



**Efficacy Study:**  
**VocabularySpellingCity®**  
**Proven to Increase Vocabulary Retention  
& Reading Comprehension**



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Proven to Increase Vocabulary  
Retention & Reading Comprehension**

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## Key Findings

VocabularySpellingCity® (VSC) helps teachers meet the challenge of providing meaningful, intentional, and extended vocabulary practice for elementary school students through a supplemental word study program. The research described here examined the effects of word study/word instruction via a high fidelity implementation of VocabularySpellingCity, versus comparable time spent on other traditional word study approaches such as looking up a word in the dictionary and writing its definition.

### The Research Proved:

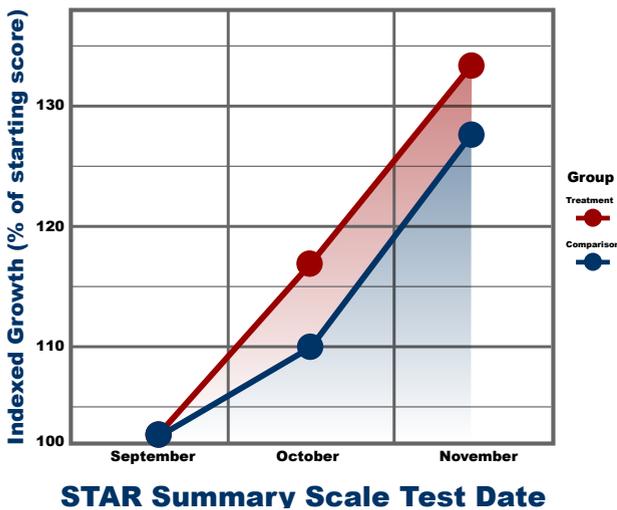
-  **43% increase** in vocabulary retention scores
-  **21.5% increase** in reading comprehension (STAR data) for native English speakers
-  **46.5% increase** in reading comprehension (STAR data) for intermediate English speakers (ELL Students)

McREL International conducted an efficacy study in a Title I elementary school and in classrooms that consisted of general education, ELL, and ESE students. McREL collected and analyzed data from 143 participating students' vocabulary word retention and reading comprehension between October and December 2016, including:

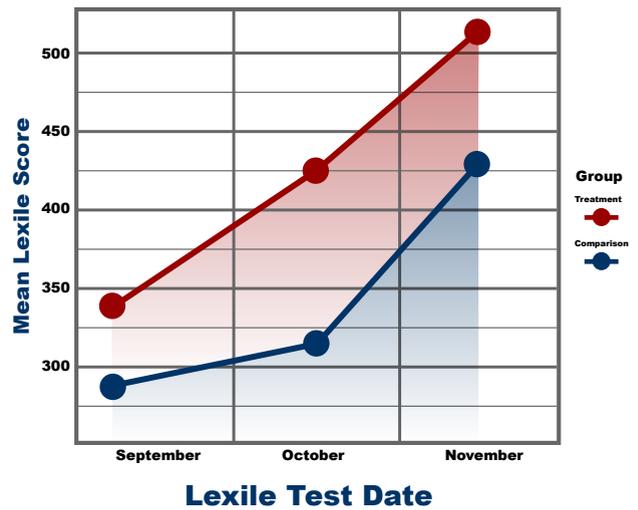
- Pre- and post-test vocabulary test
- Reading comprehension assessment
- Lexile readability levels

The key finding of the study was that VocabularySpellingCity had a measurable and significant impact on reading comprehension (STAR™ data), Lexile® level (STAR data), and vocabulary retention (VocabularySpellingCity data). (See graphs).

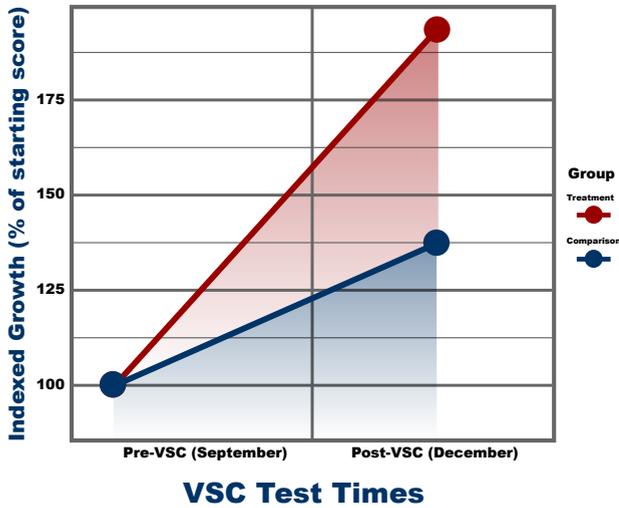
Percent increase from starting score of STAR™ Summary Scale scores over time for comparison and treatment groups



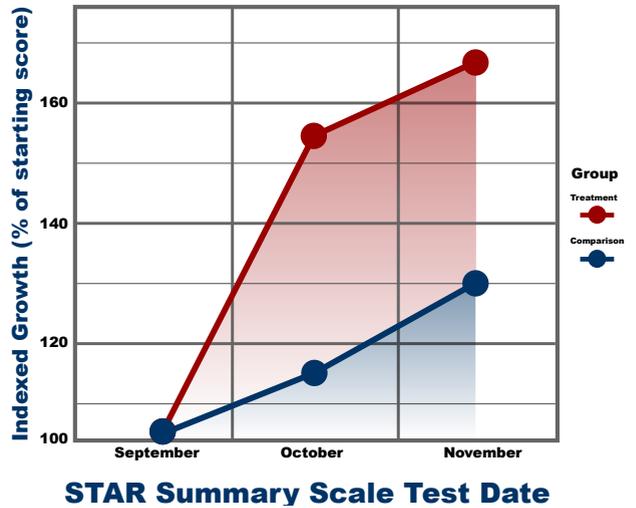
Mean Lexile® scores over time for comparison and treatment groups



Percent increase from starting score on VSC aligned assessment for comparison and treatment groups



Percent increase from starting score of STAR Summary Scale scores of Intermediate English Speakers only over time for comparison and treatment groups



The results also demonstrated superior growth with intermediate level ELL students. (See graph).

The marked improvement using VocabularySpellingCity was found in as little as ten minutes per student per day over a three-month period. As you will learn from the detailed report, the key explanation for the improvement is that VocabularySpellingCity extends the students' experiences with words over weeks by using a combination of new and review word lists. This contrasts with a more conventional vocabulary acquisition approach when students study words for a week and then move on to a new list words.

As the study demonstrates, **the impact of VocabularySpellingCity on student vocabulary retention and reading comprehension should be considered when making decisions about how best to support instruction in the classroom.**

## Background

After decades of research efforts aimed at identifying the factors that are most critical to the literacy and overall academic success of students, the key theme of **vocabulary knowledge** has risen to the top (Anderson & Freebody, 1981; Baumann, Kame'enui, & Ash, 2003; Becker, 1977; Davis, 1942; Whipple, 1925). From among these findings, many studies have identified a strong link between vocabulary knowledge and reading comprehension (Beck, McKeown, & Kuncan, 2013; Blachowicz, Fisher, Ogle, & Watts-Taffe, 2006; Freebody & Anderson, 1983; Pearson, Hiebert, & Kamil, 2007). In addition to confirming the link between vocabulary knowledge and other areas of academic success, there are multiple findings about the nature of **vocabulary instruction** that have the potential to overturn what we believe about how to best prepare students to read and comprehend. In fact, this body of evidence has revealed that teachers and administrators operate with common assumptions about how vocabulary is developed, which are in direct conflict with the most current findings.

In 2016 VocabularySpellingCity, requested McREL International's assistance in (1) articulating the theory of change and concomitant research undergirding their intervention via a white paper and (2) conducting a study to examine the efficacy of VocabularySpellingCity. For McREL researchers, supporting the white paper provided a unique opportunity to collaboratively engage in the developer's attempt to understand their program at its foundation—to work side-by-side with the developers as they described and documented how decisions were made regarding their intervention and wrestled with how components of their intervention conformed to or aligned with best practices evident in the research base. Supporting this white paper provided a lens through which our research team can now more clearly view the program and the program elements, making us stronger partners to VocabularySpellingCity as they embark on more rigorous studies.

The white paper (available here: <https://www.spellingcity.com/pdfs/vsc-vocabulary-efficacy-research.pdf>) outlined the evidence and implications associated with the evidence; in summary:

**1. The Evidence:** Vocabulary is multi-faceted, and can be learned.

**Implications:** Daily vocabulary instruction must be prioritized, and words must be carefully selected.

**2. The Evidence:** Students need to encounter a single word multiple times before they understand it.

**Implications:** Vocabulary instruction must include spaced practice with multiple exposures using multiple modalities.

**3. Evidence:** Supplemental resources and methods can better address the rigorous demands of vocabulary development.

**Implication:** Teachers must supplement their existing curricular materials to transform the vocabulary development of their students.

The white paper suggests that teachers who still struggle to find the time to integrate vocabulary strategies or methods into their existing lessons and word lists might be served by emerging innovative enabling technologies that eliminate the hassle and time commitment needed to implement these best practices. One example of such an innovative tool is **VocabularySpellingCity**, a user-friendly management system that seamlessly integrates the **direct instruction** of any word list, **best practices** of strategic word selection, **multiple exposures using multiple modalities**, reinforced **spaced practice**, and the **tracking and measurement of student learning**.

As vocabulary instruction should provide students with opportunities to encounter words repeatedly and in a variety of activities (Stahl, 2005), **VocabularySpellingCity**, with 37 games, permits students to have 12–15 or more encounters with words to ensure acquisition of each word. In addition, the tool expedites a teacher's ability to:

- Make tough decisions on **word choice**. By reducing the volume of words and strategically selecting only 8–14 words per week (depending on grade level), the teacher can facilitate long-term retention.
- **Integrate vocabulary lists** with class studies, existing curriculum resources, and nationally-known literacy programs.
- Efficiently apply the selected word list to **games and learning activity** that emphasize the use of the words in context, the sounds of the words, the syllables in the words, and word relationships, providing multiple multimodal, context-rich touches.
- Use **existing methods** such as index or flash cards, which automatically load the common spelling and pronunciation patterns, definitions, uses in a sentence, antonyms, synonyms, and roots, to ensure repetition and new application. Pre-loaded definitions themselves only use words that are at or below the level of the defined word, and teachers can add new definitions and sentences at any time.
- Apply **spaced practice** rather than cramming, thereby strengthening an otherwise fragile memory.

## The Current Study

McREL and VocabularySpellingCity (VSC) entered into an agreement in 2016 to conduct a collaborative, small-scale study that could provide insight into how using VSC might relate to student outcomes such as self-efficacy and achievement. Four overarching questions were used to guide the evaluation and reflect key evaluation outcomes:

- What are the characteristics of participating classrooms / teachers?
- What are teacher-reported benefits of VSC?
- What is the experience of students in the study?
- What are the student outcomes associated with VSC?

These questions were used to guide research efforts over the project period and to examine the extent to which VSC successfully accomplishes its intended outcomes. Table 1 provides an overview of the evaluation questions, data collection methods and sources of data.

This report provides details on the methods, the data collection instruments, the sample (teachers and students), data analysis, and key findings. The findings section of the report is organized around the fourth overarching evaluation question.

Table 1: Evaluation Questions, Data Collection Methods, and Sources of Data

Overarching Evaluation Question	Ancillary Questions	Data Collection Method(s), Source(s) of Data & Instrument Development Needed
What are the characteristics of participating classrooms / teachers?	<ul style="list-style-type: none"> <li>✓ What are the characteristics of participating teachers?</li> <li>✓ What vocabulary practices do participating teachers use?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Teacher survey</li> </ul>
What are teacher-reported benefits of VSC?	<ul style="list-style-type: none"> <li>✓ How do teachers characterize the engagement of their students?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Teacher survey</li> <li>✓ Teacher focus groups</li> </ul>
What is the experience of students in the study?	<ul style="list-style-type: none"> <li>✓ What are the characteristics of participating students?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Extant data</li> <li>✓ Student survey</li> </ul>
What are the student outcomes associated with VSC?	<ul style="list-style-type: none"> <li>✓ Does participation in VSC lead to increased self-efficacy in English language arts?</li> <li>✓ Does participation in VSC lead to increased student achievement (increased vocabulary retention; increased reading comprehension)?</li> <li>✓ Are student outcomes mediated by teacher- or student-level characteristics?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Student survey</li> <li>✓ Student focus groups</li> <li>✓ Student assessment aligned to VSC</li> <li>✓ Standardized student assessment (STAR, Lexile Scores)</li> </ul>

## Methods

VSC staff contacted schools in the southeastern United States regarding the opportunity to participate in a small-scale study of VSC. In return for agreeing to participate, schools were offered access and training to VSC for all teachers in grades K-5 at the conclusion of the study. To assess promise of efficacy, researchers aimed to secure one site with multiple teachers per grade level.

The selected elementary site was in close proximity to the VSC offices, thereby minimizing the cost of data collection. The selected site had buy-in and resources such as principal and teacher support, a literacy coach, and aides in each classroom. Moreover, all teachers at the school were using the same textbook series, Journeys. These factors enable smooth implementation, which is paramount for conducting small-scale studies aimed at isolating the treatment effect. In addition, the selected school is classified Title I and is not high-performing.

All teachers agreed to participate in the study, regardless of the condition (treatment versus comparison) in which they participated. Researchers were unable to randomly assign teachers to the treatment condition, making this a quasi-experimental study (threats to internal validity are discussed in the conclusions section)<sup>1</sup>. The research team from VSC met with all participating teachers on September 28, 2016 to review the parameters and requirements of the study;

these are provided in Table 2. The study kicked off in October 2016 and analysis and reporting concluded at the end of February 2017.

All vocabulary words came from Journeys© 2014 edition core stories. At each grade level, teachers in both the treatment and comparison groups used the vocabulary words based on the story they were working on from the Journeys anthology. For example, both 2<sup>nd</sup> grade classrooms were reading the same story at the same time. Each story's instructional cycle was 5 days. Appendix A contains the vocabulary lists by grade level along with suggested activities.

Treatment teachers were asked to implement VSC with their students during the fall of 2016 (the calendar of activities is provided in Appendix B). Students were asked to log in to VSC each school day for vocabulary practice of new words as well as review previously taught vocabulary words. In week 1, students only had one assignment for new words. However, starting in week 2, students were given an assignment for new vocabulary words and another assignment for review words. Each assignment contained one or two learning tasks and took students about 5 minutes to complete. Comparison teachers were asked to implement business-as-usual vocabulary instruction as part of the reading block during the same time period. As a quasi-experimental study, teachers self-selected into the treatment and comparison conditions.

Table 2: Study Parameters for Teachers and their Students

Treatment teachers and their students	Comparison teachers and their students
Teachers given VSC login information and instructed to have students use VSC daily to complete assignments	Teachers not given access to VSC; instructed to continue typical vocabulary instruction
Teachers not provided “professional development” on using VSC	
All teachers and their students	
Provided grade-appropriate vocabulary words from Journeys; vocabulary lists are identical, regardless of condition	
All assignments using the vocabulary words will be entered by research team member	
Students take the pre- and post-test	
Students take survey both before and after the study	
Teachers take survey of practices and beliefs	
Following the study, all teachers provided “professional development” on using VSC and full access to VSC	

<sup>1</sup> In September, 2016, VSC researchers and McREL researchers requested approval from the district and McREL's institutional review board to conduct the study.

## Instruments

McREL researchers, in collaboration with VSC staff, created or identified data collection instruments to enable the collection of formative and summative (outcome) data. These included surveys for teachers, assessments of student understanding of vocabulary and comprehension (VSC aligned assessment), surveys of student motivation and self-efficacy in ELA, and focus group interview protocols for teachers and students. In addition, the research team collected extant student-level data (Lexile scores and STAR summary scores) for three time periods of the study (September, October, and November/December).

## Sample

Participating teachers and their students were from one school in the southeastern part of the United States. Eight teachers (two per each grade, 2 – 5) and 143 students participated. All teachers voluntarily agreed to participate in the study; data from students were not collected without parental consent. Sample consent letters are provided in Appendix C.

## Teacher Sample

Prior to the study, teachers were asked to complete a background survey to gather demographic details, information about teachers' professional background, perceived self-efficacy and details about pedagogy (see Appendix D for a copy of this survey).

Seven of the participating teachers were female; three participating teachers were African American and five were white. Participating teachers were evenly split by grade level, with two teachers participating from each of the grades, 2-5. Participating teachers were also asked to share details on their education background, including their highest level of education and the area of their degree(s), the total amount of time they had received professional development in ELA in the last twelve months, the number of years teaching, and the number of years teaching their current grade (see Table 3).

Table 3: Teachers' Background Characteristics

Group		
	Treatment (n=4)	Comparison (n=4)
<b>Highest Education Level of Participating Teachers</b>		
B.A./B.S.	3 (Elem Ed)	1 (Elem Ed)
M.A./M.S.	1 (Curriculum & Instruction in Literacy Instruction)	3 (Elem Ed, Business Mgmt)
Doctorate (Ed.D. or Ph.D.)	-	-
<b>Professional Development in ELA in the Last Twelve Months</b>		
None	-	-
Less than 6 hours	-	1
6-15 hours	1	2
16-35 hours	2	0
More than 35 hours	1	1
<b>Number of years teaching (K-12 only) prior to school year</b>		
Average (standard deviation)	11 (12.19)	11.5 (1.73)
<b>Number of years teaching current grade level prior to school year</b>		
Average (standard deviation)	1 (.82)	5.5 (5.57)

## Student Sample

As previously noted, 143 students participated in this study. Of these, 70 were in treatment teachers' classrooms and 73 were in comparison teachers' classrooms. Table 4 provides the total number of students by grade and demographic variables as well as the number of students by level by condition (treatment versus comparison).

Table 4: Participating Students by Grade Level

		Group		
		Treatment (n=70)	Comparison (n=73)	Total (n=143)
Grade	2	14	19	33
	3	16	14	30
	4	21	20	41
	5	19	20	39
Gender	M	32	39	71
	F	38	34	72
Ethnicity	Asian	1	-	1
	African American	5	11	16
	Hispanic	30	24	54
	White	32	35	67
	Mixed Race	2	3	5
Free or Reduced-Price Lunch	Yes	22	28	50
	No	48	45	93
Retention	Yes	14	21	35
	No	53	52	105
	Missing	3	-	3
ELL Classification*	A	4	4	8
	B	8	10	18
	C	58	57	115
	Missing	-	2	2
SPED Eligibility	Eligible	28	29	57
	Not Eligible	42	44	86

\* A = A1 Non-English Speaker or minimal knowledge of English and A2 Limited English Speaker; B = B1 Intermediate English Speaker and B2 Intermediate English Speaker; C = C1 Advanced English Speaker, C2 Fluent English Speaker, and E Not ELL / Monolingual English Speaker

## Data Collection

Researchers administered baseline surveys to teachers regarding their approach to teaching ELA in September 2016. Researchers administered pre- and post-surveys to students regarding their perceptions of ELA and their self-efficacy in ELA in September 2016 and then again in December 2016. Researchers administered the VSC-aligned student vocabulary pre- and post-test to all participating students in October 5-6, 2016 (pre) and December 14-15, 2016 (post). In addition, researchers conducted two focus groups with treatment teachers and two focus groups with comparison teachers between October 20, 2016 and November 15, 2016 as well as focus groups by grade level by classroom (treatment versus comparison) in the month of November 2016.

## Teacher Findings

### Approach to Teaching ELA

Teachers were asked to complete a survey related to their approach to teaching ELA. Table 5 and Table 6 provide the number of teachers indicating they engaged in different activities during vocabulary instruction or the number reporting their students took part in particular activities during vocabulary instructional time.

Table 5: Teacher Activities in Vocabulary Instruction

About how often do you do each of the following in your vocabulary instruction?	Group									
	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison
	Never		Rarely		Sometimes		Often		All or Almost All Lessons	
Introduce vocabulary in content	-	-	-	-	-	-	1	2	3	2
Select words that are necessary for understanding	-	-	-	-	-	-	1	3	3	1
Provide students with at least 12 exposures to new vocabulary words	-	-	-	-	1	2	1	2	2	-
Play games or engaging learning activities with new vocabulary words	-	-	-	-	2	2	1	2	1	-
Ask students to create their own vocabulary word lists	-	-	2	2	-	1	2	-	-	-
Differentiate students' vocabulary words list	-	-	2	3	-	1	1	-	1	-
Allow students to practice their vocabulary words over several days	-	-	-	1	-	-	2	1	2	2
Provide constant exposures to previously taught words	-	-	-	1	-	2	3	1	1	-

Table 6: Student Activities in Vocabulary Instruction

In your typical vocabulary instructional routine, how often do students take part in the following types of activities?	Group									
	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison	Treatment	Comparison
	Never		Rarely		Sometimes		Often		All or Almost All Lessons	
Listen and take notes during direct instruction by teacher	-	1	1	-	-	1	2	2	1	-
Engage in a word study literacy center	-	-	1	-	-	1	1	3	2	-
Work in groups	-	-	-	-	-	-	1	2	3	2
Create own word lists based on what they are reading	1	-	-	3	1	-	1	-	1	-
Engage in vocabulary homework	-	-	-	-	1	1	2	2	1	1
Play a variety of vocabulary games	1	-	-	-	2	3	-	1	1	-
Use vocabulary word lists identified with textbooks	-	-	-	-	-	-	1	3	3	1
Use computers as a tool to learn	-	-	-	1	-	1	2	1	2	1
Take assessments on the computer	-	-	-	2	-	2	3	-	1	-

Researchers created two composite scores for each teacher based on the sum of these items (one score for teacher activities and one score for student activities); these scores were then compared. Although there are few participating teachers, no differences were found

between treatment and comparison teachers on either of the composite scores. This indicates that—largely—teaching instruction and learning activities were similar across both groups. Means and standard deviations for these composite scores are provided in Table 7.

Table 7: Composite Scores for Vocabulary Instruction

	Group	
	Treatment (n=4) Average (standard deviation)	Comparison (n=4) Average (standard deviation)
About how often do you do each of the following in your vocabulary instruction? (Composite)	14.5 (1.00)	13.5 (1.29)
In your typical vocabulary instructional routine, how often do students take part in the following types of activities? (Composite)	27.25 (6.85)	21.5 (3.11)

In the focus groups, teachers in both the treatment and comparison groups reported differentiating how they taught vocabulary depending on the levels of individual students (with lower level students receiving more “kid-friendly” definitions). Although all children get the same words and read the same stories, they might have different graphic organizers or different context worksheets, for instance. In addition, treatment and comparison teachers reported that they provided multiple exposures to words (as one comparison teacher described, “...spiraling that word throughout what you’re doing and [giving] them opportunities to use that word”), but many indicated that time constraints often do not allow teachers to revisit previously taught words. And one teacher in the comparison group expressed frustration with presenting vocabulary words multiple times, but the word still being lost for struggling readers—in part because the students do not use the word.

Teachers were asked to estimate the number of minutes of vocabulary homework they assign in a typical week. The majority of teachers indicated that they assign between 6 and 10 minutes. Only one comparison group teacher (2<sup>nd</sup> grade) indicated she assigned more than 25 minutes per week. Table 8 provides these data.

Table 8: Number of Minutes of Vocabulary Homework Assigned in a Typical Week

	Group	
	Treatment (n=4)	Comparison (n=4)
0-5 minutes	1	-
6-10 minutes	2	2
11-15 minutes	1	-
16-20 minutes	-	1
21-25 minutes	-	-
More than 25 minutes	-	1



Teachers were also asked to report on how often they explicitly teach vocabulary words across a variety of subject areas. As shown in Table 9, treatment and comparison teachers reported explicitly teaching vocabulary words in different subject areas at about the same rate (comparison teachers reported less explicit vocabulary instruction in writing than their VSC counterparts). During the comparison teacher focus group, one teacher noticed “a huge change in my kids’

vocabulary from working on [Quizlet®] with the science words, because [they are] not just hearing it from me.” Teachers are explicitly teaching vocabulary in other subject areas, but are also strategically enhancing their own instruction with interactive, child-friendly options. And one teacher in the treatment focus group reported seeing “an improvement in a lot of my students’ writing and reading abilities.”

Table 9: Vocabulary in Subject Areas

How often do you explicitly teach vocabulary words to your students in these subject areas?	Group							
	Treatment		Comparison		Treatment		Comparison	
	Never	Rarely	Once a month	Often				
Reading	-	-	-	-	-	-	4	4
Writing	-	-	-	-	-	2	4	2
Math	-	-	-	-	-	-	4	4
Science	-	-	-	-	1	2	3	2
Social Studies	-	-	-	-	1	2	3	2

### Textbooks & Computer Use

All participating teachers, regardless of condition (treatment or comparison) reported using the Journeys reading series for literacy instruction. Likewise, all participating teachers reported using computer software to deliver literacy instruction. All teachers reported using iStation® (other non-specific literacy programs reported were Quizlet, Raz Kids™, AR™, Socrative®, and Kahoot!®).



## Teacher self-efficacy and perceptions of student engagement

Teachers were asked to complete items related to self-efficacy in ELA and their perceptions of student engagement. Although the sample sizes are small, researchers found no significant differences between the treatment and comparison group teachers relative to their self-efficacy in ELA or their perceptions of student engagement. Table 10 provides these data.

Table 10: Average for Teacher Self-Efficacy in ELA and Perceptions of Student Engagement

	Group	
	Treatment (n=4) Average (standard deviation)	Comparison (n=4) Average (standard deviation)
Self-Efficacy in ELA	3.68 (.06)	3.75 (.27)
Perceptions of Student Engagement	3.85 (.57)	3.35 (.41)

During the focus groups, treatment teachers provided additional details on the role that VSC played in increasing student engagement. Many of the teachers provided positive feedback about their students' enjoyment of VSC and associated engagement and motivation:

- "...they're constantly begging me to go on..."
- "They want to do it. My kids want to do it. They want to log in. They want to do the activities. They are trying to help each other. They want to help and they like it so far."
- "...it's funny to see now my kids are like 'Can I please go on VocabularySpellingCity?'"
- "I find that my kids are now self-motivated to want to learn new vocabulary words."
- "I think they're enjoying it, and I think that is a plus because when they're enjoying it, they're learning and it's not boring..."
- "When they find a word that they know, and now they know that this word means the same or it's the opposite they get excited just to learn new words. To have that familiar word mean something compared to what they are looking at on this vocabulary card for a word they have never seen before."

In a related (and policy-relevant) vein, teachers reported a perceived connection between VSC and student outcomes such as comprehension / understanding:

- “The vocabulary is really helping them understand more of what they’re reading and they love it. They like going on the website and doing the activities and the assignments.”
- “I’ve definitely noticed my students are using better vocabulary now that they’ve been exposed to more and they are looking at words in a new way... They are definitely understanding more vocabulary words because of this.”

One treatment teacher commented that her lower students are motivated in VSC to “catch up and finish the activities because they were behind ... just the enthusiasm...” Moreover, as one treatment teacher explained, students “feel successful on VSC because it’s not a pass or fail thing.” Another commented that “...the way the vocabulary is presented makes the difference.”

Researchers collected data on the number of minutes students in the treatment group used VSC. The average number of minutes of student use was 442.99 (standard deviation=246.99). Table 11 provides the average number of minutes disaggregated by grade. A one-way analysis of variance was conducted to determine whether there were differences among grades in terms of minutes that students used VSC. There were no significant differences between grades.

Table 11: VSC Student Use in Minutes

Group		
	N	Average number of minutes (standard deviation)
Grade 2	14	536.36 (481.44)
Grade 3	16	327.69 (141.45)
Grade 4	21	426.19 (131.11)
Grade 5	19	489.84 (97.12)
Total	70	442.99 (246.99)

McREL examined student-level outcomes associated with participation in VSC. Quantitative data analysis primarily consisted of calculating frequencies and using descriptive statistics as well as running repeated measures hierarchical linear models using pretest student and teacher scores as covariates (as appropriate). In the statistical data analysis, a result is called statistically significant when the observed P-value is less than 0.05, meaning there is a less than 5% probability that the result was obtained by random chance alone.

Researchers were particularly interested in whether participation in VSC led to increased self-efficacy in English language arts, whether participation led to increased student achievement (increased vocabulary retention; increased reading comprehension), and whether student achievement outcomes were mediated by teacher- or student-level characteristics. Each of these questions is addressed below.

## Data Analysis

## Student Perceptions of ELA and Self-efficacy

Students were asked to complete a survey to assess their opinions about ELA as well as their ELA self-efficacy (see Appendix E). Item-level frequencies are provided in Appendix F. Researchers used these data to create two composite scores for each student—one representing student opinions / perceptions of ELA and one representing student ELA self-efficacy. These data were then compared at pretest to determine if there were pre-existing differences on the items prior to the study and then compared from pre- to posttest to determine whether there were changes in students' perceptions of ELA or their ELA self-efficacy following implementation of VSC. Students did not differ on composite pretest measure for ELA perceptions; however, ELA self-efficacy was significantly higher on pretest for students in the treatment classrooms. There were no significant differences in either composite score at posttest. Figure 1 and Figure 2 provide composite averages for participating students.

During focus groups, students were asked to talk about how learning words might help them become better readers. Students from both the treatment and comparison groups felt that knowing words helped them be more fluent readers and helped them with their comprehension. Some students indicated that they try to use new words when they talk with their friends and when they write stories or sentences, noting this strategy helps them better retain the words. Others commented that they repeat words or use flashcards to facilitate their retention—either at home or at school. One student commented that s/he was reluctant to use new words because others might not understand them. The children from both groups generally considered it important to learn new vocabulary words—and some expressed a clear sense of self-efficacy when they came across words in their books that they knew; however, some indicated that reading words they did not know or remember could be confusing or decrease their joy of fun reading. In other words, knowing vocabulary is an important mechanism that can keep students engaged and interested. Students in the VSC treatment group expressed appreciation for the way the program sounds out words for them (3<sup>rd</sup> grader) and specifically mentioned VSC as helping them learn vocabulary words (including definitions and how to use in sentences) (5<sup>th</sup> grader).

Figure 1: Average Student Perceptions of ELA, pre-to-post

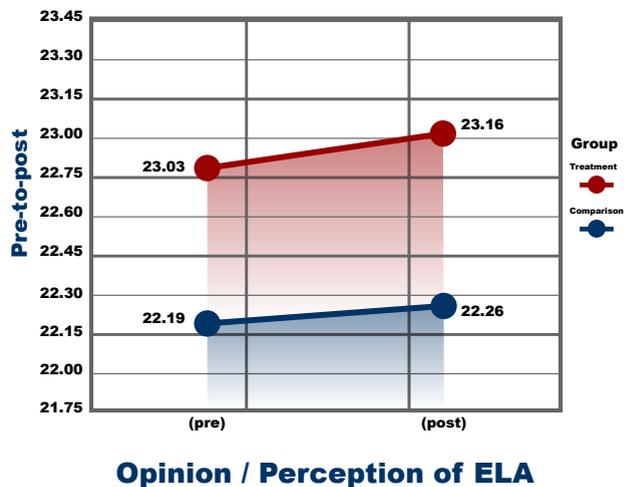


Figure 2: Average Student Self-Efficacy, pre-to-post



## Vocabulary Retention & Mediation

Students' scores from the VSC aligned assessment before and after using VSC were analyzed to determine if VSC had an effect on vocabulary retention. In order to account for other factors that could be influencing students' scores, those data were analyzed using a hierarchical linear mixed model. The fixed factors included were the treatment (VSC), STAR Summary Scale score from September, a student's English language level (ELL), race, gender, free- or reduced-price lunch status (FRPL), and special education eligibility (SPED). ELL classifications were simplified for ease of analysis and to provide larger sample sizes at each level (Table 10). Grade and student nested in teacher were included as random factors. This model explained 75% of the variation in the data with the fixed factors alone explaining 60% (conditional  $R^2 = 0.75$  and marginal  $R^2 = 0.60$ ). There is a significant and large effect of VSC on student scores ( $p < 0.001$ ). As might be expected, student scores go up over time in both groups, but in the treatment group the scores went up significantly faster (Figure 3). The mean score in the comparison group pretest was 45.9 (sd = 19.2) while the posttest was 57.3 (sd = 23.0). In the treatment group, the mean pretest score was 50.5 (sd = 18.7) while the posttest was 82.0 (sd = 18.5).

ELL Class, SPED, and STAR Summary Scales scores in September all impacted a student's score, but none of these factors affected the rate of change from pre- to posttests. This means that while these factors do impact scores, they do not impact the effectiveness of the treatment (or improve scores). Gender, race, and FRPL status did not affect the scores or the change in scores. Interestingly, the time that students spent in VSC, which ranged from 243 to 2,167 minutes, was not a factor in how much students' scores improved in the treatment group. This means that the effectiveness of the treatment is not tied to the length of time spent using VSC. As a result, students who spent about 10 minutes completing both assignments on school days made significant gains in a short period of time.

Figure 3: Percent increase from starting score on VSC aligned assessment for comparison and treatment groups

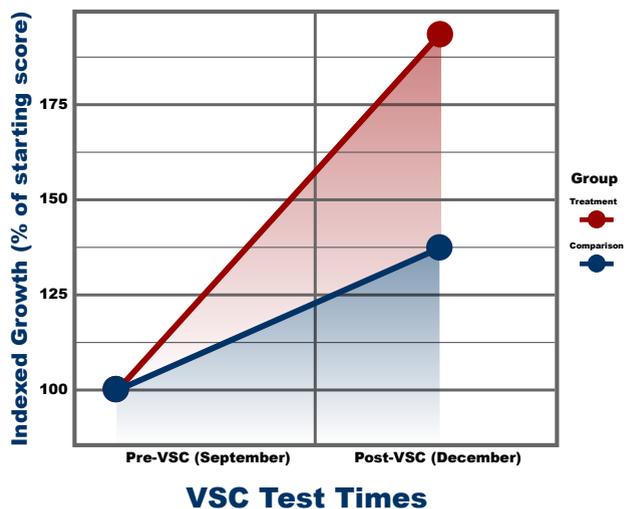
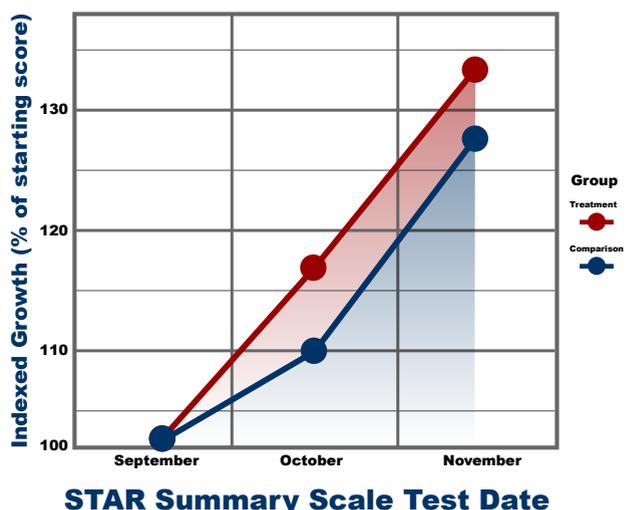


Figure 4: Percent increase from starting score of STAR Summary Scale scores over time for comparison and treatment groups

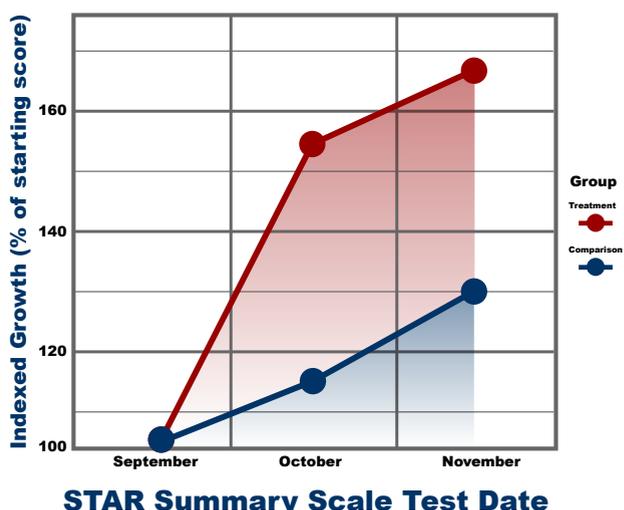


## Reading Comprehension & Mediation

More important than retaining vocabulary words is the ability to comprehend those words in context. A comparison teacher in the focus group intimated that one of her students reads "...completely fluid, on level" – is a "great reader" but is unable to answer questions about text or really comprehend the meaning. Knowing the vocabulary words is a solid, requisite foundation for comprehension; however, comprehension is the ultimate measure.

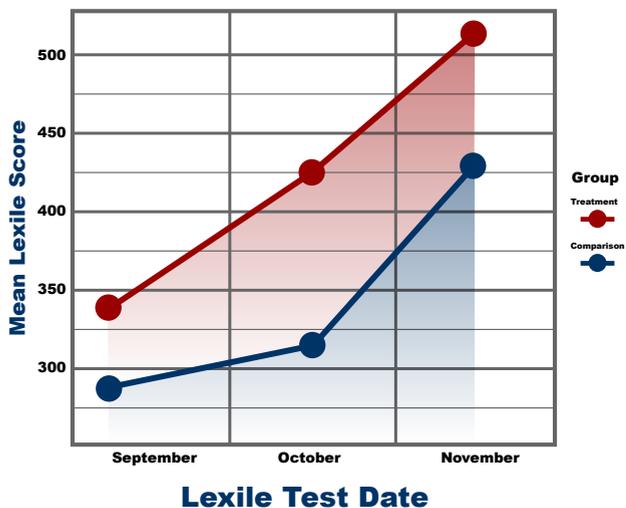
Student's STAR Summary Scale scores, a measure to compare students' reading performance over time, were analyzed for changes over time between the treatment and comparison groups. The rate at which scores increased was significantly greater with VSC ( $p = 0.003$ ). Figure 4 shows the means of the scores in each month. This model explained 90% of the variation in STAR Summary Scale scores but only 15% was explained by the fixed factors and the rest was attributed to the random effects of student nested in teacher and grade level (conditional  $R^2 = 0.90$  and marginal  $R^2 = 0.15$ ). Students in the treatment group had a faster rate of increase in STAR Summary Scale scores over time after accounting for the effects of the other variables. A student's ELL status and SPED all impacted a student's score, while Gender, FRPL, and Race did not. Only ELL level impacted the increase in score, meaning that students in different ELL classifications reacted differently to VSC. This was driven by the fact that Intermediate English Speakers in the treatment group improved faster than those in the comparison group (Figure 5). Being in the treatment group improved STAR Summary Scale scores over time after taking into account all the other factors. Therefore, average reading comprehension scores increased faster for students using VSC.

Figure 5: Percent increase from starting score of STAR Summary Scale scores of Intermediate English Speakers only over time for comparison and treatment groups



Finally, Lexile™ scores, a measure of reading ability, were analyzed in a separate model with all the same factors included (6). Lexile scores also increased faster over time in the treatment group compared to the comparison group ( $p < 0.001$ ). The full model explained 90% of the variation in Lexile scores but, as with STAR Summary Scale scores, only 15% was explained by the fixed factors and the rest was attributed to the random effects of student and grade level (conditional  $R^2 = 0.90$  and marginal  $R^2 = 0.15$ ). A student's race, gender, FRPL, SPED, and grade all impacted a student's score. However, only ELL affected the rate of change over time. As with the STAR Summary Scale scores, this was driven by students categorized as Intermediate English Speakers increasing their scores more in the treatment group as compared to the comparison group. Being in the treatment group improved Lexile scores over time after taking into account all the other factors. Intermediate ELL students using VSC increased their scores faster and ended with significantly higher scores.

Figure 6: Mean Lexile scores over time for comparison and treatment groups<sup>2</sup>



Graphs of student achievement presenting means and standard errors are available in Appendix G.

## Conclusions

VSC can improve both vocabulary retention and reading comprehension for students in grades 2-5. The effect on vocabulary retention was very pronounced. Students who were exposed to VSC (in the treatment group) scored much higher on the VSC aligned vocabulary retention assessment than the equivalent students in the comparison group. Moreover, students' demographic characteristics – gender, qualification for free and reduced price lunch, race, special education eligibility, and ELL classification – did not change their ability to retain more vocabulary after having VSC. Grade level also did not have an impact, meaning that VSC is useful for students across grades 2-5.

VSC also improved students' reading comprehension as measured by more distal means: STAR Summary Scale scores and Lexile scores. Demographic characteristics, with the exception of ELL classification, did not play a role here either. On both of these assessments, students using VSC showed faster increases in scores, although the differences were more pronounced early on. Following students over a longer period of time would give more insight into these effects.

Interestingly, VSC had the largest impact on reading comprehension for students classified as B1 Intermediate English Speakers or B2 Intermediate English Speakers. These students showed large and significant increases in STAR Summary Scale and Lexile scores as compared to students in the same classifications in the comparison group. This is promising for the use of VSC with ELL students. However, the sample size for this analysis was quite small. Examining the effect of VSC on a larger sample of intermediate English speakers would be valuable to solidify this research finding.

VSC did not, however, impact how students perceived ELA and their own self-efficacy. In fact, students in the treatment group started with higher self-efficacy scores but were the same as the comparison group by the end. This means that they had a drop in reported self-efficacy. This is perhaps because these students' awareness of their limitations became more salient as they progressed through the year. However, focus group data indicate that students recognize the importance of vocabulary and students' high levels of interest in using VSC as a learning tool. Tracking all students' self-efficacy through an entire school year may provide additional information as to why scores declined over time.

<sup>2</sup> Lexile scores are not presented as percent growth because they can be negative, which distorts the percent growth calculation.

## Summary

This study was conducted as a collaboration between VocabularySpellingCity and McREL International for the purpose of providing insight into how using VSC might relate to student vocabulary retention, reading comprehension, and perception of self-efficacy. It was conducted in a Title 1 school in the southeastern United States during the fall of 2016. 143 students from eight classrooms participated. The research was organized around four overarching research questions:

- What are the characteristics of participating classrooms / teachers?
- What are teacher-reported benefits of VSC?
- What is the experience of students in the study?
- What are the student outcomes associated with VSC?

Four teachers (three in the treatment, one in the comparison) had a B.A. in Elementary Education. Four teachers (one in the treatment, one in the control) had a Master's degree. Only one teacher (comparison group) had had less than six hours of professional development in ELA in the past year. Two teachers (one treatment, one comparison) had had over 35 hours. Teachers in the treatment and comparison groups had been teaching in K-12 for an average of 11 and 11.5 years respectively. Teachers in the treatment group had been at their current grade level for a much shorter time than the comparison teachers, 1 vs 5.5 years respectively. Teachers reported similar vocabulary teaching practices.

Teachers in the treatment group felt their students both benefited from and enjoyed VSC. Students were excited to use VSC to learn vocabulary. Such high levels of interest and engagement could be a factor in helping students learn and retain vocabulary, and, thereby, strengthen reading comprehension.

This study of VSC revealed several noteworthy findings:

- Students in the VSC treatment group showed significantly increased vocabulary retention in relation to the comparison group.
- The increase in STAR Summary Scale scores was faster for students in the treatment group. Lexile scores also increased faster for students in the treatment group.
- VSC can increase both vocabulary retention and reading comprehension of students in multiple grades. These results are most pronounced for students classified as B1 Intermediate English Speakers or B2 Intermediate English Speakers, who showed significantly greater and faster gains in STAR Summary Scale scores in relation to the equivalent students in the comparison group.

Reading comprehension is a necessary component of academic success and, as such, is vitally important for students. Overall, this small-scale study shows promise that VSC can have an important impact on students' vocabulary retention and reading comprehension as well as be a fun learning tool for them. The reading comprehension of intermediate English speakers benefited substantially from VSC, although the sample size for this analysis is quite small. While a larger study would provide more substantial results on the effect of VSC for intermediate English speakers, these results are encouraging.

## Appendix A: Vocabulary Words, Activities, Review Words, and Tested Words by Grade Level

### Grade 2: New Words, Activities, Review Words, Test Words

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
<b>New Words</b>	wonderful noises quiet sprinkled share noticed bursting suddenly	shaped branches pond beaks deepest break hang winding	blooming shovels scent tough wrinkled plain muscles nodded	beware damage bend flash pounding prevent reach equal	tunnel curled height direction toward healed brag tease	choices drift simple weaker wrapped disgusting decide millions	understand gathered impatient impossible believe problem demand furious	*
<b>New Word Activities<sup>^</sup></b>	FLASH, TMM, WS, SB, SU, WOR, WV, VTM	FLASH, TMM, WS, WOR, WV, VTM	FLASH, TMM, SU, MIS, MID, WD, VTM	FLASH, TMM, WS, SB, SU, WOR, WV, VTM	FLASH, TMM, WS, WD, SU, VTM	FLASH, TMM, WD, SU, MIS, VTM	FLASH, TMM, WS, MIS, VTM	*
<b>Review Words</b>		**	noises branches quiet share hang suddenly bursting wonderful beaks noticed sprinkled break	noises branches quiet share hang suddenly bursting wonderful beaks noticed sprinkled break	noises branches pond blooming tough share quiet wonderful break noticed sprinkled deepest suddenly muscles bursting	tough winding pond wrinkled blooming scent shovels beaks flash wonderful share noises prevent deepest	suddenly damage flash noises muscles noticed blooming deepest sprinkled beware pounding wrinkled break plain reach equal prevent tough	noises deepest muscles tough flash prevent sprinkled toward reach damage blooming suddenly tunnel pounding choices plain wrinkled noticed direction break
<b>Review Word Activities<sup>^</sup></b>		**	SU, WDs	SU, WDs	WS, WD, WOR, FLASH, TMM	WS, WOR, FLASH	WD, WOR	TMM, WOR, FLASH
<b>Pre &amp; Post Test Words</b>	bursting, sprinkled, wonderful, judge, rotten, breeze, winding, beaks, deepest, blooming, wrinkled, nodded, beware, damage, prevent, height, brag, healed, drift, wrapped, simple, impatient, impossible, furious							

Notes:

\* = No new words, teacher was behind due to holidays so she spent a little more time with the words. \*\* = Did not start a review list until the third week. 2nd graders were learning the website and games; did not want to overwhelm them. <sup>^</sup>: Crossword = CW; Flashcards = FLASH; Match It! Definitions = MID; Match It! Sentences = MIS; Sentence Unscramble = SU; Sentence Writing = SW; Silly Bulls = SB; Teach Me More = TMM; Vocabulary Test Me = VTM; Which Word Sentences = WS; Whichword? Definitions = WD; Word Videos = WV; Word-O-Rama = WOR

### Grade 3: New Words, Activities, Review Words, Test Words

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
<b>New Words</b>	harvest separate ashamed borders advice borrow patch serious	polish pronounced fans slammed style stands league score	twitch detail swoops slithers squeak dozes echoes snuggles	examined rugged peak mist fondly pausing steep pleaded	risky grunted crops profit scowled plucked tugged hollered	ability patrol loyal partners shift snap lying quiver	tracing imagine illustrate scribbles sketches research textures tools	afford customers contacted raise earn figure block spreading
<b>New Word Activities<sup>^</sup></b>	FLASH, TMM, WS, SB, SU, WOR, CW, SW, WV, VTM	FLASH, WV, SU, WOR, VTM	FLASH, TMM, SU, MIS, MID, VTM	FLASH, TMM, SU, WD, SB, VTM	FLASH, TMM, SU, WD, MIS, SW, FLASH, VTM	FLASH, TMM, WD, SW, SU, VTM	FLASH, TMM, WD, SW, MIS, VTM	FLASH, TMM
<b>Review Words</b>		separate ashamed borrow borders serious patch advice harvest	ashamed fans stands advice style polish score slammed patch league harvest pronounced	slammed twitch pronounced fans serious squeak detail ashamed borders score snuggles harvest	serious pleaded score fondly advice twitch borders style pronounced squeak league snuggles peak detail dozes	examined ashamed cling swoops stretch foggy mist twitch detail plucked serious hollered rugged score balancing	twitch grunted hollered pleaded advice style profit crops risky tugged borders snuggles plucked dozes scowled pronounced detail fondly	twitch plucked tugged snuggles grunted scowled hollered crops advice fans serious borders risky style pleaded detail pronounced profit dozes fondly
<b>Review Word Activities<sup>^</sup></b>		WS, WD, SU	WOR, WD	WS, MID, WD	MIS, MID, WOR	WOR, TMM	WS, WOR	WOR, WD, WS
<b>Pre &amp; Post Test Words</b>	foggy, crew, cling, pronounced, league, slammed, twitch, swoops, dozes, harvest, ashamed, borrow, gadget, laboratory, occasional, risky, grunted, scowled, rugged, fondly, pleaded, shift, loyal, quiver							

Notes:

<sup>^</sup>: Crossword = CW; Flashcards = FLASH; Match It! Definitions = MID; Match It! Sentences = MIS; Sentence Unscramble = SU; Sentence Writing = SW; Silly Bulls = SB; Teach Me More = TMM; Vocabulary Test Me = VTM; Which Word Sentences = WS; Whichword? Definitions = WD; Word Videos = WV; Word-O-Rama = WOR

## Grade 4: New Words, Activities, Review Words, Test Words

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
<b>New Words</b>	yearning memorable betrayed condition seafaring shortage tidal outcast foaming horrified	alarmed reacted convey daring awe luminous indescribable extraordinary fade conferring	entertaining promote focus advertise jolts critics target thrilling angles generated	studio glorious feast streak yanked schedule concerned ruined model smeared	reference borrow local fault apologize insisted fainted proof genuine slimy	debut stubborn permission hauling mournful towered triumph discouraged toured border	whirling rapidly condense source rotating rage experience ancient predict registered	trembles wreckage slab possessions tenement crushing rubble debris timbers constructed
<b>New Word Activities<sup>^</sup></b>	FLASH, SB, TMM, SU, WOR, MIS, WS, WD, CW, SW, WV, VTM	FLASH, TMM, SU, SW, WOR, VTM	FLASH, TMM, WV, SW, WOR, VTM	FLASH, TMM, WS, SW, WOR, VTM	FLASH, TMM, SU, SW, WOR, VTM	FLASH, TMM, SU, SW, WD, VTM	FLASH, TMM, MID, SW, WD, VTM	FLASH, TMM, MID, SW, WS, VTM
<b>Review Words</b>		condition yearning horrified betrayed outcast seafaring memorable shortage tidal foaming	reacted alarmed conferring convey extraordinary outcast tidal awe fade daring condition shortage	alarmed fade reacted indescribable conferring convey luminous extraordinary awe shortage daring outcast	focus awe outcast thrilling shortage target jolts convey alarmed critics advertise generated promote daring condition	alarmed convey generated awe focus shortage promote outcast critics daring target condition advertise thrilling jolts	model convey local extraordinary slimy luminous fade indescribable conferring reacted awe fainted alarmed proof daring	apologize shortage critics generated promote reference alarmed stubborn condition awe insisted outcast permission daring discouraged genuine convey thrilling
<b>Review Word Activities<sup>^</sup></b>		WD, CW	WS, SU	WOR, FLASH	WOR, MIS	WOR, TMM	MID, WOR	FLASH, TMM
<b>Pre &amp; Post Test Words</b>	yearning, seafaring, tidal, convey, luminous, indescribable, jolts, critics, generated, glorious, yanked, smeared, reference, genuine, slimy, debut, towered, toured, whirling, condense, rage, trembles, wreckage, debris							

Notes:

<sup>^</sup>: Crossword = CW; Flashcards = FLASH; Match It! Definitions = MID; Match It! Sentences = MIS; Sentence Unscramble = SU; Sentence Writing = SW; Silly Bulls = SB; Teach Me More = TMM; Vocabulary Test Me = VTM; Which Word Sentences = WS; Whichword? Definitions = WD; Word Videos = WV; Word-O-Rama = WOR

## Grade 5: New Words, Activities, Review Words, Test Words

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
<b>New Words</b>	frantic lunging stride checking wheeled bounding shouldered strained romp picturing	endangered unique adapted vegetation conserving restore guardians attracted regulate responsibility	critical secured realization annoyance bundle clammy squalling commotion demolished elite	unobserved available detecting mature ferocious resemble particular vary contentment keen	embark surveyed conduct cramped bracing pressing distracted representatives viewpoint shattered	benefit objected contrary advantages temporary rebellious repeal midst previously prohibit	formal legendary foes revolution plunged gushed magnificent shimmering strategy retreat	influential persuade bondage tentative aspects provisions dexterity contributions apprentice authorities
<b>New Word Activities<sup>^</sup></b>	FLASH, SB, TMM, SU, WOR, MIS, WS, WD, CW, SW, WV, VTM	FLASH, TMM, SU, SW, WOR, VTM	FLASH, TMM, WV, SW, WOR, VTM	FLASH, TMM, WS, SW, WOR, VTM	FLASH, TMM, SU, SW, WOR, VTM	FLASH, TMM, SU, SW, WD, VTM	FLASH, TMM, MID, SW, WD, VTM	FLASH, TMM, MID, SW, WS, VTM
<b>Review Words</b>		presence transferred perch calculate snug procedure enthusiastic dwarfed outfitted beaming	adapted conserving regulate unique bounding shouldered wheeled checking attracted responsibility romp vegetation lunging strained stride	adapted commotion shouldered checking conserving responsibility attracted bounding strained stride regulate critical	responsibility conserving contentment regulate commotion keen adapted strained stride critical attracted shouldered	annoyance lunging ferocious keen picturing commotion contentment checking critical detecting strained stride bundle frantic particular	surveyed attracted contentment viewpoint regulate adapted critical advantages pressing repeal commotion rebellious responsibility bracing conserving objected contrary keen	temporary advantages critical objected bracing strained surveyed attracted pressing conserving commotion regulate contentment benefit responsibility prohibit repeal adapted contrary rebellious
<b>Review Word Activities<sup>^</sup></b>		WD, CW	WS, SU	WOR, FLASH	WOR, MIS	WOR, TMM	MID, WOR	FLASH, TMM
<b>Pre &amp; Post Test Words</b>	frantic, lunging, shouldered, tentative, bondage, dexterity, regulate, guardians, restore, elite, squalling, demolished, contentment, keen, detecting, embark, representatives, conduct, contrary, prohibit, midst, legendary, foes, retreat							

Notes:

<sup>^</sup>: Crossword = CW; Flashcards = FLASH; Match It! Definitions = MID; Match It! Sentences = MIS; Sentence Unscramble = SU; Sentence Writing = SW; Silly Bulls = SB; Teach Me More = TMM; Vocabulary Test Me = VTM; Which Word Sentences = WS; Whichword? Definitions = WD; Word Videos = WV; Word-O-Rama = WOR

## Appendix B: Calendar of VSC Activities

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday					
<b>OCTOBER 2016</b>							1					
	2	No School	3	4	Pre Test Student Survey	5	6	Pre Test Student Survey (Make-up)	7	8		
	9	<b>DAY 1</b> Send Home Parent Letters Word List 1	10	<b>DAY 2</b>	11	No School	12	<b>DAY 3</b>	13	<b>DAY 4</b>	14	15
	16	<b>DAY 5</b> Word List 1 Test	17	<b>DAY 6</b> Word List 2 Review List 1	18	<b>DAY 7</b>	19	<b>DAY 8</b> Teacher Focus Group 2:20 – 2:50	20	<b>DAY 9</b>	21	22
	23	<b>DAY 10</b> Word List 2 Test	24	<b>DAY 11</b> Word List 3 Review List 2	25	<b>DAY 12</b>	26	<b>DAY 13</b>	27	Planning	28	29
	30	<b>DAY 14</b> Halloween	31									

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday					
<b>NOVEMBER 2016</b>			<b>DAY 15</b> Word List 3 Test	1	<b>DAY 16</b> Word List 4 Review List 3	2	<b>DAY 17</b>	3	<b>DAY 18</b>	4	5	
	6	<b>DAY 19</b>	7	Election Day	8	<b>DAY 20</b> Word List 4 Test	9	<b>DAY 21</b> Word List 5 Review List 4	10	No School Veterans Day	11	12
	13	<b>DAY 22</b>	14	<b>DAY 23</b> Teacher Focus Group 1:00-1:30	15	<b>DAY 24</b>	16	<b>DAY 25</b> Word List 5 Test	17	<b>DAY 26</b> Word List 6 Review List 5	18	19
	20	<b>DAY 27</b>	21	<b>DAY 28</b>	22	No School	23	No School Thanksgiving Day	24	No School	25	26
	27	<b>DAY 29</b>	28	<b>DAY 30</b> Word List 6 Test	29	<b>DAY 31</b> Word List 7 Review List 6	30					

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday					
<b>DECEMBER 2016</b>					<b>DAY 32</b>	1	<b>DAY 33</b>	2	3			
	4	<b>DAY 34</b>	5	<b>DAY 35</b> Word List 7 Test	6	<b>DAY 20</b> Word List 8 Review List 7	7	<b>DAY 37</b>	8	<b>DAY 38</b>	9	10
	11	<b>DAY 39</b>	12	<b>DAY 40</b> Word List 8 Test	13	Post Test Student Survey	14	Post Test Student Survey (Make Up)	15	16	17	
	18		19		20		21		22		23	24
	25 Christmas		26		27		28		29		30	31

## Appendix C: Teacher and Parent Consent Letters

### Teacher Consent

September 2016

Dear Colleague:

You have been asked to take part in a study aimed to provide information about students' and teachers' outcomes associated with the use of VocabularySpellingCity.

Participation in this study means consenting to the following activities:

- Administer vocabulary Pre- & Post-Test to students (approximately 10 minutes per assessment).
- Participate in a discussion following the research study (approximately 30 minutes).
- Complete one teacher survey (approximately 15 minutes per survey).
- Participate in a two focus group discussions (approximately 20 minutes per discussion)
- Attend a professional development training on how to use VocabularySpellingCity (approximately 90 minutes).  
[NOTE: DELETE FOR COMPARISON TEACHERS]
- Implement the VocabularySpellingCity research protocol as recommended by the program developer (approximately 4 hours total). [NOTE: DELETE FOR COMPARISON TEACHERS]

A direct benefit of the study participation is access to VocabularySpellingCity in the 2016-17 school year. Moreover, your participation in the study will contribute to an understanding of the use of VocabularySpellingCity on teachers' and students' outcomes and the improvement of future versions of the program. There are no known risks related to your participation in this study. Your participation is completely voluntary. You may choose to withdraw from the study at any time. Should you choose to withdraw, you will still have access to VocabularySpellingCity in the 2016-17 school year.

The information gathered from the activities listed above will be kept **strictly confidential**. Your name will not be used in any study reports. Instead, comments will be summarized. We may directly quote what is said in a report, but we will not use the name of the person making the comment. Data files will be kept in a safe place during the study and destroyed after the end of the study.

Should you have any questions about this study or your rights as a participant, you may contact Sheila Arens, Executive Director at McREL International (McREL), 303-632-5625 or sarens@mcrel.org.

**I have read (or had someone read) this form and understand the descriptions of the study. I have asked for and received a satisfactory explanation of any language that I did not fully understand.**

I agree to participate in this study, and I understand that I may withdraw my consent at any time. I have received a copy of this consent form.

NAME (Please Print) \_\_\_\_\_

I give consent to participate in this study.  I do NOT give consent participate in this study.

SIGNATURE

DATE

## Parent Consent

September 2016

Dear Families of Students:

This fall, your child's teacher is working with two companies named McREL and VocabularySpellingCity to learn about vocabulary retention. The purpose of this study is to find out more about:

- Teacher and student experiences when they use the VocabularySpellingCity program;
- Whether VocabularySpellingCity helps students learn and retain vocabulary words; and
- Whether students' vocabulary retention leads to improved comprehension.

We ask your permission for your child to be part of this study. This means your child may be participating in one or more of the following activities:

- Participate in a student survey about their feelings related to learning vocabulary (approximately 5 minutes)
- Complete a vocabulary pre- and post-assessment (approximately 10 minutes per assessment)
- Participate in student interviews (approximately 15 minutes)
- Utilize VocabularySpellingCity learning activities to practice vocabulary words

With this information, researchers will learn how students feel about VocabularySpellingCity and whether VocabularySpellingCity helps students learn.

Your child's answers on his/her survey, interview, and scores on assessments will be kept private. No student will be named in any report about the study. All students in the study will be given an ID number instead of using their names. No personal information (name, birthday, etc.) will be shown. Any personal information we have will be locked up in a file and will not be given to anyone.

Responses to this data collection will be used only for statistical purposes. The reports prepared for this study will summarize findings across classrooms and will not link information to a specific teacher or student. We will not provide information that identifies you, or your child to anyone outside the study team, except as required by law.

**Your child's participation in this study is voluntary.** Whether you wish your child to be part of this study or not, please fill out the form on the next page. Either way your child may still use the VocabularySpellingCity materials, but we will not survey, interview, or assess your child. If you wish to take your child out of the study at any time, you may.

If you have any questions about the study or about your child's part in it, please call [REDACTED], Literacy Coach at [REDACTED]. You may also call or email me. I can be reached at McREL at 303-632-5625 or by email at [sarens@mcrel.org](mailto:sarens@mcrel.org).

Sincerely,

Sheila A. Arens, Ph.D., Executive Director or Research and Evaluation, McREL International

## Parent Consent Form

September 2016

**Please complete this form and return to your child's teacher no later than Monday, September 19, 2016**

1. Write your child's name on the blank below.
2. Check ("X") in the box under it indicating whether you grant permission or not.
3. Sign your name and write the date.

Thank you.

School Name: XXXXXXXXXX Elementary School

Child's name: \_\_\_\_\_

- Yes, my child has my permission to participate in the study of VocabularySpellingCity and to speak with members of the research team.
- No, my child DOES NOT have my permission to participate in the study of VocabularySpellingCity.

\_\_\_\_\_  
Signature of Parent/Guardian

\_\_\_\_\_  
Date

## Appendix D: Teacher Survey

Welcome

Dear Educator,

Thank you for taking the time to complete the VocabularySpellingCity survey for Mid-continent Research for Education and Learning (McREL).

Your participation in completing this survey is voluntary. You may choose to stop completing the survey at any time. If you have any questions about the survey, please call or email McREL Senior Director, Sheila Arens, Ph.D. She can be reached at 303-632-5625 or by email at [sarens@mcrel.org](mailto:sarens@mcrel.org).

Thank you for your time!

Please answer the following questions.

1. What is your name?

2. What is your gender:

- Female  
 Male

3. Are you:

- American Indian or Alaskan Native  
 Asian  
 Black or African-American  
 Hispanic or Latino  
 Native Hawaiian or Other Pacific Islander  
 White  
 Mixed Race (please specify) Please enter an 'other' value for this selection.

4. What grade(s) do you teach? (Select all that apply)

- 2  
 3  
 4  
 5

5. Do you have any of the following degrees?

	Yes	No
Bachelors	<input type="radio"/>	<input type="radio"/>
Masters	<input type="radio"/>	<input type="radio"/>
Doctorate	<input type="radio"/>	<input type="radio"/>

6. Please indicate the subject(s) for each of your degrees.  
(Select all that apply.)

	Bachelors	Masters	Doctorate
Please indicate the subject(s) for each of your degrees. (Select all that apply)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Elementary Education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other subject	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you selected "other" above, please specify.

7. What is the total amount of time you have spent on professional development in literacy in the last 12 months? (Include attendance at professional meetings, workshops, and conferences, but do not include formal courses for which you received college credit or time you spent providing professional development for other teachers.)

None	Less than 6 hours	6-15 hours	16-35 hours	More than 35 hours
<input type="radio"/>				

8. How often do you explicitly teach vocabulary words to your students in these subject areas?

	Rarely	Once a month	Weekly
Reading	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Writing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Math	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social Studies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other subject	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. How many years have you taught at the K-12 level prior to this school year?

10. How many years have you taught at your current grade level(s) prior to this school year?

11. About how often do you do each of the following in your vocabulary instruction?

	Never	Rarely (e.g., a few times a year)	Sometimes (e.g., once or twice a month)	Often (e.g., once or twice a week)	All or Almost All Science Lessons
Introduce vocabulary in context	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Select words that are necessary for understanding the text	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide students with at least 12 exposures to new vocabulary words	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Play games or engaging learning activities with new vocabulary words	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask students to create their own vocabulary word lists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Differentiate students' vocabulary words list	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allow students to practice their vocabulary words over several days	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide constant exposures to previously taught words	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assign vocabulary homework at least 3 times a week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Review student vocabulary work weekly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. About how often do you do each of the following in your vocabulary instruction?

	Never	Rarely (e.g., a few times a year)	Sometimes (e.g., once or twice a month)	Often (e.g., once or twice a week)	All or Almost All Science Lessons
Listen and take notes during direct instruction by teacher	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage in a word study literacy center	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work in groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create own word list based on what they are reading	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage in vocabulary homework	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Play a variety of vocabulary games	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Follow a five day cycle for learning vocabulary (Assign words on day 1, practice days 2-4, assess on day 5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use vocabulary word list identified with textbooks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use computers as a tool to learn and be assessed using vocabulary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. Do you use computer software to deliver literacy instruction?

If yes, which program(s) do you use?  
(iReady, iStation, etc.)

How much time do students spend on the computer using this program?

14. How many minutes of vocabulary homework do you assign to your students in a typical week?

- 0-5 minutes
- 6-10 minutes
- 11-15 minutes
- 16-20 minutes
- 21-25 minutes
- More 25 minutes

15. Are you using Journeys reading series for literacy instruction?

- Yes
- No

If no, please indicate the title, author, publisher, and publication year of the one reading textbook/program used most often by students in this class.

	Textbook/program used most often
Title	
First Author	
Publisher	
Publication Year	
Edition	

16. How would you rate the overall quality of this textbook/program?

- Very Poor
- Poor
- Fair
- Good
- Very Good
- Excellent

17. Please indicate the degree to which you agree or disagree with each statement.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Uncertain
When a student does better than usual on a vocabulary assessment, it is often because the teacher exerted a little extra effort	<input type="radio"/>				
I am continually finding better ways to teach vocabulary	<input type="radio"/>				
Even when I try very hard to teach vocabulary during my reading instruction, I don't explicitly teach vocabulary in other subject areas	<input type="radio"/>				
When the reading scores of students improve, it is most often due to their teacher having found a more effective teaching approach	<input type="radio"/>				
I know the steps necessary to teach vocabulary effectively	<input type="radio"/>				
I am not very effective in monitoring my students' vocabulary acquisition	<input type="radio"/>				
If students are underachieving in reading, it is most likely due to ineffective vocabulary instruction	<input type="radio"/>				
I find that students who have larger vocabularies are better at comprehending what they've read	<input type="radio"/>				
Students' achievement in reading is directly related to their teacher's effectiveness in vocabulary instruction	<input type="radio"/>				
I find it difficult to explain to students the definitions of academic vocabulary	<input type="radio"/>				
I am typically able to answer students' vocabulary questions	<input type="radio"/>				
Effectiveness in vocabulary acquisition has little influence on the achievement of students with low motivation	<input type="radio"/>				
Given a choice, I would not invite the principal to evaluate my vocabulary instruction	<input type="radio"/>				
When teaching vocabulary, I usually welcome student questions	<input type="radio"/>				
I don't know how to get my students interested in vocabulary	<input type="radio"/>				

18. Think about your students' actions during literacy block in the last two weeks. In general, please indicate your level of agreement with the following statements.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Uncertain
Students exhibit body postures that indicate they are paying attention	<input type="radio"/>				
All students are focused on the learning activity with minimum disruptions	<input type="radio"/>				
Students express thoughtful ideas, reflective answers, and questions relevant or appropriate to learning	<input type="radio"/>				
Students exhibit confidence and can initiate and complete a task with limited coaching and can work in a group	<input type="radio"/>				
Students exhibit interest and enthusiasm in vocabulary	<input type="radio"/>				

## Appendix E: Student Opinion and Self-Efficacy Survey and Student Focus Group Questions

**Directions for the Administrator to read:** *Thank you for helping us with this research study. Today you are going to take part in a survey about your feelings towards reading and learning vocabulary. The information from this survey will help teachers better understand how students learn best.*

*Give me a thumbs up if you would like to take this survey about vocabulary. (Wait for students to give a thumbs up. If a student does not give a thumbs up, ask them do something else such as read a book or complete an unfinished assignment.) If at any time you don't want to participate, let me know immediately.*

Evaluator hands out survey to participating students. Students may use pen or pencil to complete the survey.

*I will read the directions to you. Listen carefully to each question. Then circle the smiley face that is closest to how you feel about the question. It is important to answer these questions honestly. Your survey is not graded and your name will not be used when the researchers write their reports.*

*Before we begin, let's review what each smiley face means:*



This big smile means I love it!



This happy face means I like it.



This straight face means it's OK. I don't really like or hate it.



This sad face means I don't really like it.



This angry face means I really DO NOT like it!

*Some questions have these two icons:*



The checkmark means yes.



The X means no.

*Does anyone have any questions before we begin? Answer all student questions before moving on. Then read each question to students, waiting approximately 10 seconds before moving to the next question.*

### **After completing the survey:**

*Thank you for all this valuable information. I appreciate your open and honest responses.*

Your Name: \_\_\_\_\_

Your Teacher's Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Administrator script:** "Children, put your finger on the first question [administrator: check that students are at the first question]. I want you to listen carefully as I read each question. Then you will circle the smiley face that is closest to how you feel about the question" [administrator, make sure to read the question number in addition to the question.]

1. How do you feel when you read?



2. How do you feel about reading stories?



3. How do you feel about reading informational text?



4. How do you feel when you are asked questions about what you read?



5. How do you feel about learning new vocabulary?



6. How do you feel when you come to a word you don't know?



7. When you come to a word you don't know, do you skip it?



8. When you come to a word you don't know, do you read the rest of the sentence to figure out its meaning?



9. Are you able to read almost all of the words in a book?



10. Can you answer questions about what you read?



11. Do you remember the vocabulary words your teacher taught you last month?



12. Do you reread when you don't understand what you have just read?



13. Do you find practicing vocabulary boring?



14. Do you like talking about what you have read?



15. Do you forget your vocabulary words after you take the test?



Administrator: "Children we are now on number 7. Please point on the page to number 7" [facilitator: check that all students are on item 7].

## Student Interview (Focus Group)

Evaluator will sit with small groups of students in treatment classrooms to ask students about their perceptions of their vocabulary and reading comprehension.

**Directions:** *Thank you for helping us with our research study. Give me a thumbs up if it is OK to ask you some questions about vocabulary and how you learn new words. (Wait for students to give a thumbs up. If a student does not give a thumbs up, ask them to leave the group.) If at any time you don't want to participate, let me know immediately.*

1. Is learning new vocabulary words fun?
2. When do you learn new words while at school?
3. How do you help yourself to remember what new words mean?
4. When you are trying to figure out the meaning of a word...
  - a. do you look at the parts of the word?
  - b. do you read the rest of the sentence to see if there are any clues?
  - c. do you look for a synonym or antonym for the word to help?
  - d. do you use reference materials to help you?
  - e. do you ask a friend or teacher for help?
5. How often do you use new words in your writing and speaking?
6. What does your teacher do to help you learn new words?
7. How do you practice or study new vocabulary words so you remember their definitions?
8. How well do you answer questions about what you read?
9. Do you like to read?
  - If yes, what do you like to read?
  - If no, what do you dislike about reading?
10. How does learning vocabulary help you become a better reader?
11. Is there anything else you want me to know about learning vocabulary words?

*Thank you for all this valuable information. I appreciate you taking the time to speak with me.*

**Appendix F:**  
**Item level data: Student Survey (Perception of ELA and Self-Efficacy)**

		Pre-VSC		Post-VSC	
		Treatment (n)	Comparison (n)	Treatment (n)	Comparison (n)
<b>Perception of ELA Items</b>					
How do you feel when you read?	I really do not like it	1	1	2	3
	I don't really like it	0	2	1	1
	It's okay	13	10	9	11
	I like it	27	28	19	25
	I love it	29	31	37	32
	Missing	0	1	2	1
How do you feel about reading stories?	I really do not like it	0	2	1	2
	I don't really like it	1	5	0	3
	It's okay	10	10	13	14
	I like it	26	23	25	20
	I love it	33	32	29	33
	Missing	0	1	2	1
How do you feel about reading informational text?	I really do not like it	6	2	6	9
	I don't really like it	6	5	1	4
	It's okay	15	21	17	24
	I like it	23	16	17	18
	I love it	20	28	27	17
	Missing	0	1	2	1
How do you feel when you are asked questions about what you read?	I really do not like it	2	5	4	7
	I don't really like it	11	14	4	11
	It's okay	21	18	21	16
	I like it	16	16	22	18
	I love it	20	18	17	20
	Missing	0	2	2	1
How do you feel about learning new vocabulary?	I really do not like it	0	2	1	3
	I don't really like it	3	10	4	2
	It's okay	6	13	9	16
	I like it	22	15	17	25
	I love it	39	32	37	26
	Missing	0	1	2	1
How do you feel when you come to a word you don't know?	I really do not like it	9	12	12	6
	I don't really like it	16	16	10	13
	It's okay	23	21	22	26
	I like it	15	16	9	15
	I love it	7	6	13	12
	Missing	0	2	4	1

		Pre-VSC		Post-VSC	
		Treatment (n)	Comparison (n)	Treatment (n)	Comparison (n)
<b>Self-Efficacy Items</b>					
When you come to a word you don't know, do you skip it?	No	42	50	52	48
	Yes	28	22	14	23
	Missing	0	1	4	2
When you come to a word you don't know, do you read the rest of the sentence to figure out its meaning?	No	8	9	10	17
	Yes	62	63	58	55
	Missing	0	1	2	1
Are you able to read almost all of the words in a book?	No	11	19	13	14
	Yes	59	53	55	58
	Missing	0	1	2	1
Can you answer questions about what you read?	No	7	14	10	8
	Yes	63	58	58	64
	Missing	0	1	2	1
Do you remember the vocabulary words your teacher taught you last month?	No	50	53	36	51
	Yes	20	19	32	21
	Missing	0	1	2	1
Do you reread when you don't understand what you have just read?	No	3	11	7	14
	Yes	67	61	61	58
	Missing	0	1	2	1
Do you find practicing vocabulary boring?	No	45	55	51	49
	Yes	25	17	17	23
	Missing	0	1	2	1
Do you like talking about what you have read?	No	22	35	24	34
	Yes	48	37	44	38
	Missing	0	1	2	1
Do you forget your vocabulary words after you take the test?	No	45	42	49	46
	Yes	25	30	19	25
	Missing	0	1	2	2

## Appendix G: Additional Figures

Figure G-1: Means and standard errors of pre- and post-treatment scores on VSC aligned assessment for comparison and treatment groups

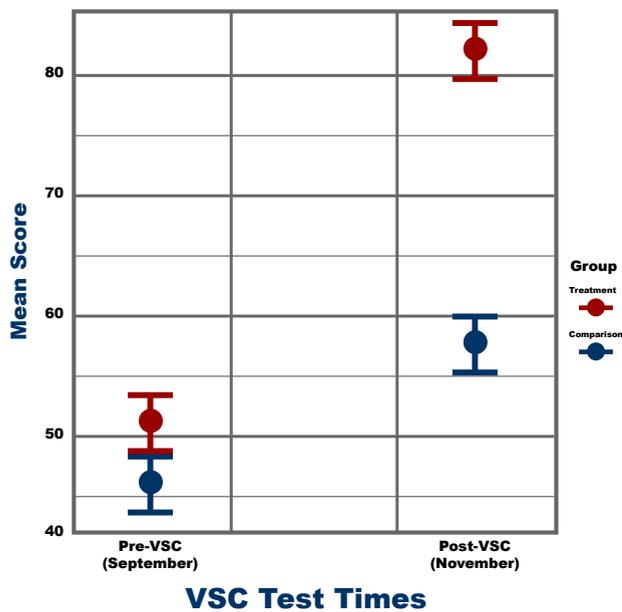


Figure G-2: Mean STAR Summary Scale scores and standard errors over time for comparison and treatment groups

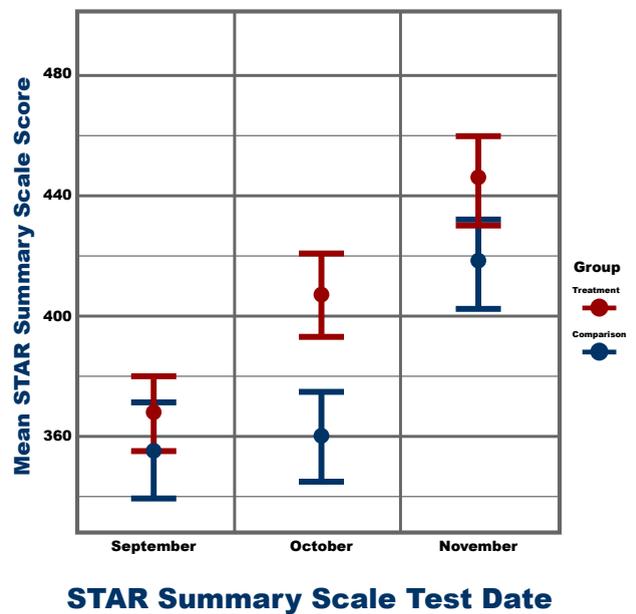


Figure G-3: Mean STAR Summary Scale scores and standard errors of Intermediate English Speakers only over time for comparison and treatment groups

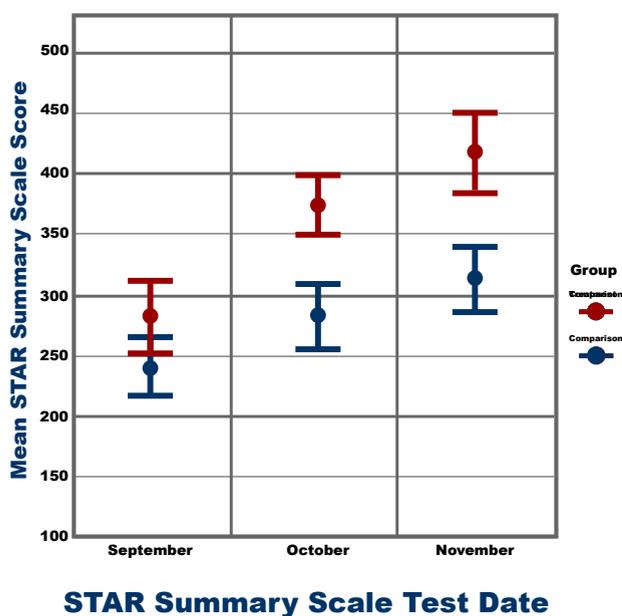


Figure G-4: Mean Lexile scores and standard errors over time for comparison and treatment groups

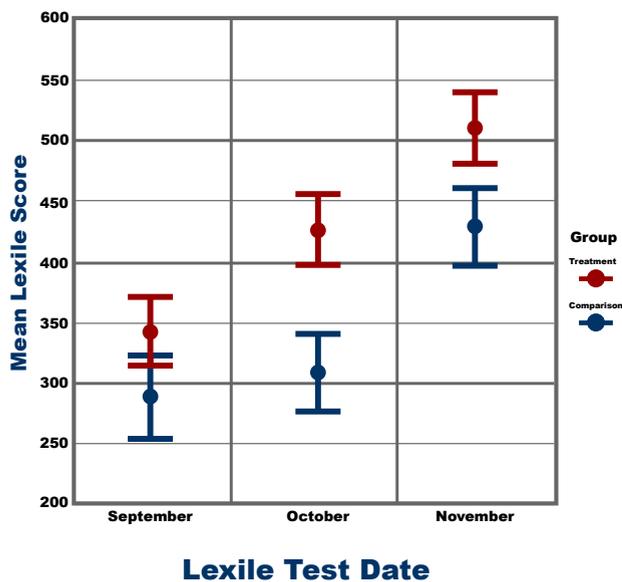
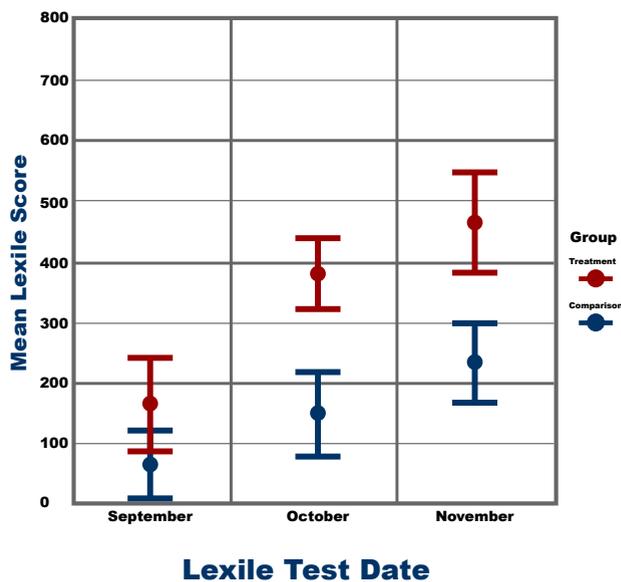


Figure G-5: Mean Lexile scores and standard errors of Intermediate English Speakers only over time for comparison and treatment groups



# VOCABULARY SPELLING CITY.COM

VocabularySpellingCity® is a K-12 game-based productivity tool that engages students with integrated word study practice, supporting the teacher. Powerful interactive activities engage students while supplementing instruction with your current reading program.

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