocabulary use test of post-administration. Therefore, the second hypothesis can be confirmed.

**The third hypothesis was stated as follows:**

“The brain-based learning and emotional intelligence based program affects developing the EFL vocabulary use skills of the experimental group students.”

To verify the third hypothesis, the effect size ((η- value) of brain-based learning and emotional intelligence-based programs was estimated after estimating the T- value. This value was converted into its parallel levels of effect size (small, middle, high). It also represents the total variance in the dependent variable, which can be attributed to the independent variable as illustrated in the following table (Kiess, 1989:486- 488 Cited in Gohar, 2007: 147)

**Table (3): Level of effect size**

|  |  |  |  |
| --- | --- | --- | --- |
| **Level of effect size** | **Small** | **Middle** | **High** |
| **d** | **0.2** | **0.5** | **0.7** |

The table below indicates the effect size of brain-based learning and emotional intelligence-based programs on developing the students’ vocabulary use skills after the experimental treatment.

**Table (4) Effect size of brain-based learning and emotional intelligence based program in developing vocabulary use skills**

|  |  |  |
| --- | --- | --- |
| **Skills** | **η2** | **Effect size** |
| **Basic Vocabulary and Reading comprehension** | 0.504 | **Middle** |
| **Vocabulary Acquisition and Retention** | 0.638 | **Middle** |
| **Vocabulary Application and Production** | 0.682 | **High** |
| **Synonyms, Antonyms, and Word Relationships** | 0.764 | **High** |
| **Contextual Understanding and Translation** | 0.827 | **High** |
| **Vocabulary Development** | 0.786 | **High** |
| **Critical Thinking and Analysis in Language Use** | 0.778 | **High** |
| **Total** | **0.907** | **High** |

Table (16) shows the effect size of the proposed program on the overall score for testing vocabulary use skills, where the values of (η 2 ) in each skill and the total score of the test ranged between (0.504 and 0.907). Results also show that the effect sizes of the proposed program on the experimental group performance on the vocabulary use test as a whole is high. These results can be interpreted in the light of (Ƞ²) values as follows:

* + - In basic vocabulary and reading comprehension, the value of Eta square was (0.504), which indicates a middle effect and it also indicates that 50.4 % of the variance in students’ ability to identify basic vocabulary and reading comprehension can be attributed to the experimental treatment.
    - In vocabulary acquisition and retention, the value of Eta square was (0.638), which indicates a middle effect. It also reflects that 63.8 % of the variance in students’ vocabulary acquisition and retention can be attributed to the experimental treatment.
    - In vocabulary application and production, the value of Eta square was (0.682), which indicates a high effect. It also reflects that 68.2% of the variance in students’ vocabulary application and production can be attributed to the experimental treatment.
    - In synonyms, antonyms and word relationships, the value of Eta square was (0.764), which indicates a high effect, and it also reflects that 76.4 % of the variance in students’ ability to identify synonyms, antonyms and word relationships can be attributed to the experimental treatment.
    - In contextual understanding and translation, the value of Eta square was (0.827), which indicates a high effect. It also reflects that 82.7% of the variance in students’ abilities in translation and contextual understanding can be attributed to the experimental treatment.
    - In vocabulary development, the value of Eta square was (0.786), which indicates a high effect and it also indicates that 78.6 % of the variance in students’ vocabulary development can be attributed to the experimental treatment.
    - In critical thinking and analysis in language Use, the value of Eta square was (0.778), which indicates a high effect, and it also reflects that 77.8 % of the variance in students’ abilities in thinking critically in language use can be attributed to the experimental treatment.
    - In the total of all vocabulary use sub-skills, the value of Eta square was 0.907, which indicates a high effect. It also indicates that 90.7% of the variance in students’ vocabulary use skills can be attributed to the experimental treatment.

**The fourth hypothesis was stated as follows:**

“There is a statistically significant difference between the mean scores of the experimental and control groups in their performance of the post-EFL reflective reading test results, in favor of experimental group students.”

**Table (5): T-test results of the experimental and control groups on the post reflective reading test**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Skills** | **Group** | **N** | **Mean** | **Std. Deviation** | **t** | **df** | **Sig.** |
| **Text analysis** | Experimental | 32 | 4.656 | 1.125 | 11.335 | 62 | 0.01 |
| Control | 32 | 1.7500 | 0.916 |
| **Text evaluation** | Experimental | 32 | 4.219 | 1.128 | 8.583 | 62 | 0.01 |
| Control | 32 | 2.031 | 0.897 |
| **Language understanding** | Experimental | 32 | 3.469 | 1.077 | 6.341 | 62 | 0.01 |
| Control | 32 | 1.937 | 0.840 |
| **Total** | **Experimental** | **32** | **12.344** | **1.894** | **15.654** | **62** | **0.01** |
| **Control** | **32** | **5.719** | **1.464** |

It’s clear from the table (5) that there is a statistically significant difference between the mean scores of the experimental and control group at (0.01) level in favour of the experimental group. This means that brain-based learning and emotional intelligence-based programs were effective in enhancing students’ reflective reading skills. Thus, the fourth hypothesis can be confirmed. The researcher attributes these differences to the proposed program.

**The fifth hypothesis was stated as follows:**

“There is a statistically significant difference between the mean scores of the experimental group in their performance of the pre-post administrations of the EFL reflective reading test results, in favour of the post-administration.”

**Table (6) t-test results of the experimental group in reading skills on the pre/post reflective reading test**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **skills** | **Group** | **N** | **Mean** | **Std. Deviation** | **t** | **df** | **Sig.** |
| **Text analysis** | Pre | 32 | 1.875 | 1.157 | -9.588 | 31 | 0.01 |
| Post | 32 | 4.656 | 1.125 |
| **Text evaluation** | Pre | 32 | 2.343 | 1.335 | -6.313 | 31 | 0.01 |
| Post | 32 | 4.219 | 1.128 |
| **Language understanding** | Pre | 32 | 1.625 | 1.385 | -5.744 | 31 | 0.01 |
| Post | 32 | 3.469 | 1.077 |
| **Total** | **Pre** | **32** | **5.843** | **2.829** | **-10.614** | **31** | **0.01** |
| **Post** | **32** | **12.344** | **1.894** |

Table (6) indicates that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental group the pre and the post-administration of the reflective reading test regarding each sub-skill of reflective reading skills in favour of post-administration. Therefore, the fifth hypothesis can be confirmed.

**The sixth hypothesis was stated as follows:**

“The brain-based learning and emotional intelligence based program affects developing the EFL reflective reading skills of the experimental group students”

The effect size ((η- value) of brain-based learning and emotional intelligence-based program was estimated after estimating the T- value. This value was converted into its parallel levels of effect size (small, middle, high). It also represents the total variance in the dependent variable, which can be attributed to the independent variable.

**Table (7) Effect size of brain-based learning and emotional intelligence based program in developing reflective reading skills**

|  |  |  |
| --- | --- | --- |
| **Skills** | **η2** | **Effect size** |
| **Text analysis** | 0.748 | High |
| **Text evaluation** | 0.562 | Middle |
| **Language understanding** | 0.516 | Middle |
| **Total** | **0.784** | **High** |

Table (7) shows the effect size of the proposed program on the overall score for testing reflective reading skills, where the values of (η 2 ) in each skill and the total score of the test ranged between (0.516 and 0.784). Results also show that the effect sizes of the proposed program on the experimental group performance on the reflective reading test as a whole are high. These results can be interpreted in the light of (Ƞ²) values as follows:

* + - In text analysis, the value of Eta square was (0.748), which indicates a high effect, and it also indicates that 74.8 % of the variance in students’ ability to analyze texts can be attributed to the experimental treatment.
    - In text evaluation, the value of Eta square was (0.562), which indicates a middle effect, and it also reflects that 56.2 % of the variance in students’ ability to evaluate texts can be attributed to the experimental treatment.
    - In language understanding, the value of Eta square was (0.516), which indicates a middle effect. It also reflects that 51.6% of the variance in students’ language understanding can be attributed to the experimental treatment.
    - In the total of all reflective reading sub-skills, the value of Eta square was 0.784, which indicates a high effect. It also indicates that 78.4% of the variance in students’ reflective reading skills can be attributed to the experimental treatment.

**The seventh hypothesis was stated as follows:**

“There is a statistically significant difference between the mean scores of the experimental and control groups in their performance of the post-administration EFL self-regulation scale, in favor of the experimental group students.”

**Table (8): T-test results of the experimental and control groups on the post-self-regulation scale**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Domains** | **Group** | **N** | **Mean** | **Std. Deviation** | **t** | **df** | **Sig.** |
| **Goal Setting** | Experimental | 32 | 19.750 | 3.877 | 4.909 | 62 | 0.01 |
| Control | 32 | 14.312 | 4.921 |
| **Environment Structuring** | Experimental | 32 | 16.812 | 2.787 | 5.847 | 62 | 0.01 |
| Control | 32 | 12.062 | 3.653 |
| **Task Strategies** | Experimental | 32 | 12.469 | 2.770 | 3.504 | 62 | 0.01 |
| Control | 32 | 9.875 | 3.139 |
| **Time Management** | Experimental | 32 | 12.437 | 2.711 | 4.178 | 62 | 0.01 |
| Control | 32 | 8.844 | 4.041 |
| **Help-Seeking** | Experimental | 32 | 17.000 | 3.436 | 5.578 | 4. | 0.01 |
| Control | 32 | 10.937 | 5.099 |
| **Self-Evaluation** | Experimental | 32 | 17.094 | 3.031 | 9.088 | 62 | 0.01 |
| Control | 32 | 10.375 | 2.883 |
| **Total** | **Experimental** | **32** | **95.563** | **13.856** | **6.792** | **62** | **0.01** |
| **Control** | **32** | **60.656** | **25.559** |

It’s clear from the table (8) that there is a statistically significant difference between the mean scores of the experimental and control group at (0.01) level in favor of the experimental group. This means that brain-based learning and emotional intelligence-based programs was effective in enhancing students’ self-regulation domains. Thus, the seventh hypothesis can be confirmed. The researcher attributes these differences to the proposed program.

**The eighth hypothesis was stated as follows:**

“There is a statistically significant difference between the mean scores of the experimental group in their performance of the pre-post administration of the EFL self-regulation scale, in favor of the post-administration.”

**Table (9):T-test results of the experimental and control groups on the pre/ post self-regulation scale**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Domains** | **Group** | **N** | **Mean** | **Std. Deviation** | **t** | **df** | **Sig.** |
| **Goal Setting** | Pre | 32 | 13.125 | 2.733 | -9.226 | 31 | 0.01 |
| Post | 32 | 19.750 | 3.877 |
| **Environment Structuring** | Pre | 32 | 9.969 | 3.147 | -8.453 | 31 | 0.01 |
| Post | 32 | 16.812 | 2.787 |
| **Task Strategies** | Pre | 32 | 7.406 | 2.576 | -9.177 | 31 | 0.01 |
| Post | 32 | 12.469 | 2.770 |
| **Time Management** | Pre | 32 | 7.344 | 2.417 | -8.424 | 31 | 0.01 |
| Post | 32 | 12.437 | 2.711 |
| **Help-Seeking** | Pre | 32 | 9.500 | 3.079 | -9.411 | 31 | 0.01 |
| Post | 32 | 17.000 | 3.436 |
| **Self-Evaluation** | Pre | 32 | 10.750 | 2.590 | -8.872 | 31 | 0.01 |
| Post | 32 | 17.094 | 3.031 |
| **Total** | **Pre** | **32** | **58.094** | **10.187** | **-12.347** | **31** | **0.01** |
| **Post** | **32** | **95.563** | **13.856** |

Table (9) indicates that there is a statistically significant difference at the 0.01 level between the mean scores of the experimental group, the pre and the post administration of the self-regulation scale, in favor of post-administration. Therefore, the eighth hypothesis can be confirmed.

**The ninth hypothesis was stated as follows:**

“The brain-based learning and emotional intelligence based program has a positive effect on developing the EFL self-regulation skills of the experimental group students”

**Table (10) Effect size of brain-based learning and emotionalintelligence based program in developing self-regulation skills**

|  |  |  |
| --- | --- | --- |
| **Domains** | η2 | **Effect size** |
| **Goal Setting** | 0.733 | High |
| **Environment Structuring** | 0.697 | High |
| **Task Strategies** | 0.729 | High |
| **Time Management** | 0.696 | High |
| **Help-Seeking** | 0.740 | High |
| **Self-Evaluation** | 0.717 | High |
| **Total** | **0.831** | **High** |

Table (10) shows the effect size of the proposed program on the overall score for testing self-regulation domains, where the values of (η 2) in each domain and the total score of the test ranged between (0.697 and 0.831). Results also show that the effect sizes of the proposed program on the experimental group performance on the self-regulation scale as a whole are high. These results can be interpreted in the light of (Ƞ²) values as follows:

* + - In goal setting, the value of Eta square was (0.733), which indicates a high effect. It also indicates that 73.3 % of the variance in students’ ability in goal setting can be attributed to the experimental treatment.
    - In environment Structuring, the value of Eta square was (0.697), which indicates a high effect, and it also reflects that 69.7 % of the variance in students’ ability in environment Structuring can be attributed to the experimental treatment.
    - In task strategies, the value of Eta square was (0.729), which indicates a high effect. It also reflects that 72.9% of the variance in students’ task strategies can be attributed to the experimental treatment.
    - In time management, the value of Eta square was (0.696), which indicates a high effect, and it also reflects that 69.6 % of the variance in students’ ability in time management can be attributed to the experimental treatment.
    - In help-seeking, the value of Eta square was (0.740), which indicates a high effect, and it also reflects that 74% of the variance in students’ help-seeking can be attributed to the experimental treatment.
    - In self-evaluation, the value of Eta square was (0.717), which indicates a high effect, and it also reflects that 71.7% of the variance in students’ help-seeking can be attributed to the experimental treatment.
    - In the total of all self-regulation, the value of Eta square was 0.831, which indicates a high effect. It also indicates that 83.1% of the variance in students’ self-regulation domains can be attributed to the experimental treatment.

**4. Results**

Results of the current study are discussed with references to the variables of the study (vocabulary use, reflective reading and self-regulation).

**Concerning the Development of EFL Vocabulary Use.**

There have been improvements in vocabulary use for the participants in the experimental group as follows:

* 1. Participants could demonstrate a broader lexicon, incorporating more sophisticated terminology and nuanced expressions.
  2. An increase in the use of specialized vocabulary was observed among the participants, indicating a deeper understanding of the subject matter.
  3. Participants could exhibit enhanced lexical diversity, manifesting in a wider range of word choices and more varied linguistic expressions.
  4. There was a notable improvement in the precision of vocabulary use, with participants employing more precise and contextually appropriate terms.
  5. Participants could display a heightened ability to articulate complex concepts, which is evident through the incorporation of advanced vocabulary into their discourse.
  6. The participants could demonstrate a more expansive vocabulary repertoire, encompassing both general and domain-specific terms.
  7. An elevated level of lexical sophistication was evident in the experimental group, characterized by the integration of elevated vocabulary into written and spoken communication.
  8. Participants exhibited a greater facility with language, showcasing improved fluency and proficiency in vocabulary selection and usage.
  9. The participants could show a marked enhancement in their lexical comprehension and application, reflected in their usage of advanced vocabulary in various contexts.

**Concerning the Development of EFL Reflective Reading.**

In the current study, the participants created a cooperative environment . Less emphasis was placed on transmitting information from the teacher and more on the participants. So, a brain-based learning and emotional intelligence program were adopted throughout the study. There are important improvements for all participants in reflective reading skills in the experimental group as follows:

1. It was noticed that the participants, through brain-based learning and emotional intelligence-based program could think aloud to express their thoughts, questions, and impressions that came to their minds through reflective reading. The teacher asked the participants some reflective questions related to the text. These questions encouraged them to think about the writer’s purpose and the main points and extract the most important information in the text.
2. It was noticed that the participants throughout the program were motivated to create questions in their minds about the text and predict the answers to these questions. The participants were encouraged to incoming information based on their reading. This program enabled participants to scan the reading text during reading and, guess the meaning of new words, and find the synonyms and antonyms of different words.
3. Through brain-based learning and an emotional intelligence-based program, the participants were motivated to create mental images in their minds and transform them into real representations to understand what they read fully. This program provided the participants opportunities to out ideas, sort out what has been learned, develop a deeper understanding, and formulate new questions so they form personal opinions about the text and suggest various titles for the passages. The participants were motivated through the program to reflect on their thinking which helped to develop their reflective reading.

The results of the present study support the use of brain-based learning and emotional intelligence intelligence-based programs. These help in the reflective process through reading contexts. In the based program, there are interactions and communications between the teacher and learners,and among learners each other. This program generates confidence and interest in reading more effectively than the regular one.

**Concerning the Development of EFL Self-Regulation.**

The improvement in self-regulation can be attributed to brain-based learning and emotional intelligence-based program that was effective in developing their self-regulation. They learned to do extra activities before, during and after studying. For example, making a detailed schedule of their daily activities, making a timetable of all the activities they have to complete and highlight important concepts and information they find in their readings. Also study at their own pace, picture in their minds, and show the test will look like based on the previous tests, using note cards to write information they need to remember. In addition represent concepts with symbols such as drawings to remember them easily, make a summary of their readings, make sample questions from a topic and answering them, use a variety of sources in making their research papers, and engage in group tasks because they help one another, inquire assistance from an expert if having a difficulty. Above all, ask others how their work is before passing it to their teacher, take note of the improvements in what they do, and ask for feedback about their performance from someone else. Accordingly, there was a development in their self-regulation.

1. **Recommendations**

Combining brain-based learning strategies with emotional intelligence programs can be highly effective in enhancing students' vocabulary use, reflective reading, and self-regulation skills in a secondary language school setting. Here's a tailored recommendation:

**Brain-Based Learning Strategies:**

* **Active Learning Techniques:** Incorporate activities that engage multiple senses, such as hands-on experiments, group discussions, or multimedia presentations. For vocabulary building, use mnemonics, visual aids, and interactive games to make learning more memorable.
* **Chunking and Spaced Repetition:** Break down complex concepts into smaller, more manageable chunks and review them regularly over time. Apply this technique to vocabulary acquisition by introducing sets of related words and revisiting them periodically through quizzes, flashcards, or interactive exercises.
* **Contextual Learning:** Connect new information to students’ existing knowledge and experiences. For vocabulary development, provide authentic contexts for word usage through reading passages, real-life scenarios, or role-playing activities.

**Emotional Intelligence Program:**

* **Self-awareness:** Help students identify their learning strengths and weaknesses, including their vocabulary proficiency level and reading preferences. Encourage self-reflection through journaling or online reflection platforms.
* **Self-regulation:** Teach students strategies for managing their emotions and behaviours during learning tasks. This could involve setting achievable goals, creating personalized study schedules, and practising mindfulness or relaxation techniques to reduce anxiety and improve focus.
* **Empathy and Social Skills:** Foster a supportive classroom environment where students feel comfortable expressing their thoughts and collaborating with peers. Encourage empathy by discussing characters’ perspectives in literature or engaging in group projects that require cooperation and communication.

**Integrated Approach:**

* **Vocabulary Expansion through Reading:** Select texts that align with students' interests and language proficiency levels. Encourage reflective reading by asking open-ended questions that prompt critical thinking and emotional engagement with the material. Provide opportunities for students to express their opinions, make connections between the text and their own experiences, and explore the nuances of language use.
* **Metacognitive Strategies:** Teach students how to monitor their comprehension while reading, identify unfamiliar words or concepts, and employ effective strategies for deciphering meaning (e.g., using context clues, analyzing word parts, referring to dictionaries or online resources). Encourage them to keep track of their progress and adjust their reading strategies accordingly.

**Assessment and Feedback:**

* **Formative Assessment:** Use a variety of assessment tools to gauge students' vocabulary growth, reading comprehension skills, and self-regulation abilities. Provide timely feedback that highlights strengths and areas for improvement and offer specific suggestions for further development.
* **Peer and Self-Assessment:** Encourage students to assess their learning progress and provide feedback to their peers. This promotes metacognitive awareness and encourages active participation in the learning process.

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