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An Investigation of the Impacts of Mnemonic Strategies on L2 Vocabulary Comprehension of Primary Students

Abstract

Effective vocabulary learning strategies play a fundamental role in the area of language learning and increase the vocabulary range and knowledge of students across various proficiency levels. Nowadays, students are eager to employ learning strategies which promote self-directed learning. Among the recommended vocabulary learning strategies, mnemonic strategies emerge as helpful and effective techniques for enlarging vocabulary. In this regard, the present study aims to examine the impacts of three mnemonic strategies, including the peg word, keyword, and loci techniques, on vocabulary comprehension among primary students. For this purpose, a total of 104 male elementary students in Iran participated in the study. The three experimental groups learned new words following the instructions of the chosen techniques, while the control group employed the memorization technique. A vocabulary comprehension post-test was administered, and the outcomes were assessed through a one-way ANOVA. The results revealed that the loci technique participants surpassed the performance of the remaining groups in the vocabulary comprehension test. The findings of this study offer valuable insights for syllabus designers, curriculum developers, institutions, and schools.

Keywords: vocabulary learning strategies, peg word technique, keyword technique, loci technique, memory strategies

Vocabulary and comprehension are related to understanding the meaning of text but operate on different scales. Vocabulary primarily focuses on understanding individual words, while comprehension most frequently involves grasping larger parts of the text. Achieving comprehension of these larger parts necessitates effective processing of the individual words (National Institute

of Child Health and Human Development [NICHD], 2000). Vocabulary plays a pivotal role in the domain of foreign language learning and the primary goal of vocabulary teaching is to enhance learners' comprehension (Nagy, 2005).

Researchers and language teaching programs emphasize the significance of vocabulary in the wider scope of language learning and teaching (Amiryousefi & Ketabi, 2011). The intricacy of vocabulary knowledge in the field of lexical understanding involves two primary notions: comprehension and production (Yalçın Tılfarlıoğlu & Bozgeyik, 2012). This intricacy causes a twofold challenge for learners. On the one hand, memorizing new words can be difficult, contributing to a struggle to retain foreign vocabulary (Amiryousefi & Ketabi, 2011). On the other hand, it leads to inadequate vocabulary knowledge among some EFL or ESL learners, which impacts their language skills (Boonkongsaen, 2012).

Effective learning in foreign language environments and EFL contexts necessitates the acquisition of an extensive vocabulary range. As students face broad foreign word lists requiring memorization, using effective vocabulary learning strategies is essential for successful language learning (Ahour & Berenji, 2015). Despite years of research in language learning field, questions remain unanswered about the most efficient vocabulary strategies in learning a second language. The diverse and numerous strategies and techniques for learning vocabulary knowledge contribute to this uncertainty and indecisiveness (Nemat Tabrizi et al., 2018). Teachers and researchers should explore this area to find appropriate vocabulary learning strategies which motivate high-quality learning results (Ghalebi et al., 2020).

Given this background, the present study specifically focuses on exploring the effects of mnemonic strategies—namely, peg word, keyword, and loci mnemonic strategies—on enhancing L2 vocabulary comprehension among sixth-grade male students in an Iranian context. These mnemonic techniques were selected for their widely proven effectiveness in enhancing vocabulary learning across diverse educational settings. The peg word technique successfully aids in learning lists of unrelated items. This technique involves first memorizing pegs or concrete words and then associating them with the initial 20 numbers (Bower & Reitman, 1972). The keyword technique creates connections through the auditory similarity of a keyword to a foreign word, while also associating the keyword visually with the meaning of the foreign word (Raugh & Atkinson, 1974). In the loci mnemonic technique, new words are associated with visual images of specific places. When needed to recall the words later, these places are mentally envisioned in sequential order (Lindenberger et al., 1992).

While several studies have separately examined the impacts of these techniques in different fields and for learners with various proficiency levels, there is a limited body of research comparing the effectiveness of these techniques collectively on vocabulary comprehension, particularly among male elementary

students. This gap emphasizes the necessity of conducting a comparative analysis to identify which of the selected mnemonic strategies is most effective in this demographic. By investigating the impact of these mnemonic strategies, the current study aims to provide valuable insights into effective comprehension of L2 vocabulary, particularly among male learners in foreign language environments. This area of research may have been relatively understudied or might warrant further exploration among male learners in foreign language environments.

Review of Literature

Vocabulary Learning Strategies (VLS) and Typologies

Language Learning Strategies (LLS) are techniques that support the development of key language skills such as listening, speaking, reading, and writing. A specific subset of these strategies is Vocabulary Learning Strategies (VLS), which contribute to the effective acquisition, retention, and application of new vocabulary. Most research in this field has primarily investigated different techniques for presenting vocabulary and assessing their effectiveness (Meara, 1980). By incorporating VLS, learners can not only enhance their vocabulary learning but also develop other crucial language skills. Furthermore, the value of VLSs is to aid learners in monitoring their own learning and assuming responsibility for their studies (Nation, 2001).

> A definition of VLSs by Catalan (2003) describes it as "knowledge about the mechanisms (processes and strategies) used in order to learn vocabulary as well as steps or actions taken by students to (a) find out the meaning of unknown words, (b) to retain them in long-term memory, (c) to recall them at will, and (d) to use them in oral or written mode." (p. 56)

Vocabulary learning stands as one of the formidable tasks for foreign language students throughout the language learning procedure. It is essential to enable language learners to become independent in second language learning, and employing effective VLSs may facilitate this independence. Teachers play a crucial role in this process by choosing strategies appropriate to learners' needs, learning styles, and language proficiency levels (Lotfi, 2007). In recent decades, there has been an increasing enthusiasm for VLS which simplifies the process of vocabulary learning and recall. The explicit teaching of VLS contributes to the progress of learners' skills by utilizing a broader range

of strategies. Focusing on these strategies emphasizes an active role of learners and learner-oriented perspective over a teaching-oriented one (Atay & Ozbulgan, 2007). This learner-centered approach aids in learning vocabulary knowledge and directs the attention of EFL or ESL learners toward self-directedness in vocabulary learning (Boonkongsaen, 2012).

The learner-centered approach discussed here aligns with Oxford's (1990) typology of language learning strategies, which fosters learner autonomy and self-regulation. These strategies enable learners to take control of their learning, plan their approaches, and assess their progress, thus promoting independence. The typology is divided into two categories and each category consists of a number of subcategories:

A) Direct Strategies

1. Memory strategies: These strategies facilitate the transfer of incoming information into long-term memory and enhance the retrieval of information during communication. They include techniques such as grouping, associating, semantic mapping, and using mnemonic devices like the keyword technique, peg word technique, or loci technique. Mnemonic strategies are a crucial part of memory strategies and connect new vocabulary to existing knowledge through mental images and associations, significantly improving retention and recall.
2. Cognitive strategies: These strategies are utilized to create and modify internal mental frameworks and aid in understanding and producing texts in the target language. Relevant cognitive strategies for vocabulary learning include recognizing patterns, taking notes, summarizing, and highlighting.
3. Compensation strategies: These strategies help learners guess unfamiliar meanings during listening or reading. They involve using linguistic clues, adjusting messages, and using synonyms.

B) Indirect Strategies

1. Meta-cognitive strategies: These strategies enable students to practice "executive control" through processes like planning, organizing and evaluating their learning. In the context of vocabulary learning, meta-cognitive strategies assist learners in setting vocabulary goals and monitoring their progress.
2. Affective strategies: These strategies allow learners to control their emotions and motivations related to language learning. Examples include using music or writing a language learning diary, which can enhance vocabulary learning by creating a more positive learning environment.
3. Social strategies: These strategies simplify the interaction and communication process in discourse. They include asking for clarification, cooperating with peers, and engaging in discussions.

According to Gu and Johnson (1996), the following categories encompass a wide range VLS: Meta-cognitive strategies are composed of selective attention and self-initiation. By using selective attention strategies, students identify essential words necessary for learning and comprehension, while applying self-initiation strategies to clarify word meanings through various approaches.

Cognitive strategies include guessing strategies (utilizing background knowledge or wider context and exploiting linguistic cues or immediate context), dictionary strategies (comprehension and extended dictionary strategies as well as looking-up strategies), and note-taking strategies (meaning-oriented and usage-oriented note-taking strategies).

Memory strategies are divided into two main types: rehearsal-based (e.g., utilizing word lists, oral repetition, and visual repetition) and elaboration-based (e.g., association/elaboration, word-structure, imagery, visual, auditory, semantic, and contextual encodings).

Activation strategies involve reading widely to identify and apply new words, building sentences with newly learned words, and employing them in speech, writing, imagined situations, and concrete contexts.

Discovery strategies and consolidation strategies are considered two dimensions of VLSs. These dimensions help differentiate the strategies learners apply to identify the meanings of new words for the first time from those utilized to consolidate those meanings when they face the words later. Discovery strategies include determination strategies and social strategies, while consolidation strategies encompass memory, social, meta-cognitive, and cognitive strategies (Schmitt, 1997).

Given the importance of VLS, language learners use various strategies, including cognitive, determination, and meta-cognitive strategies (Letchumanan et al., 2016). These strategies help students organize their vocabulary studies and monitor their progress. In addition, teachers and learners also employ various common techniques, such as flashcards, dictionaries, notebooks, as well as synonyms and antonyms (Nemati, 2009; Ghalebi et al., 2020). Moreover, as vocabulary knowledge is a crucial research topic, extensive research has been conducted recently to investigate both memory strategies and vocabulary learning strategies (Al-Faris & Jasim, 2021).

Mnemonic Strategies in L2 Vocabulary Learning

Educational programs utilize mental images to represent knowledge purposefully. These mental images are systematically applied to aid the learning process and memory in various activities, such as foreign language acquisition (Paivio, 1980). Additionally, most memory aids depend on imagery instruction to students (Roediger, 1980). In this context, verbal and imagery mnemonic

devices are defined as techniques for transforming the new material into a form which facilitates its learning and remembering procedures (Cohen, 1987). It is worth mentioning that mnemonics are considered one of the numerous facets of vocabulary learning strategies (Gu & Johnson, 1996).

Moreover, mnemonics are viewed as instructional techniques to enhance memory, aiding students in connecting new information to previously known information (Amiryousefi & Ketabi, 2011). In language learning, mnemonics enable foreign or second-language students to remember better materials or words (Chekhab, 2016). Additionally, mnemonics encompass any strategy which helps improve and increase memory (Nemat Tabrizi et al., 2018). Thus, mnemonics are recognized as highly effective mental tools in vocabulary learning (Al-Faris & Jasim, 2021).

Mnemonic strategies are subdivided in various ways. These strategies, while frequently applied to vocabulary learning, are equally valuable in supporting the acquisition of other language skills. The rote technique is a widely used mnemonic strategy, while peg word, loci, and keyword techniques are less frequently employed. These three strategies are based on mental pictures and are contingent upon connections between images of to-be-recalled objects and images of physical locations and verbal mediators (Krinsky & Krinsky, 1996). Thompson (1987) classified mnemonic devices into five distinct groups: linguistic mnemonics (encompassing the peg word and keyword techniques), spatial mnemonics such as the loci technique, visual mnemonics, physical response techniques, and verbal techniques (Amiryousefi & Ketabi, 2011).

Therefore, mnemonic strategies, as discussed, are a subset of memory strategies, which fall under direct language learning strategies according to Oxford's (1990) framework. These strategies particularly focus on enhancing memory retention and recall by creating mental associations, and they are pivotal in vocabulary learning within language learning.

Linguistic Mnemonics

Peg Word Technique. A rhyming mnemonic scheme, known as the peg word mnemonic technique, signifies a vocabulary learning technique designed to teach individuals how to create mental images. Using these mental images aids in finding new words' meaning in a context and facilitates the recall of their meanings with greater ease. The rhyming mnemonic scheme is composed of sequences of ten or twenty peg words rhyming with numbers, such as 1—bun, 2—shoe, 3—tree, and 4—door. These sequences act as cues to remember new words by visualizing their referents or meanings interacting with the rhyming pegs. For instance, if the first word to be memorized is *pencil*, one can visualize a pencil within a hamburger bun. Subsequently, 1—bun shows the recombination of the image of the pencil along with the hamburger bun (Paivio,

1980). Using the peg word mnemonic technique allows one to memorize a sequence of new items through mental images and to recall them successively using the associated numbers as cues. For example, one can visualize the word *chair* within a big hamburger bun, and the number 1 prompts the recall of the image of the bun together with a chair (Paivio, 1969).

Continuing from the descriptions above, the peg word technique encodes items into mental images and creates clear associations between peg words and the memorized items. This technique builds links between peg words and numbers to retain new items in a numerical series (Hodges, 1982). To this end, the first step in learning the peg word technique involves memorizing ten rhyme pairs based on number-name associations, for instance, 1—bun, 2—shoe, 3—tree, and 4—door. In the next step, learners create mental images associating the rhyming words with images of objects to-be-recalled (Krinsky & Krinsky, 1996).

Experimental Studies on the Peg Word Technique. In a study by Krinsky and Krinsky (1996), fifth-grade male and female children were instructed the peg word technique and taught common nouns to assess self-paced study and immediate retention. The results revealed significant increases in both self-paced study and immediate retention. This study highlights the efficacy and value of the peg word technique instructions in enhancing study time and memory throughout the learning process.

Wang and Thomas (2000) examined the long-term efficacy of applying the peg word mnemonic strategy and the loci mnemonic strategy on serial recall, comparing their outcomes with visual-based techniques. A total of 202 students were divided into four groups for the experiment. The peg word strategy group received the peg word rhymes, along with specific instructions for memorizing 20 vocabulary items using this strategy. Additionally, the loci strategy subjects utilized instructions and examples of this technique to sequentially acquire 20 words. The study's findings indicated similar performance between both groups, suggesting that these special mnemonic strategies were as effective as visual-based strategies created by participants. Moreover, both mnemonic groups performed better than the rehearsal group. The results of this study highlighted the effectiveness of utilizing mnemonic strategies for students.

In another study, Nemat Tabrizi et al. (2018) compared the effects of two mnemonic techniques, namely the peg word technique and the loci technique, on vocabulary retention in Iranian EFL students. To this end, one hundred male and female learners participated in the study and were equally assigned to two groups. After applying research treatments, ANCOVA was conducted to analyze the students' scores. Based on the obtained results, both peg word and loci mnemonic techniques demonstrated positive effects, but the peg word technique exhibited a more substantial impact on vocabulary retention. This study suggests that the peg word technique may be beneficial for some Iranian EFL students.

In addition, Rahayuningsi (2020) conducted a study focusing on how the peg word mnemonic instructions improved the EFL vocabulary skills of seventh graders. Using a pre-test and post-test design, the investigation revealed statistically significant differences between the mean of the pre-test and the post-test. The outcomes also showed teaching the peg word mnemonic technique resulted in a significant improvement in the vocabulary of young learners.

The Keyword Technique. The peg word technique or the rhyme mnemonic is closely related to another mnemonic technique known as the keyword strategy. This technique is widely utilized in the realm of foreign language learning and encompasses two crucial components: the verbal acoustic part and the visual imagery part. The keyword strategy creates both an acoustic and imagery link between a new foreign word and its synonym in the native language. The acoustic connection facilitates the recall of the pertinent word, while the imagery connection provides a clue to the word's meaning. A native language word or keyword forms these connections by resembling a foreign word or at least a part of it (Paivio, 1980). Among mnemonic strategies, special emphasis is placed on the keyword strategy, which involves two associations. The first one is the acoustic association between native and second language words, and the second involves the interaction of mental images depicting the keyword with the native language word (Cohen, 1987). The first step in learning and retaining a new word is to select a keyword that possesses an acoustic resemblance to the new word. It is noteworthy that the selected keyword and the new word have independent meanings. The next step involves a visual connection between the keyword and the new word's meaning through the creation of a mental image (Brown & Perry, 1991).

For instance, when learning the new word *shear,* signifying the act of *cutting the wool off a sheep,* the student is provided with the Persian keyword شیر *(shir)*, which means *lion in English*. The word *shear* displays an acoustic resemblance to the keyword شیر *(shir).* In the next step, the student links these words by creating a mental image, such as a lion shearing a sheep (Amiryousefi & Ketabi, 2011).

It is crucial to highlight that the keyword technique simplifies recall of definitions. This mnemonic technique also enhances vocabulary comprehension by facilitating deeper semantic associations between new words and familiar concepts and promotes the application of the same vocabulary in a new context (Pressley et al., 1981). Moreover, it is particularly beneficial for receptive learning, as it aids students in understanding and processing vocabulary (Ellis & Beaton, 1993). Furthermore, the keyword strategy is regarded as an efficient technique for teaching vocabulary and is placed among well-recognized and

broadly surveyed vocabulary teaching techniques (Rodríguez & Sadoski, 2000). The keyword mnemonic technique demonstrates more effectiveness than other memorization strategies in Shapiro & Waters (2005).

Numerous studies have examined the efficacy of the keyword mnemonic technique in different languages, such as French (Paivio, 1980), Russian (Raugh et al., 1977), and Spanish (Pressley, 1977; Sagarra & Alba, 2006), as well as for learners at various proficiency levels (Wei, 2015).

Experimental Studies on the Keyword Technique. Pressley (1977) examined the skills of second and fifth-grade children to employ the keyword strategy to learn simple foreign words. In this investigation, to memorize a foreign word, the keyword strategy involved connecting a foreign word (Spanish) to an English keyword that is acoustically similar to the foreign word, and then creating an interactive image of the keyword and its foreign translation. The results highlighted that children using the keyword strategy memorized more simple Spanish words with interactive images than the control group.

In a study conducted by Avila and Sadoski (1996), the keyword technique was used to assist learners with limited English proficiency in learning English vocabulary. Spanish keywords were utilized in this study to facilitate English vocabulary learning. The study involved sixty-three 5th-grade learners with limited English proficiency. In the experimental group, the participants were taught ten English words using the keyword technique, while the control group learned the words through the direct translation technique. The study employed a between-subjects experimental design to administer a cued-recall task, assessing memory retrieval, and a sentence-completion task, evaluating vocabulary comprehension. Participants then completed these tasks under two timing conditions (immediately or after a 1-week delay). Analysis of the test data illustrated that the keyword technique increased the comprehension and recall of elementary students with limited English proficiency in both immediate and delayed tests. Besides, the results showed the effectiveness of this mnemonic technique in ESL classrooms.

Zhang and Schumm (2000) conducted a study to compare the efficiency of the keyword strategy with the rehearsal technique on vocabulary recall and comprehension among sixty 5th-grade learners with limited English proficiency. The subjects were divided into three groups: two experimental groups (keyword Spanish group and keyword English group) and one control group (rehearsal). At the end of the instructional program, two tests (immediate and one-week delayed) were administered to assess vocabulary recall and sentence completion. The post hoc Scheffé test results emphasized that both keyword mnemonic groups exhibited superior performance compared to their peers in the rehearsal group in both vocabulary recall and sentence completion tests.

This suggests that the keyword technique not only aids in immediate recall but also strengthens long-term retention and understanding of vocabulary through its associative nature. Additionally, both keyword mnemonic groups showed insignificant differences in the related tests.

In a subsequent study conducted by Taheri and Davoudi (2016), the impact of the keyword technique on vocabulary learning and its retention in the long run was examined among female and male elementary students in an Iranian EFL setting. Fifty primary students participated and were assigned to the keyword group and the control group (memorization technique). The experimental group learned words using the instructions of the keyword strategy, while the control group learned identical terms utilizing the memorization method. Both groups took immediate and delayed post-tests, and t-tests were employed for data analysis. The findings indicated that the keyword strategy group performed better than the students of the memorization technique in vocabulary learning and retention. The study's findings further highlighted the crucial role of using a mnemonic technique to create mental connections and visual images in enhancing vocabulary learning and retention among primary EFL students.

Fasih et al. (2018) conducted a study to examine the impacts of keyword mnemonic teaching on learning and comprehension of content words in an EFL setting. The study included 256 male students in Zanjan, Iran, selected on the basis of a multistage cluster random sampling method using a placement test. Two male groups were randomly selected; one control group and one experimental group (the keyword strategy group). Utilizing covariance analysis, the educational outcomes revealed that the keyword strategy significantly promoted students' content vocabulary learning in the students. This implies that mnemonic techniques facilitate not only recall but also a deeper understanding of vocabulary by enabling learners to establish meaningful connections between words and their usages.

Spatial Mnemonics

The Loci Technique. The loci technique, a well-known form of imagery mnemonic strategy, shares principles similar to the peg system. However, a crucial distinction between these two techniques lies in the use of a set of locations as storage places in the loci technique, in contrast with a series of pegs or hooks memorized in the peg word system (Roediger, 1980). In the loci mnemonic technique, the memorizer chooses a sequence of familiar places and mentally traverses the chosen path, such as a daily route. The learner transforms each item, typically a word, into a mental image and situates that mental depiction at pertinent locations along the mental route. To recall, the learner re-travels the mental path, observes each place, and recalls the names of the associated items (Roediger, 1980).

In the loci technique, "loci" refers to locations, where the memorizer associates items or words with a known series of places. The high efficacy of this technique enables students to memorize any list of items (Hodges, 1982). For instance, according to Amiryousefi & Ketabi, (2011), to memorize words such as "era, artificial, mission, sample, mass, density, disturb, and distant," students might select a known location, such as the moon. Subsequently, students may create a mental image and visualize the following scenario:

> It is the robot *era*. There are some robots with *artificial* hands and legs. They are on a *mission* on the *moon*. They collect a *mass* of *sample* rocks to examine their features and *density*. No one can *disturb* them because they are in a *distant* area. (Amiryousefi & Ketabi, 2011, p. 179)

Beyond its use for spatial words, the loci mnemonic technique demonstrates effectiveness in encoding non-spatial word lists (Fellner et al., 2016). As a long-established mnemonic technique, it enhances the recall of items or words in a specific order (Kroneisen & Makerud, 2017). Furthermore, it relies on a spatial and navigational metaphor and the learner is required to visualize moving through a familiar location and situating words at specific loci. The memorizer then envisages navigating the same way and recalling words along the way (Caplan et al., 2019). As an ancient mnemonic strategy, the loci technique also benefits from highly structured encoding and recalling procedures (Blunt & VanArsdall, 2021).

Experimental Studies on the Loci Technique. Roediger (1980) investigated the efficiency of four mnemonic strategies in ordering recall: the imagery technique, the link technique, the peg word system, and the loci strategy. Compared with a control group, all mnemonic participants indicated an improvement in memorizing 20 word lists in an unordered recall. Using a strict positional criterion scoring method, subjects in the peg word system and loci strategy demonstrated the best performance on the immediate test, while subjects in the imagery technique and control exhibited the worst performance. Meanwhile, the scores showed the intermediate performance of the linking images technique. The results also emphasized that exploiting mnemonic strategies aids in a higher order of recall than recalling words without considering the order. Additionally, the link technique, peg word system, and loci technique helped to recall words in the correct order of input more effectively than the elaborative rehearsal technique and mental images in both immediate and delayed assessments. This outcome is attributed to the specific instructions that the subjects received to recall words using these strategies.

In a study conducted by Richmond et al. (2008), researchers investigated the transferability of the three mnemonic techniques (loci, peg word, and keyword

techniques) among 8th graders. The aim was to determine if participants could effectively transfer the utilization of a mnemonic technique under general and specific situations. For this objective, 108 students of the 8th grade took part in the study and were randomly allocated into four groups (three mnemonic groups and one control group). Over two weeks, students received instructions based on their selected mnemonic technique. Assessments were then carried out to evaluate their capacity to transfer the mnemonic technique in two different situations: a general transfer form related to a study of Revolutionary War battle events and a specific transfer form using a study of metal alloy uses. The results revealed that the keyword mnemonic technique group indicated greater success in transferring the application of a mnemonic technique in general and specific situations. Additionally, the groups using the peg word and loci techniques, along with the control group, demonstrated similar abilities and functions in distinguishing the uses of specific and general transfer activities.

In 2012, Garcia and Herrera conducted a study investigating the effects of memorization techniques on 5th graders' science words using mnemonic instructions. The objective was to evaluate the efficacy of chosen mnemonic instructions in comparison to the traditional recall technique. The memorization techniques used in the study included loci, peg word, and keyword techniques. After instructional sessions, four tests were administered, and the study's findings revealed the equal effectiveness of both memorization strategies and the traditional recall technique in learning science words.

Furthermore, Ahour and Berenji (2015) conducted a study comparing the impacts of loci mnemonic and rehearsal techniques on EFL students' vocabulary learning. The study aimed to ascertain which technique functioned better concerning word retention and recall. In this quasi-experimental design, 80 Iranian students were randomly allocated to the experimental group (loci technique) and the control group (rehearsal technique). At the end of the treatment sessions, a multiple-choice vocabulary test assessed students' ability to recall words from their short-term memory. Additionally, a delayed vocabulary post-test was conducted a month later to assess the students' long-term retention. Independent Samples of t-tests were used, and the study's outcomes revealed the superior performance of the loci technique group compared to the rehearsal group in retaining and recalling words in the immediate post-test. The findings further highlighted the effectiveness of the loci technique, specifically in the long-term retention of words, in comparison with the rehearsal technique.

Beyond the evaluation of mnemonic techniques on vocabulary learning, it is also important to explore additional factors which can influence vocabulary learning outcomes. The inclusion of the section on gender differences in vocabulary learning is based on a recommendation from a previous review. Understanding the role of gender differences in vocabulary learning is crucial for informing future studies and developing effective instructional strategies

that address the needs of both male and female learners. Although the current study focuses exclusively on male learners due to the single-gender policy in the Iranian educational context, acknowledging these gender differences provides a comprehensive context. This section sets a foundation for future exploration of these differences more extensively. Existing literature on gender differences in vocabulary learning offers a better understanding of how diverse factors affect language learning and creates more inclusive educational practices.

Gender Differences in Vocabulary Learning

Gender plays a crucial role in vocabulary learning and is among the most pertinent factors considered in SLA (Second Language Acquisition) research. While some studies have emphasized the dominance of males over females, others highlight girls' proficiency as superior language learners compared to boys. Additionally, some studies have demonstrated that gender is an insignificant variable in SLA (Llach & Gallego, 2012). Furthermore, diverse researches have revealed the effectiveness of explicit instruction of VLS, while other studies have suggested that the factor of gender plays a role in learners' utilization of language learning strategies, particularly those related to vocabulary learning strategies (Kobayashi & Little, 2020).

It is important to note that examinations of vocabulary learning strategies emphasize that female students make fewer errors in second language compositions, generate more words, and particularly utilize a larger number of language learning strategies compared to their male counterparts in classrooms (Catalán, 2003). Furthermore, numerous studies have verified that females tend to exploit a wider range of language learning strategies compared to males (Kobayashi & Little, 2020).

On the one hand, both male and female students employ similar strategies to discover meaning, such as using a bilingual dictionary and inferring meaning from contextual clues. On the other hand, both male and female students exhibit significantly different percentages in the number of vocabulary strategies they employ, including formal rule strategies and memory techniques, suggesting different learning styles and preferences influenced by gender (Catalán, 2003). Moreover, variations in language learning styles and different motivation levels between males and females contribute to gender differences in using vocabulary learning strategies (Catalán, 2003).

Additionally, there are gender differences in children's learning of new words, emphasizing that girls often perform better than boys in word learning activities, especially when learning familiar knowledge. Moreover, the influences of phonological and semantic familiarity appear to have a more significant impact on girls than on boys (Kaushanskaya et al., 2013). Furthermore, many male students may possess limited vocabulary skills as a result of their disinterest

in participating in language learning activities (Na, 2016). Consequently, an implication for teaching English is that teachers should recognize the potential need for male students to receive additional practice (Maulina, 2018).

Several factors contribute to gender differences, including physiological, psychological, social background, and personal life experiences, all of which can impact the language learning process. In terms of psychological factors, male students often demonstrate confidence and adventurousness but may also exhibit carelessness, while female students tend to be more reserved and delicate (Na, 2016). Additionally, individual factors can be categorized as internal or external. Internal factors encompass age, attitude, motivation, personality, intelligence, and language aptitude, while external factors include teaching methods, learning environment, social background, and evaluation methods (Na, 2016). Moreover, gender differences in language learning are influenced by several factors, including the psychological conditions of students, their cultural and social backgrounds, their interactions with native speakers, as well as their physical attributes and the instructional materials utilized by teachers (Omar Ali, 2016).

Furthermore, gender differences encompass diverse elements such as "motivation, self-regulation, cognitive load, and attitudes towards learning," which may vary between males and females. These distinctions can impact both language learning experiences and eventual outcomes (Kheder & Rouabhia, 2023, p. 106). Recognizing these gender differences in language learning enables educators to develop more personalized teaching methodologies which address the distinct needs and preferences of male and female learners. Comprehension of these factors facilitates the development of more efficient strategies and interventions (Kheder & Rouabhia, 2023).

A study conducted by Catalán (2003) aimed to determine whether there were gender differences in the number and range of L2 vocabulary learning strategies. The study involved 581 male and female Spanish-students learning English. After administering a questionnaire, the findings indicated significant differences between male and female students in terms of the number of strategies employed. Specifically, female students exploited more formal rule strategies, including input elicitation strategies, rehearsal strategies, and planning strategies, while their male counterparts tended to rely more on image-based vocabulary learning strategies. Furthermore, the results revealed that female students exhibited higher percentages of total strategy usage compared to their male counterparts.

Llach and Gallego (2012) examined the significance of gender differences on developing L2 vocabulary knowledge in primary education, given various ages and instructional stages. The study investigated the role of gender in receptive vocabulary size learning and involved 176 young male and female EFL learners. The outcomes demonstrated that the understanding of English words among both male and female students improved across various grades. Additionally,

there were considerably meaningful differences in vocabulary size over the educational years. Students' vocabulary knowledge increased sequentially with a trend toward a significant rise in the final period. Moreover, in the initial three intervals, female students indicated greater vocabulary gains compared to males. However, male students included more words in their glossary than their female counterparts.

Barbu et al. (2015) investigated the interactions between children's gender and family socioeconomic status (SES) in language development during early childhood. The study examined the constancy of gender differences across SES and children's age by observing 262 children, aged 2 to 6, from two different social backgrounds, learning French liaison. A picture-naming task was used to elicit obligatory liaison. Consequently, the results showed significant gender differences among low SES compared to high SES children, who exhibited similar performances across gender. Boys in the low SES group performed the worst, while low SES girls outperformed boys in the same group. Additionally, the low SES girls demonstrated the poorest functions compared to both genders in the high SES group. Despite improvements in mastering obligatory liaisons with age, low SES considerably impeded progress, particularly for boys.

In another study conducted by Shadikah et al. (2017), the impact of VLS on vocabulary mastery among female and male EFL learners was investigated considering gender differences. This qualitative study involved 20 high-intermediate students, both male and female, at Lembaga Bahasa dan Pendidikan Professional LIA Solo (LBPP LIA Solo), a popular English institute in Surakarta. VLS questionnaires, interviews, and tests were administered to collect data. The outcomes revealed that females exhibited a higher tendency to employ VLS and were more successful in vocabulary mastery than males. Female students utilized dictionary strategies, activation strategies, guessing strategies, note-taking, and memory strategies (such as encoding and rehearsal) from most frequently used to least frequently used strategies. However, male students most often employed guessing strategies, followed by dictionary strategies, activation strategies, memory strategies (such as encoding and rehearsal), and note-taking, respectively. Additionally, a higher usage of VLS resulted in a greater effect on vocabulary mastery.

In another study, Kobayashi and Little (2020) investigated the impact of gender differences as a factor on explicit VLS instruction. The study involved 109 Japanese EFL students who completed a questionnaire on vocabulary learning behavior both before and after receiving explicit VLS instruction. The questionnaire comprised various vocabulary learning categories, including meta-cognitive strategies, cognitive and memory strategies, and overall use of VLS. The VLS instructions emphasized four memory strategies: imagery, association, affixation, and grouping. The study's findings indicated the effectiveness of VLS instruction in increasing the use of meta-cognitive strategies,

writing rehearsal, and grouping strategy. Significant gender differences were noted in the utilization of writing and grouping strategies, as well as in the overall use of strategies. Male students reported a greater use of grouping strategies, while their female counterparts' use of grouping strategies stayed consistent. Additionally, female students exhibited statistically higher usage of the writing rehearsal strategy.

The objective of the current study is to address the following research question:

(1) Are there significant differences in the impacts of mnemonic strategies (the peg word, keyword, and loci techniques) on the L2 vocabulary comprehension of male sixth graders?

Methodology

Participants

A sample of 120 male Iranian students from a nongovernmental primary school in Paveh, Kermanshah, participated in this study. These students, all at the elementary level, constituted four classes of sixth-graders, with each class holding 30 students. To investigate effective mnemonic techniques, they were assigned to four groups, including three experimental groups and one control group. Then, the experimental groups were randomly allocated one of the chosen techniques, such as the peg word, keyword, and loci techniques. In contrast, the control group utilized a general memorization technique focused on rote learning, which involved repetition and straightforward memorization of vocabulary. It is worthy to note that this study focused exclusively on male subjects due to the single-gender policy classes in the educational context in Iran, where schools are often segregated by gender. Additionally, including only male participants helps control for possible gender-related variables that might complicate the interpretations of the outcomes.

Instruments

The materials and instruments utilized in the present study comprised the following components:

1. Elementary Vocabulary book by Thomas Nelson (1990), published by Longman, and the Longman Children's Picture Dictionary were selected as the main books to choose 110 vocabulary items. Additionally, the Oxford Elementary Dictionary was implemented to extract examples of the sentences

which incorporate these words. These sources assured consistency of target words across all groups and appropriateness for the selected techniques. Using these sources to choose vocabulary items simplified the process of creating mental images for the students.

2. A Standard English Placement Test, comprising 30 items presented in a multiple-choice structure, was conducted as a pre-test to homogenize the participants. In this context, the reliability of the pre-test was estimated using the KR-21 formula, and yielded a value of 0.84.
3. After homogenizing the participants, a word knowledge pre-test was conducted. This test included 110 words chosen from the aforementioned sources, which were bolded and contextualized in 70 sentences. The word knowledge test aimed to confirm that the specified words were new to the students and that they had no previous knowledge of them. Highlighting the use of the KR-21 formula, the estimated reliability index was found to be 0.81 in the context of this study.
4. The post-test used in the present study was a vocabulary comprehension assessment, including 30 multiple-choice tests selected from the Key English Test (KET). This test aimed to evaluate and measure the impacts of the aforementioned mnemonic techniques on the vocabulary comprehension of primary students. It is crucial to note that the test's reliability was computed utilizing the KR-21 formula. The reliability metric resulted in a value of 0.85.

Procedure

At the outset, 120 male Iranian students from a nongovernmental primary school in Paveh, Kermanshah, were selected to examine the effects of the peg word, keyword, and loci techniques on the sixth graders' vocabulary comprehension. Each of the four sixth-grade classes had 30 students attending English two times a week, with each class session lasting for duration of 50 minutes.

Before the experiment began, a pre-test was conducted to ensure the participants' homogeneity and to determine their language proficiency level. The pre-test made use of an English Placement Test, published by Oxford University Press, consisting of a standard set of 30 multiple-choice items. The allocated time for the pre-test was 30 minutes. The scores' mean and standard deviation were calculated. Those students whose scores were one standard deviation beyond or below the mean were not considered in later analyses. As a result, 16 students were omitted, and the remaining 104 homogenous students, all at the elementary level of language proficiency, took part in the instructional sessions in the study and the analysis of the data.

Subsequently, a pre-test on word knowledge was carried out to determine the main words for the study. For this purpose, 110 vocabulary items were chosen,

bolded, and contextualized in 70 sentences using the Nelson Elementary Vocabulary book and Longman Children's Picture Dictionary. Samples of these sentences were derived from the Oxford Elementary Dictionary. The students were required to write the Persian meanings of the words within a 40-minute timeframe. The outcomes of the word knowledge test indicated that 45 familiar words were omitted from the instructional sessions, leaving 65 words as target words.

Next, each experimental group (Group A—peg word technique, Group B—keyword technique, Group C—loci technique) randomly received one of the chosen techniques, while Group D (control group) used the memorization technique. The instructional sessions lasted two months, with a total of 14 sessions. The students learned new English words twice a week, spending 50 minutes in each session. During each session, they were taught five or six words based on the specific instructions of each technique.

A description of the chosen mnemonic techniques is as follows:

1. Peg Word Technique (Group A): Participants (n = 26) were taught the peg word mnemonic technique and received instruction in each session on six new words. In the first phase, the students, with the teacher's help, created suitable peg words (rhyming words). These rhyming words were concrete and facilitated making meaningful mental images. In the second phase, the students linked the new word to its peg word and formed a mental image. McCabe (2010) describes the two stages of the peg word technique: creating rhyming words (peg words) for numbers one to ten in the first stage and creating mental pictures of the new word and its related peg word, then linking them to the related number in the second stage.
2. Keyword Technique (Group B): Participants (n = 26) received related instructions and procedures in the first session. Using the keyword technique, the group learned six new words each session. With the teacher's guidance, the students generated associated Persian keywords and then created mental pictures of the keyword linking with the Persian meaning of the English word. According to Masteropieri and Scruggs (1998), the keyword technique is defined as a mnemonic technique with two main phases: creating a keyword with a similar sound to the new word and visualizing the pertinent keyword along with the definition of the English word, then associating them together.
3. Loci Technique (Group C): Participants (n = 26) received this mnemonic strategy to learn six new words each session using the provided instructions. The learners found a familiar location, mentally imagined new words, and mentally placed them in pertinent positions. For recall, the learners visualized the familiar place again and retrieved the names of the words. According to Nemati (2009), the loci technique is an old technique where learners visualize a known place such as a room and put new words there mentally. To recall, they mentally navigate through the room and then retrieve the related words.

4. Memorization Technique (Group D): Participants (n = 26), serving as the control group, received six words in each session. However, they learned new words using the traditional technique of memorization without any special instructions.

After the completion of the instructional sessions, a post-test on vocabulary comprehension was conducted to assess the impacts of the peg word, keyword, and loci techniques on the sixth graders' vocabulary comprehension. This vocabulary comprehension post-test was composed of 30 multiple-choice questions chosen from KET tests. The allocated time to perform the test was 40 minutes. Subsequently, a one-way ANOVA analysis was employed to examine the collected data. The ANOVA procedure addressed the research question and measured the impacts of the above-mentioned techniques on vocabulary comprehension of primary students.

Results

Investigation of the Research Question

In the current study, the research question sought to examine the impacts of the three mnemonic techniques, including the peg word, keyword, and loci techniques, on L2 vocabulary comprehension among sixth graders. For this purpose, the effectiveness of these techniques was assessed using a one-way ANOVA analysis to scrutinize the outcomes of the vocabulary comprehension test. To provide an overview of the statistical analysis, Table 1 represents the descriptive statistics outcomes obtained from the ANOVA procedure on vocabulary comprehension. This table offers valuable insights into the scores' distribution and the variability among the groups.

Table 1

Descriptive Statistics for the ANOVA Analysis on Vocabulary Comprehension

Groups	*N*	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Peg word	26	16.88	3.24	.63	15.57	18.19
KWM	26	18.76	3.19	.62	17.48	20.05
Loci method	26	21.46	2.46	.48	20.46	22.45
Control	26	14.57	1.62	.31	13.91	15.23
Total	104	17.92	3.68	.36	17.20	18.63

Table 1 presents that the loci technique group exhibits the highest mean ($\bar{x}$ = 21.46), followed by the keyword technique group with the subsequent highest mean ($\bar{x}$ = 18.76). The participants in the peg word technique group place third in terms of mean ($\bar{x}$ = 16.88), while the control group has the lowest mean ($\bar{x}$ = 14.57).

A one-way ANOVA procedure was conducted to assess whether these mean differences among the chosen mnemonic techniques are statistically significant. Table 2 displays the outcomes of the ANOVA analysis on the vocabulary comprehension test.

Table 2

Outcomes of the ANOVA Analysis on the Vocabulary Comprehension Test

	Sum of Squares	df	Mean Square	F	Sign
Between Groups	663.30	3	221.10	30.03	.000
Within Groups	736.07	100	7.36		
Total	1399.38	103			

The ANOVA outcomes reveal the significant F value (F = 30.03) and the level of significance (P < 0.05), indicating statistically significant differences exist among the groups. In this regard, a Post-Hoc Scheffe test was conducted to pinpoint the specific differences among the chosen groups. Table 3 contains the detailed results of the post-hoc multiple comparisons of the means.

Table 3

Post-Hoc Analysis-Multiple Mean Comparisons for Students' Vocabulary Comprehension

(I)group	(J)group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Peg word	KWM	–1.88	.75	.106	–4.02	.25
	Loci method	–4.57*	.75	.000	–6.71	–2.43
	Control	2.30*	.75	.029	.16	4.44
KWM	Loci method	–2.69*	.75	.007	–4.83	–.55
	Control	4.19*	.75	.000	2.05	6.33
Loci method	Control	6.88*	.75	.000	4.74	9.02

*. Significant Mean Difference is at 0.05 Level.

Table 3 illustrates that the mean differences between the peg word technique and the keyword technique groups are statistically insignificant, implying that both groups performed similarly on the vocabulary comprehension test.

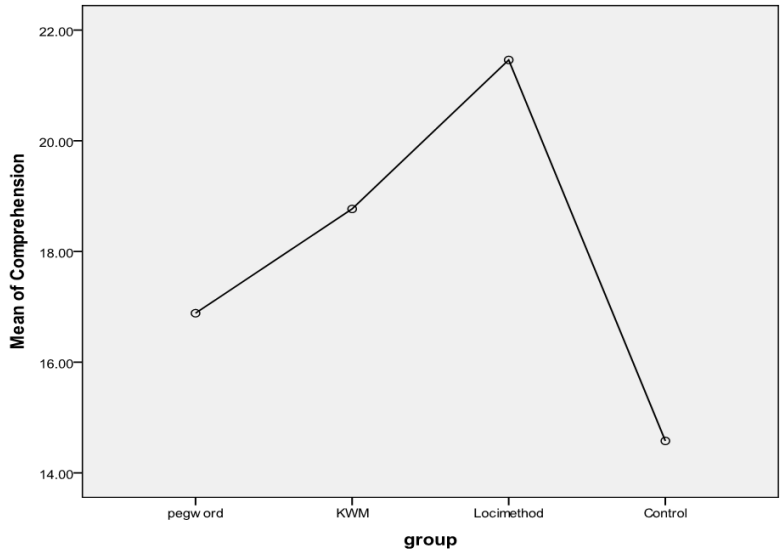
However, significant and notable differences emerge when comparing the loci technique group to both the peg word and keyword technique groups. The implication is that the participants of the loci technique exhibited significantly better performance than their peers in the other mnemonic groups.

Additionally, the control group displayed the lowest mean in comparison to the three mnemonic groups. A close look at the obtained results indicates that statistically significant mean differences exist between the loci, peg word, and keyword technique groups compared to the control group. These findings suggest that the control group performed less effectively and demonstrated the lowest proficiency in the vocabulary comprehension test.

Figure 1 graphically highlights significant differences among the chosen groups on the vocabulary comprehension test.

Figure 1

Students' Performance on the Vocabulary Comprehension



Discussion

This study aimed to examine the impacts of mnemonic strategies, including the peg word, keyword, and loci techniques on L2 vocabulary comprehension among primary students. Additionally, a control group used the memorization technique for learning target words. The findings of the current study reveal

statistically significant differences among the groups in vocabulary comprehension among elementary students.

Based on the findings, the loci technique participants demonstrated the highest mean in comparison to the other three groups. The observed statistically significant differences between the loci technique group and the other groups suggest superior performance in vocabulary comprehension among the loci technique participants. This implies that the loci technique could increase the vocabulary comprehension of elementary students. The results also demonstrated that despite observed differences between the means of the peg word and keyword technique groups, these differences were insignificant, implying that both groups functioned similarly in vocabulary comprehension. However, the keyword technique group's performance exhibited slight superiority over the peg word technique group, suggesting that the keyword technique may be more beneficial than the peg word technique in enhancing vocabulary comprehension among elementary students. In contrast, the control group participants performed significantly poorly compared to the three mnemonic groups. This indicates the potential effectiveness of mnemonic strategies over memorization technique.

Based on the findings of the current study, the loci technique group, exhibiting the highest mean in vocabulary comprehension, performed better than the peg word technique group. This contrasts with Roediger's (1980) study, where both the peg word technique and loci technique groups functioned similarly in recalling words. These two groups recalled more words and exceeded other mnemonic techniques such as the link and imagery techniques. Additionally, unlike the present study, Richmond et al. (2008) reported similar performances among the loci technique, peg word technique, and control groups in distinguishing the applications of specific and general transfer activities. The finding of the current study also contrasts with that of Garcia and Herrera (2012), who reported those mnemonic techniques, including the loci, peg word, and keyword techniques, as well as the traditional technique of recall, demonstrated equal effectiveness in aiding fifth graders in learning science words.

Moreover, the study's finding differs from those of Zarei and Keysan (2016), who compared the effects of mnemonic techniques (peg word, keyword, and loci techniques) and mapping techniques on vocabulary learning. Zarei and Keysan reported that the peg word technique group outperformed their classmates in the loci technique and keyword technique groups and mapping groups on both vocabulary comprehension and production assessments. Additionally, the outcomes of Nemat Tabrizi et al. (2018), unlike the findings of the current study, revealed that although both peg word and loci mnemonic techniques had positive effects on vocabulary retention in Iranian EFL students, the participants of the peg word mnemonic technique performed better than the loci mnemonic

technique group, indicating that the peg word had a more substantial effect on vocabulary retention.

Similarly to this study, where the peg word group outperformed the control group who used the memorization technique, Krinsky and Krinsky (1996) also found that using the peg word technique instructions increased both self-paced study and immediate retention among elementary students. The present study's findings also align with those of Rahayuningsi (2020), who reported meaningful differences between pre-test and post-test outcomes following the implementation of the peg word technique instructions. Consequently, using the peg word positively affected and enhanced the vocabulary skills of seventh graders.

The present study's outcomes also indicate that the peg word technique group places third in terms of the mean scores after the keyword technique group. Although the differences between the means of these two groups were statistically insignificant, the keyword technique group exhibited trivially better performance than the peg word group on the vocabulary comprehension test. This finding somehow aligns with the study by Richmond et al. (2008), who examined the transferability of the three mnemonic techniques involving the keyword, peg word, and loci techniques under general and specific conditions. Richmond et al. elaborated that the participants using the keyword technique were highly successful in transferring the application of a mnemonic under both general and specific conditions compared to the peg word and loci techniques. However, this contrasts with the present study, where the loci technique participants outperformed the keyword technique participants.

In light of the results from the present study, the statistically significant mean differences between the selected mnemonic groups and the control group suggest that visual mnemonic techniques are more effective than traditional vocabulary learning techniques. The participants of the control group performed poorly on the vocabulary comprehension assessment in this study. This finding aligns with the research conducted by Avila and Sadoski (1996), who found that the keyword technique increased vocabulary comprehension and recall among primary learners with limited English proficiency in both immediate and delayed assessments. Similar to the present study, Taheri and Davoudi (2016) also found that the keyword technique group outperformed the control group in both vocabulary learning and long-term retention. Thus, using the keyword as a visual mnemonic technique demonstrated greater effectiveness than the memorization technique in both vocabulary learning and retention of elementary EFL students. This trend is further supported by the study of Ahour and Berenji (2015), who reported that the loci group outperformed the rehearsal group (the control group) in both vocabulary learning and retention, indicating that the rehearsal technique was less effective than the loci mnemonic technique in retaining and recalling words.

Given the above-mentioned explanations, in many globalized societies, the primary trend entails introducing foreign language education to children at a young age. Although many studies confirm teaching a foreign language to children, there needs to be more information on the effectiveness of techniques for teaching new foreign words to children (Toghyani Khorasgani & Khanehgir, 2017). Thus, to guarantee learners' success, they must use an extensive array of effective vocabulary learning strategies (Susanto & Binti Ab Halim, 2017).

Several factors can explain the observed outcomes. Firstly, the participants' unique educational context and demographic characteristics, including their cultural background, gender, age, and language proficiency, had substantial impacts on the outcomes. For example, the Iranian EFL students in this study might exhibit different learning styles and preferences compared to those in other EFL/ESL contexts. Secondly, the specific mnemonic instructional strategies and materials used in this study, tailored to meet the learners' needs and fit the educational environment, may have influenced the results. Additionally, the study's methodology, including the use of a control group and systematic application of mnemonic techniques, helped ensure the reliability and validity of the findings. The controlled conditions reduced external variables that might have obscured the results, providing a clearer understanding of the efficacy of the mnemonic strategies. Finally, the results may also be influenced by the interaction between the students' intrinsic motivation and the engagement promoted by the mnemonic techniques. The involvement and relevance of the mnemonic tasks could have contributed to the improved vocabulary comprehension outcomes observed in this study. These factors help explain why the current results may align with or differ from those of previous studies.

Conclusion

While vocabulary instruction as a component of classroom syllabus in Iranian EFL contexts has received less attention than other aspects of language (Taheri & Davoudi, 2016), learning English vocabulary remains a primary goal for many learners as an indispensable part of language learning (Susanto & Binti Ab Halim, 2017). Recognizing the crucial role of vocabulary in language learning, teachers must prioritize vocabulary instruction to make a sturdy foundation for learning (Al-Faris & Jasim, 2021).

In light of the crucial role of effective and successful vocabulary learning strategies, the current study investigated the effects of mnemonic strategies involving the peg word, keyword, and loci techniques on L2 vocabulary

comprehension among sixth graders. The control group, as observed, exhibited poor performance in the vocabulary comprehension test. Given the results, the loci technique proved high efficacy over other mnemonic techniques. The loci technique participants were more successful than the other two mnemonic groups. Furthermore, the peg word and keyword technique groups functioned similarly, with a slightly better performance observed in the keyword technique group.

Therefore, various mnemonic techniques, whether spatial, linguistic, music, chunking, rhyming, visual, or other types of mnemonic devices, may show different outcomes in L2 vocabulary learning. Many factors account for the variety of such results and explain why some mnemonic strategies are more effective while others lack success. These factors include the appropriateness of chosen techniques, cultural setting, gender, students' feedback, language proficiency level, degree of teachers' and students' acquaintance with the mnemonic technique in the educational system, and different study fields. The present study's findings may be helpful for teachers, students, institutions, educational systems, and syllabus designers, attempting to employ various L2 vocabulary learning strategies.

Future Research

Future research could compare the effectiveness of mnemonic strategies in various cultural settings and different EFL/ESL contexts. Comparative studies provide deeper insights into how these contexts impact the efficiency of these strategies. Additionally, implementing longitudinal studies to evaluate the long-term effects of mnemonic strategies on vocabulary learning over time would be valuable. This study focused solely on male learners due to the single-gender policy in the Iranian educational context. Consequently, the outcomes may not be directly generalizable to female learners. While this gives valuable insights into this specific group, it also emphasizes the necessity for future research to include female learners. This would allow for a full investigation of the gender-specific effects of mnemonic strategies and how these outcomes might differ if female subjects were included. Comparing the outcomes between male and female learners can elucidate any gender-specific variations in the efficiency of these strategies. Furthermore, conducting similar studies in mixed-gender or female-only educational settings is crucial to validate and compare the findings. Moreover, incorporating technology in education, including digital tools, applications, and multimedia resources, can increase the tendency toward implementing mnemonic strategies for vocabulary learning, offering new approaches to language education.

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