MinneTESOL Journal, *37*(1), 2021

Teacher-led, spaced retrieval for mastery of content vocabulary

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For university-level English learners (ELs) struggling with mastery of content vocabulary, teacher-led spaced retrieval may improve student memorization and understanding of critical vocabulary.
Keywords: content vocabulary, college ELs, spaced retrieval

The number of English learners (ELs) was rising in American university classrooms (Institute for International Education, 2018). Unfortunately, the Coronavirus pandemic of 2020 resulted in a 16% decrease in international students studying in America, and 99% of American institutions moved to online and hybrid delivery of course content (Institute for International Education, 2020). However, ELs in American universities are not just the product of fluctuating numbers of international students; ELs may also be American high school graduates. According to Haynie (2015), 73% of surveyed universities reported having graduates who had participated in English as a Second Language (ESL) programs, with an average of 2.3% of their graduates having participated in ESL programs to some extent. Many of these students may be unprepared for the demands of learning complex, content-specific vocabulary words (Gabriel, 2008), and teacher-led, spaced retrieval[1] shows promise for ESL and content instructors to support ELs with vocabulary learning.

The challenge of content vocabulary for ELs

Teaching vocabulary has long been a focus for ESL instructors (e.g., Bongers, 1947; Coxhead, 2000; Fox, 1980; Sawamura, 1937), so instructors of introductory university courses might assume that ELs coming from university ESL programs are prepared to handle the large amount of vocabulary presented in content courses. On the contrary, research has shown that ELs may not be prepared to learn large amounts of content-specific vocabulary as ESL textbooks frequently focus on word families from the Academic Word List (AWL) (Coxhead, 2000). When Miller (2011) analyzed ESL reading textbooks and textbooks from introductory university courses, he found that ESL reading textbooks often do not contain the level of academic vocabulary students will need in introductory university courses. Content textbooks have significantly longer words (e.g., *cognitive-behavior therapy* or *systematic desensitization* in Myers & DeWall, 2015) and a higher percentage of words from the AWL than ESL textbooks. Furthermore, the introductory textbooks themselves may not provide the amount of exposure needed to learn the vocabulary. Nation's (1990) meta-analysis of the research found that students need to interact with new words five to 16 times to learn the new words adequately, but 40% of new words in introductory textbooks occurred once, which means that students do not get sufficient interaction with new vocabulary words from the textbook itself.

Content instructors might also believe that developing strategies for learning new vocabulary words is the responsibility of the student. Unfortunately, almost half of adult language learners studied by Sanaoui (1995) had no system for studying and learning vocabulary, which makes vocabulary learning an "important pedagogical focus" (p. 25) for instructors to incorporate into

their classrooms. Gabriel (2008) pointed to vocabulary deficiency as one reason some students cannot understand lectures, leading to discouragement and desperation, which can lead to cheating (p. 111). Gabriel maintained that, even if students used a dictionary for every unknown word, they would be unlikely to remember the meanings for so many words.

Halpern and Hakel (2003) summarized ten principles for long-term retention and transfer of information. They cited *spaced practice retrieval* as the "single most important variable" for learning and stated, "[i]nformation frequently retrieved becomes more retrievable" (p. 38). Furthermore, spaced retrieval has been shown to improve student learning when done in the classroom (Brown, Roediger, & McDaniel, 2014). Additionally, Lang (2016) found that brief interventions led by instructors could be effective, especially in the beginning or ending moments of class. Short quizzes (graded or ungraded) worked well to encourage students to memorize and understand what they were retrieving.

Why focus on mastery of content vocabulary?

For two years prior to this study, the researcher had provided reading and vocabulary support for American ELs in a Psychology 101 course during their first year at a four-year public university. In the Psychology course each week, students were expected to read approximately one chapter with 20 to 50 targeted vocabulary words each chapter. As researchers such as Gabriel (2008) and Sanaoui (1995) predicted, the students lacked strategies for learning that many academic vocabulary words and quickly became overwhelmed by the sheer volume and complexity of the vocabulary. Many students chose to memorize the words without taking the time to understand their meaning; other students worked hard to understand their meaning but sacrificed memorization activities. Both types of students struggled to succeed on tests, which represented a large portion of their final grades. To address these issues, the researcher asked the question, "What is the best approach to support ELs in memorization *and* comprehension of content-specific vocabulary?" and hypothesized that teacher-led, spaced retrieval would address the students' need to both understand and memorize content vocabulary. A Scholarship of Teaching and Learning grant from the University of Wisconsin Teaching Fellows and Scholars program funded this research project.

The study

The participants

The 15 participants were first-semester freshmen enrolled in a program for ELs who had not met the university's standard admissions requirements. The students were all graduates of American high schools and reflected a variety of ethnic backgrounds, including, but not limited to, Hmong, Karen, Somali, Hispanic, and Oromo Ethiopian. Six students were male, and nine students were female.

The participants were concurrently enrolled in an ESL reading course and a Psychology 101 course. The researcher was the instructor of the ESL reading course, which directly supported the Psychology course in that all the ESL materials were from the Psychology textbook and lectures. All students in the course consented to participate in the study.

The intervention

In this experiment, the intervention was the teacher-led, spaced retrieval activity referred to in class as *Quiz Yourself*, which was a daily, five-minute PowerPoint slideshow that combined multiple choice and fill-in-the-blank questions requiring students to demonstrate memorization of definitions or application of ideas (see Figures 1-4 for examples). Each slide was timed to show the answer after six to twelve seconds (depending on the length and complexity of the question). Each slideshow was shown at the beginning of class, lasted about five minutes each day, and covered approximately twenty-five words.

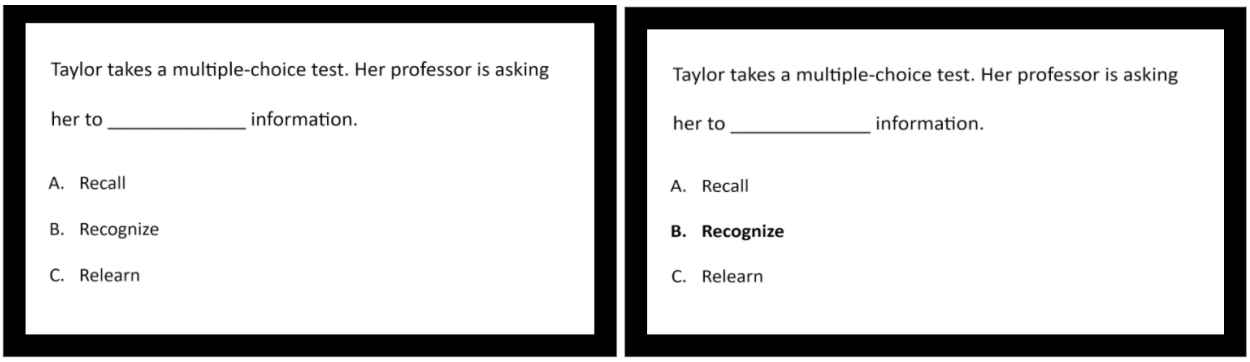

Figure 1: Application example 1

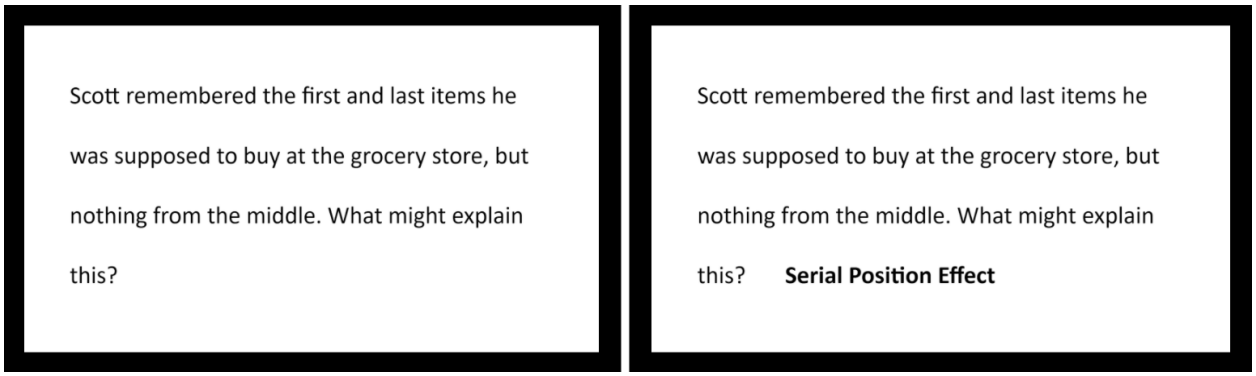

Figure 2: Application example 2

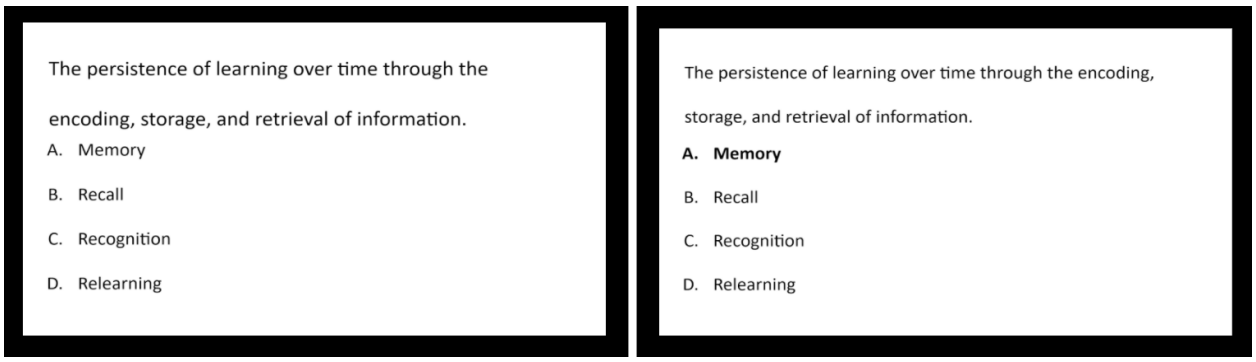

Figure 3: Memorization example 1

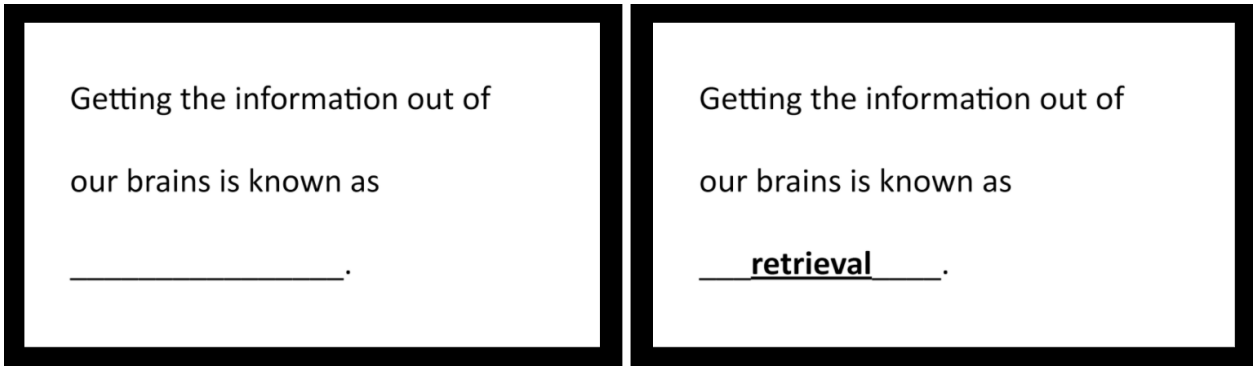

Figure 4: Memorization example 2

Methodology and data collection

The researcher identified two chapters on which to conduct the experiment (one without intervention and one with intervention) during the second month of the semester and two chapters on which to repeat the experiment during the third month of the semester. Each set of chapters (in this case, chapters seven and eight, and 14 and 15 in Myers and DeWall's [2015] *Psychology*, 11th edition) had approximately the same number of targeted vocabulary words. Data was collected using pre- and post-tests on four chapters.

On the first day of the first non-intervention (control) round of the experiment, participants completed the chapter seven pre-test, which was a ten-question fill-in-the-blank quiz with a word bank provided. For homework, students were required to re-write (in their own words) the definitions of all bold words in the chapter. In class the next day, students completed activities designed to understand the definitions more fully. These activities included think-pair-share with a partner, small group revisions, large group discussions, and finding real life examples of the concepts studied. The instructor provided feedback on student work and a link to a practice set on Quizlet, an online vocabulary resource with flashcards for practice. Before class the next day, students needed to read the chapter and identify (in writing) the main ideas of each section in the chapter. Additionally, during this time, students attended the psychology lectures in which the professor used the vocabulary words. In ESL class on the third day, students reviewed and synthesized their lecture and textbook notes. On the final day, the students were required to complete one vocabulary game and one practice test on Quizlet, which was monitored with the purchased teacher account on Quizlet. Then, students took the ten-question post-test (fill-in-the-blank with a word bank provided), which counted for a grade in the ESL class. Results analyzed from the chapter seven pre- and post-tests provided a baseline for student improvement after the standard classroom and homework activities.

On the first day of the first intervention round of the experiment, participants completed a ten-question, fill-in-the-blank pre-test on chapter eight. Over the next three class days, students were assigned and completed all the same activities as during chapter seven. However, during the second, third, and fourth class period, the intervention *Quiz Yourself* was added to the standard activities. Over the course of the three days, the students were quizzed on each word at least twice. On the final day, students completed a post-test (ten-question, fill in-the-blank quiz

with a word bank), which counted for a grade in the ESL class and was used to collect data for the experiment.

The experiment was repeated for a second round on chapters 14 and 15 from the Psychology textbook to provide a second set of data. Chapter 14 was the non-intervention (control) round, and chapter 15 measured the effects of the intervention (*Quiz Yourself* PowerPoint slideshow).

Findings

Data from the two pre-tests and two post-tests were analyzed using paired t-tests. The results from the first set of chapters (seven and eight) of the experiment are reported in Table 1.

	Mean score	Difference	*t*-value	*p*
7 pre-test No INT	22	48.7	0.094	0.93
7 post-test No INT	70.67			
8 pre-test INT	14.67	48.2		
8 post-test INT	62.87			

Table 1: Round 1 pre- and post-test results
No INT = non-intervention and INT = Intervention with *Quiz Yourself*

The first round of the experiment showed no significant difference between the non-intervention (No INT) and the intervention (INT) cycles with the mean difference for the non-intervention pre- and post-tests of 48.7 and the mean difference for the intervention pre- and post-tests of 48.2. The *t*-value of .094 indicates no significant difference because students did not perform significantly better or worse during the intervention round of the experiment. The *p* value (0.93) is statistically insignificant and neither supports nor contradicts the effectiveness of the intervention.

In the second round of the experiment, the post-tests with the intervention showed a marked improvement over the non-intervention post-tests. The mean difference between pre- and post-tests with no intervention was 31 and the mean difference with the intervention was 42.85, with a *t*-value of 4.29 indicating a significant difference in the non-intervention and intervention phases, which indicates that students did significantly better on the posttest when the *Quiz Yourself* intervention was used. The *p* value (0.0002) is statistically significant and provides support for the effectiveness of the intervention. The results from the second set of chapters (14 and 15) of the experiment are reported in Table 2.

	Mean score	Difference	*t*-value	*p*
14 pre-test No INT	28	31	4.29	0.0002
14 post-test No INT	59.33			
15 pre-test INT	37.86	42.85		
15 post-test INT	80.71			

Table 2: Round 2 pre- and post-test results
No INT = non-intervention and INT = Intervention with *Quiz Yourself*

At the end of the semester, the researcher distributed a survey completed by thirteen students who reported positively on their experience with the intervention. Thirteen students (100%) agreed or strongly agreed that the intervention helped them memorize the vocabulary, and nine of thirteen students (69%) agreed or strongly agreed that the intervention helped them understand the vocabulary. Open-ended comments included appreciation for the warm up at the beginning of class, the instant feedback, and the help with memorization. Sample comments included "I was able to push myself a little more to fully understand what the word meant" and "I like the activity because [it] helped [me] remember what I learned." Comments such as these indicate that students felt the *Quiz Yourself* intervention helped them address understanding and memorizing the content vocabulary.

Limitations

This study must be interpreted cautiously as there were several limitations. An external variable disrupted the research experiment during the intervention phase of round one. Students were assigned a major essay in the Psychology class based on a scholarly journal article that was not directly related to the chapter studied that week in class. Learning vocabulary took a backseat to the essay due that week, and many students failed to complete the out of class work assigned. Additionally, the sample size was small, and all students were from one cohort with the same instructor.

Conclusions

These findings tentatively support the effectiveness of teacher-led, spaced retrieval for supporting students in memorizing and understanding content vocabulary. While the first round results did not show significant improvement, the intervention was not detrimental to student success. The second-round results demonstrated a positive effect of the intervention *Quiz Yourself* over the non-intervention post-test scores.

This study has implications for instructors with ELs in their classrooms and future researchers. This intervention was designed and implemented as a supplemental technique for supporting students in both memorization and understanding of content vocabulary. It is not intended to be used as a comprehensive method to teach vocabulary. ESL instructors and university instructors in content courses can use this approach to facilitate the memorization and understanding of critical content vocabulary with a minor time commitment. It could be easily utilized while teaching online as the slideshow can be played as students are waiting for class to begin or as a review on their own time. Future research is required to know if this intervention would provide equal benefits to the native English-speaking students in the content courses.

Note

1. For this article, *teacher-led, spaced retrieval* is defined as when the instructor incorporates activities that facilitate students' mentally retrieving the relevant information during class.

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Author bio

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