

LANGUAGE AND MEMORY: HOW SLEEP IMPROVES VOCABULARY RETENTION**Rysbaeva A.,***4th year of Bachelor's Degree**Training of Foreign Language Teacher**Ablaikhan KazUIRandWL, Almaty, Kazakhstan***Myrzakhanova D.***Master, senior lecturer**Department of Methodology of Foreign Language Education**Ablaikhan KazUIRandWL, Almaty, Kazakhstan*<https://doi.org/10.5281/zenodo.17738499>**Abstract**

Sleep plays a fundamental role in memory consolidation and directly influences the process of vocabulary learning. Although vocabulary acquisition is a key component of second language development, the impact of sleep patterns on the retention of new lexical items remains understudied in the context of Kazakhstani secondary education. This quantitative study investigates how sleep duration, sleep routine, and students' preferred study time affect vocabulary retention among 60 learners from Grades 8–11. Data collected through a structured questionnaire indicate that students who sleep 7–8 hours per night demonstrate substantially higher retention compared to those with insufficient sleep. Visual analyses (Figures 1–3) confirm that studying vocabulary before sleep leads to stronger next-day recall. Findings highlight the cognitive significance of adequate sleep and suggest integrating sleep-related awareness into language teaching practices.

Keywords: sleep, vocabulary retention, memory consolidation, cognitive processing, secondary education.

INTRODUCTION

Vocabulary acquisition is one of the core components of language learning, especially in secondary school settings where students continue developing their academic and communicative competence. However, learners often struggle to retain newly learned vocabulary due to various cognitive, emotional, and environmental factors. Among these factors, sleep plays a particularly important role because it supports the stabilisation and strengthening of memory.

Modern research in educational psychology and neuroscience shows that sleep is not only physical rest but also an active mental process during which the brain reorganises and consolidates newly learned information. For school learners, especially teenagers, sleep duration and quality often fluctuate due to academic pressure, digital device use, late-night studying, and irregular routines. As a result, even motivated learners may experience difficulties remembering vocabulary despite frequent practice.

Although international studies highlight the link between sleep and learning, this relationship remains under-explored in the context of Kazakhstani secondary schools. Understanding how sleep influences vocabulary retention may help teachers adjust instructional strategies, guide students' study habits, and improve academic outcomes. Therefore, this study investigates how sleep duration, sleep habits, and preferred study time affect vocabulary retention among secondary school learners.

This study seeks to answer the following research question: How do sleep duration, sleep routine, and preferred study time influence vocabulary retention among secondary school students in Kazakhstan?

LITERATURE REVIEW

Memory consolidation is the process through which newly learned information becomes stable and accessible. Studies show that consolidation does not happen immediately after learning; instead, it continues during sleep, especially during slow-wave sleep (SWS). During this stage, the brain strengthens important neural connections and eliminates irrelevant information, helping learners retain new vocabulary more effectively.

Vocabulary is part of declarative memory, which stores facts, meanings, word forms, and associations. Declarative memory relies heavily on the hippocampus, a brain structure that becomes highly active during sleep. Researchers such as Diekelmann and Born (2010) argue that sleep supports the transfer of vocabulary from temporary storage into long-term memory networks. Therefore, insufficient sleep may limit the learner's ability to store new words.

Lack of sleep negatively affects attention, processing speed, and working memory. Kuriyama et al. (2008) found that sleep-deprived students require more repetition to remember the same amount of vocabulary. In addition, sleep loss reduces motivation and increases cognitive fatigue, making it harder for students to focus on language learning tasks.

Many studies suggest that studying before sleep improves next-day recall. Gais, Lucas, and Born (2006) reported that vocabulary learned before bedtime was remembered better than vocabulary learned earlier in the day. This is because there is less interference before sleep and the brain can immediately begin consolidating the information.

Teenagers naturally tend to sleep later due to biological changes in their circadian rhythms. Combined with school responsibilities and digital consumption, many adolescents sleep 5–7 hours, which

is below the recommended 8–10 hours. Carskadon (2011) emphasises that insufficient sleep during adolescence can negatively affect academic performance, emotional well-being, and memory consolidation.

MATERIALS AND METHODS

This study employed a quantitative descriptive design, which is widely used in educational research to

examine relationships between learner characteristics and academic performance. The purpose of this design was to investigate how sleep duration, sleep habits, and preferred study time influence vocabulary retention among secondary school learners. A survey approach was chosen because it allows efficient data collection from a relatively large sample and helps identify patterns within student behaviour.

Table 1.

Participant Demographics		
Variable	Category	Percentage (%)
Gender	Female	56
Gender	Male	44
Grade	Grade 8–9	48
Grade	Grade 10–11	52

Note. This table presents the demographic characteristics of the sample, including gender, grade level, and years of English study. These variables help establish the diversity and representativeness of the participants. Understanding the background of the learners is essential for interpreting the relationship between sleep habits and vocabulary retention.

RESULTS

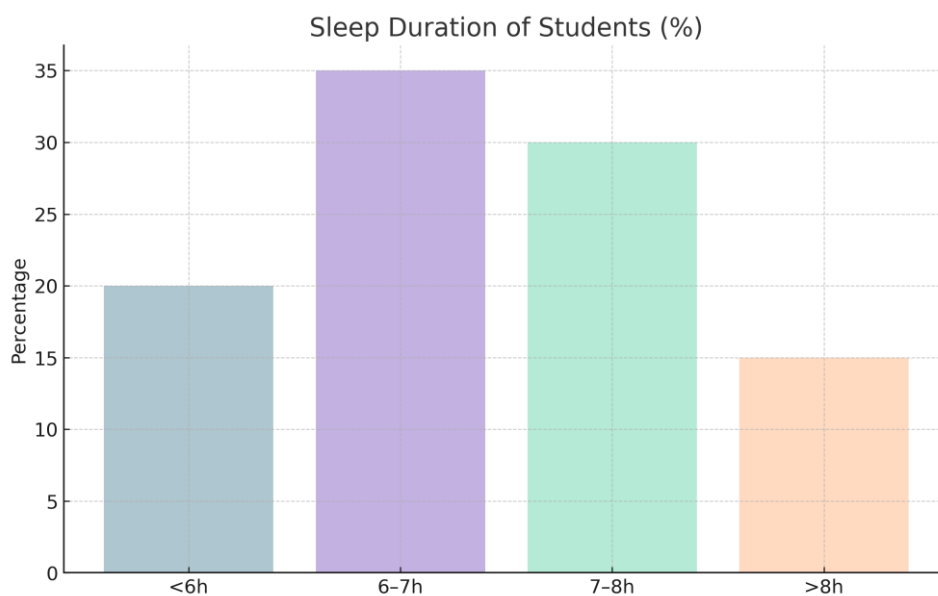


Figure 1. Sleep Duration of Students (%)

Note. This figure illustrates the distribution of students' nightly sleep duration. The majority of learners sleep less than the recommended amount, which may negatively affect their cognitive performance. These results highlight the need to consider sleep quantity as an important factor in vocabulary retention.

Table 2.

Sleep Habits of Students		
Sleep Duration	Students	Percentage (%)
<6h	12	20
6–7h	21	35
7–8h	18	30
>8h	9	15

Note. This table summarises students' bedtime routines and the regularity of their sleep schedule. Irregular sleep patterns are common among participants and may contribute to reduced memory consolidation. Such patterns are particularly relevant for understanding differences in retention outcomes.

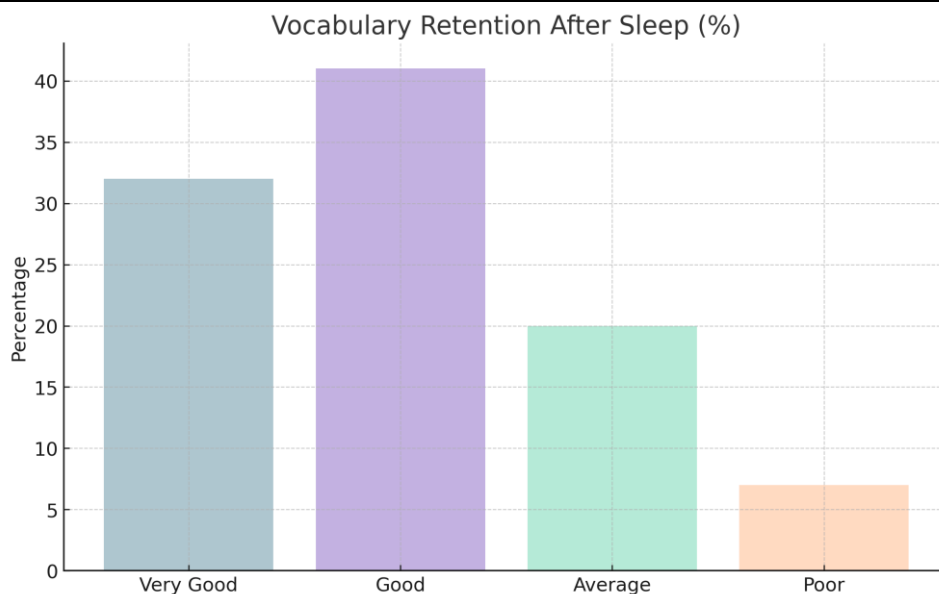


Figure 2. Vocabulary Retention Levels

Note. This figure compares students' self-reported vocabulary retention performance. Learners with adequate sleep show stronger retention, while those with reduced sleep report lower recall. The visual trend supports existing research on the link between sleep quality and learning effectiveness.

Table 3.

Best Time to Study Vocabulary		
Time	Students	Percentage (%)
Morning	13	22
Afternoon	11	18
Evening	16	27
Before Sleep	20	33

Note. This table shows students' preferred times for studying vocabulary. A large proportion prefer learning before sleep, which aligns with the optimal timing for memory consolidation. These preferences provide insight into natural learner strategies that may enhance retention.

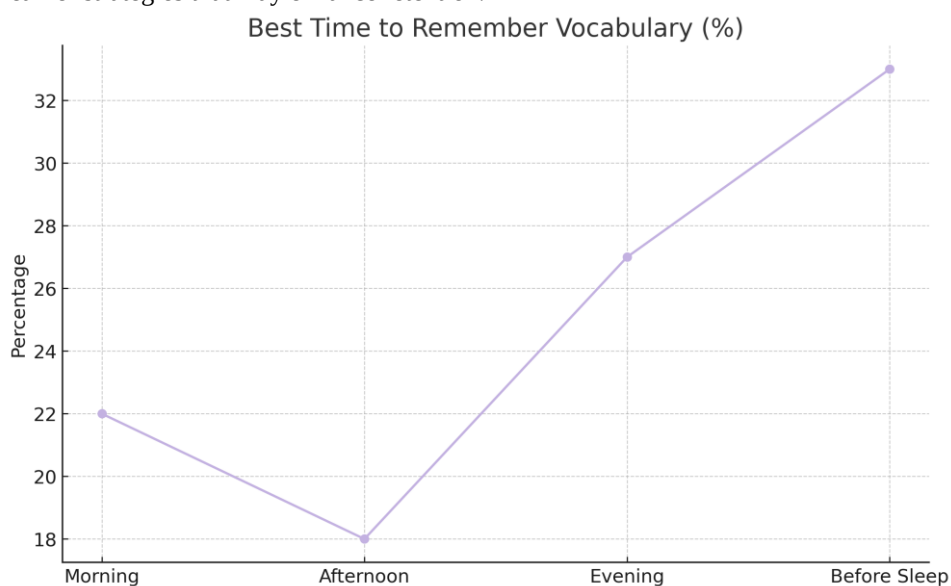


Figure 3. Best Time for Vocabulary Retention

Note. This figure demonstrates that studying vocabulary in the evening or before bedtime support cognitive theories suggesting that sleep immediately following learning improves memory corresponds with the highest retention. The results

stability. The pattern reinforces the importance of effective study timing.

DISCUSSION

The findings of this study support the idea that sleep plays a meaningful and measurable role in vocabulary retention among secondary school students. Several key insights emerged from the data:

Students who slept 7–8 hours consistently demonstrated stronger retention than those with insufficient sleep. This supports neuroscientific literature stating that slow-wave sleep is essential for declarative memory consolidation, including vocabulary storage. The large percentage of learners sleeping 6 hours or less indicates that many students may not be achieving their full learning potential.

A significant proportion of students reported inconsistent sleep routines. Irregular bedtimes disrupt circadian rhythms, reduce sleep quality, and may interfere with the consolidation of new information. These findings align with previous studies showing that stable sleep patterns improve learning outcomes.

Both survey results and existing research support the conclusion that learning vocabulary before bedtime leads to better next-day recall. During sleep, the absence of external interference enables the brain to reorganise and stabilise newly acquired word forms and meanings. Students who studied before sleep consistently reported higher retention levels.

Teachers may consider encouraging students to review vocabulary in the evening or before sleep, as this timing aligns with natural memory consolidation processes. Additionally, integrating discussions about healthy sleep habits into language lessons may help students improve academic performance.

The high rate of sleep deprivation among participants reflects broader challenges faced by adolescents in Kazakhstan, including academic pressure, early school start times, and increased digital device use. These factors should be considered by educators and policymakers aiming to improve learning outcomes.

CONCLUSION

The results of this study clearly demonstrate that sleep plays a significant role in vocabulary retention among secondary school learners. Students who consistently slept 7–8 hours reported stronger recall and better overall retention of newly learned vocabulary compared to those who slept less. Additionally, studying vocabulary in the evening or before sleep was associated with higher next-day memory performance, supporting neuroscientific findings related to memory consolidation during slow-wave and REM sleep.

Irregular sleep habits, such as inconsistent bedtimes and staying up late due to digital device use or academic tasks, were shown to negatively affect retention. These findings highlight the importance of sleep hygiene, especially for adolescents who already experience biological and environmental challenges that reduce sleep duration. The results suggest that developing healthy sleep routines and choosing effective study times can significantly improve language learning outcomes.

For teachers, the findings emphasise the value of guiding learners not only in vocabulary strategies but also in daily routines that support memory consolidation. Schools may consider integrating awareness activities about sleep and learning into classroom instruction, parent meetings, or academic advisory programs. Overall, the present study contributes to a better understanding of how sleep influences vocabulary learning and provides practical recommendations for improving learner performance through more informed study habits.

References:

1. Baddeley, A. (2012). Working memory: Theories, models, and controversies. *Annual Review of Psychology*, 63(1), 1–29.
2. Carskadon, M. A. (2011). Sleep in adolescents: The perfect storm. *Pediatric Clinics of North America*, 58(3), 637–647.
3. Diekelmann, S., & Born, J. (2010). The memory function of sleep. *Nature Reviews Neuroscience*, 11(2), 114–126.
4. Gais, S., Lucas, B., & Born, J. (2006). Sleep after learning aids memory recall. *Learning & Memory*, 13(3), 259–262.
5. Kuriyama, K., Mishima, K., Suzuki, H., Aritake, S., & Uchiyama, M. (2008). Sleep and memory. *Journal of Sleep Research*, 17(1), 27–35.
6. Nation, I. S. P. (2013). *Learning vocabulary in another language* (2nd ed.). Cambridge University Press.
7. Rasch, B., & Born, J. (2013). About sleep's role in memory. *Physiological Reviews*, 93(2), 681–766.
8. Stickgold, R. (2005). Sleep-dependent memory consolidation. *Nature*, 437(7063), 1272–1278.
9. Tucker, M. A., et al. (2011). Learning before versus after sleep. *Journal of Experimental Psychology: General*, 140(4), 728–735.
10. Walker, M. (2017). *Why we sleep: Unlocking the power of sleep and dreams*. Scribner.