

# Role of Connectionist and Activation Theory Approaches Teaching Vocabulary in Context: Exploring Vocabulary Teaching Methods with Adult Mexican Students

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## *Abstract*

This study examines whether cognitive-based instruction improves vocabulary use and recall in adult Mexican English learners compared to traditional methods. The study adopted a mixed methods approach, combining quantitative data from the Peabody Picture Vocabulary Test (PPVT) with qualitative insights from learner questionnaires. The participants were ten adult beginner English learners (A1-A2 level, CEFR) from the University of Guanajuato's language program. Participants were exposed to both connectionist/activation and conventional vocabulary teaching techniques. While qualitative thematic analysis investigated learners' attitudes and the perceived efficacy of each strategy, quantitative data evaluated vocabulary retention. Despite learners expressing a strong preference for context-based, associative learning strategies, often describing them as more enjoyable, meaningful, and reflective of real-world language use, this preference did not translate into superior short-term vocabulary test performance. In contrast, participants consistently achieved higher vocabulary scores in post-instruction assessments when they were exposed to traditional methods such as drilling, repetition, and lexical sets. Importantly, this is the first study in the Mexican context to directly compare vocabulary instruction based on cognitive theories with traditional lexical set approaches among adult EFL learners, making it a significant contribution to the field of applied linguistics and language pedagogy in Latin America. The significance of this research lies not only in its practical implications for classroom instruction but also in its theoretical contributions. It challenges prevailing assumptions about the universal superiority of cognitive-based methods by demonstrating that traditional approaches, often overlooked or dismissed as outdated, still hold substantial value in certain learner contexts.

**Keywords:** cognitive-based instruction, connectionist theory, vocabulary acquisition, vocabulary retention and retrieval, and vocabulary teaching methods.

## 1. Introduction

Vocabulary acquisition is a fundamental pillar for communication and comprehension. For English learners (ELLs), recalling and using vocabulary effectively is imperative for achieving fluency. Traditional vocabulary and grammar teaching methods have been utilized in Mexican public schools for years despite the Mexican government advocating and pushing for communicative language teaching (CLT) competencies in basic-level education. These

methods rely on rote memorization and have plagued language learning whilst remaining stagnant due to ill-prepared English language teachers who have often “fallen” into these positions.

However, recent advancements in cognitive science have introduced alternative methods (Joanisse & McClelland, 2015; Shirai, 2013), such as in connectionist and activation theories, which emphasize the interconnectedness of linguistic concepts and the activation of mental networks during learning. Several studies have investigated the comparative effectiveness of traditional and cognitively-based vocabulary teaching methods. For instance, recent research has found that both rote memorization and semantic mapping enhanced vocabulary retrieval, but semantic mapping yielded greater improvement than the traditional method, “The students’ retrieval of the target vocabulary words improved as a result of implementing both strategies, but the improvement which resulted from the use of semantic mapping overrode that which ensued from rote memorization” (Badr & Abu-Ayyash, 2019). This suggests that while cognitive-based methods such as semantic mapping may lead to better vocabulary gains, traditional strategies like rote memorization can still play a beneficial role, particularly in supporting short-term retention.

Building on these findings, this study investigates whether cognitive-based instructional methods, specifically those informed by connectionist and activation theories, can outperform traditional techniques in helping Mexican adult learners improve vocabulary retention. By comparing the efficacy of both approaches and incorporating learners’ perceptions, this research aims to provide a more comprehensive understanding of effective vocabulary teaching strategies. Importantly, this is the first study in the Mexican context to directly compare vocabulary instruction based on cognitive theories with traditional lexical set approaches among adult EFL learners, making it a significant contribution to the field of applied linguistics and language pedagogy in Latin America.

## 2. Literature review

Vocabulary acquisition is an important and critical component of language learning. It is an even a more challenging task for EFL learners. Traditional vocabulary instruction has predominately relied on rote memorization and translation-based methods (Nation, 2001; Schmitt, 2000). These methods are common in public education, especially in Mexican curricula. As research has evolved in the field of linguistics, these methods have been criticized for short-term recall over meaningful usage (Barcroft, 2004). This is due to the nature of older methods such as the grammar-translation method which were used to help students read and translate texts rather than build communicative and critical thinking skills (Sadikova, 2024). The use of this method results in a disconnect between the material and students, which leads to failure in long-term retention. As Sadikova (2024) explains, “Translation exercises often lack meaningful context or relevance to real-world language use, resulting in disconnected learning experiences” (p. 241).

In contrast to traditional methods, cognitive theories have proposed a distinct framework for vocabulary acquisition. Connectionist models, such as the parallel distributed processing model, suggest that language learning occurs through associative networks and that repeated exposure is necessary for better retention (Ellis, 2003). Activation theory also emphasizes the importance of neural network stimulation and how careful selection of input is required to activate certain patterns of neurons within the brain which results in stronger connections (Field, 2004). These theories align with the *involvement load hypothesis* (Laufer & Hulstijn, 2001), which states that deeper cognitive processing enhances vocabulary retention. While scholars in fields like memory and information processing (Anderson, 1995; Baddeley, 1997) have yet to provide a model, there is an agreement that elaborated processing such as attending to meaning and grammatical features leads to better long-term retention than shallow processing (Laufer & Hulstijn, 2001).

While there have been studies comparing these methods, they have unfortunately yielded mixed results. Traditional techniques are linked to better immediate recall (Meara, 1990), on the other hand, cognitive approaches appear superior for long-term retention and communicative use (Schmitt & Schmitt, 2020). However, Nation (2001) emphasizes the importance of a hybrid approach where both quantity and quality are taken into account, or in other words, a mixture of repetition and depth or processing.

When taking into account the learner's preferences this only further confounds the discussion. Some students report greater engagement with cognitive methods, while others perform better with traditional techniques. This discrepancy highlights the need for mixed-methods research (Creswell & Clark, 2017) to evaluate both measurable outcomes and subjective experiences. This is particularly relevant to my study which explores vocabulary retention among Mexican adult learners an understudied population whose diverse learning preferences and backgrounds may influence how they respond to different teaching approaches.

### 3. Methodology

Given the nature of the study, the best approach for collecting data is a mixed-methods approach. As mentioned by Creswell (1999) a researcher can use this kind of study to both qualitatively understand complicated occurrences and provide a basic statistical analysis explanation of the phenomenon. The quantitative component will offer measurable data on vocabulary retention, allowing for comparison between students' actual performance and their perceived effectiveness of different learning methods. As Creswell and Clark (2017) explain "Mixed methods research provides a way to harness strengths that offset the weaknesses of both quantitative and qualitative research" (p. 12).

### 4. Contexts and participants

The study took place in the University of Guanajuato's language department. The participants in this study are 12 adult Mexican learners, six male participants, and six female participants, enrolled in beginner English courses at the University of Guanajuato's English language courses. These courses focus on developing basic language skills, including vocabulary, grammar, and conversation. Their ages range from 20 to 40 years old, with varying degrees of previous English exposure. All participants are at an A1-A2 level according to the Common European Framework of Reference for Languages (CEFR).

### 5. Instruments

The study utilized two tools to measure vocabulary retention and learner perceptions: An adapted version of the Peabody Picture Vocabulary Test (PPVT) for qualitative data, and questionnaires to gather qualitative data. The first tool that was used to obtain the quantitative data was an adaption to the Peabody Picture Vocabulary Test. This test is an evaluation instrument designed to test receptive language skills in individuals ranging in age from two years and six months to over ninety years (Dunn & Dunn, 2007 as cited in Gould et al., 2011). The examiner uses visuals and the subject's ability to pair them together to determine the subject's receptive language skills. The PPVT takes approximately 10–15 minutes to administer. Participants are presented with a series of images and are asked to select the one that corresponds to a spoken word. This test, in particular, is appropriate for the research because it measures vocabulary recognition and comprehension and provides insight into how well learners can recall words learned using connectionist and activation-based methods.

Finally, to gather qualitative data, a questionnaire was used to capture learners' perceptions of the teaching methods and to get an insight of any preferences or beliefs about vocabulary learning. The questionnaire included open-ended questions to explore learners' attitudes, engagement, and perceived effectiveness of the instructional methods. As mentioned by Taguchi (2010) questionnaires are not just cost-effective; additionally, because of their great versatility, they may be effectively applied to a wide range of audiences, in a wide range of contexts, and on a wide range of subjects.

To ensure validity, the questions were created based on previous studies, particularly Schmitt's (2000) and Nation's (2001) frameworks, which assess vocabulary learning strategies. The questions focused on their previous experiences with learning English vocabulary and their perceived effectiveness of the two methods being tested. They also focused on any difficulties or strengths they experienced while learning vocabulary through each method, their preferences between the two methods, and how they believe they perform in terms of recalling and using vocabulary.

## 6. Data analysis

The present study adopted a mixed methods approach. The goal of this approach was to examine how well learners retain vocabulary after a brief instructional period. The design was used to compare two instructional approaches: a traditional method using lexical sets (Nation, 2000), and a connectionist method that focused on repeated exposure to vocabulary in varied contexts and the activation of multiple cognitive connections (Ellis, 2003). For the quantitative side, an experimental test was designed to provide measurable evidence of vocabulary retention and retrieval. The experiment involved two groups of adult EFL learners, both groups were provided a vocabulary lesson through traditional methods and then immediately after the connectionist lesson. To complement the quantitative perspective, questionnaires were designed to provide descriptive insight into the learners' perspectives and to support the interpretation of the quantitative results. The questionnaires were analyzed using thematic analysis (Braun & Clarke, 2006) to identify recurring themes related to vocabulary retention, ease of retrieval, and learner engagement with each method.

## 7. Data collection

This research consisted of pre- and post-test design. First students were administered an adapted version of PPVT test and were asked to choose the image that best suited the word that was called without any prior instruction. Afterward students were given proper vocabulary instruction. Traditional methods such as vocabulary instruction where words are presented thematically (e.g., colors, fruits) were first introduced to students, and almost immediately afterward an adapted version of the PPVT test was administered. This is done due to the fact that short-term memory (STM) according to Cascella (2024) recalls around  $7 \pm 2$  items typically up to 30 seconds. After concluding this test, students will then be asked to answer a short questionnaire about their experience, beliefs, and preferences about vocabulary learning.

## 8. Quantitative data: Results

Based on the results of the exam implemented after the instructional connectivism vocabulary lesson, this statistical analysis provides the most interesting insights into the more optimal approach for students. According to the data, participants averaged a score of 8.25 correct answers on their test following the traditional method vocabulary class compared to an average of 7.17 for the connectionist method vocabulary class. This suggests that while most participants

expressed more positive sentiments towards the connectionist approach, they scored better with the traditional approach. These results suggest that students performed better on recall-based assessments after learning vocabulary through traditional methods commonly used in Mexican EFL classrooms. This might indicate that learners are already familiar with this instructional approach, and their brains have developed established neural pathways due to prior exposure. As a result, traditional methods may feel more intuitive or easier to process, leading to better performance.

#### 9. PPVT Test Results for traditional and connectionist methods for vocabulary retention

| Participants   | Traditional method correct answers out of 10 total questions | Connectionist method correct answers out of 10 total questions |
|----------------|--------------------------------------------------------------|----------------------------------------------------------------|
| Samuel Ford    | 8/10                                                         | 8/10                                                           |
| Peter Bennett  | 7/10                                                         | 6/10                                                           |
| Michael Reed   | 10/10                                                        | 5/10                                                           |
| Daniel Harris  | 9/10                                                         | 7/10                                                           |
| Adam Clarke    | 7/10                                                         | 9/10                                                           |
| Jamie Davis    | 8/10                                                         | 7/10                                                           |
| Emily Scott    | 7/10                                                         | 7/10                                                           |
| Riley Carter   | 8/10                                                         | 6/10                                                           |
| Olivia Wright  | 10/10                                                        | 6/10                                                           |
| Grace Mitchell | 8/10                                                         | 8/10                                                           |
| Sarah Thompson | 9/10                                                         | 9/10                                                           |
| Skyler Avery   | 8/10                                                         | 8/10                                                           |
|                | Average correct answers: 8.25                                | Average answers: 7.17                                          |

#### 10. Qualitative data: Results

The qualitative data collected from the participants reveal interesting insights into preferences regarding vocabulary learning strategies.

The most common theme that emerged from the questionnaires was the importance of repetition and practice for the participants.

Jamie Davis stated: *“Lo aprendo al repasarlo varias veces y empleándolo en actividades escritas u orales.”* [P1-01]

Skyler Avery shared: *“Escribo las palabras junto a su significado y repito la pronunciación varias veces.”* [P2-02]

It seems these participants tend to prefer repetition drills when learning vocabulary which are found in more traditional forms of learning vocabulary such as the grammar-translation method or audiolingualism.

The questionnaires also revealed some of the participants' learning strategies, which include associating words with experiences or creating mnemonic devices.

Peter Bennett mentioned: *“El conectar las nuevas palabras con experiencias hace que jamás las olvide.”* [P6-06]

Daniel Harris related the word *“cantaloupe”* to a mnemonic *“Canta Lupe.”*:

*“La sección de frutas en la parte de escribir muchas veces las palabras esto me hizo relacionar cantaloupe con (‘canta Lupe’). [P5-05]*

Participants, like Daniel Harris, applied interesting strategies when learning new vocabulary because they reflect connectivism techniques. Peter Bennette mentioned that he learns best when connecting vocabulary with real-life experiences [again distinctively connectionist methods] and states that he would never forget new vocabulary taught this way. These findings suggest that participants prefer to make mental connections and associations to previous knowledge or past experiences, hinting at a preference for connectionist methods of learning.

Additional evidence of these preferences emerged through participants' expressed support for contextualized vocabulary learning.

Adam Clarke expressed: *“Me enseñaron el vocabulario dentro de su contexto, no solo lo vimos en listas.”* [P3-03]

Adam Clarke explained: *“Es un mejor manera porque no solo enseñan la palabra, sino también sus usos.”* [P3-16]

Sarah Thompson noted: *“Prefiero actividades en situaciones realistas donde debo tomar decisiones.”* [P4-04]

Adam Clarke mentioned that a memorable and meaningful vocabulary lesson he had was when he learned vocabulary in context instead of lists, and following up with another of his answers, he favors learning methods that connect vocabulary to meaningful contexts and usages. Sarah Thompson also expresses a clear preference towards connectionist methods by stating that she prefers authentic activities where she has to make decisions using the language. This data suggests that participants feel more engaged and gravitate towards meaningful vocabulary lessons created by learning words in context.

The above is noteworthy given the fact that research indicates that students learn best when what they are learning is relevant and engaging for them.

Sarah Thompson stated: *“Solo estudié el vocabulario en esa ocasión; no lo memoricé.”* [P4-15]

Sarah Thompson highlighted: *“Lecciones relevantes y realistas me motivan más a aprender vocabulario.”* [P4-21]

Sarah Thompson states that she struggles to recall words that were not perceived as relevant to her. The participant also mentioned that her motivation is directly influenced by whether or not activities are relevant or engaging.

This qualitative data provided a descriptive insight into the learners' perspectives and supported the interpretation of the quantitative results. Although some learners preferred connectionist methods, test scores were higher for the traditional method. This adds to the theory of a predisposition for traditional methods by adult Mexican EFL learners. For instance, [P3-03]

preferred contextual learning but scored higher with the connectionist method, while Sarah Thompson ([P4-O4]) performed equally well using both methods. Participants who reported benefiting from repetition ([P1-O1], [P2-O2]) performed better using the traditional method, supporting the idea that structured learning aids immediate recall.

While traditional methods produced higher immediate recall, connectionist approaches may contribute to deeper understanding and long-term retention” Vocabulary learning requires two basic conditions – repetition (quantity of meetings with words) and good quality mental processing of the meetings” (Nation, 2001). As mentioned by Nation (2001), contextual exposure alone is insufficient for learning vocabulary, suggesting that a balance between repetition and meaningful exposure is crucial: “Without quantity and quality of processing, learning cannot occur” (p. 1). Sarah Thompson ([P4-O4]) performed equally well using both methods, which may indicate that learners who naturally integrate multiple learning strategies benefit from a hybrid approach.

Participants who reported benefiting from structured repetition ([P1-O1], [P2-O2]) also performed better in the traditional method. This aligns with the Involvement Load Hypothesis introduced by Laufer and Hulstijn (2001), which suggests that tasks requiring repeated cognitive engagement with words lead to better retention. As stated by Laufer and Hulstijn (2001), “Higher involvement in a word induced by the task (natural or artificial) will result in better retention regardless of whether it is an input or an output task” (p. 20).

This supports the observation that learners who engaged in repetition-based strategies performed better. For example, Jamie Davis ([P1-O1]) emphasized that repeated exposure helped them remember vocabulary, and their test scores reflected this. Skyler Avery ([P2-O2]) similarly noted the importance of writing and repetition, reinforcing the effectiveness of explicit vocabulary practice.

## 11. Conclusion

This study set out to examine the relationship between participants’ perceptions of memorization and drilling methods versus contextual vocabulary teaching and whether their preferences aligned with measurable learning outcomes. Based on the findings, students’ performance using traditional methods, such as drilling, repetition, and the use of lexical sets, suggests a deeper but less noticeable impact on retention. While participants regarded the connectionist approach as more engaging and effective, likely because it is interactive and associative, traditional methods still demonstrated better retention outcomes. These findings challenge the assumption that connectionist methods are universally more effective for vocabulary retention across all contexts and demographics.

This study also draws to an important question: Can Mexican participants have a predisposition to learning new vocabulary in their L2 brought on by previous traditional instruction that is still prevalent in public Mexican education? This comparison emphasizes how familiarity and structure in traditional approaches may help students retain information in ways they are not immediately aware of, meaning that perceptions of learning effectiveness may not always match quantifiable results.

Taken together, these findings highlight the potential benefit of mixed-method approaches to vocabulary instruction in enhancing retention. Further research is needed to explore how prior vocabulary instruction influences participants’ receptiveness to associative learning methods, particularly if they are accustomed to more traditional methods.

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