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**PEER-MEDIATED CONSTANT TIME DELAY TO TEACH CONTENT AREA
VOCABULARY TO MIDDLE SCHOOL STUDENTS WITH BEHAVIOR PROBLEMS**

A Dissertation in

Special Education

by

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ABSTRACT

Vocabulary knowledge is essential for reading comprehension and general academic success for all learners. For students with problem behaviors, the substantial vocabulary loads encountered in secondary settings and content-area texts can be especially challenging. A multiple-probe design study was used to evaluate a peer-implemented constant time delay intervention to teach science and social studies definitions to 6 middle school students (2 with and 4 without identified learning disabilities) nominated as exhibiting problematic classroom behaviors. Overall, students demonstrated relatively efficient mastery of target definitions they were taught as well as those definitions they taught peers. Learning generalized to word reading and word production upon exposure to definitions, and to a lesser degree recognition of correct usage on a multiple-choice measure. Learning maintained at 4 and 10 week post-instruction probes but diminished at the end of the academic year. Implications for practice and future research are discussed.

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DEDICATION

To Brendan, who made this possible, and Elliot, who made this worthwhile.

Chapter 1

Introduction

Language difficulties present academic challenges for students who exhibit problematic behaviors in the classroom (e.g., talking out, work refusal, fighting) and these difficulties manifest in academic performance. Students with behavior problems often concurrently experience a host of negative academic and social outcomes that hinder their school success. Whether or not they have identified disabilities such as learning disabilities (LD) or emotional/behavior disorders (EBD), students who display significant problem behaviors tend to lag behind their peers academically. Reading problems are a special concern because such a large degree of academic learning is language-dependent and relies on reading comprehension.

Secondary students face specific difficulties in their content-area classes because a large proportion of critical information is delivered from textbooks that may be poorly organized, lack cohesion, and contain a substantial amount of unfamiliar, technical vocabulary (Mastropieri, Scruggs, & Graetz, 2003). Because students with behavior problems are likely to be struggling readers, their difficulties with content-area textbooks may tend to be worse. Thus, it is important to intervene in middle school at a point where content area reading becomes a greater demand. The main purpose of this study is to investigate whether middle school students with teacher-identified behavior problems are able to efficiently learn definitions of unknown content-area vocabulary words from their textbooks via a peer-mediated constant time delay (CTD) intervention. A secondary purpose is to determine if they incidentally learn their partners' definitions.

It is well-documented that vocabulary knowledge is a critical component of reading comprehension (Baumann & Kameenui, 1991; National Reading Panel [NRP], 2000) and a prerequisite for fluent reading (e.g., Joshi, 2005). The correlation between vocabulary knowledge and reading comprehension has been demonstrated across all grade levels and in many countries (Joshi). A great proportion of academic learning is language-based and thus largely dependent on vocabulary (Baker, Simmons, & Kameenui, 1995).

The increasing heterogeneity of American classrooms has led to growing recognition that struggling readers and students with special educational needs require more support in the area of vocabulary development to achieve their academic potential than has been typically offered in mainstream classrooms. Traditional methods of addressing vocabulary such as weekly word lists do little to help learners progress towards the two key goals of vocabulary instruction outlined by Baker, Simmons, and Kameenui (1995); (1) increase total number of words learned beyond what could be expected in a given time frame, and (2) reduce the gap between students with rich and poor vocabularies.

The vocabulary gap presents itself early and grows wider with each successive year of schooling. For example, Chall, Jacobs, and Baldwin (1990) found that children from low-income backgrounds were largely on grade level for academic vocabulary through 3rd grade, but by 4th grade they had fallen behind, and this trend exacerbated with age. Beginning in 4th grade, vocabulary measures included more words that were either abstract or very specific and context-bound. These low-income students were more likely to demonstrate grade-level academic vocabulary mastery in 4th grade when they had teachers who addressed vocabulary in the content areas.

Developing and validating effective vocabulary interventions and understanding the components of appropriate vocabulary instruction for struggling readers are particularly important in secondary settings because as students progress through grade levels, curricula increasingly rely on vocabulary (Harmon, Hedrick, & Wood, 2005). Relatedly, in inclusive settings it is important to develop interventions that not only assist students with behavior problems, but their peers without these issues as well. Teachers are responsible for the education of all their students and are more likely to use a particular instructional method if it is appropriate for all their students. A recent meta-analysis of vocabulary instruction for students with LD (Jitendra, Edwards, Sacks, & Jacobson, 2004) concluded in part that direct methods of instruction should be emphasized and that practice maximizes intervention effects. These findings are largely consistent with other research on vocabulary instruction for students with LD (e.g., Bryant, Goodwin, Bryant, & Higgins, 2003) or non-disability-specific vocabulary research (e.g., NRP, 2000).

Many literacy researchers (e.g., Baumann, Simmons, & Kamennui, 1991; Jitendra et al., 2004; NRP, 2000) agree that a fundamental underpinning of well-designed vocabulary instruction is alignment of academic goals and instructional methods. Words that occur frequently across multiple contexts and/or have several common meanings should be taught to the generation (Stahl & Fairbanks, 1986) or full concept knowledge (Kameenui, Simmons, & Darch, 1987) level. This allows students to develop decontextualized word knowledge useful to them in both their receptive and expressive vocabularies. Standards for utility in the receptive vocabulary alone, however, are significantly less stringent (Baumann & Kamennui, 1991) and may be met by association-level (i.e., between a word and a single definition or synonym) knowledge.

The interdependence between vocabulary and reading achievement that increases as students advance through school (Baker, Simmons, & Kammenui, 1995) occurs in all domains but is particularly notable in content-area classes because textbooks involve a substantial amount of low-frequency (Harmon, Hedrick, & Wood, 2005), specific, and unfamiliar vocabulary (Mastropieri, Scruggs, & Graetz, 2003). In order to understand a selection from a secondary science text, for example, students need to have a basic (association level) understanding of included words that may be highly technical (e.g., oxidize, parallax) and unlikely to occur in other contexts. Broader knowledge of higher-frequency words (e.g., determinant, improbable) that occur across contexts also plays an essential role in acquiring content knowledge. Students must have a well-developed knowledge base of the high- and low-frequency words and concepts encompassed in each selection in order to understand what they read (Harmon, Hedrick, & Wood).

Even familiar words can refer to at least slightly different concepts in the context of a textbook than they do through the course of typical adolescent reading or conversation (Harmon, Hedrick, & Wood, 2005). For example, if students understand the word *pardon* means *excuse* when someone says, “Pardon me,” they may not grasp the meaning of, “The Governor pardoned four men who had been sentenced to death.” Students familiar with the word *discount* in the context of shopping, where it indicates a reduction in price, might not understand that a *discounted* opinion would be disregarded

entirely. Difficulties posed by unfamiliar words or unique usage of known terms are exacerbated for struggling readers and/or those with poor vocabularies. The amount and complexity of information to which students are exposed in secondary settings, particularly in content-area classes, increases dramatically concurrent with increased heterogeneity of educational needs in individual classrooms (Bulgren, Deshler, Schumaker, & Lenz, 2000) which creates a difficult task for teachers who have to design and implement instruction to meet the diverse needs of all their students. This is especially difficult in situations where content-area teachers have no or little control over textbook selection and must use a single title for all their students regardless of student reading ability or textbook composition.

Characteristics of typical content-area texts often function to make comprehension difficult. Texts may be written at grade levels higher than the classes in which they are used (Kinder, Bursuck, & Epstein, 1992), contain vocabulary loads approaching the total number of words students may be expected to learn a year (Yager, 1983), and be organized in such a way to make comprehension onerous (Armbruster, 1984). Teachers may have a variety of tools to make these texts more understandable such as graphic organizers and study guides, but vocabulary knowledge is necessarily an internal limiting factor to the effectiveness of such external supports.

Because reading requires use of receptive vocabulary, it may not be necessary (and may, in fact, be wasteful) to invest large amounts of teacher and student effort as well as limited class time teaching particular words to levels deeper than association. Instructional efficiency is a key consideration for all learners, though it is most critical for students behind their peers in academic achievement. Whether the reason for academic struggles is related to a disability, behavior problems that prohibit optimal learning, a history of negative educational experiences, or some combination of these factors, in order to succeed, these students need effective instruction presented in an efficient manner. Due to characteristics of typical textbooks, the quantity of unfamiliar vocabulary that students must learn in order to comprehend their lessons is large. For students with behavior problems and/or LD who may have significant vocabulary and general reading deficiencies, the need for expeditious vocabulary instruction is clear.

Research has shown CTD procedures to be effective and efficient compared to other instructional methods used to teach academic skills (McDonnell, Johnson, Polychronis, & Risen, 2002; Schuster, Stevens, & Doak, 1990), and to have low error rates (Wolery, Ault, & Doyle, 1992). In terms of vocabulary instruction, CTD is a response prompting strategy with two defining characteristics: (a) initial trials involve presentation of the target stimulus (e.g., vocabulary word) followed immediately by the controlling prompt (e.g., definition), and (b) subsequent trials involve presenting the target stimulus followed by a fixed interval during which the student may respond by providing the controlling prompt, followed by reinforcement if the prompt is provided, or presentation of the controlling prompt as error correction if the student fails to do so (Wolery, et al.). CTD has been used successfully in a classwide peer tutoring format to teach vocabulary definitions to 6th graders with and without LD with high efficiency and low error rates (Hughes & Frederick, 2006).

Apart from selecting instructional methods such as CTD that are demonstrated to be efficient, an additional way to optimize available instructional time may be to capitalize on opportunities for incidental learning by having students work on acquiring definitions in pairs. Promoting opportunities for incidental learning permits more information acquisition in the same amount of instructional time. Grouped instructional arrangements may have a potential benefit in addition to efficiency for students with social difficulties that commonly accompany behavior problems and LD because these arrangements allow structured opportunities for students to engage in appropriate peer interactions.

Students who exhibit disruptive or otherwise problematic classroom behavior tend to be behind their peers in academic achievement. They also receive lower amounts of positive teacher attention and report elevated rates of academic disengagement, often leading them to fall further behind academically. Because these problems do not typically resolve over time without intervention, by the time students with behavior problems reach secondary school their situation is urgent. Language difficulties often experienced by students with behavior problems make it likely that they will require intervention to improve their vocabularies in order to make progress towards both increasing their overall word learning and reducing the vocabulary gap with their peers.

Reducing the vocabulary gap is a complex endeavor that is rightly the purview of teachers of all subjects. However, the high load of unfamiliar and technical vocabulary in textbooks is a specific barrier to success in science, social studies, and other content-area classes. Overcoming this barrier by increasing word learning may prove simpler than broad-based vocabulary gap reduction because these words do not need to be learned deeply for comprehension to improve. To address the efficacy of using a peer-mediated CTD procedure as a means of enhancing vocabulary learning, five experimental questions were posed. First, could middle school students with teacher-identified behavior problems verbally demonstrate acquisition of unknown content area target vocabulary definitions via a peer-mediated CTD intervention? Second, could the students verbally demonstrate incidental acquisition of unknown content area vocabulary definitions as a result of teaching those definitions to their partners? Third, would the students be able to correctly read target and non-target words out loud? Fourth, when presented with definitions, could the students verbally produce vocabulary words? And fifth, would students demonstrate recognition of correct usage of vocabulary words in sentences on a written multiple-choice measure?

Chapter 2

Methods

Experimental Design

A multiple probe design (Tawney & Gast, 1984) was used to assess effectiveness of a peer-delivered CTD vocabulary intervention for middle school students with teacher-identified problematic behavior. This variation of the multiple baseline design was selected because it maintains the experimental control of multiple baseline studies by sequentially introducing the independent variable (in this case, peer-mediated CTD vocabulary instruction) to one participant at a time while baseline data are collected intermittently rather than continuously on behaviors yet to be introduced. This has the benefit of minimizing negative behaviors such as noncompliance resulting from frustration that may occur when students are repeatedly asked to perform a skill they have yet to learn, especially for students who receive intervention toward the end of the study because they would spend the most time in the baseline phase of the intervention.

Three dyads were formed and each dyad had two stable baseline sessions at the beginning of the study. The first dyad to engage in the intervention phase had a third baseline session prior to intervention, and each subsequent dyad had two baseline sessions before beginning their intervention phase in order to establish that rates of correct responding were consistently at 0%. Both members of each dyad had to reach criterion before the next pair began the intervention phase.

Setting

The study took place in an urban charter school in a large northeastern state. Total school enrollment was 320 students in grades 5-8. Forty-one students had identified special needs and the principal reported that approximately 15 students without identified disabilities had behavior problems significant enough to impact their learning and that of their peers in the classroom.

Eighty percent of the student population was African-American and 20% was Hispanic. Ninety percent of the student body was receiving federal free or reduced-price lunches based on family income, and gender distribution was roughly equal. Instructional and probe sessions took place in vacant rooms

around the school—most often in the library but also in conference rooms and occasionally empty classrooms.

Participants

Participants were six 6th grade students identified by at least two teachers as displaying significantly problematic classroom behavior that was outside the norms of typical and expected school behavior (e.g., shouting across the room during class, fighting). All students were assessed to ensure they possessed sufficient verbal imitation skills to participate in the study. For the verbal imitation assessment, 15 phrases of length and structure comparable to the target definitions were selected and the researcher read each phrase to each student individually and instructed him/her to repeat it. All students did this with 100% accuracy.

Four girls and two boys participated in the study. All were African-American and all qualified for free lunch based on their families' incomes. Tamika was 13 years old with a 4th grade reading level at the beginning of the study and had no identified special education needs. Keisha was 12 years old and diagnosed with a Specific Learning Disability in the area of reading comprehension and a 4th grade reading level. Jamila was 11 years old with a 6th grade reading level at the time of the study and had no identified special educational needs. Jatara was 12 years old with a 4th grade reading level and no identified special educational needs. Jamar was 12 years old with an identified Specific Learning Disability in the area of reading comprehension and had a reading level of 4.6 (i.e., between 4th and 5th grade). Keon was 12 years old, had no identified special educational needs, and had a 7th grade reading level. There was no indication in any students' files that they had been assessed for possible language deficits (e.g., specific language impairment) although Keisha was receiving weekly speech therapy.

Materials

Word determination flashcards. Potential science and social studies target words were handwritten on one side of index cards and definitions devised by the researcher and approved by the students' science/social studies teacher were written on the back. Twenty words in each content area were used to create a deck of 40 cards.

Training flashcards. A stack of 10 flashcards to be used to teach participants to conduct the CTD intervention was created by taking sample words from a geometry text. One target vocabulary word was written on the front of each card, and a glossary definition with three underlined key words was written on the back.

Intervention flashcards. A stack of flashcards containing each target word three times (21 total cards) was created for each content area. Target words were written on the front and definitions were written on the back. Additionally, three key words or phrases per definition were underlined in order to provide a simple way for students to approximate whether or not their partners were able to produce a correct definition. See Figure 1 for a sample flashcard. Scoring sheets used by student pairs during instructional sessions were created and are available in Appendix E. Intervention cards were also used to assess generalization (i.e., word reading and word production upon exposure to definition) and incidental (non-target) definition acquisition and for maintenance checks.

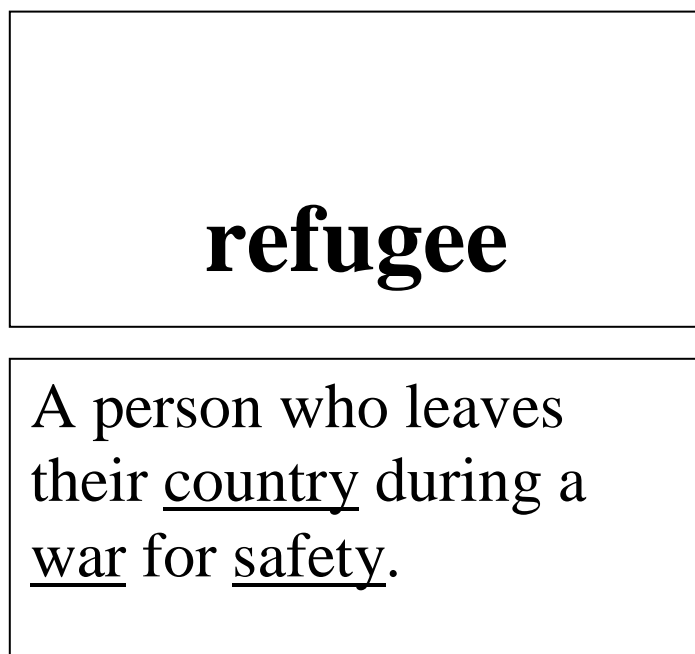


Figure 1: Sample Flashcard

Correct usage recognition generalization assessment. A 14-item multiple-choice test was developed in which each target word was the subject of 1 item. Each item consisted of the target word

above four sentences: one in which the target word was used correctly and three in which it was used incorrectly. Sentences were labeled a-d and position of the correct choice was randomized across items.

Measures

Independent variable. The independent variable was a peer-delivered CTD vocabulary intervention. Participants were assigned partners and provided instruction to their partners on seven definitions from either science or social studies content areas, and received instruction from their partners on seven definitions from the other content area.

Dependent variables. The dependent variable was percent correct of target word definitions stated during instructional and probe sessions in the main phase of the study and for probe sessions during maintenance checks. Percent correct was calculated by dividing the number of correct responses by 21, the number of trials in each session. During instructional sessions, tutors marked their partners' responses as correct if the tutee started to speak within five seconds of word presentation and provided a definition that included all underlined words.

Other variables of interest measured generalization: (a) percent correct target words stated by participants after listening to definitions, (b) percent target and nontarget words read out loud correctly upon visual presentation of the words, and (c) number of correct responses on a multiple-choice exam in which students had to identify correct usage of target and nontarget vocabulary. Number rather than percent was the measure of interest on the multiple-choice exam because the total number of opportunities to respond was fewer than 20 (Tawney & Gast, 1984) and small changes in number correct could translate to relatively large and potentially misleading changes in percentage. Percent correct definitions stated after visual presentation of nontarget words (i.e., each student's partner's target words upon which the student received no direct instruction) was also recorded to serve as a measure of incidental learning.

For the multiple-choice generalization exam, every effort was made to create a set of incorrect choices that each varied one (and only one) of the underlined words or phrases for all terms. For example, the definition for the social studies target word *refugee* read, "A person who leaves their country during a

war for safety.” One incorrect choice depicted a person moving across town (varying “country”), another described a person moving during the hurricane season (varying “war”), and the third represented a person moving to save money (varying “safety”).

Due to the nature of six definitions (i.e., definitions for the words *xenophobia*, *monopoly*, *assimilate*, *cell*, *trachea*, and *pathogen*), it was not possible to construct incorrect choices in this manner for each target word. For example, the definition for the science target word *trachea* read “The tube in the throat that moves air to and from the lungs,” and a choice depicting something other than air moving to and from the lungs would be incorrect, but it would also be nonsensical and would thus increase the chances of a correct response without the corresponding knowledge the item was meant to assess. Directions read, “Circle the letter of the sentence that shows an example of each bolded word.” An example item appears below.

Refugee

- (a) Marnie and her mother went to live with cousins in another country during the war because they wanted to save money.
- (b) Marnie and her mother went to live with cousins on the other side of town during the war because they didn’t want to get hurt.
- (c) Marnie and her mother went to live with cousins in another country during the war because they didn’t want to get hurt.
- (d) Marnie and her mother went to live with cousins in another country during the hurricane season because they didn’t want to get hurt.

In this example item, choice (a) varies “safety,” (b) varies “country,” (d) varies “war,” and all are incorrect. Choice (c) is the only one that does not vary any key definitional elements and is the correct option.

Procedures

Target word selection. Twenty potential target words in each content area were generated by the students' science/social studies teacher based upon importance to instructional goals and perceived likelihood that definitions would be unknown to all students. The researcher devised functional definitions of all potential words and the teacher approved the definitions as capturing the essential ideas as they would be used in future lessons. Forty flashcards with a potential word on one side and the corresponding definition on the reverse were created for target word selection.

In order to determine whether words were known or unknown, each flashcard was displayed to participants individually by the experimenter who asked students to verbally provide a definition. If a student was unable to produce an approximate definition within 15 seconds for two consecutive trials, the word was included as a candidate for training. Words deemed unknown by all participants were separated and seven words per content area were randomly selected for instruction.

Intervention training. The experimenter trained one special education teacher and one administrative staff member in the procedures of the CTD intervention. First, the experimenter provided a brief overview of the theoretical underpinnings of CTD in academic settings and described the study procedures including error correction and data sheet usage. Next, the experimenter acted as the tutor and used the practice set of geometry flashcards to conduct a session with each school staff member acting as the tutee. Then the school staff participated in two instructional sessions, playing the role of tutor and tutee once each. The experimenter provided corrective feedback as necessary about marking data sheets, waiting the appropriate amount of time between word presentation and initiation of correction procedures, and provision of verbal confirmation in response to correct definitions. Neither staff required any correction after the first 5 of the 21 trial sessions. Staff were given the opportunity to ask questions during and after the training.

Students were assigned to dyads based on schedules and with their homeroom teacher's input in order to minimize potential behavior problems. One student per dyad was randomly assigned to science target words, and one to social studies target words. Students were assigned to pairs as follows: Tamika

(science target words) and Keisha (social studies); Jamila (science) and Jatara (social studies); and Keon (science) and Jamar (social studies).

Participants were trained with the practice word set in their dyads a day or two before they were to begin instruction. The experimenter trained the first pair while the two staff members observed. School staff members conducted intervention training for the remaining dyads. Participants were instructed to show target words to their partners and read them out loud when acting as tutors. The adult (i.e., school staff or experimenter) supervising the instructional sessions provided corrective feedback on word pronunciation if necessary.

Instructional sessions. Each instructional session consisted of 21 trials in which the seven target words were presented three times. Flashcard decks were shuffled prior to each session to randomize word order. Because target words were unknown to tutors as well as tutees, tutors could not be expected to independently judge whether tutees produced a functional definition, so tutors marked their partners' responses as correct during instructional sessions if the tutee provided a definition that included all underlined words. The tutee also had to start speaking within five seconds of word presentation for a response to be marked correct.

For each pair's first instructional session, tutors were directed to read the definition on the back of the flashcard and wait for their partners to repeat it. For all subsequent sessions, tutors were instructed to silently count to five ("one-one thousand, two-one thousand," etc.) while waiting for their partners to begin saying the definition. If tutees produced a definition containing all three underlined words or phrases, tutors were instructed to inform their partners that the definition was correct and to mark it as such on the data sheet. If tutees did not begin to speak within five seconds or failed to reproduce all three underlined words or phrases, tutors were instructed to mark the response as incorrect, read the definition from the back of the flashcard, and wait for their partners to repeat the definition. Corrections were repeated if tutees failed to repeat target definitions accurately. Criterion was 100% correct responses for three consecutive trials. If one participant reached criterion before his or her partner, instructional sessions consisted of only the student who had yet to reach criterion receiving instruction.

Probe sessions. Probe sessions were conducted by trained school staff or the experimenter prior to training to provide a baseline and after criterion was reached to provide maintenance data. Procedures for these sessions were similar to those for instructional sessions except that they were conducted individually and without error correction. Probe sessions assessed target and nontarget vocabulary.

Generalization. All generalization measures were taken after students reached criterion on target definitions. Prior to instructional sessions, it was established that all target and nontarget definitions were unknown by all participants and data were collected for comparison purposes describing percentage of target and nontarget words read out loud correctly.

Incidental learning. Incidental measures were taken after students reached criterion on target definitions. School staff conducted probe sessions following procedures described above in which they asked students to define the nontarget words they had taught to their partners but had not studied themselves.

Maintenance. Maintenance checks were conducted approximately 4 and 10 weeks after completion of instructional sessions for each pair. An additional maintenance check was conducted for all participants during the last two weeks of the school year. Duration of time between reaching criterion and completing the final maintenance session ranged from 19 weeks for the last dyad to 39 weeks for the first dyad. Maintenance checks were conducted by the school staff members who conducted probe sessions during the instructional phase of the study, and in one case by the experimenter. Procedures for these sessions were identical to probe sessions described above.

Procedural integrity. The majority of instructional and probe sessions were tape-recorded. The principal investigator served as the reliability observer and randomly selected tapes of 20% of each dyads' sessions. Behaviors selected for observation were: (a) accurate marking of correct and incorrect definitions, (b) waiting between 4 and 6 seconds after word presentation to begin correction procedures, and (c) providing verbal confirmation for accurate responses. The number of correct behaviors was divided by number of opportunities to exhibit correct behaviors and the result was multiplied by 100 in order to determine percentage of behaviors performed correctly. Range of reliability rates was 92-100%

with an overall mean rate of 94%, well in excess of Horner and colleagues' (2005) suggested minimum of 80% accuracy for determining evidence-based practices in single-subject special education practices. The most common incorrect behavior was waiting longer than six seconds to begin correction procedures. Mean reliability for accurate marking of correct and incorrect definitions was 98%.

Chapter 3

Results

Correct Target Definitions

Results for percentage of correct target definitions during instructional and probe sessions are shown in Figure 2. Each student responded with 0% accuracy during 3 or 4 baseline trials and, with the exception of Keisha, went on to reach 100% accuracy during the course of the study. Keisha's participation in the study was terminated by school staff due to repeated severe behavior problems during instructional sessions.

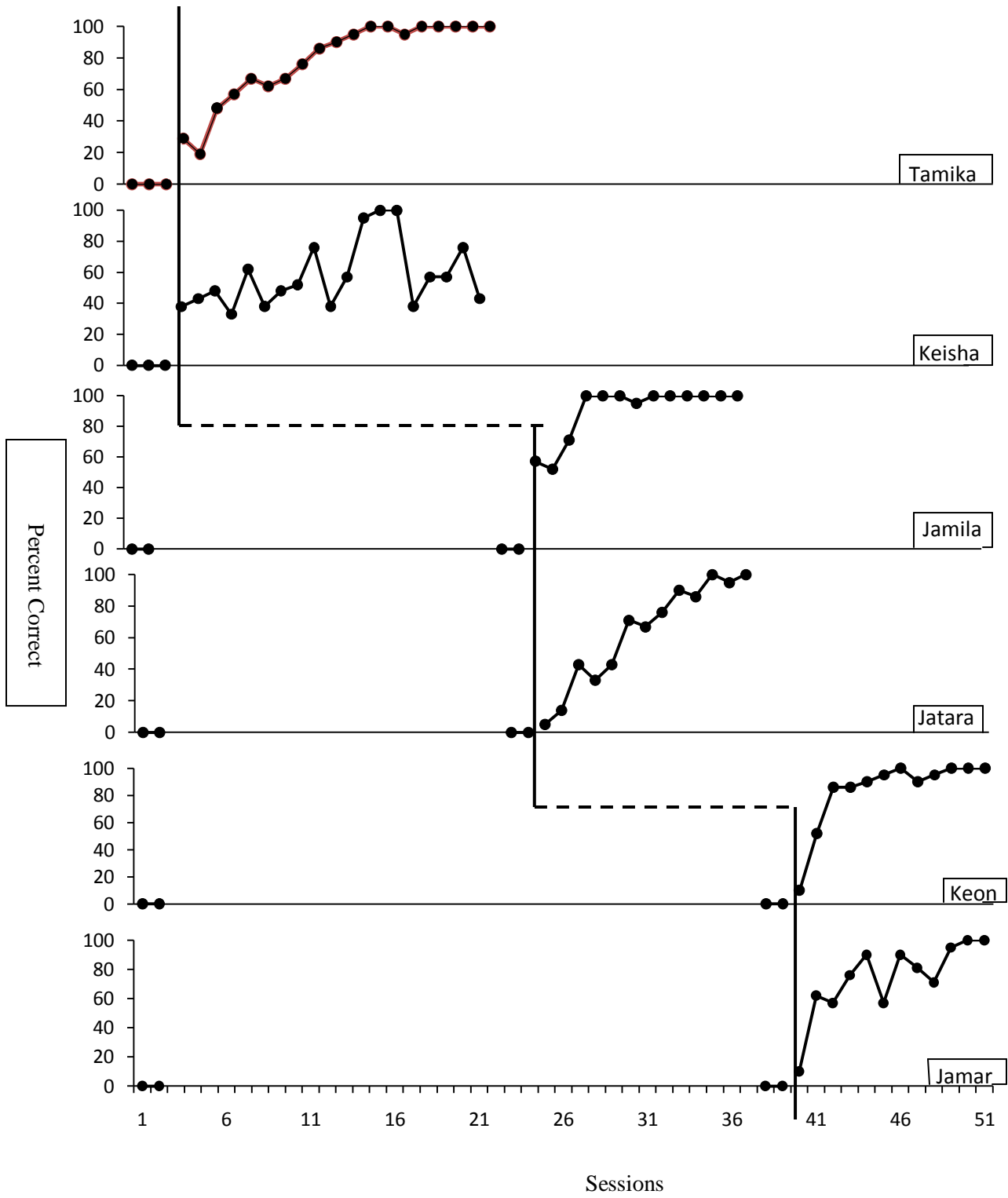
Tamika and Keisha were randomly assigned to receive intervention first. They both showed a sharp increase in correct responses upon intervention introduction. Tamika had a dip on her second session but then went on to make consistent increases until she reached 100% on her 12th trial. Because she dropped slightly below 100% two trials later she required an additional four trials to reach criterion. Keisha's progress was much more variable with several large positive and negative swings. She reached 100% on her 13th trial and maintained it on her 14th. Following that trial she dropped lower than her first day of intervention and staff reported that her inappropriate behavior escalated. She completed four more trials with varying levels of success before her participation was terminated.

Jamila and Jatara were randomly selected to receive intervention second. After both students scored 0% on two additional baseline trials, Jamila responded with over 50% accuracy on her 1st instructional trial and reached 100% on her 4th. She completed 9 more trials, 8 at 100% accuracy. (This was a slight deviation from established methods because she should have stopped her trials after four at 100% but she asked to be allowed to continue and school staff made the judgment to allow this.) Jatara did not show a sharp increase on her first instructional session, but her progress was consistent and incremental and she reached 100% on her 11th trial.

Keon and Jamar were randomly selected to receive intervention third. Both students scored 0% correct on the two baseline trials immediately prior to the intervention phase. Neither student made a sharp jump on the 1st instructional trial, but both did on the 2nd trial. Keon made another large gain on the

3rd trial then slowly increased to 100% accuracy on his 7th trial. Jamar's responses were more variable but he reached 100% on his 11th trial.

Percent Correct Definitions



Generalization Measures

Word reading. Results for percent correct word reading of science and social studies words are presented in Table 1-1. Pre-test scores ranged from 14-79% correct (mean = 41.4%) and the five participants with post-test data all responded with 100% accuracy.

Word production when given definition. Results for percent of correct word production when provided definition are presented in Table 1-1. All but one student (Tamika, 29%) scored 0% on the word production pretest. Presumably this was due to her guessing words she remembered hearing from when she was given the initial assessment to determine the words that had definitions unknown to all participants. The five students who completed this measure all scored 100% at post-test.

Table 1
Percent Correct Responses on Incidental and Generalization Measures

Student	Non-target definitions		Word reading		Word production	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Tamika	0	48	79	100	29	100
Jamila	0	95	57	100	0	100
Jatara	0	81	21	100	0	100
Keon	0	--	36	100	0	67
Jamar	0	90	14	100	0	93

Note. Dashes indicate that data were not obtained.

Correct usage identification. Results for the five students with data for number of correct answers on a multiple-choice test designed to measure identification of correct vocabulary (target and non-target/incidental) usage are presented in Table 1-2. Maximum total correct score was 14, and results are divided into target and non-target scores (maximum = 7). Range for total score was 6-11 (mean = 8.4). Four students accurately identified correct usage for 5 or 6 of the 7 items; Jatara got 3 correct. Non-

target/incidental scores were lower and more variable: Jamar got 2 correct; Jatara, 3; Keon and Tamika, 4; and Jamila, 5. All but one student scored higher on items assessing his or her own target words; Jatara got 3 correct from each set.

Table 2
No. Correct on Correct Usage Identification Measure

Student	Target score (of 7)	Incidental score (of 7)
Tamika	5	4
Jatara	3	3
Jamila	6	5
Keon	5	4
Jamar	5	2

Incidental Definitions

Results for pre- and post-test correct percentage of nontarget definitions are presented in Table 1-1 above. All students responded with 0% accuracy on the pre-test, and the four students who were post-tested demonstrated between 48 and 95% (mean = 78.5%) correct when asked for definitions of words they had never studied, but had taught to their partners. No post-test data are available for Keisha who did not finish the study as explained above, nor for Keon, who finished instructional sessions and completed generalization measures but was removed from the school before completing the incidental session or maintenance checks.

Maintenance Data

Maintenance checks were conducted at approximately 4 and 10 weeks after each participant reached criterion and again at the end of the school year. Maintenance data are presented in Table 1-3. The time elapsed between each participant's final probe session and the last maintenance session ranged from 19 to 39 weeks for the four participants (Tamika, 39 weeks; Jamila and Jatara, 30 weeks; Jamar, 19 weeks) who completed the final check.

All four students maintained 95-100% accuracy at 4 weeks, and 3 of 4 scored between 90-100% at 10 weeks; Jatara had a correct response rate of 71%. For the end-of-year maintenance check, Jamar and Tamika scored 67% correct, Jamila scored 57%, and Jatara maintained 43% correct responses.

Table 3
Maintenance Session Percent Correct Target Definitions

Student	No. weeks from final session				
	4	10	19	30	39
Tamika	95	90			67
Jamila	100	100		57	
Jatara	100	71		43	
Jamar	95	90	67		

Chapter 4

Discussion

Students with teacher-identified problem behavior present more management challenges to teachers than do their peers without such behavioral issues. Participants in this study were clearly no exception; they were nominated for inclusion due to disruptive classroom behaviors including talking out, fighting, and general noncompliance, so perhaps it should not be surprising that 2 of the 6 participants failed to complete all measures. Keisha's participation in the study was terminated before she reached criteria because she was unable or unwilling to maintain behavior that was consistent with participation. She did evidence definition learning with a positive (though highly variable) trendline, but staff reported her performance and behavior deteriorated significantly before they made the determination that she should not continue. Keon did reach criterion and completed all measures with the exception of incidental learning and maintenance checks before being sent to a more restrictive environment for behavioral reasons unrelated to the study.

Effectiveness Data

Middle school students with teacher-identified problem behavior demonstrated knowledge of previously unknown content-area vocabulary words after participating in a peer-mediated CTD intervention. Words were relatively complicated and academically useful, and though there was considerable variation between students, all participants reached (or came very close to reaching) criterion. Given the necessary role that vocabulary plays in reading comprehension, the reliance of secondary content-area classes on textbooks, and the academic difficulties experienced by students with problem behaviors, efficiency of instruction is critical for these students.

Efficiency Considerations

Definition characteristics. The primary implication derived from pilot data (unpublished) pertaining to efficiency was that the instructional rationale for the intervention could be satisfied by simplifying and/or shortening target definitions rather than using glossary definitions verbatim. Definitions used in the present study were simplified by the researcher and approved by the teacher in

order to lead to an appropriate cognitive load for this learning task. The substantial majority of student errors made in the pilot study was due to failure to complete potentially correct definitions within the specified time frame. Using simplified definitions, school staff who observed sessions in the current study reported that almost all errors were due to either no response or to confusion between word/definition pairings (i.e., providing the correct definition for a different target word). Though stating definitions is an expressive language task, the receptive task of definition acquisition is a prerequisite for successful performance. It should be recalled that while no participant had documentation of having been evaluated for a language problem, participants were all referred to the study due to externalizing behaviors; furthermore, such behaviors are linked more strongly to receptive than expressive language deficits (Benner, Nelson, & Epstein, 2002), at least among students with documented behavior disorders. It is possible that reducing the set size would minimize opportunities for confusions related to word/definition pairings and lead to more rapid acquisition. Use of smaller set sizes concurrent with simplified definitions should be explored in future research.

Constant time delay. One of the primary benefits of CTD interventions is that they tend to be more efficient than other intervention types, largely because they produce near-errorless learning (Wolery, et al., 1992). Results of this study are encouraging in that participants were able to both demonstrate mastery of previously unknown definitions after brief instructional sessions and to implement the intervention with fidelity.

Constant time delay interventions are relatively simple to implement because they focus on association-level knowledge and do not require the same amount of teacher training and planning time as interventions targeting more complicated skills, and in this study students were able to learn procedures quickly. Procedural integrity was robust and the intervention was successfully supervised in large part by school staff without direct researcher involvement, supporting the idea that peer-mediated CTD interventions could be successfully implemented in classrooms without substantial investments of training time.

Incidental Learning

Four students completed the measure of incidental learning and all demonstrated mastery of a substantial number of previously unknown vocabulary definitions even though they received no direct instruction on them. Three students demonstrated greater than 80% mastery: Jamila (95%), Jatara (81%), and Jamar (90%).

Tamika demonstrated knowledge of slightly less than half (48%). One possible explanation for her comparatively poor performance on the incidental measure is that her partner's participation in the study was terminated due to behavioral concerns. Keisha's target word learning was highly variable and staff reported her behavior was highly erratic. Because Tamika would have been learning her incidental words as a result of teaching them to Keisha, perhaps Keisha's behavior damaged the information Tamika was able to absorb. It is not possible to draw firm conclusions from one pair of students, but it seems quite possible that the fact that Tamika's incidental learning was significantly lower than any of the other students completing the measure could be related to the fact that she had as a partner the only student removed from participation due to behavior during sessions.

Incidental learning can contribute to instructional efficiency because students learn more information in the same amount of time. Incidental learning has been recommended for use with students who have a range of disabilities (Keel & Gast, 1993) and the reasons it is desirable for students with special educational needs also hold true for students who are behind their peers and whole classes in inclusive settings.

Generalization

Participants were assessed on three distinct generalization measures—word production upon definition exposure, word reading, and recognition of correct usage. The first two measures are similar in that they address (uninstructed) association-level knowledge. Whether a student produces a definition in response to a word or a word in response to a definition, it is the association between the word and definition that is being assessed. Sight-word reading such as that which was assessed by the second measure is also association-level knowledge. For word production, scores increased from very low levels

(in all cases but Tamika who scored 29%, correct responses at pretest were 0%) to the much higher scores of 100% (Jamila), 100% (Jatara), 100% (Tamika), 67% (Keon), and 93% (Jamar). Pre-test scores on the word reading measure were variable, ranging from a low of 14% (Jamar) to a high of 79% (Tamika), but at post-test all students responded with 100% accuracy.

The measure assessing recognition of correct usage is distinct from the other generalization measures assessing word reading and word production from definitions because it deals with the deeper comprehension level knowledge whereas the other two address association level knowledge. Students learned definitions but did not see target and non-target words used in sentences, use the words to express themselves, or do anything with the definitional information other than learn it and say it when prompted or prompt their partner to respond with verbal definitions for the other word set. This measure was developed and included to determine to what degree students would be able to apply newly acquired knowledge at a level deeper than it was taught.

There are two ways to consider these data. The first is by looking at total scores. First, a range of 6-11 (out of 14) may mean that some participants were simply more skilled at the task itself because all participants were given this measure within days of reaching criterion on their target words, so they had similar levels of word knowledge coming in to it. Being skilled at this task would require the ability to transform known definitional information to an unfamiliar context.

A second way to consider this data is by examining the scores disaggregated by target and non-target/incidental words. This reveals that all but one student scored higher on the items that dealt with target rather than incidental words. Even though these students demonstrated high levels of incidental learning (95%, 81%, 48%, and 90% correct at post-test) they seemed less able to recognize when words, whose definitions they largely knew, were being used correctly.

For three students the difference in favor of target words was a single point, and for Jamar the difference was three points. While it is true that a single point still represents a significant proportion when the total score is seven, it is important to avoid extrapolating too much from such small numbers.

Indeed, it is for this reason that we report scores on this measure alone as numbers rather than percentages.

Maintenance

Maintenance data for all four students completing the checks were strong at the 4- and 10-week measures (mean of all scores = 92.6%, range = 71-100%) but the end-of-year data were considerably less robust. Jamar and Tamika scored 67% correct at 19 and 39 weeks from the end of intervention respectively, and at 30 weeks post-intervention, Jamila scored 57% while Jaquania dropped below half with a score of 43% correct. It may be discouraging that this newly-acquired knowledge maintained so poorly, but the characteristics of the words themselves perhaps explain this result. Target words were not only unfamiliar to all students at the beginning of the study, but they were also low-incidence outside of the contexts of the particular science and social studies courses from which they were drawn.

The reason it was decided to teach these words only to the association level, as opposed to the deeper and presumably longer-lasting levels of comprehension or generation was that they represented a specific barrier to understanding particular lessons in these courses. Once the intervention was concluded and students were no longer being exposed to definitional information on a regular basis, and once they had moved beyond those lessons in their courses, it is unlikely that they would have encountered the words again with enough frequency to maintain learning. This would pose a problem in a more general vocabulary development program aimed to improve overall vocabulary performance or to reduce the vocabulary gap, but the intent of this intervention was to eliminate a specific barrier to textbook comprehension as efficiently as possible. In order for learning to maintain, information must be repeated over time and across contexts. However, for the purposes of the current study, the instructional time it would have taken to maintain this learning at very high levels for sustained periods would probably be better spent on other academic activities--perhaps vocabulary instruction on unfamiliar content-area words from subsequent chapters.

The above is not intended to suggest that targeted vocabulary instruction should be viewed as “cramming” for a test. It is rather intended to suggest that educators be judicious in allotting their limited

and valuable teaching time, especially to students with learning disabilities, students with behavior problems or behavior disorders, and to struggling readers. Instructional methods must match instructional goals, and if the word “secede” will help a student understand his social studies reading assignment but will most likely not present itself again to him for some years, there are probably better uses for the teacher and student time it would take for him to maintain that single definition.

Implications for Research

Efficiency was enhanced in the present study by having students work in pairs to capitalize on opportunities for incidental learning. If peer-mediated CTD interventions can be used with whole classes rather than one pair of students at a time, efficiency from the perspective of the teacher could be improved because all students would be engaged simultaneously.

Though a few modifications would likely need to be made (for example, ensuring that all definitions are unknown to all students may be prohibitively cumbersome) it is important for research to explore the practicality of peer-mediated CTD interventions for whole classes. Participants with and without learning disabilities in the lone study located with this focus (Hughes & Fredrick, 2006) learned vocabulary efficiently and implemented procedures with integrity. In the current study, students supplied words in response to presented definitions rather than producing definitions. Producing a definition is more demanding than producing a word, and determining the correctness of a definition is also more demanding than determining the correctness of a word, but definition production more closely matches task demands of content area classes.

Limitations

An important limitation pertains to the practical significance of the results. The rationale for learning low-incidence content-area vocabulary definitions is primarily in order to comprehend specific texts. Understanding concepts represented by unfamiliar words is necessary for text comprehension, but it is certainly not sufficient and the present study does not indicate whether or to what degree textbook comprehension improved as a result of vocabulary mastery. There is evidence that preteaching unfamiliar content-area vocabulary can enhance comprehension (e.g., Koury, 1996) but comprehension was not

measured in the current study. Because target words were both entirely unfamiliar and fundamental to comprehension, it seems reasonable that definition acquisition would lead to comprehension enhancement, but the extent to which this may be true cannot be extrapolated from the results of this study.

A second limitation relates to attrition. As mentioned above, only 4 of 6 participants completed all measures. Keon was removed from the school and placed in a more restrictive setting for behaviors occurring outside the context of the current study and so did not complete the final maintenance session. The rest of his data were largely similar to other participants' but his data set is not complete. More problematic was Keisha's termination from the study. Staff decided that she should be removed from the study as a direct result of behavior she displayed during sessions. She did demonstrate target vocabulary acquisition and was near criterion (though with a highly variable trendline) before her behavior and correct responses deteriorated precipitously. This meant that her generalization, maintenance, and incidental learning were not assessed and may have impacted her partner's learning as well. Participants were selected because they displayed teacher-identified problem behaviors during class, and it is not entirely unexpected that these behaviors would also be displayed during an intervention, but it is a limitation that her data are not available. Student behavior is a factor that should be monitored closely in future research because students with the worst behavior are often the ones in most need of effective, efficient instruction.

Implications for Practice

Students learn most words from context (Baumann & Kameneuei, 1991). Even with efficient instruction, the maximum amount of words that could be reasonably taught in school settings would make up a small proportion of students' total vocabularies. Words targeted for explicit instruction should fall into one of two categories: words that are essential for comprehension of content-area texts or other lesson components, or relatively high-frequency and useful in multiple contexts. Target words from the present study fall into the first category and for efficiency were taught to the association level only. General vocabulary words fall into the second category and would need to be taught to the generation

level to be most useful. What is key is that instructional goals should guide instructional methods. This implication is no different for students with behavior problems than for other students, though students with behavior problems have perhaps a greater need for efficient instruction than other groups.

Secondary content-area teachers are responsible for educating classes of students with ever-widening characteristics and they face significant challenges in providing students the most effective academic instruction possible. Though only a relatively small proportion of students in mainstream classrooms are diagnosed as having EBD, more than that display behavior that disrupts the educational environment or their own learning. Students with learning disabilities, language disorders, giftedness, or no specific identifications all must learn the same basic content in inclusive classrooms. Content-area classes must cover increasingly complex ideas even as the gap between students with poor and rich vocabularies widens. Especially for students who are behind, teachers should consider using the most efficient methods to meet instructional goals. Interventions such as CTD that are brief but effective should be part of instructional plans for academic demands requiring association-level knowledge. Peer-mediated instruction is supported in the literature across subject areas, age groups, and student characteristics and has the added benefit for students with behavior problems of providing structure for appropriate peer interactions.

This study is the second in a line of research that may have practical implications for inclusive classrooms. The body of research pertaining to peer-mediated vocabulary instruction in inclusive classrooms is small but encouraging. All students in the present study exhibited behavior that was challenging and significantly problematic for their classrooms, though 4 had no identified disabilities and 2 were identified with LD. Students with LD were not paired together for the intervention in either this study or a somewhat similar one conducted by Hughes and Fredrick (2006). In both studies, students with and without LD were able to implement CTD procedures accurately and to demonstrate efficient acquisition. Hughes and Fredrick's vocabulary task was a less demanding one than definition production, but they conducted their study with a whole class of students at once and found it to be largely workable. Students with and without disabilities were able to work together accurately, learn targeted information

efficiently, and maintain acceptably appropriate classroom behavior. While one student did have her participation in the current study terminated for sustained inappropriate behavior, the rest of the students maintained positive behavior and complied with staff directives. The present study should be replicated in a whole class situation to determine whether students demonstrate the ability to learn definitions and maintain appropriate behavior in an inclusive setting.

Stahl and Fairbanks (1986) hypothesized that vocabulary interventions conducted in groups would be more effective than those conducted individually because group discussion could provide more opportunities for practice and anticipation of being called on in a group could increase motivation. More recent research has generally supported this contention; for example, Foorman and Torgeson (2001) point out that individual reading interventions have not been shown to be more effective than those conducted in small groups. Two studies that addressed incidental vocabulary learning (Gast, et al., 1991; Shelton, et al., 1991) support the idea that instructional grouping can be beneficial even without discussion of definitions. Gast and colleagues found that students were able to acquire definitions of some target sight words from listening to definitions inserted into feedback statements directed toward their peers even though the definitions were never explicitly taught. Students in this study acquired definitions of their own target words more successfully than the target words of other students in their group. Shelton and colleagues, in a similar experiment, also found students acquired target and nontarget word definitions incidentally, but the three boys in their study acquired their nontarget word definitions more successfully. These studies lend support to the notion that individual vocabulary instruction is not necessarily more intensive or effective than instruction provided to small groups of students.

Group arrangements have the potential to address social deficits as well, making group interventions perhaps more functional than other interventions if they are structured appropriately. For example, students with EBD have significant difficulties interacting prosocially with peers and teachers, as well as high levels of negative interactions (Gresham, Cook, Crews, & Kern, 2004). Students in this study displayed teacher-identified problem behavior rather than having documented EBD, but it seems reasonable that carefully structured, explicit programs can be helpful in encouraging positive interactions

(Hansen & Lignugaris/Kraft, 2005) and provide opportunities to practice critical school behaviors such as turn-taking and listening.

Approaches to vocabulary learning should be selected with the goals of instruction in mind. It is unlikely that CTD interventions in and of themselves will make significant progress towards Baker, Simmons, and Kameenui's (1995) goal of reducing overall vocabulary gaps, but the present study supports the idea that peer-mediated CTD interventions can not only meet the first goal (learning more vocabulary in the same amount of time) but also aid in content-area comprehension.

Research generally supports the idea that pre-teaching key vocabulary can improve comprehension (Koury, 1996). Because vocabulary knowledge is a necessary prerequisite to understanding content-area readings (though not sufficient in and of itself), future research should address the degree of impact peer-mediated CTD vocabulary interventions may have on later reading comprehension.

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Appendix

Review of the Literature

Academic Problems for Students with Disruptive Behavior

Both academic and behavioral difficulties are predictors of a wide range of negative long-term outcomes, and students with problems in both areas are most at-risk for school failure, serious and persistent antisocial behavior, and school drop-out (Gest & Gest, 2005). Reading difficulties, in particular, have been shown to have a strong link to behavior problems in academic settings. This is not surprising given the language-dependent nature of most learning (Baumann & Kameenui, 1995) and the proportion of information presented in written form over other modalities.

Morgan, Farkas, Tufis, and Sperling (2008) explain four competing causal models for the co-occurrence of behavior and academic problems: (1) “common cause” variables such as poor attending cause difficulties in both areas, (2) reading problems cause behavior problems, (3) behavior problems cause reading problems, or (4) reading and behavior problems cause each other. Each model suggests a different emphasis in intervention efforts. If the first model is true, research and intervention should focus on identifying and ameliorating the common cause variables. If the second, effective reading interventions should positively impact behavior as well as improve reading skills. If the third model is true, intervention efforts should focus on diminishing disruptive behaviors in order to improve school performance. But if the bidirectional model holds true, then behavior and reading problems cause each other through a negative feedback cycle of “increasing problem behaviors, school disengagement, and academic failure” (p. 418) and intervention efforts may be complicated. A multi-level logistic regression modeling of a nationally representative data set (*Early Childhood Longitudinal Study—Kindergarten Class*) maintained by the U.S. Department of Education’s National Center for Education Statistics provided support for the bidirectional model after controlling for a wide range of potential confounds (e.g., poor attention, race/ethnicity, social class, gender) (Morgan, Farkas, Tufis, & Sperling). The pertinent implication is that interventions likely to be most effective are those that target reading problems and task-focused behaviors simultaneously.

Constant Time Delay

One type of intervention that targets both reading and task-focused behavior (as recommended by Morgan and colleagues [2008]) is constant time delay targeting content-area vocabulary acquisition.

Constant time delay interventions have their basis in Applied Behavior Analysis and are from a group of interventions collectively referred to as “delayed prompting.” Delayed prompting interventions involve inserting a fixed (constant) or increasing (progressive) time delay between the presentation of a stimulus and the prompt for the desired behavior (Handen & Zane, 1987). It is during this time delay interval that the participant may produce the behavior before the prompt—in the context of the current study the vocabulary word is the stimulus, the desired response is the student saying the correct definition, and the prompt is the tutor saying the definition if the tutee fails to do so within the five-second time delay.

Constant time delay interventions have been implemented successfully across a wide range of student populations targeting a variety of academic and other skills. Academic skills include multiplication fact acquisition (Cybriwsky & Schuster, 1990; Koscinski & Gast, 1993a and b; Morton & Flynt, 1997), spelling (Edwards, 1995; Hughes, Fredrick, & Keel, 2002), and sight word reading (Winterling, 1990). Reported benefits of CTD interventions include effectiveness in terms of acquiring target information, efficiency in terms of total instructional time and number of sessions required to reach criterion, and lower error rates than other intervention types (Keel & Gast, 1992). Though CTD interventions have been reported with participants as young as seven and as old as high-school aged or adult, the vast majority of interventions targeting academic skills involved participants in the upper-elementary age range. Other CTD investigations with older students have focused principally on recreational or independent living skills and students with lower-incidence more severe disabilities such as moderate/severe mental retardation (e.g., Ayres & Langone, 2002; Zhang, Cote, Chen, & Liu, 2004).

Vocabulary knowledge, defined as definition production rather than solely sight word recognition, has been rarely targeted in CTD interventions, though three published studies with a definitional focus were located. McDonnell and colleagues (2002) used a CTD procedure embedded within daily activities to improve the vocabulary acquisition of two adolescents with moderate mental

retardation. Paraprofessionals who accompanied the students in inclusive settings presented words to the students during brief non-instructional times (e.g., transitions or breaks). During the initial presentation, the paraprofessionals provided definitions immediately after presenting the word; during subsequent presentations they paused to give students opportunities to provide the definitions and supplied error corrections as needed. The experimenters found that both students acquired all 15 target definitions with 2.8 and 3.7 mean trials per word.

Another study of interest was conducted by Schuster, Stevens, and Doak (1990) who taught three ten-year old students with learning and behavior problems the definitions of 10 target words using a 5-second CTD procedure similar to the one utilized in the present study. All students successfully acquired all definitions with low error rates and learning consistently maintained at 6, 10, and 14-week maintenance checks.

More recently, CTD was combined with Classwide Peer Tutoring to teach vocabulary definitions to students with and without LD (Hughes & Fredrick, 2006). Sixth-grade students with LD were able to implement instructional procedures accurately and students with and without LD successfully demonstrated acquisition of target definitions following instruction. Students learned target definitions efficiently with low error rates, implemented the intervention with high fidelity, and social validity data indicated that students with and without LD enjoyed the tutoring.

In addition to the aforementioned studies, the author conducted a pilot study for the current study in which a teacher-implemented CTD procedure was used to teach textbook content-area definitions to three high school students with EBD. Criterion was 100% correct responses for four consecutive sessions with teacher praise provided for all correct responses during the first two trials, one instance of praise for every five correct responses during the third trial, and one instance of praise for every ten correct responses for the final trial. All students were able to demonstrate knowledge of previously unknown vocabulary definitions and it was determined that simplifying glossary definitions could enhance intervention efficiency. Using a similar instructional procedure but in a peer format was suggested as a potential way to enhance efficiency.

Peer Tutoring/Group Instructional Arrangements

A primary reason for considering constant time delay formats for academic interventions is their efficiency. Another way to improve efficiency may be to utilize peer tutoring or other group instructional arrangements so that students would have access to peers' target information as well as their own in the same amount of instructional time. In an extensive meta-analysis of vocabulary instruction studies, Stahl and Fairbanks (1986) hypothesized that interventions conducted in groups would be more effective than those conducted individually because group discussion could provide more opportunities for practice and anticipation of being called on in a group could increase motivation. More recent research has generally supported this contention; for example, Foorman and Torgeson (2001) point out that one-on-one reading interventions have not been shown to be more effective than those conducted in small groups. Potential benefits of instructional grouping over individual instruction include: (a) increased instructional time, (b) potential for appropriate peer interactions, (c) increased opportunities for students with disabilities to access less restrictive environments, (d) greater skill generalization, (e) increased control of student motivational variables, (f) more efficient use of teacher time, (g) increased time on task, and (h) opportunities for observational learning (Keel & Gast, 1991).

Two vocabulary interventions that addressed incidental learning (Gast, et al., 1991; Shelton, et al., 1991) supported the idea that instructional grouping can be beneficial even without discussion of definitions. Gast and colleagues found that students were able to acquire definitions of some target sight words from listening to definitions inserted into feedback statements directed toward their peers even though the definitions were never explicitly taught. Students in this study acquired definitions of their own target words more successfully than the target words of other students in their group. Shelton and colleagues, in a similar experiment, also found students acquired target and nontarget word definitions incidentally, but the three boys in their study acquired their nontarget word definitions somewhat more successfully. These studies lend support to the notion that individual vocabulary instruction is not necessarily more intensive or effective than instruction provided to small groups of students.

In addition to efficiently improving academic skills, group arrangements have the potential to address social deficits as well, making them potentially more functional than individual interventions if they are structured appropriately. For example, students with EBD have significant difficulties interacting prosocially with peers and teachers, as well as high levels of negative interactions (Gresham, Cook, Crews, & Kern, 2004). Carefully structured, explicit programs can be helpful in encouraging positive interactions (Hansen & Lignugaris/Kraft, 2005) and provide opportunities to practice critical school behaviors such as turn-taking and listening.

An explicit intervention delivered by peers could have several significant advantages over one delivered by adults: efficiency could be increased because more students in a given classroom could be engaged in learning tasks simultaneously, opportunities for appropriate social interaction would be provided (especially important to students with EBD and serious behavior problems) and students may have the opportunity to learn many more unknown vocabulary words incidentally by being exposed to their partners' target words and definitions in addition to their own.

Incidental Learning

The terms *incidental* and *observational* are frequently used interchangeably to describe learning that takes place when a student acquires information or skills that were not the direct target of instruction, though they describe distinct but related types of learning. Incidental learning is when students acquire “extra” information that is related to the target skill but not directly taught (e.g., a student learns vocabulary definitions inserted into praise statements as a part of learning sight word recognition), and observational learning occurs when students learn by observing information targeted at peers (e.g., a student in a group learns definitions taught to another group member in addition to her own target definitions). Both types of learning have the potential to be of value in increasing instructional efficiency because they result in acquisition beyond that which is targeted. The present study assesses both types of learning in the same intervention, in addition to learning definitions of vocabulary words from target sets.

There have been several studies examining incidental vocabulary learning in which definitions were not the primary target of instruction, but rather were inserted into praise, prompt, or general

feedback sessions. Vocabulary acquisition has also been investigated in studies in which students learned other students' target definitions observationally and without any direct instruction.

Gast, Wolery, Morris, Doyle, and Meyer (1990) found that two adolescents with moderate mental retardation learned the definitions of approximately one-third of 40 words after hearing the definitions in praise statements following the successful reading of a sight word. With the exception of one probe during which he acquired only 1 of 8 possible definitions, the first student's scores ranged from 45.8 to 100%. The second student acquired fewer definitions (range = 0-66.7%). Both students learned more definitions of their own target sight words (incidental) than the other student's (observational).

Johnson, Schuster, and Bell (1996) reported that two 17-year old students scored an average of 60% on a matching test of 20 definitions of previously unknown science words following an intervention in which they heard definitions after reading sight words in unison. These students made little improvement when asked to verbally define the same words.

Shelton, Gast, Wolery, and Winterling (1991) found that all three 12-year-old male students made some improvement in learning the definitions of 24 previously unknown words. Two students were able to define 25% and one student correctly defined 83% of the words after hearing the definitions in feedback statements following their spelling of the target words.

There are different instructional goals that may be used to drive vocabulary instruction. Students may need to learn relatively common words that they will see across academic and other contexts with a variety of meanings and nuances. In other cases, students may need to develop a very basic understanding of complicated words that are less likely to occur outside the specialized areas of their science, social studies, or other content area classes. The present study is concerned with the second sort of words.

Vocabulary in the Content Areas

“Although Lincoln did not live to carry out his plan, before his death he made it clear that he favored a lenient Reconstruction policy. Even in the midst of war, he had considered how to treat Confederate states if the Union should win. In reality, Lincoln believed, the Confederate states had never left the Union, because secession was constitutionally impossible. He contended that it was individuals, not

states, who had rebelled and that the Constitution gave the president the power to pardon individuals.” (*The Americans*, p. 350)

“The thick prairie sod broke wooden plows, and reaping wheat by hand with a scythe was slow, backbreaking work.” (*The Americans*, p. 399)

The above selections were chosen from a widely used secondary social studies text and are roughly representative of its content. In order to make sense of the passages, a student must have at least a working knowledge of a large number of vocabulary words that potentially occur only infrequently outside of the social studies domain—*Reconstruction*, *constitutionally*, *lenient*, *midst*, *secession*, *contended*, *pardon*, *sod*, *reaping*, and *scythe*. Even words that may be familiar, such as “pardon” or “lenient” signify at least slightly different concepts in the textbook context than they do through the course of typical adolescent reading or conversation. Secondary students in content-area classes frequently encounter words that have a common meaning as well as a specific context-bound content area meaning (Harmon, Hedrick, & Wood, 2005). This difficulty is exacerbated for struggling readers.

For our purposes, “content areas” refers to science, social studies, and mathematics. Though a wide range of other classes, frequently electives such as communications, philosophy, or vocational courses could also be considered content areas, insufficient research exists to speak with any authority about subject-specific vocabulary in these disciplines. English or language arts are not considered here as “content area” because vocabulary necessary for success in these classes tends to be higher-frequency, both in number and contexts of exposures. Students may be able to comprehend narrative texts with only vague knowledge of words, but in content areas students need more explicit knowledge, at least to the association level, because unfamiliar terms address fundamental concepts (Harmon, Hedrick, & Wood, 2005). It has been clearly and repeatedly demonstrated that vocabulary demands increase as students progress through grade levels. Individual characteristics of vocabulary vary across content areas, but the importance of word knowledge to content-area comprehension remains consistent and fundamental.

Whether reading is done for pleasure or to gain information, its underlying purpose is comprehension. Vocabulary knowledge is a necessary, though certainly not sufficient, prerequisite for

textbook comprehension. Textbook-specific considerations include *global coherence* (i.e., integration of ideas across chapter sections) which can be increased by such elements as graphic organizers, review statements, and clear topic sentences, and *local coherence* (i.e., clarity at the sentence level) (Armbruster, 1984). Textbooks are the principal source of academic information from middle school on even though they tend to have structural inadequacies and problems in the areas of coherence and audience appropriateness (Horton & Lovitt, 1994). It has been suggested that the typical content-area textbook is instructionally appropriate for only the top 50% of students in any given class.

Social studies. Kinder, Bursuck, and Epstein (1992) conducted an evaluation of 10 widely-used 8th grade American History textbooks and they found reading levels to range from 9th grade to the 3rd year of college. Another key finding was that there was an average of 1.25 new vocabulary words introduced per page of text. It is important to note that the experimenters only considered words that were highlighted by the textbook authors to be “new vocabulary.” Taking the example of the passages introduced at the beginning of this section, none of the identified words that could pose problems for struggling readers were identified by authors as new vocabulary, so it is quite likely that 1.25 new words per page is a serious underestimation of the true vocabulary load of social studies texts, especially for students with vocabulary deficits such as typical students with EBD.

Harmon, Hedrick, and Wood (2005) addressed geography instruction and found that secondary students were seriously lacking in what they termed “place geography” and contended that without this fundamental association-level knowledge, higher-order learning tasks would be impossible. Smith and Larkins (1990) recommend systematic drilling and mnemonics methods in order to improve place geography knowledge.

Science. Yager (1983) reviewed 25 science textbooks at all grade levels for the occurrence rate of technical words. His primary finding was that the number of technical vocabulary words presented typically approached the number of new words that a student at a given grade level could be expected to learn across *all* contexts in a particular year.

Harmon, Hedrick, and Wood (2005) offer important implications about science vocabulary instruction as it pertains to comprehension. Teachers must pay attention to both technical words with which students are unlikely to be familiar (e.g., the aforementioned “oxidize” and “parallax”) and nontechnical words (e.g., “determinant” and “improbable”) that are essential for understanding. When vocabulary is addressed in science courses, target words tend to be exclusively technical. These experimenters also contend that vocabulary instruction must be addressed in pre-reading activities if students are to attain maximal comprehension.

Mathematics. Mathematics vocabulary is arguably more abstract, and thus more difficult to learn independently, than vocabulary from any other content area. A particular challenge of vocabulary in this content area is the large number of words (e.g., rational/irrational numbers, limit, proportion, and volume) that have a common usage that differs significantly from the mathematics-specific usage.

Bintz (1997) recorded conversations with math teachers who expressed frustration at uninteresting textbooks and lack of ability to teach students with wide-ranging reading abilities and vocabularies. One high school math teacher said, “So many students struggle in math because of not being able to read and understand the math problem.”

Types of Vocabulary Knowledge

It is widely accepted that there are different levels of word knowledge. Stahl and Fairbanks (1986) introduced the terminology of *association* between a word and one synonym or definition, *comprehension* demonstrated by “showing understanding of a word in a sentence or by doing something with definitional information, such as finding an antonym, classifying words, and so forth” (p. 76), and *generation*, production of a novel written or oral response, such as restating the definition in students’ own words. Kameenui, Simmons, and Darch (1987) proposed the more commonly used terms *association knowledge*, *partial concept knowledge*, and *full concept knowledge* to encompass essentially the same conceptualizations. A dichotomous and common way to explain this is by describing vocabulary learning as either “fast mapping” (i.e., learning a very basic meaning quickly) or “extended mapping” (i.e.,

developing a full understanding of a word's meaning through multiple exposures in many contexts) (Carey, 1978).

In order for students to develop decontextualized word knowledge so that it is useful to them in *both* their receptive and expressive vocabularies, they must know the word to the generation or full concept level. The standards for utility in the receptive vocabulary alone, however, are significantly less stringent (Baumann & Kameenui, 1991) and may be met by association-level knowledge. Because reading requires use of the receptive vocabulary, if comprehension is the instructional goal, it may not be necessary (and may, in fact, be wasteful) to invest large amounts of teacher and student effort as well as limited class time to teach words to levels deeper than association. For example, in the second selection from the history text mentioned above, it would be necessary for a student to have an association-level knowledge of the words “scythe” and “reap” in order to make sense of the sentence in which they occur. Because “scythe” and “reap” are words that are for most students unlikely to appear frequently in any other context, however, developing association-level knowledge of the word would not only be sufficient, but *efficient* as well.

It should be noted that only a small percentage of students' total vocabularies is likely to be impacted by targeted instruction. Estimates vary, but a rough estimate of typical vocabulary growth during elementary and secondary school is 3,000 words a year (Baker, Simmons, & Kameenui, 1991). Even though this estimate is meant to represent mostly very basic levels of knowledge, it would break down to between 7 and 8 words a day if they were all directly taught. Many diverse learners acquire new words more slowly than their peers, so the vocabulary gap that increases with each year of schooling is not likely to be impacted to any great degree by a vocabulary development program that relies upon direct definition instruction in isolation. Wide reading is the single most powerful method of incidental vocabulary expansion (Jitendra, Edwards, Sacks, & Jacobsen, 2004), but most struggling readers fail to engage in enough independent reading to begin to close the vocabulary gap. Direct vocabulary instruction may indirectly impact broader vocabulary development because when preteaching specific vocabulary

facilitates comprehension, reading in general should become less aversive though no research on that particular connection was located.

Vocabulary Instruction

Vocabulary instruction, unlike textbook characteristics, is a factor over which teachers typically have control. As such, it is important to develop the most effective and efficient means of enhancing vocabulary as an aid to content area comprehension, regardless of the specific texts employed by school districts. There is support for the idea that pre-teaching key vocabulary increases comprehension of content-area texts in social studies (e.g., Carney, Anderson, & Blackburn, 1984) and science (e.g., Koury, 1996). Some methods of teaching key vocabulary, however, are more effective than others.

Stahl and Fairbanks (1986) conducted a meta-analysis of 52 vocabulary intervention studies that contained 94 independent method comparisons in order to determine the effects of various methods of instruction upon both word learning and reading comprehension. They concluded that the most effective methods provided multiple exposures of target words, required students to process words at more than a superficial depth, and included both contextual and definitional information about the target words. More recently, the National Reading Panel (2000) conducted a review of vocabulary studies to determine (a) whether vocabulary instruction improves reading achievement, and (b) how that instruction is best provided. Among the chief implications offered by the panel:

- Vocabulary should be taught both directly and indirectly.
- Repetition and multiple exposures to target words are important.
- Students should be exposed to words in several contexts.
- Vocabulary learning should entail active engagement in learning tasks.
- Vocabulary can be acquired through incidental learning.
- Assessment and evaluation can differentially affect instruction.
- Dependence on a single instructional method will not result in optimal learning.

It is important to note that neither the National Reading Panel (2000) or Stahl and Fairbanks (1986) offered any guidance or specific information pertaining to vocabulary instruction for

struggling readers or students with special educational needs. The National Reading Panel eliminated from consideration studies that reported data exclusively from populations of students with disabilities, though some students with disabilities were included in their review when students without disabilities were also recipients of instruction. Stahl and Fairbanks (1986) did not exclude studies based on student disability or reading deficiencies, but neither did they report disaggregated results for students with these characteristics.

Recently, a meta-analysis (Jitendra, Edwards, Sacks, & Jacobsen, 2004) and a literature review (Bryant, Goodwin, Bryant, & Higgins, 2003) have addressed vocabulary instruction for students with learning disabilities. Jitendra and colleagues analyzed 19 articles that included 27 intervention studies categorized as *keyword or mnemonic*, *cognitive strategy*, *constant time delay*, *activity-based*, or *computer-assisted*. The effect sizes calculated were positive and large for each method except computer-assisted instruction, which had mixed results. The primary implication the researchers offered was that instructional methods that directly teach vocabulary should be emphasized and that practice maximizes the effects of instruction. Bryant and colleagues reviewed 6 studies concerning vocabulary instruction for secondary students with learning disabilities categorized as *computer-assisted*, *fluency building*, *mnemonic strategy*, and *concept enhancement*. They reported that in all cases the vocabulary interventions produced better outcomes than more traditional approaches to instruction (e.g., dictionary methods or context clues). Authors of both syntheses pointed out that effective results were achieved in relatively short periods of time, lending support to the notion that vocabulary instruction does not have to consume large portions of limited class time.

There is much agreement among the conclusions of the authors of the four syntheses mentioned above. Whether students have diagnosed learning disabilities or no disabilities, vocabulary instruction seems to be most effective when words are carefully selected for utility and presented in multiple contexts, active processing of information is facilitated, and information about the words is repeated over time. When words are essential for reading comprehension but low-frequency outside a specific context, providing simple definitions for students before reading is recommended (Baker, Simmons, & Kameenui,

1991). This is particularly important for struggling readers such as those in the present study who tend to have trouble inducing rules and would thus be more likely to experience prohibitive difficulties with independent strategies such as searching out context clues (Stahl & Erickson, 1996).

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