

Improving Student Understanding of Academic Assessment Vocabulary Words Using Visual Cues: A Collaborative Effort

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Abstract

Many students have difficulty understanding terms from the academic register such as “analyze,” “discuss,” and “compare.” This issue may be exacerbated for some Native American students, especially those who live on reservations with limited exposure to mainstream cultures. In this community-based participatory research project, academic investigators partnered with educators and community members from Native communities in Nebraska and South Dakota to expand students’ academic vocabulary and improve student achievement. Together, we formed a team in which community members collaborated with academic investigators to develop word-wall cards incorporating dual-coding theory—that is, combining visual and verbal cues—to help students understand academic vocabulary words. Paivio’s dual-coding theory postulates that verbal and visual information are encoded in separate but interconnected pathways and that concepts encoded via both pathways are more easily remembered. Accordingly, presenting information using multiple mediums, such as graphs, photographs, or demonstrations, may enhance learning. These cards were shared with community educators who used them in their classrooms. We present evidence that incorporating these multimodal tools into classrooms may improve students’ understanding of academic vocabulary. Through this partnership, educators in Native American communities were able to represent their lived experiences. Teachers and administrators in Native American and non-Native classrooms could easily partner with other experts to incorporate similar innovations in their own schools and classrooms.

Most schools are required to administer standardized tests to their students at some point in a given school year. Many authors have noted the possibility of bias in these tests, particularly toward students of color and those of lower economic status. Both of these groups may have difficulty grasping the meaning of terms commonly used in standardized test questions (Au, 2010; Christopher et al., 2008; Demmert et al., 2006; Reynolds et al., 2009). Comprehending key academic terms is critical to understanding any subject, but students may struggle to understand question stems that use terms from the academic register such as “analyze,” “compare,” and “infer.” This register includes “lexical, grammatical, and discourse features that carry out specific teaching and learning functions” (Gallagher, 2016, p. 383). It has been argued that students must become proficient in this type of language in order to succeed in school (Gallagher, 2016; Townsend et al., 2012). While students who are a part of the dominant culture tend to be socialized to academic language jointly in the home and in the classroom, students from nondominant backgrounds may experience “discontinuities” in language socialization between home and the classroom, compounding possible

challenges in understanding academic vocabulary (Gallagher, 2016, p. 383).

Thus, there is a need to reinforce learning opportunities for some Native American students, particularly those on reservations who have had limited exposure to alternative cultures (Pewewardy, 2002). Compared to White children, Native American children, like those from other racial and ethnic minority groups, have less exposure to books in the home and are less likely to have parents with advanced educations (Demmert et al., 2006; DeVoe et al., 2008). Both of these factors are related to lower levels of literacy and language proficiency (Davis-Kean, 2005; C. M. Green et al., 2009). A National Assessment of Education Progress study revealed little change in literacy for Native American students from 2000 to 2015: Average reading scores for Native American students improved 1 point for fourth graders and 2 points for eighth graders, compared to increases of 13 points for Asian American/Pacific Islander students and 15 points for Black students over the same period (Brayboy & Lomawaima, 2018).

Although many differences exist among individuals in any learning environment, students who have been raised in Native American

cultures may share some common learning characteristics. For example, based on the understanding that it is respectful to perform a task well, some Native American students may skip test questions on unfamiliar topics due to a fear of not performing as expected (Morgan, 2009; Pewewardy, 2002). Additionally, in many Native American cultures, parents and elders teach children new skills through demonstrations and modeling. According to Pewewardy (2002), “children are expected to watch, listen, and then do” (p. 29). Thus, Native American students may learn better from content delivered in multiple mediums, such as graphs, videos, photographs, demonstrations, and active learning experiences (Morgan, 2009; Pewewardy, 2002).

This strategy of teaching information across different modalities is supported by Paivio’s dual-coding theory (Paivio, 1971), which postulates that verbal and visual information are processed and encoded separately and that both interconnected pathways are essential for learning. According to this theory, concepts that are encoded both verbally and visually can be recalled more readily than can information that is only coded via one of these systems (Cuevas & Dawson, 2018; Hodes, 1994). Additionally, this dual-coding process possibly “contributes additively to memory performance,” and image-based memories are generally more powerful than verbal memories (Paivio, 1986, p. 225). Presenting concepts both visually and verbally is fairly straightforward for concrete nouns such as “house,” “car,” “fox,” or “flower.” However, it becomes much more difficult when the words being addressed are abstract concepts such as “analyze,” “compare,” and “infer” (Bates & Son, 2020; Wang & Li, 2019).

Development of Community Partnerships

The motivation for this study came from a community-identified desire to expand academic vocabulary and improve achievement among students, and we chose a community-based participatory research (CBPR) framework. There are many definitions of CBPR in the literature (L. W. Green & Mercer, 2001; Minkler, 2005; D. Robinson et al., 2014), most of which focus on equitable collaboration, shared decision-making, and co-ownership with those in the community who would be impacted by the project (Israel et al., 1998). These components are important when

partnering with Native American communities, where maintaining trust between community members and academic researchers is key (Christopher et al., 2008; Rogers & Petereit, 2005).

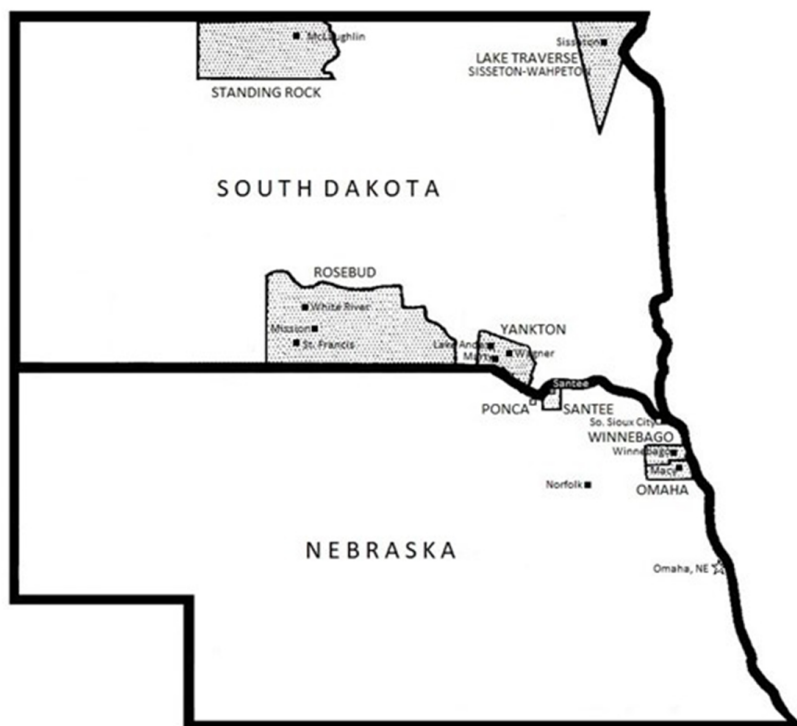
A CBPR research framework mirrors the approach we have taken with our Native American community partners since the inception of our project. For more than 15 years, we have nurtured trusting relationships with communities on Indian reservations in Nebraska and South Dakota. We received our first Science Education Partnership Award (SEPA) grant from the National Institutes of Health in 2005; our goal was to facilitate a pathway to success in the health care field by introducing students to health professions and by providing opportunities for them to prepare for postsecondary and health professions education.

Using colleagues’ preestablished relationships with Native American communities as a starting point, we built rapport with administrators, teachers, students, tribal elders, and other members of Native American communities (Figure 1). Since the inception of the grant award, we have partnered with 14 schools or school districts representing at least eight Native nations.¹ An advisory board serves to maintain our commitment to fully engaging community members. A standing open invitation exists for interested community members to participate on the board, and their input ensures that our contributions meet their individual and local educational needs. An average of 20 community members along with the academic research team have regularly participated on the board, which meets at a central location for half-day meetings three times per year to discuss ideas, concerns, programming, and areas of need. During the height of the COVID-19 pandemic, board meetings continued via Zoom. Board members have been partners in our efforts and have shared in decision-making since the beginning.

We worked with advisory board members to administer needs assessment surveys to partner school personnel in 2006 and again eleven years later in 2017. With guidance from the advisory board, we have developed formal and informal educational programs, including teacher professional development and summer camps for students. Rather than imposing ideas and curricula, our programs have responded to the needs expressed by our schools and communities.

¹ Information about some of our activities can be found at <https://www.unmc.edu/mmi/training/sepa/index.html>

Figure 1. Community Partner Locations (Gray Areas Indicate American Indian Reservations)



We have also nurtured our relationships with community participants through community visits. Because our grant serves schools in reservation communities spread across Nebraska and South Dakota (see Figure 1), the research team's principal investigator and educational consultant have made determined efforts to visit each partner school every fall. In addition, they have visited schools for in-service days, summer workshops, classroom visits, presentations, and meetings with tribal council members to maintain open lines of communication.

We identified common strategies teachers use to support their vocabulary lessons, such as graphic organizers, word games, shared class journals, and word walls (Casteel & Narkawicz, 2007; Christopher et al., 2008; Cuba, 2020; Moody et al., 2018; Rogers & Petereit, 2005). Collaborating with our partner teachers and administrators, we developed vocabulary "word-wall" cards that we termed "Winning Words for Success." These cards incorporated the principles of dual-coding theory by combining both visual and verbal cues.

The purpose of this CBPR study was to work with our community-based colleagues to create cards that would help students better understand the meanings of abstract vocabulary words often

found in the academic register. Our specific objectives were as follows:

1. Collaborate with our community educational leaders on improving Native American students' academic vocabularies.
2. Pair visual images (nonlinguistic representation) with abstract concepts to give students something concrete to which they can anchor or refer prior knowledge.
3. Encourage teachers in our partner schools to use these academic vocabulary pairings in their lessons.
4. Determine whether these pairings would help students better comprehend academic vocabulary.

Methods

To assemble the Winning Words for Success team, we used several methods to recruit teachers and administrators. These methods included sending flyers to school, implementing a snowball sampling method (Sedgwick, 2013), and inviting members of the advisory board (including the teachers who proposed the idea). Over the course of the project, our team included 7-10 community teachers and/or administrators from tribal schools. Some were Native American, and all were educators

in Native American communities. In addition to community members, the study team included a PhD investigator, an educational curriculum specialist, a health science education coordinator from an academic medical center, a district curriculum/assessment coordinator, and a graphic artist. This project was determined by the institutional review board to be educational evaluation and not to constitute human subjects research.

The Winning Words for Success team worked through several phases to develop a series of cards that each included an abstract academic term, a verbal explanation of the desired action associated with the term, and a corresponding image that illustrated the concept (Figure 2). Study team members engaged teachers from our partner Native American communities by inviting them to share the cards with their students. Based on direct and indirect feedback from both teachers and students, we focused on test-specific instructional and academic terms such as “analyze,” “compare,” and “infer.” The long-term goal of these cards was to improve students’ academic vocabulary, comprehension, and test performance by combining visual and kinesthetic modalities of learning with verbal instruction.

Development of Intervention (Phase 0)

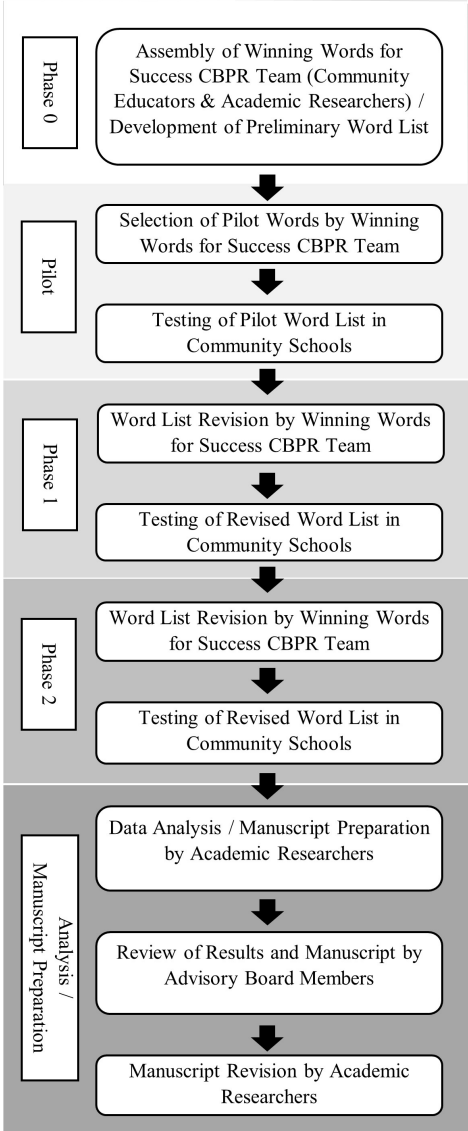
The district curriculum/assessment coordinator compiled a list of 169 terms used in Nebraska State Accountability (NeSA) Practice Test questions for students in Grades 3–12. Additional terms were identified via a web page defining common exam instruction words (*Defining Common Exam Instruction Words*, 2021). Guided by members of the academic research team, the community educators selected the most frequently used terms from this list along with those they believed would be most beneficial for their students to understand. In addition, they identified several other words to add to the list. Altogether, they chose 16 terms for the pilot test of Winning Words (see Appendix).

After the words were selected, the team turned to the graphic designer to create word-wall cards to aid students in the retention and comprehension of these abstract concepts. Each card included the academic term, a visual image that illustrated it, and a written explanation of the term (Figure 3).

Pilot Test (Phase 1)

Prior to the 2014–2015 school year, we gave these pilot word-wall cards to principals at six elementary, middle, and high schools in our

Figure 2. Community-Based Participatory Research Process



partner community school districts and requested that they share them with their classroom teachers. Participating classroom teachers individually determined how they would incorporate the cards into their classroom activities.

Along with the cards, we included a 16-question test that asked students to match each term with its corresponding explanation. Teachers administered the test to their students before they began using the cards in their lessons. As part of their lessons, they presented the words and explained the accompanying visuals to ensure that students understood the connection between the images and the words. Further, teachers were asked to post the cards on their classroom walls and to use the words in their own assessments

so that students would become familiar with and have opportunities to use these words in classroom settings. Six months after they began using the cards, teachers administered a posttest. Finally, classroom teachers “closed the loop” by providing unstructured feedback to the collaborative development team regarding the pilot cards, instructions, selected words, and images.

Revisions

Based on this feedback, during the summer following the pilot test, seven community-based teachers joined the academic team in a work session to improve and expand the Winning Words cards. These teachers represented elementary, middle, and high school grades and included specialists in science, English, and special education. Together, this group:

- revised the word explanations as needed based on their experiences in the pilot test;
- identified additional words to be included in the set;
- developed two lists of words, one specifically for elementary students (Grades 2–5; $n = 23$ words) and the other for middle and high school students (Grades 6–12; $n = 30$ words; see the Appendix for all of the word list modifications);
- recommended revisions of the visual images;
- completed a “wish list” of adaptations, including a possible electronic version of Winning Words; and
- modified the pretests and posttests to be grade-level appropriate.

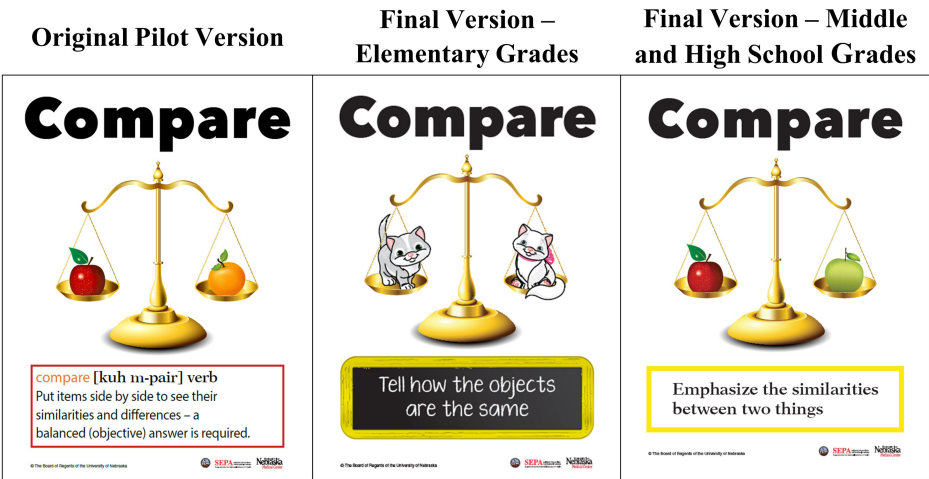
Figure 3. An Example of the “Compare” Word Card



As a result of this work session, we made several changes to the word cards. Figure 4 illustrates the progression of one of the cards. Color bands corresponding to Webb’s depth of knowledge levels (Webb, 2002) were added (see the yellow frames around the concept explanations in the two final cards in Figure 4). In response to teachers’ requests, we also developed two classroom review games to provide additional exposure to the material and to reinforce learning.

In addition, the team added a kinesthetic component to the vocabulary instruction by developing a flipbook template based on Zike’s theory of using Foldables®: three-dimensional graphic organizers that students interact with

Figure 4. The Development of the “Compare” Word Card



to make learning concepts both visual and kinesthetic (C. Robinson, 2018; Zike, 2009). The flipbooks incorporated both the visual elements of the cards (words, pictures, and explanations) and the kinesthetic component by allowing students to construct booklets from the templates and add their own notes, references, and examples. This type of graphic organizer can improve information retention and recall for students of all ages and skill levels and can allow students to take ownership of their learning (Bos & Anders, 1992; Moody et al., 2018; Ritchie & Volkl, 2000).

Phases 2 and 3

Classroom teachers from the partner schools involved in pilot testing used the revised grade-specific cards and other materials during the 2015–2016 school year (Phase 2). Some teachers had used these materials previously, while others were using them for the first time due to faculty turnover and other factors. Students in Grades 2–5 used the 23 elementary-level cards, and those in Grades 6–12 used the 30 middle/high school cards. To keep the length of the pre- and posttests manageable for both groups, the tests included only 15 words chosen from the longer word lists. Students took pretests at the beginning of the school year and posttests at the end of the year.

Based on Phase 2 test results, the collaborative team further narrowed the cards' use; in the 2016–2017 school year (Phase 3), the cards were

only used with elementary school students, excluding second graders. Students in these grades have been shown to benefit from targeted vocabulary instruction (Hairrell et al., 2011). In addition, it is at these younger ages when students are first exposed to standardized testing and begin to develop their testing and reading comprehension skills. Phase 3 students were tested in the fall, winter, and spring, corresponding with the school's scheduled testing cycles.

Results

Pilot Test (Phase 1)

We collected pre- and posttest scores from students in Grades 4–12 across six schools, with complete data from 446 students. Of these, 51% were female and 87% were Native American. The average pretest score was 2.98 out of 16 possible points (18.6% correct; $SD = 2.8$), and the average posttest score was 6.71 out of 16 (42.1% correct; $SD = 4.2$; see Table 1). Results of a repeated measures t test indicated a significant improvement in scores from pre- to posttest ($p < 0.001$). When results were examined by grade level, students at all grades except 12th grade showed significant improvement.

Phase 2

Grades 2–5. There were 277 students from four schools who participated in the elementary school version of Phase 2. Of these, 48.7% were female

Table 1. Pilot Testing Outcomes (Number Correct), by Grade Level

		Pretest			Posttest			t	p
		n	Mean	SD	Mean	SD			
Overall		446	2.98	2.8	6.71	4.2	−20.91	< 0.001	
Grade	4	61	2.05	2.2	5.05	4.3	−6.23	< 0.001	
	5	104	2.96	3.0	6.92	3.8	−11.13	< 0.001	
	6	92	2.74	2.7	7.38	4.0	−11.59	< 0.001	
	7	38	4.34	3.8	8.24	4.4	−5.12	< 0.001	
	8	41	3.68	3.0	7.98	4.6	−7.76	< 0.001	
	9	49	3.20	2.3	5.76	3.9	−5.63	< 0.001	
	10	30	2.43	1.9	5.67	4.4	−3.95	< 0.001	
	11	22	2.77	2.3	6.45	3.3	−5.70	< 0.001	
	12	9	4.11	2.7	5.56	2.4	−1.73	0.122	

and 87% were Native American. Teachers in these classrooms used the 23 revised elementary-level cards and the revised pre/posttests that consisted of 15 of the 23 words.

The average pretest score for these students was 5.76 correct out of 15 words (38.4%; $SD = 3.4$) and the average posttest score was 8.62 correct (57.5% correct; $SD = 4.0$; Table 2). Analyses using repeated measures t tests revealed that, similar to the pilot results, students at each grade level except second grade, and overall, showed significant improvement following exposure to the intervention.

Grades 6–12. In addition to the 277 elementary school students, 290 middle and high school students from five schools participated in Phase 2. Similar to the other samples, 50.3% of these students were female and 93% were Native American. These students received the revised

middle/high school cards, which contained 30 words, and the revised pre- and posttests, which included 15 of the 30 words.

On average, these students got 4.52 items correct out of 15 possible (30.1% correct; $SD = 3.1$) on the pretest and 6.64 items correct (44.3% correct; $SD = 6.3$) on the posttest (Table 3). Repeated measures t test analyses indicated that this was a significant improvement ($p < 0.001$). However, when examined at a grade-by-grade level, only those in the sixth and eighth grades demonstrated significant improvement from pre- to posttest.

Phase 3

In Phase 3, the 23 elementary-level cards were used in Grades 3–5. Students were tested (using the 15-item test) three times during the school year, rather than two. A total of 288 students

Table 2. Phase 2 Elementary Testing Outcomes (Number Correct), by Grade Level

		Pretest			Posttest			
		<i>n</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	<i>t</i>	<i>p</i>
Overall		277	5.76	3.4	8.62	4.0	−11.47	< 0.001
Grade	2	35	3.84	2.8	4.52	2.7	−0.74	0.465
	3	10	4.50	1.9	7.78	3.9	−3.52	0.008
	4	141	6.28	3.9	9.53	4.0	−8.97	< 0.001
	5	91	5.45	2.7	8.81	3.3	−7.57	< 0.001

Table 3. Phase 2 Middle and High School Testing Outcomes (Number Correct), by Grade Level

		Pretest			Posttest			
		<i>n</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	<i>t</i>	<i>p</i>
Overall		290	4.52	3.1	6.64	6.3	−5.37	< 0.001
Grade	6	95	5.60	2.9	9.37	3.9	−10.87	< 0.001
	7	37	2.50	2.1	5.16	13.3	−1.29	0.210
	8	32	3.61	1.7	6.32	3.9	−2.76	0.012
	9	22	4.36	3.2	3.45	2.6	1.59	0.128
	10	53	4.12	3.6	4.33	2.8	−0.79	0.433
	11	15	4.62	2.2	5.64	2.3	−2.17	0.062
	12	36	5.94	3.9	6.17	4.1	−0.69	0.496

Table 4. Phase 3 Elementary Testing Outcomes (Number Correct)

	All students			Students tested at all three time points ^a		
	<i>n</i>	Mean	<i>SD</i>	<i>n</i>	Mean	<i>SD</i>
Fall	265	6.72	4.1	83	6.35	4.1
Winter	254	7.97	4.6	83	7.06	4.6
Spring	106	8.06	4.4	83	8.14	4.6

^a Scores improved significantly from fall to spring ($p < 0.001$) and from winter to spring ($p = 0.014$).

completed at least one test administration, but only 83 students had test scores for all three time points.

Overall, the mean test score improved steadily—from an average of 6.35 correct out of 15 possible (42% correct; $SD = 4.1$) in the fall to 8.14 correct out of 15 possible (54% correct; $SD = 4.6$) in the spring (Table 4). A dependent analysis of variance including the 83 students who completed the test at all three time points indicated no statistically significant change from fall to winter ($p = 0.063$) but a statistically significant improvement from winter to spring ($p = 0.014$) and from fall to spring ($p < 0.001$).

Partner Review

We shared the results of our analyses and early versions of this manuscript with the SEPA advisory board, including many of the partnering teachers and administrators, during the scheduled meetings. Attendees were asked for recommendations at each step, and they offered suggestions for analyses as well as small changes to the wording of the manuscript. In addition, they had the opportunity to make further recommendations for future iterations of the project.

Discussion

The goal of our study was to partner with community-based educators to determine whether linking visual images to abstract academic register words and explanations of the associated actions would aid students, primarily Native American students, in their understanding of academic and instructional terms. The knowledge and experience that our community partners contributed as part of the CBPR team strengthened our study. Community educators who had a vested interest in the outcome were vital decision-makers in the development and testing processes.

While our sample size was relatively small, this study lends some credence to the idea that students may benefit from a combination of verbal,

visual, and kinesthetic presentations of academic vocabulary words. A multimodal instructional intervention based on dual-coding theory (Paivio, 1971) may help students better understand words from the academic register that are often found in test instructions and questions. Results of Phase 3 of our project, in which the students were tested three times over the course of a year, suggest that more prolonged, continuous exposure to the terms may result in a stronger effect.

There is no indication that testing with written directions will disappear from classrooms in the near future; therefore, it is essential that all students be exposed to these materials and given every opportunity to effectively demonstrate their understanding and use of these terms. Some students may have difficulty understanding instructional words in test questions (Marzano & Pickering, 2005), and students who have stronger academic vocabularies will undoubtedly have additional opportunities to succeed (Sprenger, 2013). Furthermore, it is important to acknowledge that Native American children may have different lived experiences and ways of knowing, which may contribute to feelings of alienation in the classroom (Brayboy & Lomawaima, 2018; Moreno, 2021). Additionally, research shows that increasing teachers' understanding of Native American culture may improve educational outcomes in Native American students (Center on Standards and Assessment Implementation, 2019; Vincent et al., 2017). Working closely with members of Native American educational communities ensures that their expertise and sociocultural perspectives and needs are honored. In our case, they were valuable partners in developing an intervention that embraces alternative ways of knowing by providing students with multiple pathways for encoding the meanings of instructional vocabulary words.

This study benefited from an evidence-based foundation for developing the word lists. A great deal of research suggests that combined verbal

and visual encoding is beneficial for learning and memory (Cuevas & Dawson, 2018; Ding et al., 2017; Frisch et al., 2013; Morett, 2019). Although research indicates that this strategy is especially effective for learning concrete words (Bauch & Otten, 2012; Ding et al., 2017; Paivio et al., 1994), it is more difficult to make these verbal/visual connections with abstract concepts such as those in our study. Rather than providing definitions of the academic assessment words, we instead gave students direction or actions to be taken in response to these words.

As the project progressed, we eventually restricted our sample to students in Grades 3–5. Vocabulary instruction tends to be emphasized to a greater degree at these grade levels, and research shows that children in this age range learn six to eight new words per day (Nagy & Anderson, 1984). Additionally, students are generally in self-contained classrooms at these lower grade levels, while students in upper grade levels usually move between classrooms and teachers during the school day. Students outside of this Grade 3–5 range may or may not benefit from similar interventions.

Future iterations of this or similar projects might benefit from a more structured implementation of the Winning Words cards. We wanted to give teachers flexibility to use the cards in ways that fit with their teaching methods. They were in charge of their own classrooms, and they implemented the Winning Words cards differently. Some teachers fully integrated the cards into their lessons, while some chose not to use them at all. Several teachers administered the pre- and posttests as scheduled, while others only administered the test one time. Many teachers received mandates from their administrators to incorporate the Winning Words materials into their teaching, while others voluntarily adopted the project on their own. Newer teachers who were not involved in developing the Winning Words and did not receive the initial face-to-face introduction to the cards may have been less comfortable incorporating the cards into their classrooms. Future CBPR investigators should work with their community members to incorporate the intervention into classrooms more consistently.

The tests we used to evaluate learning were simple vocabulary tests in which students matched each word with its explanation. It is unclear whether results would differ if the Winning Words were placed in the context of actual exam instructions or questions. It is also unclear how much of the demonstrated improvement could be

attributed to the Winning Words cards themselves. Future researchers should try to isolate the effects of the Winning Words cards while ensuring that all students have exposure to the cards. In addition, to truly claim success, future interventions must demonstrate that the Winning Words cards improve performance on classroom grades and/or standardized test scores. These outcomes should be examined before, during, and after the implementation of the Winning Words cards.

Additionally, while our project demonstrated that the Winning Words cards may have improved students' understanding of academic vocabulary words, our overall test scores were still very low; rarely did they surpass 50%. More and better intervention is still needed. Future investigators should incorporate multiple groups to examine the individual effects of the verbal and visual components and develop additional interventions that will further increase students' knowledge.

Our participants consisted of primarily Native American students in rural areas of Nebraska and South Dakota. Our findings may not be generalizable to other populations of students. Additionally, Native American populations are often difficult to reach (Demmert et al., 2006), and our student population is highly transitory, with substantial rates of absenteeism. Loss to follow-up significantly reduced the number of students who completed all three test administrations during Phase 3. Community members can provide strategic input on how to maximize the project's usefulness and how to reduce the impact of student absenteeism on the project's success.

The long-term relationship between the academic research team and the participating Native American schools and communities played a pivotal role in this CBPR project's success. The academic team has worked hard over the past 15 years to develop and nurture an ongoing relationship with members of the Native American community, particularly with individuals who are integral to education. Regular in-person board meetings and annual visits to participating schools and communities allowed strong partnerships to grow organically, and the free-flowing lines of communication between community members and the academic team led to the development of this specific project. Nurturing and maintaining these relationships has always been our first priority.

We were able to develop a core research team because trust and rapport had already been built, and our team's teachers and school administrators

were integrally involved in developing and implementing the intervention. They were partners in every phase of the process, from inception through multiple revisions. This core research team also broadened the scope of the project by connecting us with educators who could help disseminate the intervention in multiple classrooms in multiple schools. The core team and the expanded group of educators incorporated the words into their teaching practices using a variety of techniques, including adding the words to their vocabulary and spelling lessons and using them in their own assessments. They reinforced the concepts with their students by hanging word-wall cards on the classroom walls, using Foldables' graphic organizers, and playing review games.

While community educators were a valuable part of our Winning Words for Success team, we failed to include parents and students as part of our research group, overlooking an important component of the community we serve. Input from parents may have highlighted opportunities for integrated learning opportunities across home and classroom, and student involvement may have illuminated opportunities for incorporating Winning Words into everyday lesson plans.

Conclusion

Our efforts on the Winning Words for Success project seem to verify that students may not understand written test instructions and may benefit from targeted interventions led by their teachers. The use of visual images and a kinesthetic component alongside verbal explanation reinforces the concepts and provides additional support while strengthening connections for learners. Working closely with our community-based partners enabled educators in Native American communities to represent their lived experiences as the project progressed. Teachers and administrators in Native American and non-Native classrooms could easily partner with other experts to incorporate similar innovations in their own schools.

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Appendix. Revisions to Winning Words Cards

Concept	Original Pilot Version Explanation	Final Version: Elementary Grades Explanation	Final Version: Middle and High School Grades Explanation
Analyze	Take apart an idea, concept, or statement and examine and criticize its subparts in detail.		Take apart an idea, concept, or statement and examine and criticize its subparts in detail.
Assess			Describe the topic's positive and negative points and their importance.
Comment		Give an opinion or explanation.	Give an opinion or explanation.
Compare	Put items side by side to see their similarities and differences. A balanced (objective) answer is required.	Tell how the objects are the same.	Emphasize the similarities between two things.
Contrast	Emphasize the differences between two things.	Tell how the objects are different.	Emphasize the differences between two things.
Critique			Give a balanced answer of the topic's weaknesses and strengths.
Define		Tell the meaning of the word.	Give the meaning of the word.
Demonstrate	Show how something works through an illustration, a written statement, or a physical action.	Show how something works.	Show how something works.
Describe	Give details of processes, properties, events, and so on.	Give details using lots of adjectives.	Give details about the topic.
Diagram	Drawing of an illustration, chart, or table.	Make a table or graph.	An illustration, chart, table, or graph.
Discuss		Talk about something in detail.	Describe, give examples, list points for and against, evaluate results.
Evaluate	Similar to discuss, but with more emphasis on a judgment in the conclusion.		Look at all points and form an opinion.
Examine	To take apart and describe a concept or idea in great detail.	Take apart and look at in detail.	Take apart and look at in detail.

Appendix, continued. Revisions to Winning Words Cards

Concept	Original Pilot Version Explanation	Final Version: Elementary Grades Explanation	Final Version: Middle and High School Grades Explanation
Explain	Give detailed reasons for an idea, principle or result, situation, attitude and so on. You may need to give some analysis as well.	Give detailed reasons for an idea.	Give detailed reasons describing the topic.
Illustrate	Give concrete examples including figures and diagrams.	Give examples using pictures or diagrams.	Give visual examples—pictures, figures, and diagrams.
Infer		Figuring out something that wasn't completely explained.	To form an opinion based on events/situations and what you know.
Interpret	To explain and comment and make a judgment or decision.	Tell what you understand and why it's important.	Explain and make a decision on the meaning.
Justify	To give reasons to support a statement.		Give reasons that support a statement.
List		Show individual items in a table or list.	Show individual items in a table or list.
Order	To put in sequence or historical time.	Put in sequence.	Put in sequence—historically by time or date.
Outline		Show important details in order.	Give main points and supporting details.
Prove/ Disprove	Provide evidence for or against and demonstrate logical argument and reasoning.		Provide evidence for or against and give logical reasons.
Provide		Give information.	
Refer		Look back for an example.	Look back for an example.
Relate			Explain how the topics are connected.
Review	Analyze and comment briefly on the main aspects of a subject.	Tell again in shorter form.	Tell again in shorter form.
Solve		Find the answer.	Find the answer.
State		Give the facts briefly.	Give the facts briefly.
Summarize	Just give the main points, not the details.	Retell with only important points.	Give the main points only, no details.
Trace			Show how something has or will develop over time.