EFFECTS OF CLASSWIDE Peer Tutoring on the Acquisition, Maintenance, and Generalization of Science Vocabulary Words for Seventh Grade Students with Learning Disabilities and/or Low Achievement

Dissertation

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By

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* * * * *

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ABSTRACT

This study investigated the effects of classwide peer tutoring (CWPT) on the acquisition, maintenance, and generalization of science vocabulary words and definitions. Participants were 14 seventh grade students at-risk for failure in a general education science course; 3 students had learning disabilities and 2 had a communication disorder.

CWPT was conducted daily for 20 minutes during the last period of the school day. Procedures for CWPT were consistent with the Ohio State University CWPT model. Students were engaged in dyadic, reciprocal tutoring. Tutors presented word cards to tutees to identify the word and definition. Tutors praised correct responses and used a correction procedure for incorrect responses. After practicing their vocabulary words, students completed a daily testing procedure and recorded and plotted data.

Many of the study’s findings are consistent with previous studies using CWPT to teach word identification. Results of this study indicate a functional relationship between CWPT and acquisition of science vocabulary. All students were able to acquire words and definitions. Results for maintenance and generalization varied. When acquisition criterion was changed, maintenance and generalization scores increased for some students, while other students remained consistently high. All students reported that they enjoyed CWPT, and all but student stated it helped them learn science vocabulary.
Dedicated to my family and friends
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CHAPTER 1

INTRODUCTION

Contemporary classrooms are becoming more diverse as an increasing number of students with disabilities are served in the general education classroom (Heward, 2006). In this setting, they have access to the general education curriculum (Nolet & McLaughlin, 2000) and participate in many of the same extracurricular activities as their peers. This increased diversity may create a need for additional support in order to meet the academic needs for students with disabilities and for those students who are at-risk for school failure. Several researchers have described methods teachers can use to support students who are challenged in general education classes (e.g., collaboration) (Fisher & Frey, 2001; Jitendra, Edwards, Choutka, & Treadway, 2002; King-Sears, 2001). Collaboration between general and special educators has been noted as a key to providing support for students who are at-risk for academic failure (Fisher & Frey, 2001; Jitendra, Edwards, Choutka, & Treadway, 2002; King-Sears, 2001). Teachers are also required to provide accommodations and modifications on assessments and tests for students with disabilities who require these services (Fisher & Frey, 2001; Jitendra, et al., 2002; King-Sears, 2001). However, when the curriculum falls short of meeting student needs, or when teachers wish to enrich the curriculum, three possible interventions can be considered. First, teachers can enhance the curriculum through peer involvement (Fisher
Several strategies have been identified as effective and efficient instructional methods. These strategies can be categorized into three groups: teacher-directed, semi-independent, and peer-mediated (Heron & Harris, 2001). Teacher-directed methods such as response cards (Armendariz & Umbreit, 1999; Heward, Gardner, Cavanaugh, Courson, Grossi & Barbeta, 1996), guided notes (Kline, 1986; Pados, 1989; Yang, 1988), and choral responding (Heward, Courson & Narayan, 1989; Sainato, Strain & Lyon, 1987) have been identified as evidence-based strategies that can be used to increase active student responding and academic achievement in the classroom. Semi-independent strategies such as assistive technology (Blackhurst, 1997) and computer-assisted instruction can provide assistance to students so they can mediate their own instruction. Finally, peer-mediated approaches such as cooperative learning (Davidson, 1985; Johnson, Maruyama, Johnson, Nelson, & Skon, 1981; Newmann & Thompson, 1987; & Slavin, 1983; 1989) and classwide peer tutoring (Barbeta, Miller, Peters, Heron, Cochran, 1991; Cooke, Heron, & Heward, 1983; Greenwood, Arreaga-Mayer, Utley, Gavin, & Terry, 2001) have been established through repeated experimentation and replication as empirically sound instructional practices.

Peer-mediated strategies have a long history of increasing academic achievement in various settings, content areas, and with many different students (Heron, Welsch, & Goddard, 2003). Research indicates that when students are engaged in peer tutoring, content knowledge increases (Barbeta, Miller, Peters, Heron, & Cochran, 1991;
Maheady, Harper, Mallette, & Winstanley, 1991; Wright, Cavanaugh, Sainato, & Heward, 1995). The majority of peer tutoring studies have been conducted in elementary schools and have focused on basic skill areas (e.g., reading sight words and completing basic math facts).

Although peer tutoring systems are effective and efficient means of supplementing and individualizing the curriculum at the elementary level, few studies have extended CWPT to the middle or secondary level. Of those studies that have included older students, results have been mixed (Allsopp, 1997; Mastropieri, Scruggs, Spencer, & Fontana, 2003; Wright et al., 1995). That is, Allsopp found that students who used classwide peer tutoring improved at a level commensurate with students who did not receive peer tutoring during their general mathematics class. Because both groups in the study showed improvement, the gains made in the classwide peer tutoring group gains could not be attributed to the intervention. In contrast to the Allsopp findings, Wright et al., (1995) implemented classwide peer tutoring in a Spanish course. Sixteen students involved in the study acquired 92 or more Spanish words during the course of the study. Not only did the students acquire the Spanish vocabulary, but also they scored 77% or higher on weekly maintenance tests. Additionally, Mastropieri et al., (2003) compared the effects of guided notes reviews and peer tutoring reviews on the test scores of sixteen students with disabilities. Results indicated that chapter test, unit test, and final exam scores were higher when students reviewed material with peer tutoring. Given the small number of studies that include middle and high school students, more research needs to be conducted to determine if the effects noted in elementary settings are to be replicated in middle and secondary settings.
In diverse classrooms, effective instructional strategies such as classwide peer tutoring are vital to meeting the needs of all students (Jitendra et al., 2002). Not only should more classwide peer tutoring studies be conducted in middle and high schools, but also there is also a need to document effects of classwide peer tutoring to increase achievement in science courses. A study conducted in a middle school classroom to determine the effects of classwide peer tutoring on the acquisition, maintenance, and generalization of science vocabulary would provide further support for the use of classwide peer tutoring to increase academic achievement with older students, and would extend the empirical support to science.

Purpose of the Study

This study was designed to: 1) provide CWPT to students who were at-risk for failure in science, 2) extend the CWPT literature to middle school students, and 3) extend the CWPT literature to include science vocabulary words. Data were collected on 1) acquisition of science vocabulary, 2) maintenance of science vocabulary, 3) generalization of science vocabulary, and 4) consumer satisfaction with peer tutoring intervention.

Research Questions

Five research questions were investigated during the course of this study.

1. What are the effects of CWPT on the acquisition of science vocabulary words and definitions?

2. What are the effects of CWPT on the maintenance of science vocabulary words and definitions?
3. What are the effects of CWPT on the generalization of science vocabulary words and definitions?

4. What are the opinions of students regarding the use of CWPT?

5. What are the opinions of teachers regarding the use of CWPT?

Glossary of Key Terms

Definitions for terms used in this study are provided below.

*Acquisition:* Acquisition referred to the student’s ability to learn vocabulary words. Prior to instruction, if a student demonstrated an inability to pronounce a word, and/or define the word during a pretest, it was not considered acquired. After instruction, if the student pronounced and defined the vocabulary word, the word was considered acquired, or learned.

*Assessors:* Assessors were the classroom teacher and experimenter who conducted a pretest or probe to determine if the student could pronounce and/or define each vocabulary word presented.

*At-risk for failure in science:* At-risk for failure in science referred to students who were identified by their general education science teacher as struggling in their science course. Struggling was defined as average or below average (grade of C or below) performance in science. These students were selected by the general education science teacher for enrollment in a district-configured science intervention class.

*Classwide Peer Tutoring System:* The Classwide Peer Tutoring System, or CWPT, referred to a systematic, peer-mediated, reciprocal, and simultaneous instructional program consisting of practice, prompting, testing, and recording of student responses to
instructional stimuli presented by the tutor. Variations of tutoring systems include one-to-one tutoring, cross-age tutoring, small-group tutoring, and home-based tutoring.

*Communication disorder:* Communication disorders were defined as impairments that affect students’ ability to hear, use or comprehend language, and/or speak (ASHA, 2005).

*Generalization test:* The generalization test was an assessment to determine if responses acquired during CWPT appeared in untrained situations. Students were expected to write the vocabulary word on the blank next to the correct definition of the word or provide the definition for the given science term. This study conducted generalization pretests and posttests for each card set.

*Intervention class:* Intervention class was a class period, at the middle school in which the study was conducted, designed to provide additional support for students who were at-risk for failure in science.

*Key words:* Key words were denoted on each definition as underlined words that were central to the correct definition of the science vocabulary word.

*Learning disability:* According to the National Joint Committee on Learning Disabilities, learning disabilities is a general term referring to a heterogeneous group of disorders. These disorders manifest as “significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical skills” (NJCLD, 1990/2001, p. 31). In addition, learning disabilities are intrinsic to the individual and are “presumed to be due to central nervous system dysfunction” (NJCLD, 1990/2001, p. 31). Learning disabilities may occur concomitantly with other disabilities or with extrinsic influences, but they are not the result of those conditions or influences (NJCLD, 1990/2001).
Maintenance: Maintenance referred to a student’s ability to retain information after instruction had been terminated. Maintenance probes were conducted initially one week after a set of vocabulary words had been acquired, then continued on a weekly basis.

Peer: A peer was a student who was approximately the same age, grade, and academic level as another student he or she was matched with for instruction.

Peer Tutoring: Peer tutoring was characterized by dyadic, 1:1 pairing such that one student taught another student who was approximately the same age or grade level.

Preassessment probes: Preassessment probes were conducted to insure that the CWPT vocabulary words were unknown prior to instruction.

Social Validity Questionnaires: Social validity questionnaires referred to a series of surveys that solicited consumer opinions about the procedures and observed effects of an intervention.
CHAPTER 2

REVIEW OF THE LITERATURE

This review of the literature is divided into seven main sections: 1) science instruction, 2) students at-risk for academic failure and students with mild learning disabilities, 3) effective instructional practices, 4) peer-mediated instruction, 5) generalization, 6) maintenance, and 7) social validity.

Science Instruction

Several national organizations, including the American Association for the Advancement of Science (AAAS) and the National Committee on Science Education Standards and Assessment of the National Research Council (NRC), are currently recommending reforms in science education. These organizations are committed to providing quality science education to all students “regardless of age, gender, cultural or ethnic background, disabilities, aspirations, or interest or motivation in science,” (NRC, 1995, p. 2). The AAAS and the NRC identified that teaching fundamental concepts, principles, facts, laws, and theories will provide a foundation for understanding and applying science, as opposed to having students “construct” the meanings for themselves. These fundamental understandings have been labeled “big ideas” by the AAAS (Kameenui, Carnine, Dixon, Simmons, & Coyne, 2002).
Textbooks are the most common instructional tool for teaching science in the middle and high school (Kameenui et al., 2002). Yet, several studies have identified science textbooks alone as ineffective due to their poor design for affecting conceptual changes required for meaningful learning due to their lack of emphasis on explicit instruction of basic concepts (Kameenui et al., 2002; Lloyd, 1989; Newport, 1990; Osborn, Jones, & Stein, 1985; Smith, Blakeslee, & Anderson, 1993). Specifically, poor textbook design is a contributing factor in the rejection of explicit instruction in favor of proficiency in science inquiry skills alone (Kameenui et al., 2002). If teachers within America’s schools are going to meet the standards identified by the AAAS and the NRC, they will need to implement effective science instruction that includes science inquiry and explicit instruction of concepts.

Students At-Risk for Academic Failure and Students with Mild Learning Disabilities

Students who are experiencing difficulty in the general education classroom are considered at-risk for academic failure. Students with learning disabilities are diagnosed as having one or more of a group of disorders that can affect their ability to listen, speak, read, write, reason, or do math (NJCLD, 1990/2001). Students who are at-risk for academic failure and students with mild disabilities have several common characteristics. These characteristics may include cognitive or metacognitive deficits, low academic achievement, poor memory, attention or hyperactivity problems, perceptual disorders, poor social skills, poor self-concept, poor motivation, adaptive behavior deficits, disruptive behavior, and withdrawal (Mercer & Mercer, 1998). Low achieving students may have problems with receiving information, connecting new knowledge with prior knowledge, or recalling or expressing new information (Mercer & Mercer, 1998). These
characteristics can hinder a student’s ability to achieve in a general education classroom (e.g. science class). Fortunately, students with learning problems benefit from individualized instruction, remediation, and effective instruction to help them attain success in their academic classes (Heward, 2006).

Effective Instructional Practices

There are several elements that compose quality instruction. Mastropieri and Scruggs (2002) suggest six elements effective teachers should use during instructional delivery. These elements are structure, clarity, redundancy, enthusiasm, appropriate rate, and maximized engagement. Instructional methods that incorporate all or several of these elements are considered to be effective instructional methods. Three practices for providing effective instruction will be discussed. These practices are teacher-directed, semi-independent, and peer-mediated approaches to enhancing instruction (Heron & Harris, 2001).

Teacher-directed Approaches to Enhancing Instruction

Teacher-directed instructional practices are those where the teacher delivers the instruction, controls the pace, and provides cues, reinforcement, or corrective feedback for each learning trial (Heron & Harris, 2001). Two examples of teacher-directed practices are Direct Instruction (Carnine, 1983) and strategies to increase active student responding (Heward, 1994).

Direct Instruction

Direct Instruction (DI) is an approach that uses highly scripted, fast-paced, and empirically tested lesson sequences to teach reading, math, spelling, and thinking skills. DI provides a constant interaction between the students and the teacher that allows the
teacher to provide praise and error correction for student choral responses. DI produces academic gains for students and has been a well established and empirically sound instructional method for over two decades (Carnine, 1983).

DI uses three critical components: organization of instruction, program design, and teacher presentation techniques (Carnine, Silbert, & Kameenui, 1997). Organization of instruction refers to the amount of time students are engaged in academic work. Research has shown that more engaged time leads to higher student achievement (Brophy & Good, 1986; Rosenshine & Berliner, 1978). In DI lessons, students are engaged with the content during fast-paced, teacher-directed lessons.

DI programs are designed to maximize student learning through identifying objectives, developing strategies, implementing teacher procedures for instruction, selecting examples and non-examples, sequencing skills, and providing adequate practice and review (Carnine et al., 1997). DI materials are carefully designed to instruct students to rely on strategies, not rote memorization (Carnine et al., 1997). The carefully chosen examples and non-examples make concepts as concrete as possible and remove any vague examples. One skill is presented per lesson to avoid confusion and allow for teaching to mastery. Teachers are instructed to deliver instruction according to specific cues, signals, and systematic feedback for student responding. Teachers also allow enough practice and review opportunities for students to master the skill before moving on in the curriculum.

Teacher presentation is conducted small groups with students chosen for each group based upon their ability level. Lessons begin as teacher-directed with modeling and guided practice. Students respond in unison to teacher presented questions. Teachers do
allow wait time for students to think about their response and use signals for wait time and response time. Teachers monitor student responding and correct errors as they occur. Students will continue to work on a lesson until everyone in the small group can respond correctly to each question. Once students can respond correctly during guided practice, the teacher transfers to more individual practice and independent work (Carnine et al., 1997).

The largest study undertaken by the U.S. Department of Education conducted between 1967 and 1970 compared nine instructional approaches, including DI. Project Follow Through included 79,000 students in 180 communities. Results indicated that DI was the superior method of instruction to foster basic skills in reading and math (Becker & Engelmann, 1996; Kozioff, LaNunziata, Cowardin, & Bessellieu, 2001). Although DI has strong empirical support, many teachers are hesitant to use DI because of their misperceptions of the program (Watkins, 1996).

**Strategies to Increase Active Student Response**

Active student response (ASR) is defined as an “observable response made to an instructional antecedent” (Heward, 1994, p. 286). Active student responding strategies use learning trials, increased opportunities to respond, and are active rather than passive methods of instruction. First, a learning trial consists of an instructional antecedent (i.e., teacher asks a question), a student response (i.e., student answers the question), and feedback (i.e., either praise for correct answer or corrective feedback for incorrect answer). Presenting and/or practicing academic content through the use of learning trials allows the teacher to increase students’ level of engagement with that content.

Educational researchers have found increased student engagement with academic content
and increased academic achievement are correlated (e.g., Heward, 1994; Rosenshine & Berliner, 1978). In addition to the structure of learning trials, ASR also exemplifies increased opportunities to respond (Greenwood, Delquadri, & Hall, 1984). Strategies to increase ASR increase students’ opportunities to respond by providing increased chances for students to respond to teacher questions or instructional stimuli during instruction. Finally, ASR is active responding. The difference between an active response and a passive response is that an active response indicates a detectable response to on-going teacher instruction (Heward, 1994). Passive responding allows students to observe or attend to on-going instruction without making a detectable response. The combined effects of using learning trials, increased opportunities to respond, and active responding make strategies to increase ASR effective instructional practices.

Three types of teacher-led active student response strategies with a research base are choral responding, response cards, and guided notes. Another strategy to increase ASR, peer tutoring, will be discussed in the peer-mediated section of the literature review.

*Choral responding.* Choral responding (CR) requires each student in the class to respond in unison to a question asked by the teacher (Heward, 1994). CR is primarily used to review content and provide the teacher with vital information regarding student understanding. CR can be interspersed into a lesson or can serve as a stand-alone review session. Procedurally, CR trials consist of a question posed by the teacher, a cue for students to respond in unison, a unison response, and either a praise statement or corrective feedback provided by the teacher. CR trials are implemented easily into any type of lesson and can be used with any age group. Typically CR is used in preschool and
early grades as a part of circle times, or in high school foreign language courses. One advantage that CR has over other review methods is the ease of usage. It is easy for teachers to ask questions and have students respond orally. One disadvantage is that it may be difficult for the teacher to discern who is making incorrect responses or to determine if every student is responding.

Research has shown that choral responding increases student response rates and involvement in the material being presented (Heward, Courson & Narayan, 1989; Sainato, Strain & Lyon, 1987). Choral responding has been shown to decrease off-task behavior (Sterling, Barbetta, Heward & Heron, 1997) and is more effective than passive learning (Heward, 1994).

Response cards. Response cards (RC) are “cards, signs, or items held up simultaneously by all students to display (the) response to (a) question or problem presented by the teacher” (Heward, 1994, p. 299). Generally, RC are used during review sessions to demonstrate students’ acquisition of content presented in a lesson.

There are two types of response cards, pre-printed (PPRC) and write-on response cards (WORC). PPRC are designed to provide the student with a definite set of accepted responses for the questions being asked by the teacher. Some examples of pre-printed sets of responses are: true and false, parts of speech, continents, numbers, colors, or states of matter (Heward, 1994). These responses can be displayed as a set of cards with one response per card, or a single card with a number of responses that students can attach a clothespin to indicate the answer they want to choose (Heward, 1994).

WORC are blank dry-erase boards or individual chalkboards used to mark answers to teacher-posed questions. Boards are erased after each learning trial is
completed. WORC also allow a variety of student responses for a given question. WORC can be used for recall or recognition questions, which allows the teacher the ability to ask more in-depth questions. Students can also learn by watching the responses of others to obtain more exposure to correct responses (Heward, 1994). Advantages of WORC include: generating multiple answers to questions, facilitating creative student responses, and checking for correct spelling of written responses (Heward, 1994). There are some possible disadvantages as well. These include: lower ASR rate due to more time allowed for writing and erasing, higher errors rates due to wide range of responses, and variations in the size and legibility of individual students handwriting, which makes responses harder for the teacher to read (Heward, 1994).

Response cards also increase student response, increase involvement in the material being presented, and reduce off-task behavior (Armendariz & Umbreit, 1999; Heward, Gardner, Cavanaugh, Courson, Grossi & Barbetta, 1996). Response cards have one advantage over choral responding; the teacher can easily detect responses of individual students. Research has also shown that using response cards to review content before a test is superior to class discussion alone (Heward, 1994).

Guided notes. Guided notes (GN) are teacher-prepared handouts that guide a student through a lecture with standard cues (e.g., bullet points) and spaces to write key facts, concepts, or relationships (Heward, 1994). Students are able to complete their copy of the notes by filling in the missing information as the teacher progressively discloses the complete copy on an overhead or Power Point™. In addition to writing the notes during the lecture, students are then able to use one of two methods to study those notes, solo mode or group huddle. Solo mode allows students to study their GN independently
before a quiz or test. Group huddle allows students to arrange themselves into a small group of three or four to study their notes together or to gather any information that an individual student may have missed during the lecture. GN can be collected by the teacher and double checked for accuracy and/or graded. The advantage of GN over student versions of notes is that guided notes allow students to take notes from a lecture or teacher-directed presentation that are more accurate and complete. GN have been proven to increase test scores when used to study (Kline, 1986; Pados, 1989; Rindfuss, 1997; Yang, 1988).

**Semi-Independent Approaches to Enhancing Instruction**

Semi-independent approaches are those that the student mediates with the assistance of a computer or a teacher-made device. In this approach, students assume the primary responsibility for delivering their own instruction (Blackhurst, 1997). Two examples of semi-independent approaches are assistive technology and computer-assisted instruction.

**Assistive Technology**

Assistive technology uses specially designed equipment to improve the independent functioning of students with disabilities (Blackhurst, 1997). There are several types of assistive technology available to students ranging along a continuum from low to high technology. Low-tech assistive devices can be something as simple as a pencil grip to improve fine motor control when writing. An example of a high-tech assistive device would be a laptop computer with voice recognition software installed. The use of assistive technology in the classroom should be based on the individual needs of the student, especially those students with disabilities. Teachers should determine on
an individual basis which type of assistive device, low- or high-tech, will produce successful outcomes for students in the classroom.

Computer-assisted Instruction

Computer-assisted instruction is instruction that uses computer hardware and/or software to assist the student with a learning task. Students are able to mediate their own instruction with the aid of the computer or computer program. Self-instructional tools such as Leap Pad Learning Workbooks provide an opportunity for students to practice skills individually at their own pace. These workbooks are interactive devices using processing chips. Computer software can also provide students with systematic instruction and feedback. Programs such as Headsprout can be used in the classroom to supplement reading instruction. Software programs are becoming increasingly popular in schools as computers become more accessible and the need for individualized instruction increases. A common element of instructional hardware and software is that it requires the student to mediate the instruction.

Peer-mediated Approaches to Enhance Instruction

Two peer-mediated approaches to enhance instruction will be discussed: cooperative learning and classwide peer tutoring. Classwide peer tutoring will be discussed in more detail including sections describing models of tutoring systems, advantages of classwide peer tutoring, disadvantages of classwide peer tutoring, and effectiveness of classwide peer tutoring.

Cooperative Learning

Many elementary school teachers employ a strategy where students are asked to work in small, cooperative groups. These groups can be used for a variety of classroom
activities, including acquisition of vocabulary. The primary goal of cooperative learning is to have students take responsibility for ensuring that all members of the group have learned the material. The role of the teacher during cooperative learning group time changes from presenter of material to facilitator of groups. The success of cooperative learning groups requires that students have been trained adequately to perform their role in the group (e.g., secretary). Often, social skills training is included during the training phase to ensure that all members of the group can contribute and participate effectively (Goor & Schwenn, 1993). Several models of cooperative learning groups exist (Kagan, 1990; Meese, 2001; Slavin, 1991). Five such models will be discussed briefly.

**Student teams-achievement divisions.** The first model is Student Teams-Achievement Divisions (STAD). A class is divided into groups of 4 students. These groups are used to collaboratively review material presented by the teacher. After the review in groups, students complete tests or quizzes individually. Test or quiz scores are compared to previous scores and points are awarded to each student based on amount of improvement over the previous score. The points of all team members are totaled to reach a team score. Once a team reaches a predetermined criterion level, a reward is delivered (Meese, 2001; Slavin, 1991).

**Teams-games-tournaments.** A second model of cooperative learning is Teams-Games-Tournaments (TGT). TGT is designed the same way as STAD, with students grouped into teams of 4, but weekly tournaments take the place of weekly quizzes or tests. In a tournament, teams compete in a head-to-head competition to review academic content. Points are awarded as teams correctly answer questions posed by the teacher.
High-performing teams earn a reward at the completion of the tournament (Meese, 2001; Slavin, 1991).

*Team assisted individualization.* The third model of cooperative learning is called Team Assisted Individualization (TAI). Students are assigned to teams during math instruction. Teams work on individual math assignments, but are able to help one another while working independently. When team members are finished with their assignments, they check their work and make sure each member of the team has checked his or her work. Unit tests are taken individually and points are awarded for passing scores and perfect papers. Team points are tallied and certificates are given to high scoring teams (Meese, 2001; Slavin, 1991).

*Cooperative integrated reading and composition.* Cooperative Integrated Reading and Composition (CIRC) is the fourth cooperative group model. CIRC is used to teach reading and writing skills to upper elementary students. Students are grouped by abilities into traditional reading groups. While one reading group is meeting with the teacher, other groups are working on writing assignments, vocabulary, spelling, and comprehension activities. Team members help decide who is ready to take tests and quizzes. Points are awarded for individual performances on tests and quizzes. High scoring teams are rewarded (Meese, 2001; Slavin, 1991).

*Numbered heads together.* Finally, a fifth cooperative group arrangement is Numbered Heads Together (Kagan, 1990; Maheady, Mallette, Harper, & Saca, 1991). Student groups are assigned two high achieving students, one average performing student, and one low performing student per group. Students number themselves 1 through 4 within each group. The teacher asks a question to the class and groups discuss
what they believe is the answer. Each group insures that all member of their group knows the answer. The teacher than asks how many number 1s know the answer. The teacher randomly selects a student to answer then asks if other numbered students agree with the selected student’s response (i.e., how many number 4s agree?). This strategy provides more student engagement than traditional teacher questioning reviews.

Recent cooperative learning research has focused on the procedures involved in organizing and conducting cooperative groups in a class. There is general consensus in the literature that cooperative learning has a positive impact on student achievement (Davidson, 1985; Johnson et al., 1981; Newmann & Thompson, 1987; & Slavin, 1983; 1989). Current research in cooperative learning is investigating the types of behaviors students need to master to make cooperative groups more effective (Webb, Farivar, Sydney, & Mastergeorge, 2002) and methods for assessment within cooperative groups (Webb, 1997). Given the inclusion of students with disabilities in general education classrooms, there are also a few studies investigating the role students with disabilities play in cooperative groups (Pomplun, 1997), and those studies that identify information that special education teachers need to know about these groups before including students with disabilities (Johnson & Johnson, 1989).

*Classwide Peer Tutoring*

Classwide peer tutoring (CWPT) is an active student response approach to instruction that requires a pair of students to engage in an explicit, didactic system of presentation, instruction, error correction, and evaluation. CWPT is different from other approaches to instruction that use students to instruct other students because CWPT is a tutoring system with several distinct phases: training, practice, and evaluation. Students
are trained to conduct each phase of the system and are reinforced for emitting correct tutoring behaviors during and after training. During the practice phase of the system, students are taught how to present material to their partner, praise correct responses, and provide error correction for incorrect responses. This explicit and systematic practice allows students to complete many learning trials, and receive feedback for every response made. Once students have completed the practice phase, the student serving as the tutor evaluates his/her partner’s performance by providing the tutee one chance per tutoring card to emit a response. Responses are recorded as correct or incorrect by recording data on the back of each tutoring card. The set of cards is then sorted into acquired cards or cards that require more practice. Providing students and teachers with daily test data on each tutoring card allows both to determine how quickly acquisition of data is occurring.

CWPT is a strategy that should be used to enhance instruction and provide opportunities to learn and/or practice important skills and concepts. CWPT is not intended to replace or become the primary curriculum for a class. CWPT has been used primarily to teach discrete skills or concepts, such as vocabulary words, math facts, or spelling words. There are some aspects of the curriculum that should be reviewed using another form of active student responding other than CWPT. For example, concepts with more than one acceptable response, or responses that require elaboration, would be difficult to practice with CWPT.

Tutoring Systems

There are several tutoring systems and variations on these systems that have been reported in the literature. Overall, these systems have emanated from four centers within the United States: Juniper Gardens Children’s Project of the University of Kansas
Children’s Project CWPT Model. The CWPT system developed by Delquadri and colleagues divides the entire class into two teams (Allsopp, 1997; Delquadri, Greenwood, Stratton, & Hall, 1983; DuPaul, Ervin, Hook, & McGoye, 1998). Within each team, students are paired in dyads or triads. Pairs are assigned randomly when math or spelling is the content area for tutoring, and are assigned by ability level when reading is the content area for tutoring. Pairs are most often rotated on a weekly basis. Tutoring sessions are conducted daily for 30 minutes. Pairs work together in a reciprocal arrangement where the tutor presents an instructional stimulus, evaluates performance, provides feedback (i.e., tutor will tell the tutee the correct answer and have them repeat it), and awards points. Points are used in this system rather than actual recording of the number of correct or incorrect responses. At the conclusion of each day’s tutoring session, points are tallied for each team and are publicly posted in the classroom. The team with the most points that day is congratulated with a round of applause. At the end of the week, all students complete a test over the tutored material.

SUNY-Fredonia’s Classwide Student Tutoring Teams. Classwide student tutoring teams (CSTT) is also a system that divides the whole class into groups (Harper, Mallette, Maheady, Parkes, & Moore, 1993; Maheady, Harper, Mallette, & Winstanley, 1991; Maheady, Sacca, & Harper, 1987). This system differs from Delquadri’s model in that...
the students are divided into small groups of 4 to 6 students. Each group includes at least one high achiever, one average achiever, and one low achiever. Teams are changed every 4 to 6 weeks. Students take turns being the tutor for the group. The tutor presents the instructional stimulus, evaluates performance, provides feedback, and awards points. Like the Juniper Gardens CWPT model, feedback involves requiring the tutee to repeat the correct answer and points are used rather than actual recording of correct and incorrect responses for each instructional stimulus. Once the tutoring session has been completed for the day, points are posted for each group. The winning group of the day is congratulated. CSTT usually occurs three or four times a week for 20 to 30 minute sessions and has been used at the elementary and middle school levels.

*Peabody College at Vanderbilt’s Peer-assisted Learning Strategies.* Peer-assisted learning strategies, PALS, divides the whole class into competing teams like Delquadri’s system (Fuchs, Fuchs, Mathes, & Simmons, 1995; Fuchs, Fuchs, Phillips, Hamlett, & Karns, 1995; Simmons, Fuchs, Fuchs, Hodge, & Mathes, 1994). Within each team, students are paired or work in triads. Students are paired using a ranking system. The entire class is ranked from top to bottom. Then, the top half and the bottom half of the class are determined. Students are paired by taking the first person from the top half and the first person from the bottom half, second person from the top half and second person from the bottom half, and so forth. Teams and dyads are rotated every four weeks. Tutoring pairs are reciprocal and work together three times a week for 30 minutes a session. The role of the tutor is to model reading a passage and provide feedback and points to the tutee when he or she reads the same passage. Dyads always work out of the lower reader’s workbook. Pairs are taught several strategies to complete during reading.
tutoring including, partner reading, paragraph shrinking, and prediction relay. Tutors use systematic error correction and award points contingent on performance. This model, as in the two previous models, has the tutee repeat the correct response when errors are made and awards points rather than recording the actual correct and incorrect data for each instructional stimulus. At the completion of each day’s session, each team’s points are totaled and the winning team is congratulated. PALS has been implemented in first through sixth grade only.

*The Ohio State University’s CWPT Model.* In the Ohio State CWPT system (Barbetta & Heron, 1991; Barbetta, Miller, Peters, Heron, & Cochran, 1991; Cooke, Heron, & Heward, 1983; Heron, Heward, Cooke, & Hill, 1983) tutoring can be conducted classwide arranged in dyads, one-to-one, in small groups, home-based, or cross-age. Dyads can be assigned randomly or by pairing the highest scoring tutor with the highest scoring tutee. These pairings can be long or short in duration. This system can be reciprocal or non-reciprocal. The role of the tutor in either reciprocal or non-reciprocal involves the tutor presenting instructional stimulus, prompting a response if necessary, providing systematic feedback (i.e., praise when correct, “try again” then model answer for tutee to repeat when incorrect), administering a testing phase, and recording performance data. CWPT in this system can occur from once a week to daily sessions for 20 to 30 minutes per session.

CWPT in this model differs from previous models in its use of self-correction and actual recording of correct and incorrect data for each instructional stimulus. When a tutee makes an incorrect response, the tutor provides the tutee with a chance to make a self-correction by saying “try again”. “Try again” allows the tutee to recognize he or she
has made an error and provides an opportunity for a correct response. If a correct
response occurs during self-correction, praise is delivered by the tutor and the next
stimulus is presented. When “try again” results in no response or another incorrect
response, the tutee is given the correct answer by the tutor and is instructed to repeat the
answer. Once a correct response is emitted by the tutee, the tutor can provide praise and
move to the next instructional stimulus. In addition to the self-correction procedure, the
OSU model also allows students to record correct and incorrect data for each
instructional stimulus during the testing phase. During testing, the tutee is presented each
instructional stimulus one time. The tutor sorts the word cards into correct and incorrect
piles as the tutee makes correct or incorrect responses. Then the tutor records the location
of each word card on the back of each word card. This data collection is different from
the points earned in other tutoring systems because the OSU system has actual data
regarding accuracy of student responses rather than aggregate data reflected by the
collection of individual and team points.

Variations of Ohio State’s Peer-tutoring System

Classwide. CWPT uses an explicit procedure of practice, testing, and recording.
Students exchange folders containing flashcards with the content to be learned. There are
usually three pockets inside the folder, a “Go” pocket, a “Stop” pocket, and a Star Card
pocket (see Figure 2.1). There is also a graph that students use to record movement of
cards from “Go” pocket (i.e., cards to be learned) to “Stop” pocket (i.e., cards learned or
acquired). Cards are removed from the “Go” pocket and are presented to the tutee as
many times as possible during the practice phase of tutoring. During this phase, each
student takes a turn being tutor and tutee, which provides many opportunities to respond
Figure 2.1: Sample peer tutoring folder.
in a short amount of time. Tutees also receive immediate praise or corrective feedback for their responses. After each student has participated in practice as a tutee, the assessment phase of tutoring begins. The tutee is presented each card in the set one time while the tutor records corrects and incorrects using the back of the folder where a happy face (☺) for corrects and an X for incorrects is located. Once each student in the dyad has completed testing, students record the location (correct or incorrect) of each card on a grid found on the back of each card. Then, folders are organized with cards being placed in either the “Go” or “Stop” pocket for the next day of tutoring. Cards move to the “Stop” pocket after 2 or 3 consecutive sessions of correct responding by the tutee during testing. The criterion for movement is determined by the teacher. Cards that move to the “Stop” pocket are considered acquired. In addition, students may complete a graph to show how many cards moved from the “Go” pocket to the “Stop” pocket each day. Once all cards in a folder are placed in the “Stop” pocket, the set will move to a maintenance file and new cards will be placed in the “Go” pocket. Maintenance probes are conducted with acquired sets one week after being placed in the maintenance file.

In addition to the above procedures, there is a tutor huddle component that is often included to address the potential problem of students being unfamiliar with the material their partner is working to acquire. This huddle allows students to ensure they know what each card says so they are able to provide either praise or corrective feedback accurately. In addition, the tutoring system could have a replacement aspect where the number of cards in the “Go” pocket remains constant. As cards move to the “Stop” pocket, they are replaced on a card-by-card basis so that the total always stays at 10 cards. For example, students would always have 10 cards in their “Go” pocket in a
replacement system, whereas students in a non-replacement system would have 10 cards or fewer to practice and would receive new cards only when all 10 in the previous set have moved to the “Stop” pocket.

**One-to-one.** In one-on-one peer tutoring only a few students are selected to participate in tutoring. This model is generally used to remediate academic skills for a student. The tutoring protocol is the same as the classwide model and consists of a practice phase, testing phase, and recording phase (Heron & Harris, 2001).

**Small group.** In small group tutoring there are two possible variations, remedial work and rotating groups. In remedial work, students who need remediation may engage in tutoring during independent work time. This would provide additional practice time for them to acquire skills. Rotating groups is similar to having tutoring as a center in the classroom. For example, while the teacher is working with a reading group, other groups may be engaged in tutoring. The groups would rotate through activities until all groups had participated in all center activities. Tutoring protocols are the same as the classwide model (Heron & Harris, 2001).

**Home-based.** In home-based systems a parent or sibling serves as the tutor. Barbetta and Heron (1991) trained parents in the tutoring protocol described in the classwide model. Parents were taught to manage the system, provide praise and corrective feedback, test and record data, and keep tutoring sessions fun (Barbetta & Heron, 1991; Heron & Harris, 2001).

**Cross-age.** In cross-age tutoring systems the tutor is usually two or more years older than the tutee (Heron & Harris, 2001). A time is arranged for the tutors to come into the younger students classroom for tutoring sessions. Sometimes this arrangement
involves students in the same building (e.g., 5th graders tutoring 2nd graders), but if there is another building close to the elementary older students may be able to tutor (e.g., high school students leaving study hall to tutor 3rd graders). Barbetta and colleagues (1991) were able to establish such a system called TUGMATE where high school students traveled to a nearby elementary school and were able to tutor students on basic sight word vocabulary. Tutoring protocols for cross-age tutoring are the same as those described in the classwide model.

*Advantages of Classwide Peer Tutoring*

There are several advantages for using CWPT with students with disabilities and those without disabilities. Advantages include ease of implementation, benefits for tutors and tutees, individualized instruction, and increases in academic achievement and opportunity to respond.

*Ease of implementation.* CWPT is flexible across settings and subject areas as these programs have been implemented in classrooms ranging from kindergarten to high school, general education to special education. Successful CWPT programs have been used to teach reading, math, spelling, foreign language, and telling time skills. Teachers who have implemented a CWPT program have reported ease of implementation and maintenance once the students have been trained (e.g., McKain, 2004). Because the program – at least the OSU model – is designed to be conducted within a 20 to 30 minute period, CWPT can be quickly integrated into daily routines.

*Benefits tutors and tutees.* Several studies have examined the benefits of tutoring for both the tutor and the tutee. Osguthorpe and Scruggs (1986) concluded that students with various disabilities can effectively perform the tasks required of the tutor, and that
disability category is not a critical factor in how much the tutor or tutee benefit from tutoring. In reciprocal peer tutoring systems, both students in the pair showed gains in the content area tutored (Heron, Heward, Cooke, & Hill, 1983). Cohen, Kulik, and Kulik’s (1982) meta-analysis provided additional support for these findings. There are academic performance gains, as well as positive attitudes toward the subject matter, for tutor and tutee in the majority of studies analyzed during their meta-analysis. Jenkins and Jenkins (1981) found that tutors showed more improvement in their self-concept, attitudes toward school and enhanced racial relations.

**Individualized instruction.** CWPT provides individualized instruction for all students no matter how large or small the class size (Enright & Axelrod, 1995; Miller, Barbetta, & Heron, 1994). This allows for efficiency in use of instructional time. Because each student is working at his/her own level, teachers have fewer concerns about the lower achieving students wasting instructional time for the higher achieving students. By using CWPT, all students are working at their optimal level during the same class time (Skinner, Fletcher, & Henington, 1996).

**Increased academic achievement.** Increased academic achievement through CWPT programs may be the most robust advantage cited in the literature. Many studies have examined academic performance and have increased achievement in spelling (Maheady, Harper, Mallette & Winstanley, 1991; Mortweet et al., 1999), math (DuPaul, Ervin, Hook, McGoey, 1998; Fuchs & Fuchs, 2001), reading, (Fuchs et al., 1995; Simmons, Fuchs, Fuchs, Hodge, & Mathes, 1994), social studies (Mastropieri, Scruggs, Spencer, & Fontana, 2003; McDonnell, Mathot-Buckner, Thorson, & Fister, 2001), foreign language vocabulary (Villareal, 2003; Wright, Cavanaugh, Sainato, & Heward,
1995), health and safety (Utley et al., 2001), and sight words (Barbetta, Miller, Peters, Heron, & Cochran, 1991; Greenwood et al., 2001). Overall, these studies show that CWPT is an effective procedure for teaching students to acquire and maintain a variety of academic content, can be used in various subjects and grade levels, and includes students with and without disabilities.

*Increased opportunity to respond.* There has been a positive correlation reported in the literature between opportunity to respond, active student response, and improved academic performance (Greenwood, Hart, Walker & Risley, 1994). Opportunity to respond is the interaction between teacher-directed instruction and student responding. Strategies to increase active student responding, such as peer tutoring, allow for more opportunities to practice skills and acquire content per unit of instructional time expended.

*Disadvantages of CWPT*

There are some disadvantages to using CWPT in the classroom. These disadvantages include the time that it may take to train students, organize the system, and maintain student folders.

*Training students.* Training students takes time. While most tutoring programs use a four-day training schedule (20 minutes per training session), the ability and age of the students can affect the duration of the training. Students with severe cognitive disabilities may take longer to acquire the procedures than typically developing peers. Likewise, students who are younger may require additional practice at each level of training to demonstrate acquisition. For students who have severe disabilities, other approaches to instruction may be more appropriate than CWPT, especially if students are having a
difficult time acquiring the skills and procedures necessary to conduct CWPT sessions effectively.

*Organizing the system.* Once the CWPT procedures have been taught to students, the system can run quite smoothly, but organizing the system can present problems for teachers. The teacher will need to determine where to keep the folders, maintenance box, and old and new card sets. Teachers also need to monitor the students as they conduct their tutoring sessions and provide systematic praise and error correction as needed. Teachers may need to retrain individuals or small groups of students to use correct procedures. Allsopp (1997) reported that some teachers found organizing and maintaining the system to be physically demanding.

*Maintaining folders.* Folders need to be checked frequently to monitor card movement from the “Go” pocket to the “Stop” pocket. Once all cards in a set have been moved to the “Stop” pocket, the teacher must have the next set ready to be placed in the “Go” pocket. Card sets should be individualized for each student, which requires additional time for the teacher to pretest and make the new cards.

*Research on the Effectiveness of CWPT*

For the past twenty years CWPT has been validated empirically as an effective means of providing supplemental, individualized instruction to students with and without disabilities. CWPT has been used extensively in elementary schools with lots of different children and content areas, but it has not been used as much for middle and high school level students. The next section will describe several CWPT studies at the elementary level, middle and secondary level, and will suggest areas where more research is needed.
The majority of CWPT studies have been conducted with elementary school students. In addition, basic skills, such as reading sight words or completing math facts, have been the focus of most research. Participants have included typically developing students and students with disabilities. Recently, CWPT studies have investigated the integration of technology into the CWPT package. One such study involved primary students with disabilities who needed to acquire basic telling time skills. McKain (2004) investigated the effects of CWPT on the telling time skills of primary students with cognitive disabilities. The CWPT package included computer-assisted instruction to help student tutors provide the correct responses to clock times during error correction. This program was designed to allow a student who may not know the correct times on a clock face to serve as a tutor. The computer-assisted tutoring program contained an on-screen sound button for the tutor to push to hear the correct time through a head set while a clock face was shown on the computer screen. The tutor was able to compare the response heard via the head set with the student response. The tutor was then able to determine if praise or error correction should occur. Results of this novel study suggested that CWPT when paired with computer-assisted instruction was effective to teach telling time to students with severe disabilities. Students were able to tell time to the hour and half hour. A few students were also able to begin to learn times to the quarter hour. Results of maintenance and generalization probes indicated that some students were able to retain and generalize telling time skills.

One of the most common curriculum areas used in CWPT systems is teaching sight words to beginning readers. A study conducted by Al-Hassan (2003) taught ten
typically developing first and second graders to identify basic sight words using CWPT. Al-Hassan used a multiple baseline across students to demonstrate the effects of CWPT on acquisition, maintenance, and generalization of sight words. Peer tutoring was reciprocal and students participated in tutor huddle before each session of tutoring began. Results of the study indicated that eight of ten students were able to acquire basic sight words. Two students struggled to learn the words in their sets. Of the eight that acquired sight words, seven were able to maintain words a week after acquisition. Six of eight generalized sight words to untrained sentences containing the sight word. The classroom teacher, parents and students involved in the study indicated on their social validity questionnaires that they believed CWPT improved the students’ ability to read sight words.

CWPT studies do not all occur in traditional academic content areas. Utley and colleagues (2001) taught health and safety skills to five students with developmental delays in an urban self-contained classroom. Students were assessed using weekly pre- and post-tests. Researchers used the Juniper Gardens’s CWPT model (Delquadri et al., 1983) as the intervention. The composite pretest scores for health and safety facts was 18% correct prior to intervention. At the conclusion of CWPT, students were able to identify 100% of the health and safety facts.

McKain (2004), Al-Hassan (2003), and Utley et al. (2001) are representative of typical CWPT studies and the results that are found when CWPT is implemented in elementary schools. Similar results are noted in middle and secondary school studies; however, the number of studies conducted with older students is limited.
CWPT studies conducted at the middle and secondary school level. While the majority of CWPT studies continue to be conducted in elementary schools, researchers have been extending tutoring systems to middle and secondary settings. Three of these studies will be described in further detail.

Mastropieri and colleagues (2003) conducted a CWPT study in an urban high school to investigate the effects of guided notes reviews compared to peer tutoring reviews on the test scores of 16 students with learning disabilities in a special education resource room. Students were enrolled in a general education world history course and received resource room support as needed. Mastropieri and colleagues used statistical analysis to compare chapter test scores, unit test scores, and final exam scores for each condition. Guided notes reviews consisted of teacher presentation of material followed by the students orally reading their chapter in a round-robin style. The teacher would intersperse questions during oral reading. Students were expected to complete their guided notes as they read the chapter. After the chapter had been read, the teacher would lead a review of the correct answers to the guided notes using the overhead projector. Students were called upon to fill in the blanks on the overhead transparency for their classmates. Peer tutoring conditions consisted of teacher presentation of material followed by students arranging themselves in dyads to read. Students would take turns reading aloud to their partner. Partners were expected to provide error correction as needed. At the end of each paragraph, the pair would use a summarization strategy and write a one-sentence summary on their own paper. After each dyad had completed reading the chapter, the students would take turns writing their summary sentences on the overhead to share with their classmates. Results indicated that test scores were higher for
chapter tests, unit tests, and final exams when students had reviewed the material using peer tutoring procedures.

Allsopp (1997) conducted a large research study involving 262 eighth grade students attending three middle schools. Students selected for the study were identified by their teachers as being at-risk for academic failure in math. Allsopp used a pretest/posttest group design with a 2x2x2 ANOVA to compare experimental groups. Students were randomly assigned to control or treatment groups. The study was conducted during general mathematics classes. Curriculum for the classes consisted of Direct Instruction, mnemonics, and manipulatives. The CWPT intervention was implemented following the procedures established by Delquadri and colleagues. Tutoring occurred four times a week for 40-minute sessions. Results indicated that there was no difference in scores between experimental groups. Improvement was noted but could not be attributed to the CWPT intervention. While the students reported they enjoyed CWPT, teachers did not agree. Two of the three general education math teachers noted that CWPT increased physical demands on the teacher due to monitoring tutoring groups and preparing materials. They also disliked public posting of points. The results of this study are interesting because they contradict much of the elementary research findings regarding effectiveness and general acceptance of procedures by teachers. A lack of research at the middle and secondary level limits the significance of this study’s findings. As more research is conducted with older students, Allsopp’s findings will either gain support or will be refuted.

Wright, Cavanaugh, Sainato, and Heward (1995) conducted a study in a suburban high school Spanish class. Sixteen students were enrolled in a modified Spanish course
designed for students at risk for failure in foreign language. Six students had been identified as having learning disabilities. Dependent variables for this study were the number of Spanish words learned, scores on weekly tests, and maintenance probes.

CWPT was chosen as the intervention. The procedures used for tutoring were consistent with those developed at OSU. CWPT was reciprocal and cards were replaced as they moved to the “Stop” pocket so that each day 10 cards were located in the “Go” pocket. The tutoring cards had a picture on one side and the Spanish vocabulary word on the other. The tutor showed a card to his/her partner. The tutee would write the Spanish word on his/her paper. The tutor would then provide either praise or error correction procedures contingent on the tutee’s response. Three attempts were allowed per card in the set. Students in this study learned a range of Spanish words from 92 to 140. Weekly test scores ranged from 77 to 100%. Every Monday an individualized maintenance test was given. Scores on the maintenance probes ranged from 38 to 90%.

*Areas identified for additional research.* There is a need to conduct more CWPT research at the middle and secondary school level. CWPT systems are effective and efficient means of supplementing and individualizing the curriculum with young students. There is a need to increase the number of studies that involve older students to provide further evidence of the effect that CWPT can have on the achievement of middle and high school students. In classrooms that are becoming increasingly more diverse, instructional strategies such as CWPT are vital to individualizing instruction for all students. Not only should more CWPT studies be conducted in middle and high schools, but there is also a need to document effects of CWPT to increase achievement in science courses. To date, there are no CWPT studies investigating the effects of tutoring on
science vocabulary. A study conducted in a middle school classroom to determine the effects of CWPT on the acquisition, maintenance, and generalization of science vocabulary would provide further support for the use of CWPT to increase academic achievement with older students, and would extend the empirical support to another content area, science.

Summary

CWPT is an effective, field-tested, best practice instructional approach that has produced positive results across different settings and with students with and without disabilities. The majority of CWPT studies have been conducted in the elementary school setting. The few studies that have been conducted at the middle and high school level have demonstrated mixed results. There is a need for more research involving middle and high school students to determine the effects of CWPT with an older population. In addition, no studies to date have investigated the effects of CWPT on the acquisition of science vocabulary words and definitions.

Generalization

This section of the review of the literature will include a description of generalization, types of generalization, strategies and tactics for promoting generalization and generalization and CWPT.

Description of Generalization

Generalization is defined as a behavior change that “lasts over time, appears in environments other than the one in which the behavioral techniques were applied, or spreads to other behaviors not directly treated by the behavior change technique” (Cooper, Heron, & Heward, 1987, p. 6). Baer, Wolf, and Risley (1968) emphasized that
generalization is a valuable characteristic of applied behavior analysis that must be programmed for behavior changes to occur across untrained conditions (i.e., across settings, people, behaviors, or time).

Stokes and Baer (1977) identified nine categories of generalization as train and hope, sequential modification, introduce to natural maintaining contingencies, train sufficient exemplars, train loosely, use indiscriminable contingencies, program common stimuli, mediate generalization, and train to generalize.

*Types of Generalization*

There are two types of generalization: response generalization and stimulus generalization. Response generalization is defined as the “extent to which a learner performs a variety of functional responses in addition to the trained response” (Cooper, Heron & Heward, 1987, p. 582). For example, a learner is taught to open a door by turning a knob to the right. Response generalization occurs when that learner can also open a door with a lever handle that is pushed down, or a door that has a bar to push to open. The function of the responses is the same, opening a door, but the student was only trained to turn a door knob, not push a lever or bar. The door opening response has generalized to other types of door handles. Stimulus generalization refers to the “extent to which a learner improves his performance of the target behavior in environments different from the original training environment” (p. 582). For example, a learner may be taught to open a door at school by turning a knob to the right. That learner should be able to open a door with a knob in multiple environments (i.e., at home, at grandma’s house, at the store, etc.). Stimulus generalization occurs when the learner can perform the task, opening a door with a knob, in multiple untrained environments. In CWPT, discrete
responses are being taught as an instructional stimulus is shown on the tutoring card. Both stimulus and response generalization will be the focus of the current study as students will be expected to use the vocabulary words taught during CWPT in their general education science classroom and on generalization tests that require written rather than oral responses. For example, during CWPT a student will be taught the word radiation and the definition direct transfer of energy by electromagnetic waves. The student will be expected to respond orally when she sees the word radiation by identifying the word and its definition. CWPT is the training environment for this word and definition. Stimulus generalization will occur if the student is able to identify the word and its definition in an untrained setting (i.e., the general education science class). Response generalization will occur if the student is able to make a correct response on the generalization posttest as this response will be written rather than the oral response that was trained.

Strategies and Tactics for Promoting Generalization

Stokes and Osnes (1989) considered the nine categories identified by Stokes and Baer and redefined them by focusing on three principles of generalization programming and outlining twelve programming tactics for teachers. Each principle has four tactics that support it. The first principle, exploit current functional contingencies, is supported by tactics 1) contact natural consequences, 2) recruit natural contingencies, 3) modify maladaptive consequences, and 4) reinforce occurrences of generalization.

The second principle, train diversely, is supported by 1) use sufficient stimulus exemplars, 2) use sufficient response exemplars, 3) make antecedents less discriminable, and 4) make consequences less discriminable.
The final principle, incorporate functional mediators, finds support through 1) incorporate common salient physical stimuli, 2) incorporate common salient social stimuli, 3) incorporate self-mediated physical stimuli, and 4) incorporate self-mediated verbal and covert stimuli. The use of some, or all, of these strategies will make generalization more likely to occur, although there is no “magic number” of strategies that should or could be incorporated to make a behavior change more likely to generalize.

Generalization and CWPT

An analysis of strategies to increase active student responding, including CWPT, indicates that, in general, most researchers report maintenance and/or generalized effects but do not identify the functional relations that may have supported those effects. This finding is supported by the literature review completed by Osnes and Lieblein (2003). Osnes and Lieblein indicate that more researchers are assessing maintenance of their effects but generalization continues to be “an elusive entity” (p. 371).

Researchers using the CWPT model developed at Ohio State have been collecting generalization data for several years. These studies indicate that generalization results are mixed with some researchers finding successful generalization while others have not. One possible explanation for the mixed results could be that generalization was not explicitly programmed in many studies. Several recent studies that reported generalization results will be described in more detail.

Welsch (1998) measured generalized effects in her study involving 24 students in a first grade inclusion classroom. Subjects in the study included typically developing students, 1 English as a Second Language learner, 8 students with developmental disabilities, and 1 student diagnosed with Attention Deficit Disorder. Welsch used a
multiple probe design to investigate the effects of peer tutoring on sight word acquisition, maintenance, and generalization. Results indicated that students with disabilities acquired an average of 60 words compared to the 125 words acquired by typically developing first grade students. All students were able to maintain a high level of accuracy (93%) three to seven sessions after words were initially acquired. To measure generalization of acquired words, Welsch administered a traditional spelling test for the acquired words. Results indicated that students were not able to spell the words correctly and had not generalized the acquired sight words. One possible explanation for the lack of generalized effect may be that reading sight words and writing dictated words are very different response classes. Welsch may have obtained more success if generalization had been reading untrained sentences that included the acquired sight word.

Three researchers have reported more success in obtaining generalized effects when using generalization measures that were more similar to those used during training. Harrison (2002) investigated the effects of peer tutoring on the acquisition and generalization of words taught using peer tutoring to students who were deaf. While the Harrison study also investigated dependent variables such as number of steps performed correctly by tutors and number of learning trials completed during practice phases, two measures of generalization were conducted. Generalization measures included a pre/post test consisting of reading sentences that contained vocabulary words taught via tutoring, and reading short stories that included tutored vocabulary words. Students were able to read words acquired during tutoring in the context of sentences and short stories.

Promising generalization results were also reported by Al-Hassan (2003). Al-Hassan’s study investigated the acquisition, maintenance, and generalization of sight
words by twelve first and second graders engaged in a peer tutoring program. Students were engaged in small group tutoring because the study used a multiple baseline across students. Pairs of students moved from the baseline phase into tutoring one pair at a time until all selected students were in the tutoring phase. Results for acquisition, maintenance, and generalization indicated high rates of accuracy for words taught during peer tutoring. Generalization was measured by asking students to read the sight word in context of simple sentences. Six of the ten participants in the study were able to read words in isolation and in context.

Finally, Barbetta, Miller, Peters, Heron, and Cochran (1991) conducted a cross-age peer tutoring program called Tugmate to teach sight words to 25 elementary students. In this study, high school students tutored elementary school students. The high school students were the tutors for their elementary tutees. The procedures used in this study were those associated with the Ohio State CWPT model. Results indicated that elementary students were able to acquire a range of sight words from 38 to 90 acquired words. Maintenance probes were completed first completed weekly, then bi-weekly, for four to six weeks. A final maintenance probe was completed four months after tutoring ended. The mean performance across all maintenance probes ranged from 93% to 98% correct. Generalization probes were also conducted. Students began generalization probes after three card sets were acquired. Generalization probes consisted of students reading sight words in the context of simple sentences. Results indicated that students could read a mean of 9.3 acquired sight words in context during generalization probes.
Summary

While generalization may be an elusive entity (Osnes & Lieblein, 2003), recent studies provide promising results that generalization can occur when principles and tactics of generalization are considered and implemented into the CWPT program (Al-Hassan, 2003; Barbetta et al., 1991; Harrison, 2002; Welsch, 1998). Several researchers have reported more success in obtaining generalized effects when using generalization measures that were more similar to those used during training. More research is needed to determine how the procedures in CWPT, and generalization measures chosen, affect generalized outcomes.

Maintenance

This section of the review of the literature will include a description of maintenance, approaches to maintain behavior change, and maintenance and CWPT.

Description of Maintenance

Maintenance is defined as the extent to which the learner continues to perform the target behavior after a portion or all of the intervention has been completed (Cooper et al., 1987). Maintenance is an important aspect of behavior change for students to acquire. Gable, Hendrickson, and Shellady (1992) note that “if a student has mastered a given skill and is not introduced to strategies for attaining proficiency, the likelihood of long term retention is decreased, especially if the skill is not used in typical daily routines” (p. 39). This becomes a key point for students with learning problems who may encounter problems retaining information via traditional teachings methods (Cooper et al., 1987).

The ultimate goal of maintenance is to maintain a high level of accuracy and fluency of the skill over time. Students with learning difficulties frequently encounter
problems after instruction is completed because the student has not obtained a level of fluency. Therefore, during the maintenance stage, teachers should provide periodic practice or use other tactics, such as over-learning or intermittent schedules of reinforcement, to ensure the student has retained the skill (Cooper et al., 1987). Vaughn, Bos, and Lund (1986) state “maintenance and generalization will need to be taught systematically as skills in and of themselves” (p. 35).

Approaches to Maintain Behavior Change

To increase the likelihood that behaviors changed during intervention will be maintained, Stokes and Baer (1977) suggest four general approaches. The first approach is to plan for natural contingencies of reinforcement. Contacting natural contingencies of reinforcement have the potential to create a “behavior trap” and cause the behavior to maintain. A second approach involves using multiple instructors or trainers in the natural environment so that the behavior does not come under the control of a single person’s presence. The third approach is to use intermittent schedules of reinforcement until the behavior is occurring at a level commensurate with the schedule occurring in the natural environment. For example, a study conducted by Koegel and Rincover (1977) determined that the thinner the schedule of reinforcement used in the research setting, the greater the maintenance of behavior in other settings. The fourth and final approach is to teach the student techniques to control his/her own behavior. Two examples of self-control techniques are self-management and recruiting reinforcement. Using one or a combination of these strategies while programming behavior change should help to maintain the behavior changes over time.


Maintenance and CWPT

CWPT provides a systematic approach to maintenance through the implementation of maintenance probes. These probes are conducted once a week following the acquisition of a set of tutoring cards. The student is shown each tutoring card once and is asked to recite the information requested (i.e., what word?). The student’s responses are recorded as either correct or incorrect. Responses that are correct are returned to the maintenance box to be probed again the following week. Incorrect responses are returned to the next set of tutoring cards for re-acquisition. Because of the inclusion of maintenance probes in the CWPT system developed at Ohio State, most studies report results for maintenance. Of recently conducted studies that included maintenance probes, the majority of studies indicate that words learned during CWPT were maintained at a high level (Al-Hassan, 2003; Franke, 2001; Harrison, 2002; McKain, 2004; Neubauer, 2002). For studies that did not report maintained effects (e.g., Kiarie, 2003), the most common explanation provided by the author was that maintenance data were inconclusive due to lack of data collected during the course of the study.

Summary

The ultimate goal of maintenance is to retain a high level of accuracy and fluency of the skill over time. Approaches such as contacting natural contingencies and using multiple trainers have been identified as ways to increase the likelihood that effects will be maintained. CWPT includes explicit procedures for conducting maintenance probes. These procedures may explain why the majority of CWPT studies conducted at Ohio
State report maintained effects of instruction. For studies that did not report maintained effects, lack of data collected was given as the explanation.

Social Validity

This section of the literature review will contain the following sections:
description of social validity, assessment of social validity, and social validity and CWPT.

Description of Social Validity

Wolf (1978) determined that for a behavioral change program to have social validity, it would need to be validated in three areas; social significance of behavior goals, social appropriateness of procedures used, and social importance of the results. The goals of an instrument to judge social validity should consider three main points, 1) if the specific goals or behavior are what the consumer and society want, 2) whether the participant and other consumers consider the treatment procedure(s) to be acceptable, and 3) whether the consumers are satisfied with the results.

Schwartz and Baer (1991) describe social validity assessment as a two-part process: first an accurate and representative sample of the consumers’ opinions are collected; then, the information that was collected is used to continue satisfactory practices or to make changes in the intervention to enhance its acceptability in the community. Schwartz and Baer caution that failure to implement either part of the process will undermine the social validity concept and may also discredit the social validity assessment.
Assessment of Social Validity

Assessment instruments. Lebow (1982) states “survey methods are the most widely used means of gathering data. Their outstanding advantage is directness; the purpose is clear, the responses are straightforward, and the tie to satisfaction is unequivocal” (p. 244). The purpose of social validity assessments is to anticipate possible rejection of an intervention before it happens, or as quickly as possible during implementation; therefore, all relevant consumers should be queried (Schwartz & Baer, 1991). The information collected should be used in future planning, implementation, and evaluation of the intervention. Socially validated assessments are not meant to be primary dependent measures, but are meant to supplement the objective measures of behavior that are the primary dependent measures (Schwartz & Baer).

Several strategies have been identified by Schwartz and Baer (1991) to help experimenters determine which answers on questionnaires are determiners of program viability, and which answers are false positives. These techniques include operationally defined affect rating scales, choosing one intervention when exposed to two or more interventions, using rates of behavior in natural environment to determine goals for the intervention, asking competent judges to rate permanent products produced by the direct consumers of an intervention, and expert judges review of videotaped or photographed pre- and post-intervention samples.

Finally, Schwartz and Baer (1991) suggest that behavioral correlates can corroborate results obtained via questionnaires. Behaviors such as unsolicited recommendations in favor of using the intervention or continuation of an intervention after the completion of a study would suggest a level of satisfaction with the goals,
procedures, and effects of the given intervention. Unfortunately, it is difficult to obtain such information without direct observation. Experimenters may be required to ask consumers if they would continue or recommend the intervention in the future. It is difficult to determine from questionnaires what behavior will occur in the future and which answers may be false positives regarding future behavior.

*Who should be assessed?* Schwartz and Baer (1991) define four classes of relevant consumers: direct consumers, indirect consumer, immediate community, and extended community. Direct consumers are the primary recipients of the intervention. In academic studies, direct consumers would be the student participants involved in the study. The second category of consumers is the indirect consumers. These are the people who are strongly affected by the behavior change of the direct consumer. Often indirect consumers are teachers or parents of the students involved in the study. The final two categories of consumers are the immediate and extended community. Immediate community members interact with the direct or indirect consumers on a regular basis while extended community members may just reside in the same community as the direct and indirect consumers.

Given these classes of consumers, and goals for social validity assessments, Schwartz and Baer (1991) state that collecting social validity information in a valid, reliable, cost efficient manner is not just a matter of constructing a sound social validity assessment instrument. It is a matter of “asking the right questions to the right people in an appropriate manner” (p. 195).

The current study collected social validity data before, during, and after the completion of the study from direct consumers. Indirect consumers, the classroom
teacher and general education science teacher, completed questionnaires at the completion of the study. Questions asked for consumer opinions about procedures and effects of the CWPT. In addition, questions regarding behavioral correlates were designed to obtain information about future usage of CWPT and the possibility that CWPT would be a recommended intervention in the future.

Social Validity and CWPT

The majority of CWPT studies contain a social validity measure. In general, students, teachers, and parents report that they enjoy CWPT and believe that CWPT is responsible for an increase in academic achievement. McKain (2004) surveyed both teacher and students. Both populations indicated that they enjoyed CWPT and attributed this intervention to the increase in students’ ability to tell time. Al-Hassan (2003) found similar results for the classroom teacher and students, and also reported parents noted improved reading at home. Parents that implemented tutoring for a summer, home-based tutoring program reported that they enjoyed training and implementation of peer tutoring (Barbetta & Heron, 1991). Many other tutoring studies have supported these results (Barbetta, Miller, Peters, Heron, & Cochran, 1991; Maheady, Mallette, Harper, & Sacca, 1991; Welsch, 1998).

Not all social validity results are positive. Allsopp (1997) noted that two of the three teachers implementing CWPT found the procedures to be too physically demanding and would not use CWPT in the future. The other teacher in the study did report that she would continue to use CWPT. Welsch (1994) reported that students enjoyed CWPT and believed it helped to increase their ability to read employability sight words, but they did not like changing tutors or some of the words they were asked to learn. Students in the
Harper, Mallette, Maheady, Parkes, and Moore (1993) study reported that they did not like the error correction procedure.

Despite the few individuals who did not like certain procedures, the acceptance of CWPT procedures remains exceedingly high and positive. The majority of teachers, students, and parents who use CWPT, or observe effects of CWPT, believe the procedures to be effective and should continue to be used in classrooms or in home-based programs.

Summary

Social validity refers to the acceptability of the intervention’s procedures to direct and indirect consumers, immediate and extended community. Opinions are solicited from all relevant consumers, generally by questionnaire, although other mechanisms are possible, and perhaps even desirable. When opinions are solicited at the conclusion of CWPT studies, procedures have been deemed acceptable by the majority of students, parents, and teachers. Consumers report that procedures are effective and should continue to be used.
CHAPTER 3

METHOD

This chapter is divided into nine sections including 1) participants, 2) setting, 3) intervention teacher, 4) experimenter, 5) definition and measurement of dependent variables, 6) independent variable, 7) interobserver agreement and procedural integrity, 8) experimental design, and 9) procedures.

Participants

The participants were a teacher and her seventh grade students who attended an urban school located in Central Ohio. Fourteen seventh grade students, representing the entire class, were selected for enrollment in this study based on the following criteria: (1) enrollment within a district-configured “intervention” class (i.e., selection by general education science teacher as struggling or at-risk for failure in general education science course) and (2) consistent and reliable attendance (90% and above). Table 3.1 documents relevant student characteristics. Once students were identified based upon the selection criteria, the appropriate consent forms recruitment letters, and consent to videotape or photograph forms for the parent and the student were distributed by the experimenter (see Appendices A to J). All students returned forms to the experimenter during the first week training phase of the study.
Setting

This study was conducted in a middle school for seventh and eighth grade students. The building was located in a large, urban Central Ohio school district. The study took place in a seventh grade intervention class at the middle school during the final period of the day from 3:05 PM to 3:55 PM, Monday – Friday for 20 minutes each day. The intervention class period was designed to provide time for teachers to provide additional support for students who struggle academically. Intervention periods have replaced the traditional study hall where the district believed students were often wasting valuable academic time. Creating the intervention periods was a decision made by the members of the building site-steering committee to provide additional time to remediate academic skills for struggling students. The intervention class chosen for this study provided support for seventh grade students who performed below the mean in their general education science course.

Intervention Teacher and Primary Observer

The intervention teacher selected for this study was a special education tutor for five years and a special education teacher since 2002. She was licensed to teach secondary social studies and students with learning disabilities. During the study, she was teaching two resource room classes, two inclusion classes, and one intervention class. She had been an intervention teacher for three years. For this study, the intervention teacher served as the primary data collector.
<table>
<thead>
<tr>
<th>Student</th>
<th>Age Years-Months (June 2005)</th>
<th>Gender</th>
<th>Average Grade in Science (March 2005)</th>
<th>Disability Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13-7</td>
<td>Female</td>
<td>D-</td>
<td>None Known</td>
</tr>
<tr>
<td>2</td>
<td>12-10</td>
<td>Female</td>
<td>D+</td>
<td>None Known</td>
</tr>
<tr>
<td>3</td>
<td>12-9</td>
<td>Male</td>
<td>B- *</td>
<td>None Known</td>
</tr>
<tr>
<td>4</td>
<td>13-4</td>
<td>Male</td>
<td>F</td>
<td>None Known</td>
</tr>
<tr>
<td>5</td>
<td>13-11</td>
<td>Male</td>
<td>D</td>
<td>Communication Disorder</td>
</tr>
<tr>
<td>6</td>
<td>12-11</td>
<td>Male</td>
<td>D</td>
<td>Learning Disability</td>
</tr>
<tr>
<td>7</td>
<td>13-4</td>
<td>Female</td>
<td>B *</td>
<td>None Known</td>
</tr>
<tr>
<td>8</td>
<td>13-6</td>
<td>Female</td>
<td>B *</td>
<td>None Known</td>
</tr>
<tr>
<td>9</td>
<td>13-4</td>
<td>Male</td>
<td>C</td>
<td>None Known</td>
</tr>
<tr>
<td>10</td>
<td>13-4</td>
<td>Male</td>
<td>C</td>
<td>None Known</td>
</tr>
<tr>
<td>11</td>
<td>13-1</td>
<td>Female</td>
<td>B *</td>
<td>Communication Disorder</td>
</tr>
<tr>
<td>12</td>
<td>13-5</td>
<td>Female</td>
<td>F</td>
<td>Learning Disability</td>
</tr>
<tr>
<td>13</td>
<td>13-6</td>
<td>Male</td>
<td>C</td>
<td>Learning Disability</td>
</tr>
<tr>
<td>14</td>
<td>13-1</td>
<td>Male</td>
<td>C</td>
<td>None Known</td>
</tr>
</tbody>
</table>

Note 1: * These students were selected by the science teacher because of their lack of participation in class and low quiz/test scores

Table 3.1: Student characteristics.
Experimentation

The experimenter in this study was a doctoral candidate at The Ohio State University. She taught special education classes for students with mild/moderate disabilities for seven years before returning to Ohio State to complete a doctoral degree. She was licensed to teach students with learning and developmental disabilities and held an additional license for special education supervision. For this study, the experimenter served as the classroom teacher.

Definition and Measurement of Dependent Variables

Four dependent variables were measured during this study: 1) acquisition of science vocabulary, 2) maintenance of science vocabulary, 3) generalization of science vocabulary, and 4) consumer satisfaction with peer tutoring intervention.

*Acquisition of Science Vocabulary*

Acquisition of science vocabulary was defined as the number of science vocabulary words learned. For a vocabulary word to be considered learned, the student must not have been able to read or define the word during a minimum of two pretest assessments, but the student could read the word correctly and state its definition for two consecutive sessions during the testing phase of peer tutoring. After Session 35, students were required to read and state the definition correctly for three consecutive sessions in order to demonstrate acquisition. Correct responses required the appropriate pronunciation of the science vocabulary word, and definitions that include the “key words” taught during the intervention. “Key words” were denoted on each definition as underlined words that were central to the correct definition of the science vocabulary word. “Key words” were selected by a general education science teacher. Tutors accepted
student versions of taught definitions that included the “key words” as correct. Any deviation from the accepted pronunciation or definitions missing “key words” taught during tutoring was counted as incorrect. Refer to Table 3.2 for examples of correct and incorrect responses.

After a student had responded correctly to both the word and its definition for two consecutive sessions (or three after Session 35), the vocabulary word moved to the “Stop” pocket in the tutoring folder and was considered acquired. A sample tutoring folder and tutoring card can be found in Appendices K and L.

*Maintenance of Science Vocabulary*

Maintenance of science vocabulary was defined as the number of words retained 1 week after all 10 cards in a set met the established criterion. Once all cards in a set were in the “Stop” pocket, the entire set of ten was removed from the student’s tutoring folder and was placed into an envelope. The envelope was labeled with the student’s number, set number (a sequential number indicating the cards entry into the system), and was post-dated for a week following the acquisition date. Terms retained after one week were placed in a second envelope and were re-tested weekly until the conclusion of the study. Terms missed were removed from the system and were retested at the conclusion of the study. Definitions of correct and incorrect responses were the same during maintenance as they were during acquisition.
<table>
<thead>
<tr>
<th>Correct Responses</th>
<th>Incorrect Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Must include both the accurate reading of the vocabulary word and the definition.</strong></td>
<td><strong>If word is mispronounced.</strong></td>
</tr>
<tr>
<td>For example, if the science word was <em>permafrost</em>, and the student said “permafrost” followed by the appropriate definition, “permanently frozen tundra soil”, a correct response would be recorded.</td>
<td>For example, if the science word was <em>permafrost</em>, and the student said “premafrost”, an incorrect response would be recorded.</td>
</tr>
<tr>
<td><strong>If correct pronunciation and only key words in definition.</strong></td>
<td><strong>If correct pronunciation without correct definition.</strong></td>
</tr>
<tr>
<td>For example, if the science word was <em>permafrost</em> and the student said “permafrost”, and gave the definition “permanently frozen soil”, a correct response would be recorded as all key words were included in the student definition.</td>
<td>For example, if the science word was <em>permafrost</em>, and the student said “permafrost” but defined permafrost as “permanent frost” instead of <em>permanently frozen tundra soil</em>, an incorrect response would be recorded.</td>
</tr>
<tr>
<td><strong>If correct pronunciation and student version of definition with synonyms for key words.</strong></td>
<td><strong>If correct pronunciation but definition without key words.</strong></td>
</tr>
<tr>
<td>For example, the student provides a correct pronunciation and says “permanently frozen dirt”, the response would be recorded as correct.</td>
<td>For example, the definition found on the back of the <em>permafrost</em> card is <em>permanently frozen tundra soil</em>. If the tutee says “frozen soil”, or anything else, without all key words, the response is incorrect.</td>
</tr>
<tr>
<td><strong>If additional words are added to the definition that are not acceptable synonyms for a key word.</strong></td>
<td><strong>If additional words are added to the definition that are not acceptable synonyms for a key word.</strong></td>
</tr>
<tr>
<td>For example, the definition found on the back of the <em>permafrost</em> card is <em>permanently frozen tundra soil</em>. If the tutee says “permanently frozen soil found in Ohio” or “permanently frozen turf”, the response is incorrect.</td>
<td>For example, the definition found on the back of the <em>permafrost</em> card is <em>permanently frozen tundra soil</em>. If the tutee says “permanently frozen soil found in Ohio” or “permanently frozen turf”, the response is incorrect.</td>
</tr>
</tbody>
</table>

Table 3.2: Examples of correct and incorrect student responses during tutoring sessions.
In most tutoring systems, instructional items that the student did not identify correctly during a maintenance probe (i.e., either the word or the definition) would be returned to the “Go” pocket for more practice when the next set of cards was placed in the “Go” pocket. The current study differed from most tutoring systems in that non-acquired words (i.e., those words that were incorrect during a maintenance probe) were unable to be returned to the tutoring system for re-tutoring. Because the words chosen for the study were approximately 1 to 2 weeks in advance of the corresponding topic area in the general education classroom, reinserting the cards into the tutoring system would mean that students could have been receiving instruction on those vocabulary words in CWPT and in the general education classroom. Since the experimenter could not control how many exposures to each vocabulary word or the type of emphasis on each word that the science teacher may provide during instruction, it was determined that the amount or quality of teacher instruction might provide an unequal impact on student performance. Therefore, to keep the relationship between the independent variable (CWPT) and the dependent variable (acquisition of science vocabulary) as uncontaminated as possible the vocabulary words were not recycled or simultaneously instructed in CWPT and in the general education science class. Non-acquired word cards were probed again at the completion of the study, but were not returned to an active tutoring card set during the course of the study.

Generalization of Science Vocabulary

Generalization of science vocabulary words was defined as the number of correct written responses on vocabulary tests. Generalization tests required written responses rather than the acquisition and maintenance data that were collected as oral responses.
Vocabulary tests were given before and after a card set was acquired as a pre- and post-test. These vocabulary tests consisted of ten, fill-in-the-blank questions. Five questions contained the definition of one of the acquired vocabulary words with a blank for the student to write the word that corresponded with the definition. The other five questions provided the vocabulary word and prompted the student to write the definition.

Vocabulary words were assigned randomly to either “write the word” or “write the definition” sections of the test. A sample generalization test can be found in Appendix M.

Accuracy of responses was determined by a correspondence between the students’ responses written in the blanks on the test and correct answers as indicated by the teacher’s answer key. Each blank was scored individually as correct or incorrect. For a student response to be coded as correct, the blank must have contained the same answer as the teacher’s answer key. For example, if the student response in blank number one was “evaporation” and the teacher’s answer key for blank number one was also evaporation, the response was coded as correct.

For a response to be coded as incorrect, it would not match the teacher’s key. In short, the students’ response was any written response that varied in concept or detail from teacher’s answer key. For example, if the student response was “condensation” and the teacher’s answer key stated the correct answer as evaporation, the student response was scored as incorrect.

If a student needed to abbreviate an answer to make the answer fit on the appropriate blank, the scorers counted the abbreviation correct if the abbreviation was logical. Random abbreviations were scored as incorrect. For example, if the teacher’s answer key stated the correct answer as actual mechanical advantage and the student
response was “actual MA”, the answer was scored as correct. Correct capitalization and/or punctuation for abbreviations was not required for a correct response.

In the case of misspelled words, the independent graders scored words that could be pronounced phonetically as correct, provided the student response corresponded to the correct answer on the teacher’s key. For example, if the student response was “evaperation” and the teacher’s answer key said evaporation, the student response was counted as correct. All other misspellings were scored as incorrect. For words that were illegible, the independent graders attempted to read the word phonetically. If the word cannot be deciphered, it was scored as incorrect. If a student did not make an attempt to write the correct answer for a blank, the response was coded as incorrect.

The total number of correct and incorrect responses for each test was written at the top of the students’ test.

Consumer Satisfaction with Peer Tutoring Intervention

A social validity questionnaire was distributed before, during, and after implementation of the intervention to solicit direct consumer opinions about the classwide peer tutoring procedures. Questionnaires were given to all students participating in the study. The classroom teacher and general education science teacher completed questionnaires at the completion of the study (see Appendices N to S).

Independent Variable

The independent variable for this study was classwide peer tutoring (CWPT). The peer tutoring model that was selected for this study has been well established at The Ohio State University (Cooke, Heron, & Heward, 1983). Peer tutoring was reciprocal and used a non-replacement system. Reciprocal peer tutoring required that each pair of students
took a turn being the tutor and the tutee in each session. In a non-replacement system, the cards in each tutoring set moved independently from the “Go” pocket to the “Stop” pocket and were not replaced until all cards in the set moved in the “Stop” pocket. Tutoring occurred five times a week for approximately 20 minutes each day. CWPT was considered a “package” program in so far as it was comprised of multiple elements: preparation, prompting, praising, testing, and charting.

Inter-scorer Agreement and Procedural Integrity

Inter-scorer Agreement

Generalization tests were scored by two master’s students in special education at The Ohio State University. Tests were copied and given to two independent graders along with an answer key. After the graders had written the total number of correct and incorrect at the top of each student’s quiz, the number of agreements over agreements plus disagreements multiplied by 100 was used to obtain a percentage of agreement. Scorers were trained using the procedures described in Appendix T.

Procedural Integrity

Procedural integrity was defined as the number of steps completed per session by the students and the experimenter. Two procedural integrity checklists were completed each session: one for the teacher and one for the students (see Appendices U and V). The checklist for the teacher was used to demonstrate that the experimenter provided the same instructions and timings for each phase of tutoring for every session. The checklist for the students was used to demonstrate that the students were correctly completing each step of the tutoring procedures. The classroom teacher, who served as the primary observer,
completed the procedural checklists daily. She marked each step with a checkmark if she observed that the step was completed by the experimenter and/or students.

_Procedural Integrity Checklists_

The classroom teacher and one trained doctoral student served as observers throughout this study. The primary observer was the classroom teacher. The secondary observer was a doctoral student in special education at The Ohio State University. The second observer observed independently 19% of the total sessions completed distributed across conditions during the course of this study and completed the two procedural integrity checklists. Agreement for the procedural integrity checklists was the number of agreements over agreements plus disagreements multiplied by 100 to obtain a percentage. Agreements were those steps that both observers checked as occurring. Disagreements were any step that one observer checked as completed when the second observer did not note the step’s occurrence. Observers were trained using the procedures previously described in Appendix T.

**Experimental Design**

The experimental design selected for this study was a multiple probe design across word sets (Cooper et al., in press). Assessment probes prior to the implementation of the intervention were used as baseline data to demonstrate that the student was unable to pronounce or define the vocabulary words in each set prior to the implementation of the Classwide Peer Tutoring intervention. Baseline data indicated that the student was not able to identify both the word and its definition for the ten words included in the set. These data served as comparison data for those data collected once the intervention had been implemented.
On the first day of intervention, students were organized into pairs via teacher nomination and began to systematically teach his/her partner to correctly pronounce and define each word in his/her set of ten science vocabulary cards. These pairs remained partners throughout the entire study. The pair completed a practice phase that allowed each student to complete as many trials with praise and corrective feedback as he or she could in the allotted five minutes. At the conclusion of the practice phase, the testing phase began. Each day, all students tested their partner and recorded correct and incorrect responses for each card in the set. These data reflect acquisition of the word and it’s meaning. When a word had been identified and defined correctly for two (or three beginning Session 36) consecutive sessions, the word was considered acquired. Once all ten words in the set were acquired, the intervention phase was complete for this vocabulary set. Intervention data were compared with the probes collected during baseline. If the baseline data collected were zero, one would predict that the words would remain unknown if the intervention did not occur. Because the data indicated an increase in word knowledge and definition, the intervention demonstrated an effect on the data path. Verification and replication were demonstrated when the second word set was graphed. Baseline data for the second word set verified and replicated the data recorded in the first word set at a level of zero words correct. Once the tutoring intervention was implemented, the data path for words in Set 2 were similar to the data path of Set 1. Similar data paths during intervention provide verification and replication of the effects noted during Set 1. Additional word sets with similar data paths strengthened the results found during Set 1 and provided further evidence of replication and verification.
Acquired words were probed each week after initial acquisition to indicate whether the vocabulary word remained acquired. These probes were located on the graph after the completion of the intervention phase. Generalization test probes were also located in the final section of the graph. Replication and verification of maintenance probe data were obtained by comparing the data collected from the first word set to the data collected in subsequent sets of cards. Similar data paths to the first word set’s data path found in subsequent sets indicated replication and verification of previous data.

**Materials**

*Permission Forms*

Permission forms were obtained from the teacher, parents, and student participants. Consent and assent to participate and video/photograph forms were attached to a recruitment letters explaining the study (refer back to Appendices C to J).

*Vocabulary Words and Definitions*

Words and definitions were obtained from the Holt Science and Technology – Earth Science textbook used in the seventh grade general education science course. Words that were boldface or key terms in the text were chosen as vocabulary words and definitions for the study. Definitions were copied verbatim from the text and the science teacher underlined “key words” that were essential for each definition. The complete set of words and definitions chosen can be found in Appendix W.

*Generalization Pre- and Posttests*

Generalization pre- and posttests were developed by the experimenter to serve as a generalization measure for the study. Words were randomly chosen for the “write the word” or “write the definition” section of the test. Students were given a pretest before
each new card set and completed an identical posttest once a card set had been acquired. A sample generalization test can be found in Appendix M.

*Tutoring Cards*

Tutoring cards were made using a word processing program template (refer back to Appendix L). Six tutoring cards could be made from one template. Six card fronts were created in a Microsoft Word™ document and were printed on a sheet of white cardstock. Next, the corresponding six definitions were created in a similar Microsoft Word™ template. The printed cardstock was turned over and definitions were printed on the back of the card fronts. The completed cards were cut out using a paper cutter. A full set of vocabulary words and definitions was made for each student and the two assessors.

*Tutoring Folders*

Tutoring folders were made from manila file folders (refer back to Appendix K). On the inside left, the experimenter glued a plotting chart created by copying a game page from a reproducible teacher workbook. On the inside right, the experimenter used double sided tape to attach three library card pockets. The experimenter labeled one pocket “go”, one pocket “stop”, and one pocket Star Card using markers. A set of 10 word cards was placed in the “go” pocket and a Star Card was placed in the Star Card pocket. On the back of the folder a large happy face and a large “X” were drawn with markers for the testing phase.

*Markers and Pencils*

Crayola™ markers were used by the experimenter to make the folders and by the students to plot data on their charts. Pencils were used by the students to record data on
the back of tutoring cards, by the assessors to record data, and by the observers to complete checklists.

*Star Cards*

Star Cards were index cards that had “Star Card” written on the front and a space for the student’s name. These cards were stamped by the experimenter to help reinforce good tutoring behaviors.

*Self-inking Stamps*

Self-inking star stamps were used by the experimenter to stamp Star Cards during tutoring. Stamps were purchased from an office supply store.

*Timer*

A small kitchen timer with a countdown setting was used to keep time during practice phases of the study.

*Data Collection Forms*

Data collection forms were used by the experimenter, teacher, and observers to record individual student data, procedural integrity checklists, and assessment information. These forms can be found in Appendices U-W and BB-DD.

**Procedures**

This study included three phases: pre-assessment, training and tutoring, and maintenance. Each phase is described in more detail in this section.

*Pre-assessment*

Pre-assessment involved two procedures for collecting information on science vocabulary acquisition: generalization pretests and pre-assessment probes.
Generalization Pretests. Vocabulary instruction in the general education classroom consisted of students completing fill-in-the-blank worksheets to match the vocabulary word from a word bank to its corresponding definition. Students in this study were given a generalization pretest prior to the CWPT intervention for each card set. These generalization pretests were the same as the generalization posttests given at the end of the intervention for each card set (refer back to Appendix M). Students were asked to write the vocabulary word that corresponded to each definition, or vice versa, without access to a word bank. These scores were collected to verify the number of vocabulary words that students were able to define correctly prior to and after the CWPT intervention.

Pre-assessment Probes. A list of science vocabulary words was compiled from the future chapters of the seventh grade science textbook, Holt Science and Technology – Earth Science. Future chapters referred to chapters that had not yet been taught, and were determined by looking at the course of study for the remainder of the school year. Vocabulary words were obtained by examining each future chapter for boldface terms. Words and their respective definitions were selected that were at least one month ahead of the students’ present curriculum. Once the list had been compiled, students were assessed individually by the classroom teacher and experimenter prior to beginning peer tutoring and throughout the intervention phase. The complete list of vocabulary words chosen for the study is located in Appendix W.

Assessors were assessing two measures: word pronunciation and word definition. The assessment procedure required the classroom teacher or experimenter to show the student the front of the tutoring card and ask the student to identify the word. The
assessor waited 3 seconds for a response. If there was no response to identify the word or an incorrect response, the assessor recorded an incorrect response and moved to the next word on the list. If the student did say the word correctly, the assessor then asked the student to give its definition. If the definition did not match the definition provided on the back of the card, the assessor recorded an incorrect response. If the definition did match the definition correctly on the back of the card, the assessor recorded a correct response. The vocabulary words that the student did not know during the pretest were selected for inclusion in the study and were organized into sets of 10 cards. Words that the student responded to both identification and definition correctly were excluded from the study. A second pretest on each set of cards occurred the week before new sets were placed into a student’s tutoring folder to ensure the words were still unknown. After the first set of tutoring cards was in the system, weekly pretest probes on each future card set were conducted to ensure that previously selected words remained unknown until it was time for each card set to enter the tutoring system. Most preassessment probes tested 10 cards at a time.

Training and Tutoring

Training. Training was conducted in five sessions, introduction to tutoring, prompting words, prompting definitions, testing, and plotting. Training scripts for these sessions can be found in Appendices X to AA. Students were trained as a whole class. The experimenter directed the training sessions while the primary observer served as an assistant to the experimenter in terms of monitoring and reinforcing correct tutoring behaviors during training. The primary observer’s assistant duties ended once training was complete and she served only as an observer during tutoring sessions.
In general, CWPT training followed a model-lead-test instructional format that provided opportunities for active student responding during training. The experimenter considered training complete when students executed the tutoring procedures with 90% accuracy.

Tutoring. Tutoring was conducted Monday through Friday during the final period of the day for approximately 20 minutes each session. Each session began with 20 minutes of tutoring. At the conclusion of tutoring, pretest and posttest generalization tests were administered and pre-assessment and maintenance probes were conducted. Appendix BB provides an example of the data collection form for card sets.

When students entered the classroom for tutoring they found their folder sitting on the table at their assigned seat. Students paired up with their partner and sat at their assigned table facing their partner. Once all students were paired, the experimenter directed students to take out their Star Cards and place them on the table. At this point, the experimenter asked students to switch folders. The students were assigned numbers 1 to 14. Even numbered students were in the role of tutor first during practice. The experimenter asked tutors to get their partner’s cards out of the “Go” pocket and get ready to practice.

The experimenter set the timer for five minutes and told the tutors to begin practicing. Tutors were trained to first shuffle the set of cards. Next, the tutor presented one card at a time to their partner, while leaving the remaining cards in the set on the table. The tutor asked the tutee what word was on the card. If the partner said the correct word, the tutor said “Good job!” and asked for the definition. If the partner was correct again, the tutor said “Good job!” again and moved to the next card in the stack. If the
tutee missed either the pronunciation, the definition, both, or said nothing, the tutor provided an error correction procedure. Error correction consisted of first telling the tutee to “Try again”. If a correct response was emitted, the tutor said “Good job!” and moved to the next card. If the tutee was incorrect or non-responsive again, the tutor provided the answer and told the tutee to repeat the given answer. Once the tutee had emitted the correct response, the tutor said “Good job!” and moved to the next card in the set. This procedure continued until the tutee had attempted all the cards in a set. When the pair had completed the set, the tutor reshuffled and went through the set as many times as possible during the 5 minutes of practice time. When timer sounded, the tutor placed all the cards in a stack on the table.

The experimenter reset the timer for 5 more minutes, told the even numbered students to place his or her partner’s cards down on their table, and directed odd numbered students to take his or her partner’s cards out of the “Go” pocket and begin practicing. The second tutor conducted the practice session in the same manner as the first tutor.

When the timer dinged for the second time, the experimenter announced the beginning of the testing phase. Students were directed to turn over their folders. The even numbered tutors tested their partners first. The procedure for testing differed from the procedure for practice in that the tutee only had one chance to respond correctly to each card. If the tutee responded correctly by reading the word and giving the correct definition, the card was placed on the happy face (☺) located on the back of the folder. If the tutee responded incorrectly to either the word or the definition, the tutor placed the card on the X on the back of the folder. The tutor presented each card in the set once and
did not provide any feedback for the responses. Once the first tutor had completed
testing, the second tutor would test. When all students had completed testing they left the
cards on their folders until the experimenter made the announcement to mark and sort the
cards.

Students marked on the back of each card whether the card was correct or
incorrect. Corrects were marked with a happy face (☺); incorrects were marked with an
X. After all cards had been marked, the students examined the back of each card. If the
card had been correct two (or three) consecutive sessions, the student moved the card into
the “Stop” pocket and colored one square on the plotting chart. All other cards were
returned to the “Go” pocket. If no cards had moved to the “Stop” pocket that day,
students were instructed to place a single line across the squares on the plotting chart.

When students were finished marking, sorting, and plotting, the experimenter
directed students to switch folders back to their partner. The experimenter directed
students to return their Star Card to the correct pocket and return their folders to the
experimenter. This ended the tutoring session.

Maintenance

Maintenance was determined in two ways, through maintenance probes and a
generalization test.

Maintenance probes. Once a set of ten cards had been acquired, the set was
removed from the “Stop” pocket by the experimenter and placed into an envelope. The
envelope was marked on the outside with the set number, student’s number, and was
post-dated one week following the acquisition date. Envelopes remained in a
maintenance box until the date on the envelope occurred. On that day, the cards were
removed from the maintenance box and were presented to the student at the conclusion of the regular tutoring session. This maintenance probe was given by the classroom teacher or experimenter. Each card in the set was presented once. If the student was able to recall the correct pronunciation and definition, the card was considered maintained. No feedback was given for correct or incorrect responses. Cards that were maintained after one week were placed in another envelope and were marked with set number, student’s name, and were post-dated for a week following the maintenance probe. Words that the student did not remember either the word or the definition were removed from the system. This process continued throughout the course of the study. Appendix CC provides a sample maintenance data collection sheet.

*Generalization test.* Generalization tests were given to students the day after a card set was acquired at the completion of tutoring for that day. Weekly vocabulary tests consisted of ten, individualized fill-in-the-blank questions. Each question contained the definition of one of the acquired vocabulary words with a blank for the student to identify which word corresponded with the definition. Students were expected to write the vocabulary word that corresponded to the given definition. A sample data collection form for generalization probes can be found in Appendix DD.
CHAPTER 4

RESULTS

This chapter presents the results of this study beginning with interobserver agreement, followed by a presentation of results for acquisition, maintenance, generalization of science vocabulary words and definitions, and social validity.

Interobserver Agreement

Procedural Integrity

Tables 4.1 and 4.2 show the number of steps judged by each observer to be completed on the teacher and student procedural reliability checklists and the percent procedural reliability for interobserver agreement (IOA) sessions. Procedural reliability data were collected by the primary and secondary observers on 10 sessions representing 19% of all sessions. Both observers separately and simultaneously marked procedural steps as completed or not completed on the checklist (see Appendices U and V) during a session. Percent interobserver agreement was determined by dividing the number of steps completed by the total number of steps. Percent interobserver agreement for teacher implementation had a mean of 100% for all 10 sessions where two observers were present. Percent interobserver agreement for student implementation had a mean of 98.3%, range 91.7 to 100%, for the 10 sessions where two observers were present.
<table>
<thead>
<tr>
<th>Session</th>
<th>Steps Completed</th>
<th>Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Observer</td>
<td>Secondary Observer</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
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<tr>
<td>13</td>
<td>9</td>
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<td>51</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

Overall Mean: 100

Table 4.1: Percent agreement showing a comparison of the number of procedural integrity steps completed for the teacher.

<table>
<thead>
<tr>
<th>Session</th>
<th>Steps Completed</th>
<th>Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Observer</td>
<td>Secondary Observer</td>
</tr>
<tr>
<td>9</td>
<td>24</td>
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<td>46</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>51</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Overall Mean: 98.3

Table 4.2: Percent agreement showing a comparison of the number of procedural integrity steps completed for the students.
Interscorer Agreement

Table 4.3 shows the mean percentage of interscorer agreement on generalization pre- and posttest scores. IOA was calculated for all of the generalization pre- and posttests completed by each student for each set of vocabulary words. Mean percentages ranged from 95% to 100%, with an overall mean of 98.25% across 2045 items for all 14 students.

<table>
<thead>
<tr>
<th>Students</th>
<th>Agreements Pre/post-test</th>
<th>Disagreements Pre/post-test</th>
<th>Total number of items in set Pre/post-test</th>
<th>Percent agreement Pre/post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>138/138</td>
<td>2/2</td>
<td>140/140</td>
<td>99/99</td>
</tr>
<tr>
<td>2</td>
<td>140/137</td>
<td>0/3</td>
<td>140/140</td>
<td>100/98</td>
</tr>
<tr>
<td>3</td>
<td>140/133</td>
<td>0/7</td>
<td>140/140</td>
<td>100/95</td>
</tr>
<tr>
<td>4</td>
<td>139/128</td>
<td>1/7</td>
<td>140/135</td>
<td>99/95</td>
</tr>
<tr>
<td>5</td>
<td>129/144</td>
<td>1/6</td>
<td>130/120</td>
<td>99/95</td>
</tr>
<tr>
<td>6</td>
<td>120/105</td>
<td>0/5</td>
<td>120/110</td>
<td>100/95</td>
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<td>110/88</td>
<td>0/2</td>
<td>110/90</td>
<td>100/98</td>
</tr>
<tr>
<td>8</td>
<td>90/40</td>
<td>0/0</td>
<td>90/40</td>
<td>100/100</td>
</tr>
<tr>
<td>9</td>
<td>30/30</td>
<td>0/0</td>
<td>30/30</td>
<td>100/100</td>
</tr>
<tr>
<td>10</td>
<td>20/10</td>
<td>0/0</td>
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<td>10/10</td>
<td>100/100</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>1076/963</td>
<td>4/32</td>
<td>1080/965</td>
<td>99.6/96.9</td>
</tr>
</tbody>
</table>

Table 4.3: Students, number of agreements, number of disagreements, total number of items in the set, and percent agreement between primary and secondary scorers on completed generalization pre- and posttests.
Student 1

Figure 4.1 depicts the baseline, CWPT, and maintenance conditions for Student 1.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 1 was unable to identify any of the words and/or definitions contained in Word Sets 1-8. Student 1’s preassessment probes ranged from a minimum of two for Set 1 to a high of six probes for Sets 6-8. Word Sets 2 and 3 had three preassessment probes. There were four probes of Set 4 and five probes of Set 5.

*Acquisition*

**Set 1**

During the CWPT phase, the data for Student 1 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the sixth intervention session for Set 1.

**Set 2**

During the CWPT phase, the data for Student 1 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the sixth intervention session for Set 2.
Figure 4.1: Student 1 baseline, CWPT, and maintenance
Figure 4.1 continued

Baseline

CWPT

Main't

Student 1 cont'd

Number of words acquired

Sessions

Baseline

CWPT

3 happy face

Set 4

Set 5

Set 6

Continued
Figure 4.1 continued

Set 3

During the CWPT phase, the data for Student 1 show an ascending trend from 0 correct to 10 correct in six intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.
Set 4

During the CWPT phase, the data for Student 1 show an ascending trend from 0 correct to 10 correct in seven intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase, the data for Student 1 show an ascending trend from 0 correct to 10 correct in four intervention sessions. The slope of the intervention data path for Set 5 is steeper than the previous sets, yet still replicates the ascending trend noted in prior sets.

Set 6

During the CWPT phase for Set 6, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 1 show an ascending trend from 0 correct to 10 correct in eight intervention sessions during Set 6. This trend replicates the intervention data for previous sets despite the acquisition criterion change.

Set 7

During the CWPT phase for Set 7, students continued the three happy face acquisition criterion. The data for Student 1 show an ascending trend from 0 correct to 10 correct in six intervention sessions during Set 7. This trend replicates the intervention data for all previous sets.

Set 8

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. The data for Student 1 show an ascending trend from 0 correct to 8
correct in three intervention sessions during Set 8. The study ended before Set 8 could be acquired.

**Maintenance**

**Set 1**

*Maintenance probes.* Student 1 maintained 5 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 1 was able to maintain four words from Set 1. The data remained stable as Student 1 maintained those four words for the remaining eight weeks of the study.

**Set 2**

*Maintenance probes.* Student 1 maintained 9 of 10 words from Set 2 on the first two maintenance probes that occurred one and two weeks after the completion of CWPT. Three weeks after the completion of CWPT, Student 1 was able to maintain eight words from Set 2. Student 1 maintained those eight words for the next two weeks. On the sixth and seventh maintenance probes, Student 1 was able to recall seven words from Set 2. Overall, the maintenance data path for Set 2 was initially higher than the maintenance achieved in Set 1, but continued to slightly decrease in a stepwise fashion for the remainder of the study.

**Set 3**

*Maintenance probes.* Student 1 maintained 8 of 10 words from Set 3 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of intervention, Student 1 was able to maintain six words from Set 1. Student 1 maintained those six words for the remaining four weeks of the study. Overall,
the data path showed an initial decrease, but remained stable at six words maintained. This stability replicated the effect noted in maintenance for Set 1.

**Set 4**

*Maintenance probes.* Student 1 maintained 8 of 10 words from Set 4 for the first three maintenance probes that occurred after the completion of CWPT. The final maintenance probe decreased slightly to seven words maintained for Set 4. Overall, the data appear stable with a decreasing trend on the last data point.

**Set 5**

*Maintenance probes.* Student 1 maintained 6 of 10 words from Set 5 on the three maintenance probes that occurred after the completion of CWPT. The data are stable and replicate the results noted in previous sets.

**Set 6**

*Maintenance probes.* Student 1 maintained 9 of 10 words on the first maintenance probe that occurred after the completion of CWPT and eight words on the second maintenance probe. These two probes represent higher levels of maintenance than Sets 4 and 5, and replicated levels achieved in Sets 2 and 3. Although Set 6 has only two maintenance data points, there does appear to be a downward trend in the data for this set.

**Set 7**

*Maintenance probes.* Student 1 maintained 8 of 10 words on a single maintenance probe that occurred after the completion of CWPT. This probe represents a high level of maintenance as noted in Sets 2, 4 and 6. Because there is only one maintenance probe for this set no trend can be noted.
Set 8

*Maintenance probes.* No maintenance probes were given for Set 8 because the set was not acquired prior to the completion of the study.

*Generalization Pretests*

Student 1 was unable to answer any items on the generalization pretest correctly for Word Sets 1-8.

*Generalization*

*Set 1*

*Generalization posttest.* Student 1 was able to answer 7 of 10 questions correctly on the posttest.

*Set 2*

*Generalization posttest.* Student 1 was able to answer all 10 questions correctly on the posttest. This is an improvement from the 7 of 10 scored on the generalization posttest for Set 1.

*Set 3*

*Generalization posttest.* Student 1 was able to answer 9 of 10 questions correctly on the posttest. This score is a slight decrease from the perfect score achieved on Set 2, but is higher than the initial 7 of 10 scored on Set 1’s posttest.

*Set 4*

*Generalization posttest.* Student 1 was able to answer 6 of 10 questions correctly on the posttest. This score is a decrease from the posttest scores on the previous three sets.
Set 5

*Generalization posttest.* Student 1 was able to answer 5 of 10 questions correctly on the posttest. This score is a slight decrease from the posttest score in Set 4 (6 of 10) and continues the downward trend in posttest scores from in the first three sets.

Set 6

*Generalization posttest.* Student 1 was able to answer 9 of 10 questions correctly on the posttest. This score is an increase from the posttest scores achieved in Sets 4 and 5, and returns to a level commensurate with the generalization data from the first three sets.

Set 7

*Generalization posttest.* Student 1 was able to answer 6 of 10 questions correctly on the posttest. This score is demonstrates a decrease from the posttest scores achieved in Set 6, and returns to a level commensurate with the generalization data from Sets 4 and 5.

Set 8

*Generalization posttest.* No posttest was given for Set 8 as Student 1 was unable to achieve acquisition before the conclusion of the study.

Student 2

Figure 4.2 depicts the baseline, CWPT, and maintenance conditions for Student 2.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 2 was unable to identify any of the words and/or definitions contained in Word Sets 1-8. Student 2’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Set 8. Word Sets 2 and 3 had three preassessment probes. There were four probes of Set 4, five probes of Set 5, and six probes of Sets 6 and 7.
Acquisition

Set 1

During the CWPT phase, the data for Student 2 show an ascending trend from 0 correct to 10 correct in seven intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the seventh intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 2 show an ascending trend from 0 correct to 10 correct in eight intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the eighth intervention session for Set 2.

Set 3

During the CWPT phase, the data for Student 2 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 2 show an ascending trend from 0 correct to 10 correct in three intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets; however, the number of sessions to meet criterion was fewer than previous trials.
Figure 4.2: Student 2 baseline, CWPT, and maintenance data.
Figure 4.2 continued

Continued
During the CWPT phase, the data for Student 2 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The trend for Set 5 is replicates trends noted in previous sets.
Set 6

During the CWPT phase for Set 6, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 2 show an ascending trend from 0 correct to 10 correct in eight intervention sessions during Set 6. This trend replicates the intervention data for previous sets despite the acquisition criterion change.

Set 7

During the CWPT phase for Set 7, students continued the three happy face acquisition criterion. The data for Student 2 show an ascending trend from 0 correct to 10 correct in four intervention sessions during Set 7. This trend replicates the intervention data for all previous sets.

Set 8

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. The data for Student 2 show an ascending trend from 0 correct to 1 correct in three intervention sessions during Set 8. The study ended before Set 8 could be acquired.

Maintenance

Set 1

Maintenance probes. Student 2 maintained 4 of 10 words from Set 1 on the first four maintenance probes that occurred after the completion of CWPT. On Probes 5-9, Student 2 maintained 3 of 10 words. Overall, maintenance data were fairly stable for Set 1.
Set 2

Maintenance probes. Student 2 maintained 4 of 10 words from Set 2 on all six maintenance probes that occurred after the completion of CWPT. Overall, the maintenance data path for Set 2 was similar to the maintenance achieved in Set 1.

Set 3

Maintenance probes. Student 2 maintained 2 of 10 words from Set 3 on the first three maintenance probes that occurred after the completion of CWPT. Four weeks after the completion of intervention, Student 2 was able to maintain one word from Set 3. Student 2 maintained that word for the remaining week of the study. Overall, the data path showed a slight decrease, but was stable at two words maintained for four weeks before decreasing. The initial low maintenance and decreasing trend does not replicate maintenance trend for Sets 1 and 2.

Set 4

Maintenance probes. Student 2 maintained 4 of 10 words from Set 4 for the first three maintenance probes that occurred after the completion of CWPT. The final two maintenance probes decreased slightly to three words maintained for Set 4. Overall, the data appear stable with a decreasing trend on the last two data points. This trend replicates trends noted in Sets 1 and 2.

Set 5

Maintenance probes. Student 2 maintained 2 of 10 words on three maintenance probes that occurred after the completion of CWPT. These three probes replicate the low maintenance trend noted in Set 3. Maintenance data for Set 5 appears stable.
Set 6

Maintenance probes. Student 2 maintained 4 of 10 words on the first maintenance probe that occurred one week after the completion of CWPT. The second maintenance probe for this set reflects a downward trend to 2 of 10 words maintained.

Set 7

Maintenance probes. Student 2 maintained 9 of 10 words on a single maintenance probe that occurred after the completion of CWPT. This probe represents a higher level of maintenance than noted in any previous set. Because there is only one maintenance probe for this set no trend can be noted.

Set 8

Maintenance probes. No maintenance probes were given for Set 8 because the set was not acquired prior to the completion of the study.

Generalization Pretests

Student 2 was unable to answer any items on the generalization pretest correctly for Word Sets 1-8.

Generalization

Set 1

Generalization posttest. Student 2 was able to answer 3 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 2 was able to answer 3 of 10 questions correctly on the posttest. This score replicates the posttest score for Set 1.
Set 3

*Generalization posttest.* Student 2 was able to answer 4 of 10 questions correctly on the posttest. This score is a slight increase from the previous two posttests.

Set 4

*Generalization posttest.* Student 2 was able to answer 3 of 10 questions correctly on the posttest. This score is a slight decrease from the posttest score on the previous set and replicates scores from Sets 1 and 2.

Set 5

*Generalization posttest.* Student 2 was able to answer 2 of 10 questions correctly on the posttest. This score is a slight decrease from the posttest scores in previous sets.

Set 6

*Generalization posttest.* Student 2 was able to answer 5 of 10 questions correctly on the posttest. This score is an increase from the posttest scores achieved on all previous posttests.

Set 7

*Generalization posttest.* Student 2 was able to answer 9 of 10 questions correctly on the posttest. This score is an increase from all previous posttest scores and continues the upward trend that started in Set 6.

Set 8

*Generalization posttest.* No posttest was given for Set 8 as Student 2 was unable to achieve acquisition before the conclusion of the study.

Student 3

Figure 4.3 depicts the baseline, CWPT, and maintenance conditions for Student 3.
Figure 4.3: Student 3 baseline, CWPT, and maintenance data.
Figure 4.3 continued
Preassessment Probes

Preassessment probes were given during baseline conditions across each word set. Student 3 was unable to identify any of the words and/or definitions contained in Word Sets 1-8. Student 3’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Set 8. Word Sets 2 and 3 had three preassessment probes. There were five probes of Sets 4 and 5, and six probes of Sets 6 and 7.
Acquisition

Set 1

During the CWPT phase, the data for Student 3 show an ascending trend from 0 correct to 10 correct in eight intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the eighth intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 3 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the fifth intervention session for Set 2.

Set 3

During the CWPT phase, the data for Student 3 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 3 show an ascending trend from 0 correct to 10 correct in five intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase, the data for Student 3 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The data for Set 5 replicate the trend for all previous sets.
Set 6

During the CWPT phase for Set 6, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 3 show an ascending trend from 0 correct to 10 correct in seven intervention sessions during Set 6. This trend replicates the intervention data for previous sets despite the acquisition criterion change.

Set 7

During the CWPT phase for Set 7, students continued the three happy face acquisition criterion. The data for Student 3 show an ascending trend from 0 correct to 10 correct in six intervention sessions during Set 7. This trend continues to replicate the intervention data for all previous sets.

Set 8

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. Student 3 started Set 8 on the last day of tutoring. The only datum point for Set 8 during CWPT is a zero.

Maintenance

Set 1

Maintenance probes. Student 3 maintained 8 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 3 was able to maintain five words from Set 1. On the third maintenance probe, Student 3 maintained 4 of 10 words. The data remained stable as Student 3 maintained those four words for the remaining five weeks of the study.
Set 2

*Maintenance probes.* Student 3 maintained 8 of 10 words from Set 2 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 3 was able to maintain seven words from Set 2. Student 3 maintained those seven words for the next four weeks. The data paths for Sets 1 and 2 are similar in trend and stability.

Set 3

*Maintenance probes.* Student 3 maintained 6 of 10 words from Set 3 on the first maintenance probe that occurred one week after the completion of CWPT. On the second maintenance probe after the completion of intervention, Student 3 was able to maintain five words from Set 1. Three weeks after the completion of CWPT, Student 3 was able to maintain 3 of 10 words and maintain those three words for the remaining three weeks. The data path for Set 3 is decreasing but stable during the last four probes.

Set 4

*Maintenance probes.* Student 3 maintained 4 of 10 words from Set 4 for all five maintenance probes that occurred after the completion of CWPT. Overall, the data appear stable and replicate the stability of previous sets.

Set 5

*Maintenance probes.* Student 3 maintained 5 of 10 words from Set 5 on the first maintenance probe that occurred after the completion of CWPT. Student 3 maintained 4 of 10 words on the second maintenance probe. On the final maintenance probe for this set, Student 3 maintained three words. The data for this set are decreasing and do not replicate the trends or stability noted in previous sets.
Set 6

*Maintenance probes.* Student 3 maintained 6 of 10 words on the two maintenance probes that occurred after the completion of CWPT. These two probes represent a return to higher levels of maintenance than Sets 4 and 5, and replicated initial levels achieved in Sets 1, 2 and 3. Data for Set 6 is stable.

Set 7

*Maintenance probes.* Student 3 completed Set 7 one day before the end of the study. No maintenance probes were completed for Set 7.

Set 8

*Maintenance probes.* No maintenance probes were given for Set 8 because the set was started on the last day of the study.

*Generalization Pretests*

Student 3 was unable to answer any items on the generalization pretest correctly for Word Sets 3, 4, 5, 7, and 8. Student 3 completed two questions on Pretest 1, 3 questions on Pretest 2, and one question on Pretest 6 correctly.

*Generalization*

Set 1

*Generalization posttest.* Student 3 was able to answer 7 of 10 questions correctly on the posttest.

Set 2

*Generalization posttest.* Student 3 was able to answer 8 of 10 questions correctly on the posttest. This is an improvement from the 7 of 10 scored on the generalization posttest for Set 1.
Set 3

Generalization posttest. Student 3 was able to answer 4 of 10 questions correctly on the posttest. This score is a decrease from the 8 of 10 achieved on Set 2 and 7 of 10 on Set 1.

Set 4

Generalization posttest. Student 3 was able to answer 6 of 10 questions correctly on the posttest. This score is an increase from the posttest score on the previous set but does not replicate the achievement levels noted on the first two sets.

Set 5

Generalization posttest. Student 3 was able to answer 5 of 10 questions correctly on the posttest. This score is a slight decrease from the posttest score in Set 4.

Set 6

Generalization posttest. Student 3 was able to answer 8 of 10 questions correctly on the posttest. This score is an increase from the posttest scores achieved in Sets 4 and 5, and returns to a level commensurate with the generalization data from the first two sets.

Set 7

Generalization posttest. Student 3 was able to answer 8 of 10 questions correctly on the posttest. This score demonstrates a replication of the posttest score achieved in Set 6.

Set 8

Generalization posttest. No posttest was given for Set 8 as Student 3 was unable to achieve acquisition before the conclusion of the study.
Student 4

Figure 4.4 depicts the baseline, CWPT, and maintenance conditions for Student 4.

Preassessment Probes

Preassessment probes were given during baseline conditions across each word set. Student 4 was unable to identify any of the words and/or definitions contained in Word Sets 1-8. Student 4’s preassessment probes ranged from a minimum of two for Set 1 to a high of six probes for Sets 6-8. Word Sets 2 and 3 had three preassessment probes. There were five probes of Set 4 and 5.

Acquisition

Set 1

During the CWPT phase, the data for Student 4 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the fifth intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 4 show an ascending trend from 0 correct to 10 correct in four intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the fourth intervention session for Set 2.
Figure 4.4: Student 4 baseline, CWPT, and maintenance data.
Figure 4.4 continued
During the CWPT phase, the data for Student 4 show an ascending trend from 0 correct to 10 correct in six intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2, but is more variable than the trends noted in Sets 1 and 2.
Set 4

During the CWPT phase, the data for Student 4 show an ascending trend from 0 correct to 10 correct in three intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets. A steeper data slope is noted for Set 4.

Set 5

During the CWPT phase, the data for Student 4 show an ascending trend from 0 correct to 10 correct in five intervention sessions. This ascending trend is similar to previous sets.

Set 6

During the CWPT phase for Set 6, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 4 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 6. This trend replicates the intervention data for previous sets despite the acquisition criterion change.

Set 7

During the CWPT phase for Set 7, students continued the three happy face acquisition criterion. The data for Student 4 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 7. This trend replicates the intervention data for all previous sets.

Set 8

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. The data for Student 4 show an ascending trend from 0 correct to 4
correct in three intervention sessions during Set 8. The study ended before Set 8 could be acquired.

Maintenance

Set 1

Maintenance probes. Student 4 maintained 3 of 10 words from Set 1 on the first two maintenance probes that occurred one and two weeks after the completion of CWPT. Three weeks after the completion of CWPT, Student 4 was able to maintain two words from Set 1. The data remained stable as Student 4 maintained those two words for the remaining five weeks of the study.

Set 2

Maintenance probes. Student 4 maintained 9 of 10 words from Set 2 on the first three maintenance probes that occurred after the completion of CWPT. Four weeks after the completion of CWPT, Student 4 was able to maintain eight words from Set 2. Student 4 maintained those eight words for the next two weeks. Overall, the maintenance data path for Set 2 was higher than the maintenance achieved in Set 1.

Set 3

Maintenance probes. Student 4 maintained 7 of 10 words from Set 3 on the first two maintenance probes that occurred one week after the completion of CWPT. On the third maintenance probe, Student 4’s maintenance decreased to four words. The final maintenance probe for Set 3 decreased to 2 of 10 correct. A decreasing trend was noted for Set 3.
Set 4

Maintenance probes. Student 4 maintained 4 of 10 words from Set 4 on the first maintenance probe that occurred after the completion of CWPT. The second maintenance probe decreased slightly to three words maintained for Set 4. The final two maintenance probes decreased to 2 of 10 correct. Overall, the data have a decreasing trend with stability noted on the last data points.

Set 5

Maintenance probes. Student 4 maintained 5 of 10 words from Set 5 on the three maintenance probes that occurred after the completion of CWPT. The data are stable and replicate the results noted in Set 2.

Set 6

Maintenance probes. Student 4 maintained 8 of 10 words on two maintenance probes that occurred after the completion of CWPT. These two probes represent higher levels of maintenance than previous sets.

Set 7

Maintenance probes. Student 4 maintained 10 of 10 words on a single maintenance probe that occurred after the completion of CWPT. This probe represents a high level of maintenance. Because there is only one maintenance probe for this set no trend can be noted.

Set 8

Maintenance probes. No maintenance probes were given for Set 8 because the set was not acquired prior to the completion of the study.
Generalization Pretests

Student 4 was unable to answer any items on the generalization pretest correctly for all Word Sets except Set 2. Student 4 answered two questions correctly on the pretest for Set 2.

Generalization

Set 1

Generalization posttest. Student 4 was able to answer 3 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 4 was able to answer all 10 questions correctly on the posttest. This is an improvement from the 3 of 10 scored on the generalization posttest for Set 1.

Set 3

Generalization posttest. Student 4 was unable to answer any questions correctly on the posttest. This score is a decrease from the perfect score achieved on Set 2.

Set 4

Generalization posttest. Student 4 was able to answer 3 of 10 questions correctly on the posttest. This score is an increase from the posttest scores on the previous set and replicates the score on Set 1’s posttest.

Set 5

Generalization posttest. Student 4 was able to answer 5 of 10 questions correctly on the posttest. This score is a slight increase from the posttest score in Set 4 and continues the variable trend in posttest scores.
Set 6

*Generalization posttest.* Student 4 was able to answer 6 of 10 questions correctly on the posttest. This score is a slight increase from the posttest scores achieved in Sets 4 and 5.

Set 7

*Generalization posttest.* Student 4 was able to answer 10 of 10 questions correctly on the posttest. This score is demonstrates an increase from the posttest scores achieved in Sets 4-6, and returns to a level commensurate with the generalization data from Set 2.

Set 8

*Generalization posttest.* No posttest was given for Set 8 as Student 4 was unable to achieve acquisition before the conclusion of the study.

Student 5

Figure 4.5 depicts the baseline, CWPT, and maintenance conditions for Student 5.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 5 was unable to identify any of the words and/or definitions contained in Word Sets 1-6. Student 5’s preassessment probes ranged from a minimum of two for Set 1 to a high of six probes for Sets 5 and 6. Word Sets 2 and 3 had three preassessment probes, and Set 4 had five probes.
Acquisition

Set 1

During the CWPT phase, the data for Student 5 show an ascending trend from 0 correct to 10 correct in 8 intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the eighth intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 5 show an ascending trend from 0 correct to 10 correct in seven intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the seventh intervention session for Set 2.

Set 3

During the CWPT phase, the data for Student 5 show an ascending trend from 0 correct to 10 correct in seven intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 5 show an ascending trend from 0 correct to 10 correct in five intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.
Figure 4.5: Student 5 baseline, CWPT, and maintenance data.
Figure 4.5 continued
Set 5

During the CWPT phase for Set 5, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 5 show an ascending trend from 0 correct to 10 correct in ten intervention sessions. The slope of the intervention data path for Set 5 is more step-wise than the previous sets, yet still replicates the ascending trend noted in prior sets.

Set 6

During the CWPT phase for Set 6, students continued the three happy face acquisition criterion. The data for Student 5 show an ascending trend from 0 correct to 5 correct in four intervention sessions during Set 6. The study ended before Set 6 could be acquired.

Maintenance

Set 1

Maintenance probes. Student 5 maintained 2 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 5 was able to maintain one word from Set 1. The data remained stable as Student 1 maintained that one word for the remaining six weeks of the study.

Set 2

Maintenance probes. Student 5 maintained 6 of 10 words from Set 2 on the first four maintenance probes that occurred after the completion of CWPT. Five weeks after the completion of CWPT, Student 5 was able to maintain five words from Set 2. Student
5 maintained those five words for the next week. Overall, the maintenance data path for Set 2 was higher than the maintenance achieved in Set 1.

Set 3

*Maintenance probes.* Student 5 maintained 7 of 10 words from Set 3 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of intervention, Student 5 was able to maintain five words from Set 3. Student 5 maintained those five words for the remaining two weeks of the study. Overall, the data path showed an initial increase, and remained stable at five words maintained. This stability replicated the effect noted in maintenance for Sets 1 and 2.

Set 4

*Maintenance probes.* Student 5 maintained 2 of 10 words from Set 4 for the three maintenance probes that occurred after the completion of CWPT. Overall, the data appear stable with a decreasing trend from the previous set.

Set 5

*Maintenance probes.* Student 5 maintained 4 of 10 words from Set 5 on one maintenance probe that occurred after the completion of CWPT. The results for Set 5 replicate the results noted in previous sets.

Set 6

*Maintenance probes.* No maintenance probes were given for Set 6 because the set was not acquired prior to the completion of the study.

*Generalization Pretests*

Student 5 was unable to answer any items on the generalization pretest correctly for all Word Sets except Set 3 with one question correct.
Generalization

Set 1

Generalization posttest. Student 5 was able to answer 2 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 5 was able to answer 2 of 10 questions correctly on the posttest. This score replicates the score achieved on the posttest for Set 1.

Set 3

Generalization posttest. Student 5 was able to answer 3 of 10 questions correctly on the posttest. This score is a slight increase from the previous scores achieved on Sets 1 and 2.

Set 4

Generalization posttest. Student 5 was able to answer 1 of 10 questions correctly on the posttest. This score is a decrease from the posttest scores on the previous three sets.

Set 5

Generalization posttest. Student 5 was able to answer 1 of 10 questions correctly on the posttest. This score replicates the posttest score in Set 4.

Set 6

Generalization posttest. No posttest was given for Set 6 as Student 5 was unable to achieve acquisition before the conclusion of the study.
Student 6

Figure 4.6 depicts the baseline, CWPT, and maintenance conditions for Student 6.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 6 was unable to identify any of the words and/or definitions contained in Word Sets 1-4b. Student 6’s preassessment probes ranged from a minimum of two for Sets 1 and 3b to a high of six probes for Set 4b. Word Sets 2 and 3a had three preassessment probes. There were five probes of Set 4a. Sets 3a, 3b, 4a, and 4b contained only five word cards.

*Acquisition*

*Set 1*

During the CWPT phase, the data for Student 6 show an ascending trend from 0 correct to 10 correct in nine intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved on the ninth intervention session for Set 1.

*Set 2*

During the CWPT phase, the data for Student 6 show an ascending trend from 0 correct to 10 correct in nine intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved at the ninth intervention session for Set 2.
Figure 4.6: Student 6 baseline, CWPT, and maintenance data.
Figure 4.6 continued

Student 6 cont’d

Note axis change

Sessions

Baseline       CWPT          Maintenance

Set 3B

Baseline

CWPT

happy face

Set 4A

Set 4B

Sessions
Set 3a

During the CWPT phase, the data for Student 6 show an ascending trend from 0 correct to 5 correct in nine intervention sessions. At Session 30, Set 3 was changed from 10 word cards to five word cards in an attempt to increase the acquisition for Student 6. The trend before Session 30 is flat with a slight increase in a step-wise trend. After Session 30 the trend for Set 3 is similar to the ascending trends noted in previous sets.

Set 3b

During the CWPT phase, the data for Student 6 show an ascending trend from 0 correct to 5 correct in seven intervention sessions. This trend replicates the trends noted in the intervention phases for previous sets.

Set 4a

During the CWPT phase for Set 4a, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 6 show an ascending trend from 0 correct to 5 correct in three intervention sessions. The slope of the intervention data path for Set 4a is steeper than the previous sets, yet still replicates the ascending trend noted in prior sets.

Set 4b

During the CWPT phase for Set 4b, students continued the three happy face acquisition criterion. The data for Student 6 show an ascending trend from 0 correct to 3 correct in four intervention sessions during Set 4b. The study ended before Set 4b could be acquired.
Maintenance

Set 1

Maintenance probes. Student 6 maintained 3 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 6 was able to maintain one word from Set 1. The data remained stable as Student 6 maintained that one word for the remaining six weeks of the study.

Set 2

Maintenance probes. Student 6 maintained 0 of 10 words from Set 2 on the first maintenance probe that occurred one and two weeks after the completion of CWPT. No more probes were conducted for Set 2.

Set 3a

Maintenance probes. Student 6 maintained 1 of 5 words from Set 3a on the four maintenance probes that occurred after the completion of CWPT. Overall, the data path remained stable at one word maintained. This stability replicated the effect noted in maintenance for Set 1.

Set 3b

Maintenance probes. Student 6 maintained 2 of 5 words from Set 3b for the two maintenance probes that occurred after the completion of CWPT. Overall, the data appear stable.
Set 4a

**Maintenance probes.** Student 6 maintained 4 of 5 words from Set 5 on the maintenance probe that occurred after the completion of CWPT. This datum point is higher than any previous maintenance probes for Student 6.

Set 4b

**Maintenance probes.** No maintenance probes were given for Set 4b because the set was not acquired prior to the completion of the study.

**Generalization Pretests**

Student 6 was unable to answer any items on the generalization pretest correctly for Word Sets 1-4b.

**Generalization**

Set 1

**Generalization posttest.** Student 6 was able to answer 1 of 10 questions correctly on the posttest.

Set 2

**Generalization posttest.** Student 6 was able to answer 1 of 10 questions correctly on the posttest. This score replicates that of Set 1.

Set 3a

**Generalization posttest.** Student 6 was able to answer 1 of 5 questions correctly on the posttest. This score is the same as the scores on the previous two sets.
Set 3b

*Generalization posttest.* Student 6 was able to answer 3 of 5 questions correctly on the posttest. This score is an increase from the posttest scores on the previous three sets.

Set 4a

*Generalization posttest.* Student 6 was able to answer 4 of 5 questions correctly on the posttest. This score is an increase from the posttest score in Set 4 and continues the increasing trend in posttest scores from the first four sets.

Set 4b

*Generalization posttest.* No posttest was given for Set 4b as Student 6 was unable to achieve acquisition before the conclusion of the study.

Student 7

Figure 4.7 depicts the baseline, CWPT, and maintenance conditions for Student 7.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 7 was unable to identify any of the words and/or definitions contained in Word Sets 1-7. Student 7’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Set 5. Word Sets 2 and 3 had three preassessment probes. There were four probes of Set 4 and six probes of Sets 6 and 7.
Figure 4.7: Student 7 baseline, CWPT, and maintenance data.
Figure 4.7 continued

Continued
Acquisition

Set 1

During the CWPT phase, the data for Student 7 show an ascending trend from 0 correct to 10 correct in eight intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the eighth intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 7 show an ascending trend from 0 correct to 10 correct in three intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the third intervention session for Set 2.
Set 3

During the CWPT phase, the data for Student 7 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 7 show an ascending trend from 0 correct to 10 correct in eight intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase for Set 5, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 7 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The slope of the intervention data path for Set 5 is steeper than the previous sets, yet still replicates the ascending trend noted in prior sets.

Set 6

During the CWPT phase for Set 6, students continued the three happy face acquisition criterion. The data for Student 7 show an ascending trend from 0 correct to 10 correct in eight intervention sessions during Set 6. This trend replicates the intervention data for previous sets.

Set 7

During the CWPT phase for Set 7, students continued the three happy face acquisition criterion. Only one datum point could be recorded before the completion of the study. Student 7 acquired zero word cards the first day of CWPT for Set 7.
**Maintenance**

*Set 1*

*Maintenance probes.* Student 7 maintained 5 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 7 was able to maintain three words from Set 1. The data remained stable as Student 7 maintained those three words for the remaining six weeks of the study.

*Set 2*

*Maintenance probes.* Student 7 maintained 8 of 10 words from Set 2 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 7 was able to maintain seven words from Set 2. Student 7 maintained those seven words for the next four weeks. Overall, the maintenance data path for Set 2 was initially higher than the maintenance achieved in Set 1, but slightly decreased and remained stable for the remainder of the study.

*Set 3*

*Maintenance probes.* Student 7 maintained 3 of 10 words from Set 3 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of intervention, Student 7 was able to maintain two words from Set 1. Student 1 maintained those two words for the remaining three weeks of the study. Overall, the data path showed a decrease, but remained stable at two words maintained. This stability replicated the effect noted in maintenance for Set 1.
Set 4

*Maintenance probes.* Student 7 maintained 5 of 10 words from Set 4 for the first maintenance probe that occurred after the completion of CWPT. The next maintenance probe decreased slightly to four words maintained for Set 4. The final maintenance probe for Set 4 decreased again to three words maintained. Overall, the data have a decreasing trend for Set 4.

Set 5

*Maintenance probes.* Student 7 maintained 6 of 10 words from Set 5 on the two maintenance probes that occurred after the completion of CWPT. The data are stable and replicate the results noted in Set 2.

Set 6

*Maintenance probes.* Student 7 was not able to complete a maintenance probe for Set 6 even though the set was completed.

Set 7

*Maintenance probes.* No maintenance probes were conducted for Set 7 as Student 7 had just begun to acquire the words for this set at the completion of the study.

*Generalization Pretests*

Student 7 was unable to answer any items on the generalization pretest correctly for all Word Sets except the two questions correct on the pretest for Set 2.

*Generalization*

Set 1

*Generalization posttest.* Student 7 was able to answer 4 of 10 questions correctly on the posttest.
Set 2

*Generalization posttest.* Student 7 was able to answer 7 of 10 questions correctly on the posttest. This is an improvement from the 4 of 10 scored on the generalization posttest for Set 1.

Set 3

*Generalization posttest.* Student 7 was able to answer 3 of 10 questions correctly on the posttest. This score is a decrease from the previous scores achieved on Sets 1 and 2.

Set 4

*Generalization posttest.* Student 7 was able to answer 3 of 10 questions correctly on the posttest. This score is the same as Set 3 but below scores from the first two sets.

Set 5

*Generalization posttest.* Student 7 was able to answer 5 of 10 questions correctly on the posttest. This score is a slight increase from the posttest scores on Sets 3 and 4.

Set 6

*Generalization posttest.* Student 7 was able to answer 5 of 10 questions correctly on the posttest. This score replicates the posttest score achieved in Set 5 and begins to stabilize the posttest scores across sets.

Set 7

*Generalization posttest.* No posttest was given for Set 7 as Student 7 was unable to achieve acquisition before the conclusion of the study.
Student 8

Figure 4.8 depicts the baseline, CWPT, and maintenance conditions for Student 8.

Preassessment Probes

Preassessment probes were given during baseline conditions across each word set. Student 8 was unable to identify any of the words and/or definitions contained in Word Sets 1-7. Student 7’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Set 7. Word Sets 2 and 3 had three preassessment probes. There were four probes of Set 4, five probes of Set 5, and six probes of Set 6.

Acquisition

Set 1

During the CWPT phase, the data for Student 8 show an ascending trend from 0 correct to 10 correct in seven intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the seventh intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 8 show an ascending trend from 0 correct to 10 correct in seven intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the seventh intervention session for Set 2.
Figure 4.8: Student 8 baseline, CWPT, and maintenance data.
Figure 4.8 continued

Student 8 cont’d

Continued
Set 3

During the CWPT phase, the data for Student 8 show an ascending trend from 0 correct to 10 correct in six intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 8 show an ascending trend from 0 correct to 10 correct in six intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase for Set 5, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 8 show an ascending trend from 0 correct to 10 correct in six intervention sessions.
correct in nine intervention sessions. This trend replicates the intervention data for previous sets despite the acquisition criterion change.

*Set 6*

During the CWPT phase for Set 6, students continued the three happy face criterion. The data for Student 8 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 6. This trend replicates the intervention data for previous sets.

*Set 7*

During the CWPT phase for Set 7, students continued the three happy face acquisition criterion. The data for Student 8 show an ascending trend from 0 correct to 7 correct in three intervention sessions during Set 7. The study ended before Set 7 could be acquired.

*Maintenance*

*Set 1*

*Maintenance probes.* Student 8 maintained 9 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. The data remained stable as Student 8 maintained those nine words for the remaining nine weeks of the study.

*Set 2*

*Maintenance probes.* Student 8 maintained 9 of 10 words from Set 2 on the first two maintenance probes that occurred one and two weeks after the completion of CWPT. Three weeks after the completion of CWPT, Student 8 was able to maintain eight words from Set 2. Student 8 maintained those eight words for the next three weeks. Overall, the
maintenance data path for Set 2 was the same as the maintenance achieved in Set 1, but slightly decreased to eight before stability was noted.

Set 3

Maintenance probes. Student 8 maintained 8 of 10 words from Set 3 on five maintenance probes that occurred after the completion of CWPT. Overall, the data path remained stable at eight words maintained. This stability replicated the effect noted in maintenance for Sets 1 and 2.

Set 4

Maintenance probes. Student 8 maintained 8 of 10 words from Set 4 for three maintenance probes that occurred after the completion of CWPT. The data continue to be stable across sets.

Set 5

Maintenance probes. Student 8 maintained 9 of 10 words from Set 5 on the first maintenance probe that occurred after the completion of CWPT. The second probe decreased slightly to 8 of 10 maintained. The trend for Set 5 is initially high as noted in previous sets with a decreasing trend on the final probe for this set.

Set 6

Maintenance probes. Student 8 maintained 10 of 10 words on the only maintenance probe for this set that occurred after the completion of CWPT. A slight increasing trend is noted for Set 6.

Set 7

Maintenance probes. No maintenance probes were given for Set 7 because the set was not acquired prior to the completion of the study.


**Generalization Pretests**

Student 8 was unable to answer any items on the generalization pretest correctly for Word Sets 3-7, but did answer one question correctly on each of the first two pretests.

**Generalization**

*Set 1*

*Generalization posttest.* Student 8 was able to answer 9 of 10 questions correctly on the posttest.

*Set 2*

*Generalization posttest.* Student 8 was able to answer 7 of 10 questions correctly on the posttest. This is a slight decrease from the 9 of 10 scored on the generalization posttest for Set 1.

*Set 3*

*Generalization posttest.* Student 8 was able to answer 8 of 10 questions correctly on the posttest. This score is a slight increase from the 7 of 10 score achieved on Set 2.

*Set 4*

*Generalization posttest.* Student 8 was able to answer 6 of 10 questions correctly on the posttest. This score is a decrease from the posttest scores on the previous three sets.

*Set 5*

*Generalization posttest.* Student 8 was able to answer 6 of 10 questions correctly on the posttest. This score is the same as the posttest score in Set 4 and demonstrates stability across Sets 4 and 5.
Set 6

*Generalization posttest.* Student 8 was able to answer 10 of 10 questions correctly on the posttest. This score is an increase from the posttest scores achieved in Sets 4 and 5, and increases scores to a level above the first three sets.

Set 7

*Generalization posttest.* No posttest was given for Set 7 as Student 8 was unable to achieve acquisition before the conclusion of the study.

Student 9

Figure 4.9 depicts the baseline, CWPT, and maintenance conditions for Student 9.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 9 was unable to identify any of the words and/or definitions contained in Word Sets 1-12. Student 9’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Set 10. Word Sets 2-4 had three preassessment probes. There were five probes of Sets 5-8. Finally, Word Sets 9, 11, and 12 had six probes.

*Acquisition*

Set 1

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved on the fifth intervention session for Set 1.
Figure 4.9: Student 9 baseline, CWPT, and maintenance data.
Figure 4.9 continued

Sets of data points are graphed over sessions, with Baseline, CWPT, and Maintenance phases indicated.

Set 4: Data points for Baseline, CWPT, and Maintenance phases.
Set 5: Similar data points for another set.
Set 6: Additional data points for the third set.

Student 9 cont’d
Baseline   CWPT   Maintenance

Continued
Figure 4.9 continued

Student 9 cont'd

Set 7

Number of words acquired

Sessions

Baseline  CWPT  Maintenance

Set 8

Baseline  3  happy face

Set 9

Continued
Figure 4.9 continued

Student 9 cont'd

Number of words acquired

Sessions
Set 2

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in four intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved at the fourth intervention session for Set 2.

Set 3

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in three intervention sessions. This steep ascending trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in four intervention sessions. Set 5 continues to replicate the ascending trend noted in all previous sets.

Set 6

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in four intervention sessions. Set 6 replicates the ascending trend noted in all previous sets.
**Set 7**

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in two intervention sessions. Set 7 has a steep ascending trend but still replicates the ascending trend noted in all previous sets.

**Set 8**

During the CWPT phase, the data for Student 9 show an ascending trend from 0 correct to 10 correct in four intervention sessions. Set 8 continues to replicate the ascending trend noted in all previous sets.

**Set 9**

During the CWPT phase for Set 9, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 9 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 9. This trend replicates the intervention data for previous sets despite the acquisition criterion change.

**Set 10**

During the CWPT phase for Set 10, students continued the three happy face acquisition criterion. The data for Student 9 show an ascending trend from 0 correct to 10 correct in four intervention sessions during Set 10. This trend replicates the intervention data for all previous sets.

**Set 11**

During the CWPT phase for Set 11, students continued the three happy face acquisition criterion. The data for Student 9 show an ascending trend from 0 correct to 8
correct in four intervention sessions during Set 11. This trend replicates all previous trends in acquisition of word sets.

Set 12

During the CWPT phase for Set 12, students continued the three happy face acquisition criterion. The data for Student 9 show two data points, both zero, as Student 9 had just begun to acquire words for Set 12. The study ended before Set 12 could be acquired.

Maintenance

Set 1

Maintenance probes. Student 9 maintained 7 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 9 was able to maintain six words from Set 1. The data remained stable as Student 9 maintained those six words for the remaining seven weeks of the study.

Set 2

Maintenance probes. Student 9 maintained 10 of 10 words from Set 2 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 9 was able to maintain nine words from Set 2. Student 9 maintained eight words on the third maintenance probe and was able to maintain those eight words for the remaining five weeks. Overall, the maintenance data path for Set 2 was initially higher than the maintenance achieved in Set 1, but continued to slightly decrease to eight words before remaining stable for the rest of the study.
Set 3

*Maintenance probes.* Student 9 maintained 6 of 10 words from Set 3 on the first maintenance probe that occurred one week after the completion of CWPT. These six words were maintained for the following six weeks of the study. Overall, the data path showed a decrease, but remained stable at six words maintained. This stability replicated the effect noted in maintenance for Sets 1 and 2.

Set 4

*Maintenance probes.* Student 9 maintained 8 of 10 words from Set 4 for the first maintenance probe that occurred after the completion of CWPT. On the second maintenance probe six words were maintained. These six words were maintained for the next four weeks. Overall, the data appear stable after an initial decreasing trend.

Set 5

*Maintenance probes.* Student 9 maintained 8 of 10 words from Set 5 on the first two maintenance probes that occurred after the completion of CWPT. The data decrease on the third maintenance probe to seven words maintained. These seven words are maintained for two more weeks. The data are stable and replicate the results noted in previous sets.

Set 6

* Maintenance probes.* Student 9 maintained 10 of 10 words on the first maintenance probe that occurred after the completion of CWPT and eight words on the second, third, and fourth maintenance probe. The first probe represents an initial high level of maintenance similar to Set 2 and replicated levels achieved in other sets.
Set 7

*Maintenance probes.* Student 9 maintained 10 of 10 words on four maintenance probes that occurred after the completion of CWPT. These probes represent a high, stable level of maintenance for Set 7.

Set 8

*Maintenance probes.* Student 9 maintained 10 of 10 words on three maintenance probes that occurred after the completion of CWPT. These probes represent a high, stable level of maintenance for Set 8 and replicate the levels noted in Set 7.

Set 9

*Maintenance probes.* Student 9 maintained 10 of 10 words on two maintenance probes that occurred after the completion of CWPT. These probes represent a high, stable level of maintenance for Set 9 and replicate the levels from the previous two sets.

Set 10

*Maintenance probes.* Student 9 maintained 10 of 10 words on one maintenance probe that occurred after the completion of CWPT. This probe represents a high level of maintenance for Set 9, and replicates the levels from the previous three sets.

Set 11

*Maintenance probes.* No maintenance probes were given for Set 11 because the set was acquired two days before the completion of the study.

Set 12

*Maintenance probes.* No maintenance probes were given for Set 12 because the set was not acquired before the completion of the study.
Generalization Pretests

Student 9 was unable to answer any items on the generalization pretest correctly for all Word Sets except the two correct questions on the pretests for Sets 2 and 8 and four correct on Set 1.

Generalization

Set 1

Generalization posttest. Student 9 was able to answer 9 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 9 was able to answer 6 of 10 questions correctly on the posttest. This is a decrease from the 9 of 10 scored on the generalization posttest for Set 1.

Set 3

Generalization posttest. Student 9 was able to answer 4 of 10 questions correctly on the posttest. This score continues the decrease from the 9 of 10 score achieved on Set 1.

Set 4

Generalization posttest. Student 9 was able to answer 2 of 10 questions correctly on the posttest. This score continues the decreasing trend since the initial score of 9 on Posttest 1.

Set 5

Generalization posttest. Student 9 was able to answer 5 of 10 questions correctly on the posttest. This score is an increase from the posttest score on Set 4.
Set 6

*Generalization posttest.* Student 9 was able to answer 7 of 10 questions correctly on the posttest. This score is an increase from the posttest score achieved on Set 5, and continues the increasing trend from Set 5.

Set 7

*Generalization posttest.* Student 9 was able to answer 6 of 10 questions correctly on the posttest. This score demonstrates a slight decrease from the posttest score achieved in Set 6, and returns to a decreasing trend in posttest scores.

Set 8

*Generalization posttest.* Student 9 was able to answer 9 of 10 questions correctly on the posttest. This score demonstrates an increasing trend from the posttest score on Set 7.

Set 9

*Generalization posttest.* Student 9 was able to answer 4 of 10 questions correctly on the posttest. This score demonstrates a decrease from the posttest scores achieved in previous sets, and returns to a decreasing trend in posttest scores.

Set 10

*Generalization posttest.* Student 9 was able to answer 6 of 10 questions correctly on the posttest. This score demonstrates a slight increase from the posttest score achieved in Set 9, and returns to an increasing trend in posttest scores.
Set 11

*Generalization posttest.* Student 9 was able to answer 7 of 10 questions correctly on the posttest. This score is demonstrates a slight increase from the posttest score achieved in Set 10, and returns to an increasing trend in posttest scores.

Set 12

*Generalization posttest.* No posttest was given for Set 12 as Student 9 was unable to achieve acquisition before the conclusion of the study.

Student 10

Figure 4.10 depicts the baseline, CWPT, and maintenance conditions for Student 10.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 10 was unable to identify any of the words and/or definitions contained in Word Sets 1-10. Student 10’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Sets 8 and 10. Word Sets 2 and 3 had three preassessment probes. There were four probes of Set 4 and five probes of Sets 5 and 6. Word Sets 7 and 9 both had six probes.

*Acquisition*

Set 1

During the CWPT phase, the data for Student 10 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The criterion of correctly identifying all
Figure 4.10: Student 10 baseline, CWPT, and maintenance data.
Figure 4.10 continued

Set 4

Set 5

Set 6

Sessions

Continued
Figure 4.10 continued

Student 10 cont'd

Sessions

Baseline       CWPT    Maintenance

3 happy face

Set 7

Set 8

Set 9

Continued
10 words, including definition, for two consecutive sessions was achieved on the sixth intervention session for Set 1.

**Set 2**

During the CWPT phase, the data for Student 10 show an ascending trend from 0 correct to 10 correct in three intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved at the third intervention session for Set 2.

**Set 3**

During the CWPT phase, the data for Student 10 show an ascending trend from 0 correct to 10 correct in five intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.
Set 4

During the CWPT phase, the data for Student 10 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase, the data for Student 10 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend continues the acquisition trends noted in all previous sets.

Set 6

During the CWPT phase, the data for Student 10 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 6. This trend replicates the intervention data for previous sets.

Set 7

During the CWPT phase for Set 7, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 10 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 7. This trend replicates the intervention data for all previous sets despite the acquisition criterion change.

Set 8

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. The data for Student 10 show an ascending trend from 0 correct to 10 correct in four intervention sessions during Set 8. This trend continues to replicate the trends noted in previous sets.
**Set 9**

During the CWPT phase for Set 9, students continued the 3 happy face acquisition criterion. The data for Student 10 show an ascending trend from 0 correct to 10 correct in 4 intervention sessions during Set 9. This trend continues to replicate the trends noted in previous sets.

**Set 10**

During the CWPT phase for Set 10, students continued the three happy face acquisition criterion. The data for Student 10 show 0 correct for two data points because Student 10 had just started to acquire this set when the study concluded. The study ended before Set 10 could be acquired.

**Maintenance**

**Set 1**

*Maintenance probes.* Student 10 maintained 4 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 10 was able to maintain two words from Set 1. On the third maintenance probe, only one word was maintained. The data remained stable as that single word was maintained for five more weeks.

**Set 2**

*Maintenance probes.* Student 10 maintained 7 of 10 words from Set 2 on the first maintenance probe that occurred one week after the completion of CWPT. Two and three weeks after the completion of CWPT, Student 10 was able to maintain four words from Set 2. On the next five maintenance probes, Student 10 was able to recall three words from Set 2. Overall, the maintenance data path for Set 2 was initially higher than the
maintenance achieved in Set 1, but continued to slightly decrease for three weeks before stabilizing at three words for the remainder of the study.

Set 3

Maintenance probes. Student 10 maintained 5 of 10 words from Set 3 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of intervention, Student 10 was able to maintain four words from Set 1. Three weeks later, Student 10 maintained three words and continued to maintain those three words for the remaining three weeks of the study. Overall, the data path showed a decreasing trend, but remained stable at three words maintained. This stability replicated the effect noted in maintenance for Sets 1 and 2.

Set 4

Maintenance probes. Student 10 maintained 5 of 10 words from Set 4 on the first maintenance probe that occurred after the completion of CWPT. The second maintenance probe decreased to three words maintained. The following three maintenance probes remained stable at three words. The trend for Set 4 replicates previous trends.

Set 5

Maintenance probes. Student 10 maintained 6 of 10 words from Set 5 on the first maintenance probe that occurred after the completion of CWPT. The next three probes were stable at five words maintained. The data increased initially and are stable at five words. This trend replicates the stability noted in previous sets.

Set 6

Maintenance probes. Student 10 maintained 8 of 10 words on the first maintenance probe that occurred after the completion of CWPT. On the second
maintenance probe, the score decreased to six, and continued to decrease on the third probe to five words. There is downward trend in the data for this set that does not replicate previous sets’ trends.

Set 7

*Maintenance probes.* Student 10 maintained 10 of 10 words on a single maintenance probe that occurred after the completion of CWPT. The second maintenance probe decreased to six words. This decreasing trend replicates the trend noted in Set 6.

Set 8

*Maintenance probes.* Student 10 maintained 9 of 10 words on a single maintenance probe that occurred after the completion of CWPT. Because this is the only maintenance datum point for Set 8, no trend can be noted.

Set 9

*Maintenance probes.* No maintenance probes were given for Set 9 because the set was acquired two days before the completion of the study.

Set 10

*Maintenance probes.* No maintenance probes were given for Set 10 because the set was not acquired before the completion of the study.

*Generalization Pretests*

Student 10 was unable to answer any items on the generalization pretest correctly for Word Sets 5-10. Student 10 answered two questions on the pretest for Set 1 correctly, six questions on the pretest for Set 2 correctly, one question on the pretest for Set 3 correctly, and two questions on the pretest for Set 4 correctly.
Generalization

Set 1

Generalization posttest. Student 10 was able to answer 1 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 10 was able to answer 4 of 10 questions correctly on the posttest. This is an improvement from the score on the generalization posttest for Set 1.

Set 3

Generalization posttest. Student 10 was able to answer 3 of 10 questions correctly on the posttest. This score is a slight decrease from the score achieved on Set 2, but is higher than the initial 1 of 10 scored on Set 1’s posttest.

Set 4

Generalization posttest. Student 10 was able to answer 2 of 10 questions correctly on the posttest. This score is a decrease from the posttest scores on the previous two sets.

Set 5

Generalization posttest. Student 10 was able to answer 8 of 10 questions correctly on the posttest. This score is an increase from the posttest scores for previous sets.

Set 6

Generalization posttest. Student 10 was able to answer 5 of 10 questions correctly on the posttest. This score demonstrates a decrease from the posttest scores achieved in Set 6.
Set 7

*Generalization posttest.* Student 10 was able to answer 7 of 10 questions correctly on the posttest. This score is demonstrates an increase from the posttest scores achieved on Set 6, but does not return to levels noted in Set 5.

Set 9

*Generalization posttest.* Student 10 was able to answer 4 of 10 questions correctly on the posttest. This score is demonstrates a decrease from the posttest scores achieved on Set 8.

Set 10

*Generalization posttest.* No posttest was given for Set 10 as Student 10 was unable to achieve acquisition before the conclusion of the study.

Student 11

Figure 4.11 depicts the baseline, CWPT, and maintenance conditions for Student 11.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 11 was unable to identify any of the words and/or definitions contained in Word Sets 1-5. Student 11’s preassessment probes ranged from a minimum of two for Set 1 to a high of five probes for Set 5. Word Sets 2 and 3 had three preassessment probes. There were four probes of Set 4.
Figure 4.11: Student 11 baseline, CWPT, and maintenance data.
Acquisition

Set 1

During the CWPT phase, the data for Student 11 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The criterion of correctly identifying all
ten words, including definition, for two consecutive sessions was achieved on the fifth intervention session for Set 1.

*Set 2*

During the CWPT phase, the data for Student 11 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the sixth intervention session for Set 2.

*Set 3*

During the CWPT phase, the data for Student 11 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

*Set 4*

During the CWPT phase, the data for Student 11 show an ascending trend from 0 correct to 10 correct in eight intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

*Set 5*

During the CWPT phase, the data for Student 11 show an ascending trend from 0 correct to 2 correct in two intervention sessions. At this point Student 11 withdrew from the study.

*Maintenance*

*Set 1*

*Maintenance probes.* Student 11 maintained 6 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two and three
weeks after the completion of CWPT, Student 11 was able to maintain five words from Set 1. Maintenance continued to decrease to three words maintained on the fourth and fifth probe. The sixth maintenance probe occurred after Student 11 had been withdrawn from the study for nearly six weeks. The data remained stable as Student 11 maintained those three words.

*Set 2*

*Maintenance probes.* Student 11 maintained 6 of 10 words from Set 2 on the first maintenance probe that occurred one week after the completion of CWPT. Two and three weeks after the completion of CWPT, Student 11 was able to maintain two and one words respectively from Set 2. The fourth maintenance probe occurred after Student 11 had been withdrawn from the study for nearly six weeks. The data remained stable as Student 11 maintained one word.

*Set 3*

*Maintenance probes.* Student 11 maintained 5 of 10 words from Set 1 on the first and second maintenance probes that occurred one and two weeks after the completion of CWPT. The third maintenance probe occurred after Student 11 had been withdrawn from the study for nearly six weeks. The data remained stable as Student 11 maintained those five words.

*Set 4*

*Maintenance probes.* The first maintenance probe occurred after Student 11 had been withdrawn from the study for nearly six weeks. Student 11 maintained three words.
Generalization Pretests

Student 11 was unable to answer any items on the generalization pretest correctly for Word Sets 3 and 4. Student 11 was able to answer three questions on the pretest for Set 1, 4 questions for Set 2, and two questions on Set 5 correctly.

Generalization

Set 1

Generalization posttest. Student 11 was able to answer 3 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 11 was able to answer 5 of 10 questions correctly on the posttest. This is an improvement from the 3 of 10 scored on the generalization posttest for Set 1.

Set 3

Generalization posttest. Student 11 was able to answer 4 of 10 questions correctly on the posttest. This score is a slight decrease from the score achieved on Set 2, but is higher than the initial 3 of 10 scored on Set 1’s posttest.

Set 4

Generalization posttest. Student 11 was able to answer 6 of 10 questions correctly on the posttest. This score is an increase from the posttest scores on the previous three sets.

Set 5

Generalization posttest. No posttest was given for Set 5 as Student 11 had withdrawn from the study.
Student 12

Figure 4.12 depicts the baseline, CWPT, and maintenance conditions for Student 12.

**Preassessment Probes**

Preassessment probes were given during baseline conditions across each word set. Student 12 was unable to identify any of the words and/or definitions contained in Word Sets 1-9. Student 12’s preassessment probes ranged from a minimum of two for Set 1 to a high of six probes for Sets 8 and 9. Word Sets 2 and 3 had three preassessment probes. There were four probes of Sets 4 and 5. Word Sets 6 and 7 had five probes.

**Acquisition**

*Set 1*

During the CWPT phase, the data for Student 12 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved on the fifth intervention session for Set 1.

*Set 2*

During the CWPT phase, the data for Student 12 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the fifth intervention session for Set 2.
Figure 4.12: Student 12 baseline, CWPT, and maintenance data.
Set 3

During the CWPT phase, the data for Student 12 show an ascending trend from 0 correct to 10 correct in five intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 12 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase, the data for Student 12 show an ascending trend from 0 correct to 10 correct in four intervention sessions. This trend continues to replicate trends noted in previous sets.

Set 6

During the CWPT phase, the data for Student 12 show an ascending trend from 0 correct to 10 correct in three intervention sessions during Set 6. This trend replicates the intervention data for all previous sets.

Set 7

During the CWPT phase for Set 7, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 12 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 7. This trend replicates the intervention data for previous sets despite the criterion change.
Set 8

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. The data for Student 12 show an ascending trend from 0 correct to 10 correct in six intervention sessions during Set 8. The ascending trend continues to replicate previous sets.

Set 9

During the CWPT phase for Set 9, students continued the three happy face acquisition criterion. The data show two data points, both zero, during the last two days of the study. The study ended before Set 9 could be acquired.

Maintenance

Set 1

Maintenance probes. Student 12 maintained 5 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 12 was able to maintain four words from Set 1. The data remained stable as Student 12 maintained those four words for the remaining seven weeks of the study.

Set 2

Maintenance probes. Student 12 maintained 4 of 10 words from Set 2 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 12 was able to maintain three words from Set 2. Student 12 maintained those three words for the next week. The word cards for Set 2 were misplaced for three weeks. No probes were conducted during those three weeks. The fourth probe was conducted three weeks after the third probe and revealed that the
three words were still maintained. A final fifth probe also maintained three words. The data replicated trends noted in Set 1.

Set 3

*Maintenance probes.* Student 12 maintained 4 of 10 words from Set 3 on the six maintenance probes that occurred after the completion of CWPT. Overall, the data path remained stable at four words maintained. This stability replicated the effect noted in maintenance for Sets 1 and 2.

Set 4

*Maintenance probes.* Student 12 maintained 5 of 10 words from Set 4 for the first maintenance probe that occurred after the completion of CWPT. The next four maintenance probes decreased slightly to two words maintained for Set 4. Overall, the data appear stable with an initial decreasing trend.

Set 5

*Maintenance probes.* Student 12 maintained 6 of 10 words from Set 5 on the first maintenance probe that occurred after the completion of CWPT. Data decreased to five words during the second probe, and continued to decrease to one word maintained on the final two probes. The data continue the decreasing trend noted in previous sets.

Set 6

*Maintenance probes.* Student 12 maintained 4 of 10 words on the first maintenance probe that occurred after the completion of CWPT and one word on the next three maintenance probes. The decreasing trend for maintenance continued during Set 6.
Set 7

*Maintenance probes.* Student 12 maintained 9 of 10 words on two maintenance probes that occurred after the completion of CWPT. These probes represent a high level of maintenance not seen on previous word sets. The data appears stable compared to decreasing trends noted in previous sets.

Set 8

*Maintenance probes.* No maintenance probes were given for Set 8 because the set was acquired two days prior to the completion of the study.

Set 9

*Maintenance probes.* No maintenance probes were given for Set 9 because the set was not acquired prior to the completion of the study.

*Generalization Pretests*

Student 12 was unable to answer any items on the generalization pretest correctly for Word Sets 3-9. Student 12 was able to answer 2 questions on each of the pretests for Sets 1 and 2.

*Generalization*

Set 1

*Generalization posttest.* Student 12 was able to answer 5 of 10 questions correctly on the posttest.

Set 2

*Generalization posttest.* Student 12 was able to answer 3 of 10 questions correctly on the posttest. This is a decrease from the 5 of 10 scored on the generalization posttest for Set 1.
Set 3

*Generalization posttest.* Student 12 was able to answer 0 of 10 questions correctly on the posttest. This score is a decrease from the two previous scores achieved.

Set 4

*Generalization posttest.* Student 12 was able to answer 1 of 10 questions correctly on the posttest. This score is a slight increase from the posttest scores on Set 3.

Set 5

*Generalization posttest.* Student 12 was able to answer 1 of 10 questions correctly on the posttest. This is the same score as Set 4.

Set 6

*Generalization posttest.* Student 12 was able to answer 0 of 10 questions correctly on the posttest. This score replicates the score of Set 3.

Set 7

*Generalization posttest.* Student 12 was able to answer 3 of 10 questions correctly on the posttest. This score is demonstrates an increase from the posttest scores achieved in Set 6, and returns to a level commensurate with the generalization data from Set 2.

Set 8

*Generalization posttest.* Student 12 was able to answer 0 of 10 questions correctly on the posttest. This score is demonstrates a decrease from the posttest scores achieved in Set 7, and returns to a level commensurate with the generalization data from Sets 3 and 6.

Set 9

*Generalization posttest.* No posttest was given for Set 9 as Student 12 was unable to achieve acquisition before the conclusion of the study.
Student 13

Figure 4.13 depicts the baseline, CWPT, and maintenance conditions for Student 13.

Preassessment Probes

Preassessment probes were given during baseline conditions across each word set. Student 13 was unable to identify any of the words and/or definitions contained in Word Sets 1-8. Student 13’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Set 6. Word Sets 2 and 3 had three preassessment probes. There were five probes of Sets 4 and 5. Word Sets 7 and 8 had six probes.

Acquisition

Set 1

During the CWPT phase, the data for Student 13 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved on the sixth intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 13 show an ascending trend from 0 correct to 10 correct in five intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved at the fifth intervention session for Set 2.
Figure 4.13: Student 13 baseline, CWPT, and maintenance data.
Figure 4.13 continued

Continued
Students 13 cont'd

Figure 4.13 continued

During the CWPT phase, the data for Student 13 show an ascending trend from 0 correct to 10 correct in seven intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.
Set 4

During the CWPT phase, the data for Student 13 show an ascending trend from 0 correct to 10 correct in six intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase for Set 5, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 13 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The slope of the intervention data path for Set 5 is more step-wise than the previous sets, yet still replicates the ascending trend noted in prior sets.

Set 6

During the CWPT phase for Set 6, students continued the three happy face acquisition criterion. The data for Student 13 show an ascending trend from 0 correct to 10 correct in four intervention sessions during Set 6. This trend replicates the intervention data for all previous sets.

Set 7

During the CWPT phase for Set 7, students continued the three happy face acquisition criterion. The data for Student 13 show an ascending trend from 0 correct to 10 correct in four intervention sessions during Set 7. This trend replicates the intervention data for all previous sets.
Set 8

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. The data for Student 13 show one datum point, a zero, as acquisition for Set 8 began on the last day of the study. The study ended before Set 8 could be acquired.

Maintenance

Set 1

Maintenance probes. Student 13 maintained 4 of 10 words from Set 1 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 13 was able to maintain three words from Set 1. The following two probes remained stable at three words. The fourth maintenance probe decreased to two words maintained and remained stable for four additional probes.

Set 2

Maintenance probes. Student 13 maintained 5 of 10 words from Set 2 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of CWPT, Student 13 was able to maintain two words from Set 2. Student 13 maintained those two words for the next five weeks. Overall, the maintenance data path for Set 2 decreased but was stable.

Set 3

Maintenance probes. Student 13 maintained 2 of 10 words from Set 3 on the first two maintenance probes that occurred one and two weeks after the completion of CWPT. Three weeks after the completion of intervention, Student 13 was able to maintain two words from Set 1. Student 13 maintained those two words for the remaining two weeks of
the study. Overall, the data path replicated the low maintenance levels and stability of the previous two sets.

Set 4

*Maintenance probes.* Student 13 maintained 1 of 10 words from Set 4 for the first two maintenance probes that occurred after the completion of CWPT. The final maintenance probe decreased to zero words maintained for Set 4. Overall, the data appear stable with a decreasing trend on the last data point.

Set 5

*Maintenance probes.* Student 13 maintained 7 of 10 words from Set 5 on the first maintenance probe that occurred after the completion of CWPT. The second probe decreased to four words. The first probe increased to a higher level than any other set, but the data continued the decreasing trend noted in previous sets.

Set 6

*Maintenance probes.* Student 13 maintained 5 of 10 words on the only maintenance probe that occurred after the completion of CWPT. This probe is higher than many sets but lower than the 7 of 10 maintained on Set 5.

Set 7

*Maintenance probes.* No maintenance probes were given for Set 7 because the set was acquired the day before the study concluded.

Set 8

*Maintenance probes.* No maintenance probes were given for Set 8 because the set was not acquired prior to the completion of the study.
Generalization Pretests

Student 13 was unable to answer any items on the generalization pretest correctly for Word Sets 1-8.

Generalization

Set 1

Generalization posttest. Student 13 was able to answer 3 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 13 was able to answer 1 of 10 questions correctly on the posttest. This is a decrease from the 3 of 10 scored on the generalization posttest for Set 1.

Set 3

Generalization posttest. Student 13 was able to answer 1 of 10 questions correctly on the posttest. This score is the same as the score achieved on the posttest for Set 2.

Set 4

Generalization posttest. Student 13 was able to answer 3 of 10 questions correctly on the posttest. This score is an increase to the level noted in Set 1.

Set 5

Generalization posttest. Student 13 was able to answer 1 of 10 questions correctly on the posttest. This score is a slight decrease from the posttest score in Set 4 and continues the downward trend in posttest scores.
Set 6

*Generalization posttest.* Student 13 was able to answer 3 of 10 questions correctly on the posttest. This score is an increase from the posttest score achieved in Set 5.

Set 7

*Generalization posttest.* Student 13 was able to answer 0 of 10 questions correctly on the posttest. This score demonstrates a decrease from the posttest scores achieved in Set 6 and is the lowest posttest score across all sets for Student 13.

Set 8

*Generalization posttest.* No posttest was given for Set 8 as Student 13 was unable to achieve acquisition before the conclusion of the study.

Student 14

Figure 4.14 depicts the baseline, CWPT, and maintenance conditions for Student 14.

*Preassessment Probes*

Preassessment probes were given during baseline conditions across each word set. Student 14 was unable to identify any of the words and/or definitions contained in Word Sets 1-10. Student 14’s preassessment probes ranged from a minimum of two for Set 1 to a high of seven probes for Sets 7 and 10. Word Sets 2 and 3 had three preassessment probes. There were four probes of Set 4, and five probes of Sets 5 and 6. Sets 8 and 9 had six probes.
Figure 4.14: Student 14 baseline, CWPT, and maintenance data.
Figure 4.14 continued

Student 14 cont'd

Baseline

CWPT

MT

happy

face

Set 7

Set 8

Set 9

Sessions

Continued
Acquisition

Set 1

During the CWPT phase, the data for Student 14 show an ascending trend from 0 correct to 10 correct in six intervention sessions. The criterion of correctly identifying all 10 words, including definition, for two consecutive sessions was achieved on the sixth intervention session for Set 1.

Set 2

During the CWPT phase, the data for Student 14 show an ascending trend from 0 correct to 10 correct in four intervention sessions. The criterion of correctly identifying all ten words, including definition, for two consecutive sessions was achieved at the fourth intervention session for Set 2.
Set 3

During the CWPT phase, the data for Student 14 show an ascending trend from 0 correct to 10 correct in five intervention sessions. This trend replicates the ascending trends during the intervention phases for Sets 1 and 2.

Set 4

During the CWPT phase, the data for Student 14 show an ascending trend from 0 correct to 10 correct in five intervention sessions. This trend replicates the trends noted in the intervention phases of the previous three sets.

Set 5

During the CWPT phase, the data for Student 14 show an ascending trend from 0 correct to 10 correct in four intervention sessions. The slope of the intervention data path for Set 5 is steeper than the previous sets, yet still replicates the ascending trend noted in prior sets.

Set 6

During the CWPT phase for Set 6, the data for Student 14 show an ascending trend from 0 correct to 10 correct in four intervention sessions during Set 6. This trend replicates the intervention data for previous sets.

Set 7

During the CWPT phase for Set 7, students were directed to make a change in acquisition criterion from two happy faces to three happy faces before a word could be considered acquired. The data for Student 14 show an ascending trend from 0 correct to 10 correct in five intervention sessions during Set 7. This trend replicates the intervention data for all previous sets.
**Set 8**

During the CWPT phase for Set 8, students continued the three happy face acquisition criterion. The data for Student 14 show an ascending trend from 0 correct to 10 correct in six intervention sessions during Set 8. This trend replicates the trends for all previous sets.

**Set 9**

During the CWPT phase for Set 9, students continued the three happy face acquisition criterion. The data for Student 14 show an ascending trend from 0 correct to 10 correct in three intervention sessions during Set 9. This trend replicates the trends for all previous sets.

**Set 10**

During the CWPT phase for Set 10, students continued the three happy face acquisition criterion. The data for Student 14 show an ascending trend from 0 correct to 8 correct in three intervention sessions during Set 10. The study ended before Set 10 could be acquired.

**Maintenance**

**Set 1**

*Maintenance probes.* Student 14 maintained 6 of 10 words from Set 1 on the first eight maintenance probes that occurred after the completion of CWPT. On the final probe, Student 14 was able to maintain five words. The data were stable with a decreasing trend on the last datum point.
Set 2

*Maintenance probes.* Student 14 maintained 9 of 10 words from Set 2 on eight maintenance probes that occurred after the completion of CWPT. Overall, the maintenance data path for Set 2 was higher than the maintenance achieved in Set 1, but replicated the stability noted in Set 1.

Set 3

*Maintenance probes.* Student 14 maintained 8 of 10 words from Set 3 on the first maintenance probe that occurred one week after the completion of CWPT. Two weeks after the completion of intervention, Student 14 was able to maintain five words from Set 1. On the third probe, Student 14 maintained four words for the remaining three weeks of the study. Overall, the data path showed an initial decrease, but remained stable at four words maintained. This stability replicated the effect noted in maintenance for Sets 1 and 2.

Set 4

*Maintenance probes.* Student 14 maintained 6 of 10 words from Set 4 for the first two maintenance probes that occurred after the completion of CWPT. The third maintenance probe decreased slightly to four words maintained for Set 4. The following two probes remained stable at four words.

Set 5

*Maintenance probes.* Student 14 maintained 7 of 10 words from Set 5 on the first maintenance probe that occurred after the completion of CWPT. The next four probes were stable after an initial decrease to five words maintained. The data replicate the results noted in previous sets.
Set 6

*Maintenance probes.* Student 14 maintained 3 of 10 words on the three maintenance probes that occurred after the completion of CWPT. These three probes represent lower levels of maintenance than previous sets. Data for Set 6 appear stable.

Set 7

*Maintenance probes.* Student 14 maintained 9 of 10 words on a two maintenance probes that occurred after the completion of CWPT. These probes represent a higher level of maintenance than any previous set. The data appear stable.

Set 8

*Maintenance probes.* Student 14 maintained 8 of 10 words on a one maintenance probe that occurred after the completion of CWPT. This probes represents a slight decrease from Set 7, but is a higher level of maintenance than other previous sets.

Set 9

*Maintenance probes.* Student 14 maintained 9 of 10 words on a one maintenance probe that occurred after the completion of CWPT. This probes represents a slight increase from Set 8, but replicates the high level of maintenance noted in Sets 7 and 8.

Set 10

*Maintenance probes.* No maintenance probes were given for Set 10 because the set was not acquired prior to the completion of the study.

*Generalization Pretests*

Student 14 was unable to answer any items on the generalization pretest correctly for Word Sets 1-10.
Generalization

Set 1

Generalization posttest. Student 14 was able to answer 1 of 10 questions correctly on the posttest.

Set 2

Generalization posttest. Student 14 was able to answer 6 of 10 questions correctly on the posttest. This is an improvement from the 1 of 10 scored on the generalization posttest for Set 1.

Set 3

Generalization posttest. Student 14 was able to answer 6 of 10 questions correctly on the posttest. This score is the same as the score achieved on Set 2.

Set 4

Generalization posttest. Student 14 was able to answer 5 of 10 questions correctly on the posttest. This score is a slight decrease from the posttest scores on the Set 3.

Set 5

Generalization posttest. Student 14 was able to answer 7 of 10 questions correctly on the posttest. This score is a slight increase from the posttest score in Set 4 and continues the upward trend in posttest scores.

Set 6

Generalization posttest. Student 14 was able to answer 3 of 10 questions correctly on the posttest. This score is a decrease from the posttest scores achieved on previous sets, although not as low as Set 1.
Set 7

*Generalization posttest.* Student 14 was able to answer 3 of 10 questions correctly on the posttest. This score is the same as the posttest score achieved on Set 6.

Set 8

*Generalization posttest.* Student 14 was able to answer 4 of 10 questions on the posttest. This is a slight increase from the posttest score achieved on Set 7.

Set 9

*Generalization posttest.* Student 14 was able to answer 9 of 10 questions on the posttest. This is an increase from the posttest score achieved on Set 7 and is the highest generalization score for Student 14.

Set 10

No posttest was given for Set 10 as Student 14 was unable to achieve acquisition before the conclusion of the study.

Class Results

*Acquisition*

Table 4.4 reports acquisition data for the entire class. Class data are recorded for the average number of sessions to acquire a word set, the range of sessions to acquire a word set, the number of word sets that were completely acquired, and the total number of words acquired during the course of the study. Class averages and class ranges are also reported for each column.

Overall, the class was able to acquire 965 science vocabulary words and definitions (average 68.9; range 35 to 110) during the study. The class average for
The number of completed word sets was seven sets (70 words). Student 11 who withdrew from the study prior to the end of the study completed only four sets of words. Student 11’s data is not included in the analysis of the data because she withdrew prior to the conclusion of the study. Typically students were able to learn a set of 10 words and definitions in just over a week (i.e., average 5.7; range 4 to 8 sessions).

Table 4.4: Class acquisition data.

<table>
<thead>
<tr>
<th>Students</th>
<th>Average Number of Sessions to Acquire a Word Set</th>
<th>Range of Number of Sessions to Acquire a Word Set</th>
<th>Number of Completed Word Sets</th>
<th>Total Number of Words Acquired</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>4 - 8</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>3 - 8</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>4 - 8</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>3 - 7</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>5 - 10</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>3 - 10</td>
<td>5 *</td>
<td>35</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>3 - 8</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>5 - 9</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>2 - 5</td>
<td>11</td>
<td>110</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>3 - 6</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>4 - 8</td>
<td>4 **</td>
<td>40</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>3 - 6</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
<td>4 - 7</td>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>3 - 6</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>Overall average</td>
<td>5.7</td>
<td>N/A</td>
<td>7</td>
<td>68.9</td>
</tr>
<tr>
<td>Overall range</td>
<td>4-8</td>
<td>2-10</td>
<td>4-11</td>
<td>35-110</td>
</tr>
</tbody>
</table>

Note: * denotes 3 of 5 completed sets contained only 5 vocabulary words each
** denotes Student 11 withdrew from study after 6 weeks
Table 4.5 reports maintenance data for the entire class. Class data are recorded for the average number of words maintained per set of 10 acquired, the range of number of words maintained from all acquired word sets, the total number of words maintained, the total number of words acquired, and the percent of words maintained for each student. Class averages and class ranges are also reported for each column.

Overall, students were able to maintain 47% of the total acquired words. Of the 965 total acquired words, the class maintained 452 words. Maintenance varied greatly across students. The lowest level of maintenance was noted for Students 6 and 13 (23% and 20% maintained respectively) while Students 8 and 9 had the highest level of maintenance data (82% and 74% respectively).

Table 4.6 reports the difference in maintenance during the two happy face condition and the three Happy Face condition. Differences are noted for individual students and the class overall. All but one student (Student 8) improved their percentage of words maintained during the three happy face condition. Student 8 maintained 80% of the words during the three happy face condition compared to 83% during the two happy face condition. The class average for maintenance during the two happy face condition was 56.4% compared to 74.4% during the Three happy face condition. The average number of words maintained per set also increased from 4.0 of 10 words in the two happy face condition to 6.3 of 10 words maintained during the three happy face condition.
<table>
<thead>
<tr>
<th>Student</th>
<th>Average Number of Words Maintained Per Set of 10 Acquired</th>
<th>Range of Number of Words Maintained From All Acquired Word Sets</th>
<th>Total Number of Words Maintained During the Study</th>
<th>Total Number of Words Acquired During the Study</th>
<th>Percent of Words Maintained</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>4 - 8</td>
<td>46</td>
<td>70</td>
<td>66</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1 - 9</td>
<td>24</td>
<td>70</td>
<td>34</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>3 - 6</td>
<td>27</td>
<td>70</td>
<td>39</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>2 - 10</td>
<td>38</td>
<td>70</td>
<td>54</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>1 - 5</td>
<td>17</td>
<td>50</td>
<td>34</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>0 - 4</td>
<td>8</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>2 - 7</td>
<td>21</td>
<td>60</td>
<td>35</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>7 - 9</td>
<td>49</td>
<td>60</td>
<td>82</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>6 - 10</td>
<td>81</td>
<td>110</td>
<td>74</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>1 - 9</td>
<td>34</td>
<td>90</td>
<td>38</td>
</tr>
<tr>
<td>11 *</td>
<td>3</td>
<td>1 - 5</td>
<td>12</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>1 - 9</td>
<td>25</td>
<td>80</td>
<td>31</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>0 - 5</td>
<td>14</td>
<td>70</td>
<td>20</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td>3 - 9</td>
<td>56</td>
<td>90</td>
<td>62</td>
</tr>
<tr>
<td>Overall average</td>
<td>4</td>
<td>N/A</td>
<td>32</td>
<td>68.9</td>
<td>47</td>
</tr>
<tr>
<td>Overall range</td>
<td>2-8</td>
<td>0-10</td>
<td>8-81</td>
<td>35-110</td>
<td>20-82</td>
</tr>
</tbody>
</table>

Note: * denotes Student 11 withdrew from the study after 6 weeks

Table 4.5: Class maintenance data.
<table>
<thead>
<tr>
<th>Student</th>
<th>Average correct</th>
<th>Range of correct responses</th>
<th>Total number correct on maintenance probes</th>
<th>Total possible</th>
<th>Percent maintained</th>
<th>Average correct per set</th>
<th>Range of correct responses</th>
<th>Total number correct on maintenance probes</th>
<th>Total possible</th>
<th>Percent maintained</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.7</td>
<td>4-7</td>
<td>27</td>
<td>50</td>
<td>54</td>
<td>8.0</td>
<td>8-8</td>
<td>16</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>2.6</td>
<td>1-4</td>
<td>13</td>
<td>50</td>
<td>26</td>
<td>5.5</td>
<td>2-9</td>
<td>11</td>
<td>20</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>4.2</td>
<td>3-7</td>
<td>21</td>
<td>50</td>
<td>42</td>
<td>6.0</td>
<td>6-6</td>
<td>6</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>4.0</td>
<td>2-8</td>
<td>20</td>
<td>50</td>
<td>40</td>
<td>9.0</td>
<td>8-10</td>
<td>18</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>3.3</td>
<td>1-5</td>
<td>13</td>
<td>40</td>
<td>33</td>
<td>4.0</td>
<td>4-4</td>
<td>4</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>6</td>
<td>1.0</td>
<td>0-2</td>
<td>4</td>
<td>30</td>
<td>13</td>
<td>4.0</td>
<td>4-4</td>
<td>4</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>7</td>
<td>3.8</td>
<td>2-7</td>
<td>15</td>
<td>40</td>
<td>38</td>
<td>6.0</td>
<td>6-6</td>
<td>6</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>8.3</td>
<td>8-9</td>
<td>33</td>
<td>40</td>
<td>83</td>
<td>8.0</td>
<td>7-9</td>
<td>16</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>9</td>
<td>7.6</td>
<td>6-10</td>
<td>61</td>
<td>80</td>
<td>76</td>
<td>10.0</td>
<td>10-10</td>
<td>20</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>3.2</td>
<td>1-5</td>
<td>19</td>
<td>60</td>
<td>32</td>
<td>5.0</td>
<td>6-9</td>
<td>15</td>
<td>20</td>
<td>75</td>
</tr>
<tr>
<td>11</td>
<td>3.0</td>
<td>1-5</td>
<td>12</td>
<td>40</td>
<td>30</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>12</td>
<td>2.7</td>
<td>1-4</td>
<td>16</td>
<td>60</td>
<td>27</td>
<td>9.0</td>
<td>9-9</td>
<td>9</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>13</td>
<td>1.3</td>
<td>0-2</td>
<td>5</td>
<td>40</td>
<td>13</td>
<td>4.5</td>
<td>4-5</td>
<td>9</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>14</td>
<td>5.0</td>
<td>3-9</td>
<td>30</td>
<td>60</td>
<td>50</td>
<td>8.7</td>
<td>8-9</td>
<td>26</td>
<td>30</td>
<td>87</td>
</tr>
<tr>
<td>Overall</td>
<td>4.0</td>
<td>0-10</td>
<td>289</td>
<td>690</td>
<td>56.4</td>
<td>6.3</td>
<td>2-10</td>
<td>160</td>
<td>215</td>
<td>74.4</td>
</tr>
</tbody>
</table>

Table 4.6: Comparison of two and three happy face conditions on average correct, range of correct responses, total number correct, and number of words possible for maintenance probes.
**Generalization**

Table 4.7 reports generalization data for the entire class. Class data are recorded for the average number of correct responses on generalization posttests, range of correct responses on generalization posttests, total number of correct responses on generalization posttests, and the total number of items on generalization posttests. Class averages and class ranges are also reported for each column.

Overall, class generalization results were similar to class results for maintenance. The class percent of words generalized was 45% (range 16% to 74%). Individual students generalization results were varied. Students 5, 6, 12, and 13 generalized the fewest words on the posttest (18%, 20%, 16%, and 17% respectively) while Students 1 and 8 generalized the most words 74% and 70% respectively of the words acquired.

Table 4.8 reports the comparison for the acquisition criterion change from two to three happy faces to demonstrate word acquisition. When the acquisition criterion changed from two happy faces to three happy faces the overall class average for generalization of science words increased. During the two happy face condition, the class generalized 42% of the words acquired. When the three happy face condition was instituted, the class average increased to 52%. Individual students generalization data was varied. Eight of 14 students increased their percentage of generalized words, 1, increased slightly, and 4 students decreased slightly.
<table>
<thead>
<tr>
<th>Student</th>
<th>Average of Correct Responses on Generalization Posttests</th>
<th>Range of Correct Responses on Generalization Posttests</th>
<th>Total Number of Correct Responses on Generalization Posttests</th>
<th>Total Number of Items on Generalization Posttests</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>5 - 10</td>
<td>52</td>
<td>70</td>
<td>74</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>2 - 9</td>
<td>29</td>
<td>70</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>5 - 8</td>
<td>40</td>
<td>70</td>
<td>57</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>0 - 10</td>
<td>35</td>
<td>70</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>1 - 3</td>
<td>9</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1 - 3</td>
<td>7</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>3 - 7</td>
<td>27</td>
<td>60</td>
<td>45</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>6 - 9</td>
<td>42</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td>2 - 9</td>
<td>66</td>
<td>110</td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>1 - 9</td>
<td>43</td>
<td>90</td>
<td>48</td>
</tr>
<tr>
<td>11 *</td>
<td>5</td>
<td>3 - 6</td>
<td>18</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>0 - 5</td>
<td>13</td>
<td>80</td>
<td>16</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>0 - 3</td>
<td>12</td>
<td>70</td>
<td>17</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>1 - 8</td>
<td>38</td>
<td>90</td>
<td>42</td>
</tr>
<tr>
<td>Overall mean</td>
<td>4</td>
<td>N/A</td>
<td>431</td>
<td>965</td>
<td>45</td>
</tr>
<tr>
<td>Overall range</td>
<td>1-7</td>
<td>0-10</td>
<td>7-66</td>
<td>35-110</td>
<td>16-74</td>
</tr>
</tbody>
</table>

Note: * denotes Student 11 withdrew from study after 6 weeks

Table 4.7: Class generalization data.
<table>
<thead>
<tr>
<th>Student</th>
<th>Two happy face condition</th>
<th>Three happy face condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average correct</td>
<td>Range of correct responses</td>
</tr>
<tr>
<td>1</td>
<td>7.4</td>
<td>5-10</td>
</tr>
<tr>
<td>2</td>
<td>3.0</td>
<td>2-4</td>
</tr>
<tr>
<td>3</td>
<td>6.0</td>
<td>4-8</td>
</tr>
<tr>
<td>4</td>
<td>4.2</td>
<td>0-10</td>
</tr>
<tr>
<td>5</td>
<td>2.0</td>
<td>1-3</td>
</tr>
<tr>
<td>6</td>
<td>1.0</td>
<td>1-1</td>
</tr>
<tr>
<td>7</td>
<td>4.4</td>
<td>3-7</td>
</tr>
<tr>
<td>8</td>
<td>7.2</td>
<td>6-9</td>
</tr>
<tr>
<td>9</td>
<td>5.7</td>
<td>2-9</td>
</tr>
<tr>
<td>10</td>
<td>3.8</td>
<td>1-8</td>
</tr>
<tr>
<td>11</td>
<td>4.5</td>
<td>3-6</td>
</tr>
<tr>
<td>12</td>
<td>1.6</td>
<td>0-5</td>
</tr>
<tr>
<td>13</td>
<td>1.8</td>
<td>1-3</td>
</tr>
<tr>
<td>14</td>
<td>3.8</td>
<td>1-6</td>
</tr>
</tbody>
</table>

Table 4.8: Comparison of two and three happy face conditions on average correct, range of correct responses, total number correct, and number of words possible for generalization posttest scores.
Social Validity

Table 4.9 summarizes student responses made on the social validity questionnaire given to students at the conclusion of training prior to actual implementation of CWPT. Overall, these data show that most students thought CWPT would be easy to implement, successful, something they might want to use in other classes, and would help them learn new words. 2 of 14 students did not have any opinion about how CWPT would be or if they would find it successful.

Table 4.10 reports student responses on the same questionnaire at the midpoint of intervention. Table 4.11 displays student responses to the same questionnaire at the conclusion of the study. An additional questionnaire comprised of open-ended questions was given to students at the completion of the study to gather more specific information regarding the intervention. The students’ responses to these open-ended questions are summarized verbatim in Table 4.12.

Over the course of the study, most students continued to report they liked CWPT and found it successful. At the midpoint of the study only one student reported no opinion about the ease of implementation or success of CWPT. Three students were unsure about using CWPT in other classes while one student reported s/he would not like to use CWPT in other classes. At the conclusion of the study, only one student had no opinion about the success of CWPT or the use of CWPT in other subjects and one student believed that CWPT did not help them learn science vocabulary. All 13 students that completed the study found CWPT easy to use.
The additional questionnaire students completed at the end of the study allowed for more detail about procedures and future use of CWPT. All students reported they liked their partner and would not like to rotate partners if that was an option. Eleven students of 13 would like to be involved in CWPT in the upcoming school year. Most students noticed that they were able to recognize words and definitions from CWPT in their general education science class. Students reported increased test scores and better grades in science class. Most students also reported feeling smarter in science because of the words they learned in CWPT. Overall, the comments written by students were positive for all aspects of CWPT.

In addition to student social validity results, the classroom teacher who served as the primary observer for the study and the general education science teacher were also surveyed. The results for both teachers can be found in Tables 4.13 and 4.14. The general education science teacher did not have any opinion regarding the success of CWPT, or on its future use in his classroom. The classroom teacher reported CWPT was easy to implement and successful. She would consider using CWPT in the future and in other subjects. She would also recommend CWPT to other teachers.
<table>
<thead>
<tr>
<th>Social Validity Questionnaire</th>
<th>After Training, Before Implementation</th>
<th>Yes</th>
<th>No</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think the CWPT project will be easy to implement with my partner.</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>I think I will have success with the CWPT project with my partner.</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>I might want to use CWPT with other subjects (e.g. math, social studies)</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>I believe that CWPT will help me to learn new science words.</td>
<td>12</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Comments, criticisms, questions, or suggestions:
- I learned a lot. (2 surveys)
- These words (training words) are too easy.
- I think this is a good project.
- This class is fun.
- I think this is a fun and easy way to learn so far.

Table 4.9: Results of social validity questionnaire given after training, before implementation.

<table>
<thead>
<tr>
<th>Social Validity Questionnaire</th>
<th>During Implementation</th>
<th>Yes</th>
<th>No</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am finding the CWPT project easy to implement with my partner.</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>I am having success with the CWPT project with my partner.</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>I would like to use CWPT with other subjects (e.g. math, social studies)</td>
<td>10</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>I believe that CWPT is helping me to learn new science words.</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Comments, criticisms, questions, or suggestions:
- This is helping me so much and I am doing better with my words and definitions.

Table 4.10: Results of social validity questionnaire given at the mid-point of implementation.
<table>
<thead>
<tr>
<th>Social Validity Questionnaire</th>
<th>Yes</th>
<th>No</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>After Completion of Study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I found the CWPT project easy to implement with my partner.</td>
<td>13</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I had success with the CWPT project with my partner.</td>
<td>12</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I wish I could use CWPT with other subjects (e.g. math, social studies)</td>
<td>12</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I believe that CWPT helped me to learn new science words.</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Comments, criticisms, questions, or suggestions:
- This class really helped me in my classes and I got better grades.
- I thought that it was lots of fun and helpful.
- It was fun.

Table 4.11: Results of social validity questionnaire given after completion of the study.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Don’t Remember</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you recognize words and/or definitions from tutoring during your science class?</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Did you like your partner?</td>
<td>13</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>If you could tutor next year during intervention would you?</td>
<td>11</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Would you have liked to switch partners or did you like having the same partner the whole time?</td>
<td>Keep</td>
<td>Switch</td>
<td>No Opinion</td>
</tr>
<tr>
<td>How did learning word/definitions in tutoring help you in science?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Helped me remember words
- They helped me more on my homework in class and I did better in classes. I actually understand what I was doing.
- I know a lot more words.
- It helped me bring my grade up.
- It helped me know what he (science teacher) was talking about when he used some of the words.
- It helped me get better grades.
- It helped me understand the words I use in science.
- Because now I actually know what they words mean.
- I did better on my exam then what I would have done before.
- It helped me memorize words that I didn’t know.
- I got a B instead of an F like usually.
- Because so you can get good grades

| Was your partner helpful or not? How? Why?                              |     |    |                |
|------------------------------------------------------------------------|-----|----|                |
- In teaching definitions
- Yes, because if I missed a word or something he told me what I was missing.
- Yes, he would try to help me
- Yes, my partner was helpful because if I did not understand something they made it easier for me
Yes, because she helped me remember the hardest words

**Was your partner helpful or not? How? Why? (cont’d)**
- Yes, he was smart but not smart enough
- Yes, he was helpful and helped me understand the words and definitions
- Because she used some special techniques to help me out
- Yes, he was helpful. He made ways to help me memorize definitions.
- Yes, because he helped me with definitions
- She was helpful in many ways
- Yes, because I learned the words
- Yes

**What would make tutoring better?**
- If the teachers had like a game with it when we are done. But I think it was good enough.
- More options for Star Cards (2 surveys)
- Nothing
- Nothing because it was easy and fun
- Nothing because it was good enough for me
- If you were allowed to have people from other classes to come to this class also
- I think it is fun by itself. It doesn’t need improved in any way.
- Giving out candy
- Nothing
- I don’t know

**What was the best part of tutoring?**
- Learning new words and helping me more in science. And the Star Card was cool because if you were good you could get a reward.
- Getting Star Card awards (4 surveys)
- Learning new words
- The teachers testing me (2 surveys)
- To be tutoring with my friends
- Probably moving all my cards
- Getting all the words right
- Working with a partner

**What was your least favorite part of tutoring?**
- The least favorite part of tutoring was nothing because it was a really good idea.
- Generalization tests (2 surveys)
- Review the words every week (maintenance probes)
- Remembering hard words
- I thought it was all good
- Nothing I liked every part of it
- Having to go from 2 smiles to 3
- Sitting there for 15 minutes
- Nothing
- Practicing

**Circle the subjects in which you would like tutoring to be used:**
- MATH
- PE (GYM)
- SCIENCE
- ART
- LANGUAGE ARTS
- TECHNOLOGY
- SOCIAL STUDIES
- COMPUTER KEYBOARDING
Did tutoring help you feel smarter in science class? Why or why not?

- No
- Yes it did
- Yes! Because you can remember words
- Yes cause I knew more words
- A little bit because I knew some words that my teacher was talking about
- Yes because I would of never of remembered
- Yes because it made me understand the science definitions
- Yes because I knew the words
- Yes because I knew the definitions
- Yes because I knew some more answers than I did before
- Yes because when he (science teacher) would ask a science word I knew it
- Yes because if he (science teacher) call and asked me the word and what’s it mean, I knew it
- Yes because I knew most words

Anything you would like Ms. Nobel to know about tutoring or this project?

- No (4 surveys)
- That’s she’s good at it
- That I was glad she picked me to do this
- I would want to let her know that she did a good job and good luck
- She did a great job in helping me remember words
- It is cool
- This really helped me in class. There was hard words but I some how got to know them

Any additional comments for Ms. Nobel?

- No (4 surveys)
- She’s the best
- That she will make a great teacher
- Thank you for all the help!
- That her and Miss L (Classroom teacher) was really good at this project. I hope you get to be a professor next year because you deserve it. The star card was a good idea.

Table 4.12: Additional social validity questionnaire distributed to students at the completion of the study.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>No Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>The students in my class appeared to have success learning science vocabulary using the CWPT</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I am interested in using the CWPT intervention with my students in the future</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Please write any other comments, criticisms, questions, or suggestions:</td>
<td></td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>
### Table 4.13: Social validity questionnaire results for the general education science teacher.

<table>
<thead>
<tr>
<th>Questions</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found the CWPT intervention easy to implement for the students in my class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The students in my class had success learning science vocabulary during the CWPT intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I plan on using the CWPT intervention with other students in the future</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I will consider using the CWPT intervention with other subjects that I teach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>I would recommend CWPT to others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Please write any other comments, criticisms, questions, or suggestions:
- This study was easy to conduct and I believe it helped the students. The feedback from students was generally positive and they seemed to enjoy the maintenance phase.

### Table 4.14: Social validity questionnaire results for the classroom teacher.
CHAPTER 5

DISCUSSION

This chapter discusses the results of this study as they relate related to each research question. Limitations of the study will be noted. Implications for current and preservice teachers, and students will be addressed. Finally, recommendations will be made for further research.

Research Question 1

*What Are the Effects of Classwide Peer Tutoring on the Acquisition of Science Vocabulary Words and Definitions?*

There was a clear functional relationship between CWPT and acquired words and definitions for all 14 students in the study. Acquisition data were strong for all students. For example, Student 6 acquired 35 words, whereas Student 9 acquired 110 words. As a further example, Student 6 had only five words per set after Set 2 because he was unable to acquire 10 words during Set 3. To increase his acquisition for Set 3, the experimenter split Set 3 into two, five-word sets. Once this adaptation was made, Student 6 acquired Set 3a quickly. Overall, the class learned 965 words and definitions. All students learned science vocabulary words and definitions that they did not know at the beginning of the study.
Experimental control was shown by comparing student responding during baseline and CWPT conditions. During the baseline phases of the study, preassessment probes and a generalization pretest were given. All students were unable to identify correctly the words and/or definitions in each word set on a minimum of 2 probes. Moreover, most students were unable to identify any words and/or definitions on the generalization pretest; however, there were a couple of occasions where one or two students did identify several words or definitions on a pretest (e.g., Student 3, Set 2). Once CWPT was implemented, all students acquired the words and definitions in each set of word cards. The acquisition of all words and definitions in a set did not occur until CWPT was implemented. All 14 students in the study showed evidence of a clear verification and replication as a function of CWPT across word sets.

The findings for acquisition in the current study are consistent with the results of previous CWPT studies (Barbetta, Miller, Peters, Heron & Cochran, 1991; Welsch, 1998; Wright, Cavanaugh, Sainato, & Heward, 1995). For instance, Barbetta et al., (1991) found that students in their study were able to acquire a comparable range of sight words (i.e., 38 to 90 words). This gain is remarkably consistent with the range of 35 to 110 acquired in the current study. Barbetta et al. (1991) also changed their acquisition criterion during the study. Their study started with a 3-day mastery criterion that they were able to decrease to a 2-day mastery criterion without noting differences in number of words mastered. Likewise, the current study did not yield evidence of acquisition differences after the criterion change. However, this study did differ from Barbetta et al. (1991) in two ways. First, this study increased the criteria for acquisition from two to three consecutive days of accurate student responding rather than decrease days. Second,
the results of the current study noted increased maintenance scores as a result of the acquisition change, whereas the Barbetta study noted continued high maintenance after the acquisition criterion was decreased.

The current study also corroborates Wright et al. (1995) findings. Specifically, Wright et al. (1995) reported that students learned between 92 and 140 Spanish vocabulary words during their study. This range is similar to the range of words acquired by students in the current study. In addition, the Wright et al. (1995) study is similar to the current study in that the subject matter was Spanish vocabulary words for at-risk students in a general education class, whereas in the present study, science vocabulary words served as the subject matter in a general education setting.

Finally, the current study supports numerous previous studies that have taught elementary and middle school students to acquire words (Al-Hassan, 2003; Franke, 2001; Welsch, 1998; & Welsch, 1995). Elementary students in the Al-Hassan (2003) study were able to read more sight words during peer tutoring than during traditional reading instruction. First graders in the Franke (2001) study increased the number of sight words they could read by 20 words. In the Welsch (1998) study, students learned an average of 60 sight words. Finally in the Welsch (1995) study, middle school students were able to learn a range from 19 to 70 employability words. The current study extends the CWPT literature in two areas by adding a middle school science vocabulary word and definition study, and supports the current literature by showing similar learning trends in number of words acquired to previous findings for CWPT studies. This study demonstrates that CWPT can be used effectively to assist at-risk and students with mild disabilities in acquiring science vocabulary.
Research Question 2

What Are the Effects of Classwide Peer Tutoring on The Maintenance of Science Vocabulary Words and Definitions?

The findings for maintenance in the current study varied greatly across students. Students maintained between two and eight words and definitions per set. Overall, the class maintained 47% of initially acquired words. Students 1, 8, and 9 had the strongest maintenance data. Student 8, for instance, maintained an average of eight words and definitions across six word sets (i.e., 49 out of 60 words). Students 1 and 9 also maintained an average of seven words and definitions across six and 10 word sets respectively. While any maintained information is of benefit to students if instruction is to be most beneficial to students, maintenance of 80% or higher of instructed information should be the goal.

On the other hand, Students 3, 4, 7, 10, and 14 maintained almost half of the words and definitions they acquired. Data for these five students ranged from an average of four to six words and definitions maintained per set (40% to 60%). This is an improvement over baseline conditions, shows promise for future study, but raises concerns about long-term acquisition of information for these students. The remaining six students (i.e., Students 2, 5, 6, 11, 12, and 13) had the poorest maintenance data. Their maintenance scores ranged from an average of two to three words and definitions maintained per set.

In an attempt to respond to the performances of Students 2 through 7, and Students 10 through 14, the experimenter changed the acquisition criterion on Session 36. The criterion for acquisition was raised from two consecutive days correct during testing.
to three consecutive days of correct responding during testing (i.e., two and three happy face condition). The data demonstrated that changing the number of days for acquisition improved the performance of individual students and the class as a whole. Thus a functional relationship can be claimed between CWPT in the 3-day acquisition condition and maintenance of science words. In effect, once the acquisition criterion was changed, students who were poor performers made important increases in their percent of words maintained once the acquisition criterion was changed. For example, Student 2 was able to maintain 26% during the two happy face condition and increased to 55% of words maintained after the acquisition criterion was changed to three days. Of particular interest to special educators is the fact that the most robust changes were noted for the three students identified as learning disabled. Student 6 increased from 13% maintained to 80% maintained when the criterion changed. It should be noted that in addition to the acquisition criterion change for Student 6, the number of cards in each set was also decreased from 10 to 5. This change may have contributed to the dramatic increase in his percent maintained for Student 6. Similarly, the other students with learning disabilities increased their maintenance scores although these students did not have a reduction in the number of words per set as Student 6 did. Student 12 increased from 27% maintained to 90% maintained while Student 13 increased from 13% to 45% maintained with the acquisition criterion change. These data suggest that students with learning disabilities benefited from having an additional acquisition day added to their program, and that the additional practice time may have accounted for their ability to maintain the words and definitions.
Students 3, 4, 7, 10, and 14 also benefited from the acquisition change. Student 3 increased from 42% maintained to 60% maintained. Student 7 increased from 38% to 60% maintained after the criterion change. Student 4’s change was more dramatic. This student increased maintenance from 40% to 90%. Students 10 and 14 greatly improved their maintenance. Their data showed increased maintenance of 32% to 75% and 50% to 87% respectively. These data suggest that students who are at-risk or who have learning disabilities may achieve greater maintenance by increasing the acquisition criteria by only one day. Increasing the maintenance of information for students by 20% and up, when only making a small change in the acquisition criterion could provide tremendous benefit to the students. This increased maintenance may allow students to comprehend more material in textbooks, worksheets, or class discussions. It may also allow students to remember more vocabulary and definitions on end-of-the-unit tests and thereby improve their overall semester or end-of-year grades.

It is important to note that the three students with excellent maintenance continued to excel when the criterion was changed. Student 1 improved her percent maintained from 54% to 80%, Student 8 decreased slightly from 83% to 80%, and Student 9 increased from 76% to 100% maintained. The slight decrease for Student 8 was minimal and her overall maintenance remained high. It is possible other factors (e.g., card difficulty) may have contributed to the slight decrease in maintenance.

Class data were also improved by the acquisition change. The average number of words correct per set during the 2-day condition was 4.0 of 10 compared to 6.3 of 10 during the 3-day condition. The overall percent of words maintained for the class improved from 56.4% to 74.4%. On the whole, with the exception of data for Student 6
who had a reduction of word cards per set and the acquisition criterion change, the data suggest that complex skills such as vocabulary words and definitions may need an additional day of correct responding before words are considered learned or acquired.

The current study’s findings for maintenance of words and definitions support Wright et al. (1995). Wright and colleagues noted class maintenance ranged from an average of 69% to 100% for words maintained. Individual students in their study had maintenance scores as low as 53% (i.e., Student 6). The findings of the current study also show a wide range of student maintenance. One potential difference in the Wright et al. study from the current study is the peer tutoring system used by Wright was a replacement system (i.e., students had 8 or 12 cards in their “Go” pocket every day). The current study used a non-replacement system (i.e., students did not get new cards in their “Go” pocket until the entire set was acquired). Using the replacement system may have created a procedural difference that explains the lower maintenance scores for Wright et al. compared to other CWPT studies. Because the current study did not use a replacement system, low maintenance scores cannot be attributed to the type of tutoring system used.

The current study stands in contrast to maintenance results reported in previous studies. One such study, Barbetta et al., (1991) reported class maintenance scores ranged from 95% to 100% for acquired sight words. Barbetta and colleagues had an acquisition criterion change similar to the acquisition change in the current study; however, the Barbetta study changed from 3-days to 2-days. This is the opposite of the current study’s acquisition change. The analysis completed by Barbetta and colleagues indicates that the range of words maintained during the 2-day criterion was 90% to 98% and the range of words maintained during the 3-day criterion was 93% to 98%. These scores are higher
and have less variability when compared to the ranges for maintenance noted in the current study.

The current study also stands in contrast to findings of Al-Hassan (2003). The students in the Al-Hassan study were able to maintain a class average between 66.6% and 100% of the sight words acquired. The current study has a range of 20% to 82% maintenance of acquired words. This finding is much lower and more variable than the range of maintenance scores for the Al-Hassan study.

One reason for the difference in the data between these studies is that students in the Barbetta, et al. (1991) and Al-Hassan (2003) studies only were required to acquire sight words while the current study required both vocabulary word and definition acquisition. The inclusion of definitions for acquisition might require students to have extra practice if they are to maintain the information. Many CWPT studies that use the OSU CWPT system teach students basic academic skills (e.g., sight word vocabulary). The current study was designed to expand the tutoring system to include the acquisition of definitions in addition to the identification of the vocabulary word. To achieve this, the current study required that “key words” in the definition be included for the student’s definition to be counted as a correct response. The experimenter often noticed during maintenance probes that students were missing correct definitions because they left out one or two “key words”. This observation may be significant in that a classroom science teacher may consider student versions of definitions without key words correct while the objective nature of this study forced the experimenter to count those definitions lacking key words as incorrect. Unfortunately, the experimenter did not systematically record
how often a missing “key word” was the reason that students did not maintain word cards.

Another potential explanation for the decreased maintenance scores for some students may be related to the rate of acquisition for each card set. For example, Student 5 took an average of 7 sessions (i.e., a slower rate of acquisition) to acquire a set of 10 cards. For each word set, after the second or third session, a few of the cards in the set moved to the “stop” pocket as acquired while the remaining cards stay in the “go” pocket for additional practice. The cards that first entered the “stop” pocket remain in that pocket until all cards in the set are mastered, perhaps as many as 5 or 6 sessions later than other cards in the set. Therefore, when Student 5 completes a weekly maintenance probe, the cards in the maintenance envelope are not equal in the amount of time since they have been acquired. Some cards in the set were acquired only a week ago (i.e., the last cards in the set to be acquired/instructed) while other cards in the set (i.e., the first cards in the set to be acquired/learned) may have been in the “stop” pocket for an additional week. In effect, there are a few cards in each set that haven’t been practiced for nearly two weeks. This difference in the amount of time that cards are in the “stop” pocket may have given an unfair advantage or disadvantage to a few cards in each set. While this problem exists for all students, it may be more pronounced for students who are acquiring words at a slower rate. For example, Student 9 who acquired words quickly during the study had a maintenance average of 7 words per set when compared to Student 6 who acquired words at a slower rate and had a maintenance average of 2 words per set. The results of this study indicate that teachers need to take into consideration the type of skills required to demonstrate mastery of content when determining an acquisition criterion.
Research Question 3

What Are the Effects of Classwide Peer Tutoring on the Generalization of Science Vocabulary Words and Definitions?

The findings for generalization in the current study varied greatly across students. The range for the average number of words and definitions generalized was 1 to 7 out of 10 items per written posttest. Overall, the average percentage of acquired words that were generalized by participants was 45%. Student 8 generalized an average of 7.2 words and definitions across five 10-item posttests. Student 1 generalized an average of 7.4 words and definitions across five 10-item posttests. Seven students had generalization data (i.e., Students 3, 4, 7, 9, 10, 11, and 14) ranging from an average of 3.8 to 6.0 words and definitions generalized per 10-item posttest. The remaining five students had poor generalization data (i.e., Students 2, 5, 6, 12, and 13) ranging from an average of 1.0 to 3.0 words and definitions generalized per 10-item posttest.

The acquisition change implemented to increase the maintenance scores for students also appeared to affect generalization posttest scores, although the results were not as robust as for maintenance data. Differences were noted for individual students and the class. A strong functional relationship can be claimed for Students 2, 3, 4, and 10, while a weak functional relationship can be claimed for Students 6, 7, 9, and 14.

Students 2 and 6 increased their percentage of generalized words and definitions. Student 2 increased from 30% to 70% words generalized and Student 6 increased from 10% to 20% words generalized. Students 5, 12, and 13 had slightly lower generalization after the acquisition change. Student 5 decreased from 20% words generalized to 10%,
Student 12 decreased from 17% generalized to 15% generalized, and Student 13 decreased from 18% generalized to 15% words generalized.

Students with average generalization all increased their percent of words generalized to written posttests. Student 3 increased from 60% to 80% words generalized. Student 4 increased from 42% to 70% generalized. Student 7 increased from 44% to 50% generalized. Student 9 increased from 58% to 70% words generalized. Student 10 increased from 38% to 67% generalized. Student 14 increased from 38% to 50% words generalized.

Students with good generalization had mixed results once the acquisition criterion changed. Student 1 increased slightly from 74% to 75% words generalized and Student 8 decreased from 72% to 60% words generalized.

The class data increased slightly from 42% acquired words generalized to 52% of acquired words generalized. The average correct for the class increased from 4 words generalized to 5 words generalized.

The current study supports the generalization findings from Moore (1996) and Welsch (1998). The Moore study used CWPT to teach high school vocational students biographic information required for job applications. Students in the study were able to acquire biographic information during peer tutoring. To measure generalization, Moore required students to complete untrained job applications that contained the biographic information learned during peer tutoring. Student results were mixed, showing very limited generalization. Most students only maintained half of what they had originally acquired. The current study also found that most students were only able to generalize about half of what they were able to acquire. One factor that might account for the low
generalization data would be that the current study did not explicitly program for generalization. While generalization pre- and posttests did utilize one generalization strategy, program common stimuli, in general there was a “train and hope” approach to generalization. The lack of focus given to explicit programming for generalization may explain why students were only able to generalize half of what they acquired.

Welsch (1998) reported similar findings to the Moore study. Welsch used CWPT to teach sight words to students with developmental disabilities included in a first grade classroom. Welsch probed for generalization by asking students to write the sight words they had acquired as the experimenter dictated the words. Generalization was poor for all students. Welsch noted that there was no programming for generalization in the study and that the difference between reading and writing sight words may have been too great for students with developmental disabilities to develop without programming for generalization. The current study reported a similar generalization problem. Many students’ poor generalization data may be attributed to the change in the mode of response from orally reading and defining science vocabulary during CWPT to writing the word or definition on the generalization posttests. In addition, as noted by Welsch (1998) and Stokes and Baer (1977), generalization should be programmed if students are expected to respond correctly in an untrained situation. As mentioned previously, the current study could attribute several students’ poor generalization results to the lack of explicit programming for generalization. This lack of planning for generalization was captured in a conversation between a student and the experimenter at the conclusion of the study. The experimenter was asked by a participant to explain why the generalization tests were not matching tests. When the experimenter explained matching tests would
have been too easy, the participant said, “Yeah, but I’d get them all right.” While a simple matching test is not the only possible solution for improving generalization, the student’s point is well taken. Programming for generalization is lacking in the current study and may explain poor generalization scores.

The current study’s findings stand in contrast to the findings from Barbetta et al., (1991). Barbetta and colleagues used acquired words in sentences to test for generalization. Students were able to generalize an average of 9.5 of 10 words when given the sentences to read after a set of 10 words was acquired. The Barbetta study may have been able to achieve higher generalization scores because the students were being asked to perform the same task during generalization as during CWPT (i.e., reading a word). The only difference between CWPT and generalization conditions was that acquired words were in context during generalization and they occurred in isolation during CWPT. The current study asked students to identify and define word orally during CWPT but write the word or definition during generalization. This difference could explain why the current study was unable to achieve the generalization levels noted by Barbetta and colleagues.

Another potential reason why the current study did not achieve higher generalization scores may be related to the stringent definitions for vocabulary that included “key words”. The two master’s students who scored the generalization tests both reported to the experimenter that many times students’ answers on generalization posttests were very close to being correct but were missing one or two “key words” and had to be counted incorrect. It is possible that a science teacher might consider these definitions close enough to be correct if the students had written the same definition on a
chapter test. The objective nature of the study did not allow for such a subjective
definition for what could be counted as correct or incorrect. Also, because the scorers
were not required to make note of how often such a circumstance arose there is no way to
be sure if this situation contributed to the low generalization scores for the current study.
In effect, the stringent definition criterion required by this study is likely to be more
conservative than that of the science teacher. This conservative approach to recording
correct responses on generalization tests may have contributed to the low scores noted for
several students.

The current study also made attempts to observe collateral effects of CWPT in the
generalized setting of the general education science classroom; however, the current
study did not directly program for generalization in the science class. Students’ six-week
grades were analyzed before and after the implementation of CWPT. Few changes were
noted in overall six-week grades. One student was able to improve his overall science
grade from a C to a B. Six students recorded nearly the same grade before as after
tutoring (e.g., C to a C). Seven students recorded lower six-week grades after tutoring
(e.g., D- to an F).

To better understand why six-week grades would be decreasing for some students
during CWPT an analysis was conducted of each six-week grade. Six-week grades were
broken into their component parts (i.e., tests, homework, labs, projects, and papers).
CWPT was conducted during the 5th and 6th six-weeks of the school year. The 4 six-
weeks grading periods prior to implementation of CWPT were also analyzed as a
comparison. Results of this analysis indicated that the 5th and 6th six-weeks had a large
project and paper that were not a part of the previous 4 six-weeks. These two assignments
carried the majority of possible points for the 5th and 6th six-weeks. Most of the students participating in the study did not complete the project or paper that caused these students to earn zeros for the projects and papers, and contributed to their failing grades for the two six weeks.

Also, the majority of the students participating in the study were poor test takers earning scores ranging from 32% to 79% correct. Little change in test scores was noted over the two six weeks that CWPT was in session. CWPT was not linked directly to the general education science tests. No attempt was made by the experimenter to link questions from the test to CWPT. The intervention teacher working with the experimenter on CWPT indicated that science chapter tests contained only a few questions that asked for vocabulary definitions or matching. It is possible that students participating in CWPT were able to answer these questions correctly, but since the experimenter was not tracking these questions it is not possible to make such a claim. Better alignment between content taught in CWPT and questions asked on science tests would allow for a more accurate comparison of the effects of CWPT on student responses on science tests.

Research Question 4

*What Are the Opinions of Students Regarding the Use of Classwide Peer Tutoring?*

Student opinions were solicited before, during, and after tutoring using a questionnaire. Students believed that CWPT was easy to implement with their partner, was successful, and helped them learn science words. Also, students reported they would like to use CWPT in other classes. A more extensive questionnaire was completed at the conclusion of the study to ask for more extended responses to questions regarding
CWPT. Question topics ranged from procedural questions, to self-esteem questions, to questions about future usage.

When students were asked about CWPT procedures, all students reported they liked their partner and would not like to switch partners during the study. Students found their partners helpful (e.g., “If I missed a word or something he told me what I was missing”). Students had few suggestions for improving tutoring (e.g., “more options for turning in Star Cards”) and noted few least favorite parts (e.g., “generalization tests”). Favorite parts of tutoring ranged from Star Cards to working with friends to learning new words.

Students were asked if they felt more confident or increased their self-esteem after participating in peer tutoring. When asked if CWPT helped them recognize tutoring words in science class all students but one reported that it had. Students reported earning better grades in science (e.g., “I got a B instead of an F like usually”) and feeling smarter in class (e.g., “when he [science teacher] would ask a science word I knew it”).

Students also reported they would like to continue to use CWPT in the future. Eleven students stated they would like to use CWPT in science intervention class next year. Nine students would like to use CWPT in math and social studies, 8 students would like to use CWPT in science, and all other classes received between 1 and 6 votes.

The finding of the current study supports Al-Hassan (2003), Barbetta et al., (1991), and Wright, et al., (1995). Al-Hassan noted that students liked the procedures associated with CWPT and would participate in the future. Students also believed that CWPT helped them learn more words. Barbetta et al. also reported high satisfaction from students involved in cross-age tutoring. Tutees reported they enjoyed tutoring and liked
having help to learn difficult words. Finally, students in the Wright et al. study indicated that they enjoyed tutoring and it helped them to learn Spanish words. Moreover, students also reported that they wished they could do CWPT in other subjects. These comments are all similar to those noted by students in the current study.

Research Question 5

*What Are the Opinions of Teachers Regarding the Use of Classwide Peer Tutoring?*

The classroom teacher who helped with the study was extremely satisfied with the procedures and results of CWPT during her intervention class. She reported ease of usage, students’ success in science, plans to use CWPT in science and other classes, and her recommendation for other teachers to use CWPT. The general education science teacher did not have an opinion about the effects of CWPT on students in his class or about using CWPT in the future. The science teacher knew that CWPT was being used in science intervention class but he was not a part of the procedures and was only asked his opinion to see if he had noted any collateral effects from students in the study during science class.

These findings support those reported by Al-Hassan (2003). Al-Hassan reported that teachers enjoyed CWPT and saw benefits for students in academics and self-esteem. The current study also found high rates of satisfaction from the teacher involved in tutoring. The teacher often commented to the experimenter about how impressed she was with the acquisition of words and definitions. She noted how confident the students in the study had become in science class often asking questions or sharing information they had learned during CWPT.
The current study partially supports the findings of Barbetta et al. (1991) and Wright et al. (1995). Barbetta et al. indicated that teachers found CWPT to be an acceptable, successful procedure to teach sight words. Teachers noted collateral effects of tutoring such as improved grades and more involvement in class discussions. The current study supports the teachers’ opinion that CWPT was successful, acceptable, and increased student involvement in class discussions, but does not support the opinion that CWPT improved grades. The results of the current study did not show any evidence that CWPT improved grades for students.

Likewise, Wright et al. noted the teacher involved in CWPT was satisfied with the number of Spanish words learned by the participants in the study. The teacher also reported how much she appreciated the cooperative nature of the students and the amount of active student responding. The teacher also reported that the amount of time to develop material for tutoring and the demands of record keeping would be daunting without help from the experimenter. The current study supports the opinion that CWPT helped students acquire words and was successful in creating a cooperative environment in the classroom. The current study does not support the opinion that creating materials would be time consuming and record keeping would be daunting. This difference in opinion may be because the experimenter for the current study created all the materials for the teacher and kept track of all records. The teacher in the current study was able to observe the class without the management side of CWPT.

The current study does stand in contrast to Allsopp (1997). Allsopp reported that teachers liked peer tutoring but believed it was only beneficial for low achieving students. These teachers reported that CWPT was physically exhausting to monitor students while
tutoring. Three of four teachers in the Allsopp study indicated that they would not use CWPT in the future, or would only use it for review because of the physical demands, planning required to implement, and time needed in the classroom to conduct a session. The current study’s findings challenge all of the above complaints as none of the above issues were reported by the teacher.

Limitations of the Study

This study was limited by the following factors student and setting characteristics, teacher characteristics, time of school year and day, acquisition criterion change, varying difficulty of word sets, maintenance procedures differed from previous studies, and alignment of generalization tests with general education science chapter tests.

Student and Setting Characteristics

The students in this study were ages 12 to 13 in an urban school district. The group was homogenous in ethnicity (i.e., Caucasian), socioeconomic status (i.e., middle class), and academic achievement in general education science (i.e., at-risk for failure). All 14 students in the district-configured intervention class were participants in the study. Results may or may not have been related to the small class size, or other homogenous aspects of the class. The extent to which the results of this study may generalize to classes with more than 14 students, students of different ethnic backgrounds and/or socioeconomic status, in suburban or rural districts, or with moderate to intensive disabilities are unknown.

Teacher Characteristics

For this study, the experimenter served as the classroom teacher while the general classroom teacher served as the primary observer. The experimenter had been in the
building for approximately 12 weeks prior to the implementation of the study while she observed a student teacher working in the building. During five observation sessions, the experimenter watched the student teacher’s class that contained 3 of the 14 students chosen for the study. The extent to which these students’ familiarity with the experimenter served as a contributing factor is unknown. In addition, prior to the implementation of the study, the district-configured intervention class had been taught by the general classroom teacher for two-thirds of the school year. The remainder of the school year the intervention class was taught by the experimenter. The effects of having the experimenter serve as the primary teacher in the classroom, or having two teachers present in the classroom are unknown.

*Time of School Year and Day*

This study was conducted from the beginning of March to the first week in June. This time period included a one-week Spring break that occurred during the first or second set of word cards. The study was conducted daily during the last period of the school day from 3:00PM to 3:50PM. The effects of the time of school year or day on this study’s results are unknown. If this study could have been completed during a different time of the year or school day, this limitation may have been ruled out.

*Acquisition Criterion Change*

This study was conducted for a total of 52 sessions. From Session 6 (the first day of CWPT after training) to Session 35, the criterion to move a vocabulary card from the “Go” pocket to the “Stop” pocket was two consecutive days of correct responding during the testing phase of CWPT. Starting with Session 36 until the remainder of the study, this criterion was changed from two to three consecutive days. Although it is difficult to
speculate on how changing the criterion may have ultimately affected the data, the change of acquisition criterion could have been implemented earlier than Session 36 to investigate effects on maintenance and generalization. However, the 16 sessions in which the three consecutive criterion was in place did serve as a fair and reasonable trial. The data for maintenance and generalization during the three consecutive criterion phase does suggest that there is a functional relationship between having the three day acquisition criterion and the amount of words cards maintained and generalized. A longer investigation of the three consecutive days criterion may provide more conclusive data regarding this change to the CWPT system.

*Varying Difficulty of Word Sets*

The difficulty level of each word set used in this study is unknown. Vocabulary words and definitions were all derived from the general education science textbook. Students were learning words related to simple machines, energy, and weather. It is possible that some word sets were more, or less, difficult than others. This variable was not controlled in the study because each student had an individualized set of word cards. It would be extremely difficult to determine the difficulty of each word set and complete the procedures required in a CWPT system. In addition to the varying set difficulty, it should be noted that the students’ previous experience with these topics was not assessed; hence it is unknown how their previous experiences in science, vocabulary decoding, or general information affected the data.

*Maintenance Procedures Differed from Previous Studies*

In previous studies that have used the Ohio State model of CWPT, words that are incorrect on a maintenance probe were returned to the system to be reacquired with the
next set of word cards. This study was unable to reinsert word cards into the system when a word or definition was unknown during a maintenance probe. Reinserting the cards into the tutoring system during this study would have meant that students could have received instruction on those vocabulary words in CWPT and in the general education classroom. Because the experimenter could not control how many word exposures, or the emphasis placed on each vocabulary word, words were not returned to the system or simultaneously taught in the general education classroom. This procedural limitation may affect how the results of this study compare to previous or future findings.

Alignment of Generalization Tests with General Education Science Chapter Tests

The generalization tests were not as well aligned with the general education class chapter tests as they could have been. The generalization tests were designed to demonstrate student knowledge of words and definitions as a written response. While the pretest and posttest data from the generalization tests are encouraging, no collateral effects were noted when students completed their general education science chapter tests. There was no attempt by the experimenter to align the generalization test questions with the types of questions asked on the chapter tests. This limitation may have accounted for the lack of collateral effects noted in the general education science grades. This limitation may have been prevented had the experimenter been able to target specific vocabulary questions on each chapter test and track the student responding on those questions.

Implications of the Study

The results of this study suggest that there are benefits to using CWPT for preservice and current teachers and students.
Preservice and Current Teachers

The results of this study indicate that CWPT is a viable intervention to use with middle school students enrolled in a science curriculum. All students acquired and maintained vocabulary words, albeit at different rates, after receiving instruction that was mediated by their peers. One student with disabilities learned 35 words and definitions during tutoring. Most students without disabilities learned 60 or more words and definitions. Although maintenance for vocabulary words differed greatly across students, every student in the study learned and remembered words and definitions that were unknown at the beginning of the study. Students reported that they recognized words from tutoring in their textbook or science class. This additional exposure to science vocabulary may have caused the increased confidence level in science class that students reported they felt. Even if the effects of CWPT are minimal in terms of their overall overall science grades, the increased sense of accomplishment and improvement of tests scores reported by students are sufficient for teachers to consider CWPT as a part of their complete instructional delivery system (i.e., teacher-directed, peer-mediated, and independent/semi-independent approaches) in their classrooms.

Both students and the classroom teacher reported that CWPT helped them learn science words and definitions. When asked if they would continue to use CWPT in the future, students and the teacher reported that they would. This high degree of satisfaction with CWPT procedures indicates that CWPT is a user-friendly intervention that students and teachers enjoy. Teachers can use CWPT to increase students’ motivation and self-esteem. Teachers appreciate their students eagerness to learn vocabulary words and
definitions. Both preservice and current teachers would benefit from training in peer-mediated interventions such as CWPT.

CWPT is an instructional strategy that is easy to use in any subject or grade. In this study, students with disabilities were included with students at-risk for failure in science. CWPT was quick, taking only 20 minutes per class period to conduct and the maintenance of CWPT folders was minimal. Students were able to conduct CWPT sessions with a high rate of procedural integrity that allowed the teacher to circulate and monitor each student’s performance. Teachers would benefit from having a fast, easy-to-use strategy that can be conducted in any subject. CWPT is an instructional strategy that meets those needs.

**Students**

CWPT helped students acquire science words and definitions successfully. This study provides evidence that a criterion change from 2 to 3 happy faces during testing did allowed for longer maintenance of acquired words. In addition, students reported they felt more confident in science class. The findings indicate that students increased their vocabulary and their confidence level when they participated in CWPT.

**Recommendations for Further Research**

The following are suggestions for future research: systematic replication, studies to address the criterion needed for various types of tasks or multiple tasks, returning maintenance cards to the system, exploring the acquisition criterion change, manipulating the feedback given during maintenance probes, instituting a “stop” pocket review in the procedures, integrating CWPT into science class instead of as a supplemental support
program, and combining CWPT with an applied activity to make the connection between vocabulary words and application skills.

**Systematic Replication**

Systematic replication could be completed by changing the student population to heterogeneous groups of students, or students with different disabilities. The study could be conducted in an urban or rural school district. Replication could be conducted in a different subject area (e.g., social studies) or with science topics not covered by this study. Changing the type of tutoring system from non-replacement to replacement system might help address the problems associated with maintenance in the current study. Future studies may find higher maintenance for vocabulary words and definitions when a replacement system is adopted. A systematic replication study may also want to improve the alignment between the general education science chapter tests and vocabulary learned during CWPT.

**Studies to Address the Criterion Needed for Various Types of Tasks or Multiple Tasks**

Future CWPT studies should investigate what the ideal acquisition criterion might be when students are engaged in different academic tasks. For example, academic tasks with multiple steps (e.g., long division) or complex skills (e.g., vocabulary words and definitions) may require a longer acquisition period than more basic academic tasks (e.g., reading sight words). Future studies should compare two- and three-day acquisition criterion to determine if complex skills are maintained for a longer period of time with the three-day acquisition criterion as suggested by the results of the current study.
Returning Maintenance Cards to System

Future studies might investigate the effects of returning non-acquired words (i.e., those incorrect on maintenance probes) to the tutoring system. Because this study was unable to complete all the maintenance procedures as in previous CWPT studies (i.e., reinserting non-maintained words back into the system), it is vital to determine what effect, if any, returning cards to the system might have on acquisition, maintenance, and generalization of science vocabulary words.

Exploring the Acquisition Criterion Change

The increased maintenance and generalization data noted when the acquisition criterion was changed from 2 to 3 happy faces holds promise for improving the findings of the current study. Maintenance and generalization in the current study were mixed, although most students did increase their maintenance and generalization of vocabulary words once the criterion was adjusted. The three happy face criterion needs to be investigated further to determine if an extra acquisition day may help to improve the maintenance and generalization of complex skills such as vocabulary words and definitions.

Manipulating the Feedback Given During Maintenance Probes

No feedback was given by the assessors during the maintenance probes conducted during this study. A future study may want to manipulate the feedback given during maintenance probes to compare effects of no feedback and praise on the number of correct answers maintained by students.
Instituting a “Stop” Pocket Review in the Procedures

Because of the problem noted when students have cards in the “stop” pocket for extended periods of time, a future study may want to investigate a procedural change to the tutoring system. Prior to practicing cards in the “go” pocket, students would be trained to complete a quick “stop” pocket review. After folders are switched, the first tutor would take the cards out of the “stop” pocket and conduct a quick assessment to ensure the words are still acquired. If the tutee can answer correctly, that card will remain in the “stop” pocket. If the tutee makes an error, that card will immediately return to the “go” pocket. Once each student has completed the “stop” pocket review, cards are taken from the “go” pocket and student continue the procedures for practice, testing, and plotting. This change in procedures may increase the number of words maintained for each set of vocabulary words.

Integrating CWPT into Science Class Instead of as a Supplemental Support

The current study was unable to find any collateral effects of CWPT on students’ general education science grades. It is possible that changes need to be made to improve the generalized effects of CWPT. The current study used CWPT during a supplemental instruction period. The effects of using CWPT as a part of the general education science class should be investigated. There may be differences when CWPT is conducted as a part of the typical class routine. In addition, future researchers should target questions on the science chapter tests and/or quizzes to determine what effect, if any, CWPT may have on achievement in the general education classroom.
Combining CWPT with an Applied Activity to Make the Connection Between Vocabulary Words and Application Skills

A future study could investigate the combined effect of CWPT plus an applied activity on the achievement of students in general education science class. In the current study, the effects noted in the general education classroom were minimal. This may be because students were unable to make the connection from content knowledge to applied skills. Future studies should investigate whether a combined program of four sessions of tutoring and one session of an applied activity may increase student achievement in science. This combination of basic information (i.e., vocabulary) and application skills may provide the additional connection students need to improve their scores on class assignments and tests.

Summary

Research has indicated that the amount of time a student spends engaged with academic content is correlated to student achievement (Greenwood et al., 1994). Research also indicates that when students are engaged in peer tutoring, content knowledge increases (Barbetta, Miller, Peters, Heron, & Cochran, 1991; Maheady, Harper, Mallette, & Winstanley, 1991; Wright, Cavanaugh, Sainato, & Heward, 1995). Many studies have examined academic performance and have increased achievement in spelling (Maheady, Harper, Mallette & Winstanley, 1991), math (DuPaul, Ervin, Hook, McGoey, 1998), reading, (Fuchs et al., 1995), social studies (Mastropieri, Scruggs, Spencer, & Fontana, 2003), foreign language vocabulary (Wright, Cavanaugh, Sainato, & Heward, 1995), health and safety (Utley et al., 2001), and sight words (Barbetta, Miller, Peters, Heron, & Cochran, 1991).
The purpose of this study was to provide CWPT to students who were at-risk for failure in science and extend the CWPT literature to middle school students learning science vocabulary words. Data were collected on acquisition of science vocabulary, maintenance of science vocabulary, generalization of science vocabulary, and consumer satisfaction with peer tutoring intervention.

Students in this study participated in CWPT during a district-configured intervention class designed to help students who are at-risk for failure in a general education science course. Students engaged in dyadic, reciprocal tutoring for 20 minutes each day to learn science words and definitions. The peer tutoring system used for this study included procedures for practicing, prompting, testing, and recording data.

Prior to tutoring, students were assessed using preassessment probes and a written generalization pretest to determine which science words and definitions were unknown. Words and definitions that were unknown were grouped into sets of 10 cards and were used during tutoring.

Students began each tutoring session by taking out their Star Cards and switching folders with their partner. Next, each student took a turn being the tutor and the tutee during a 10-minute practice time (i.e., 5 minutes for each student to tutor). During practice, tutors praised correct responses and provided corrective feedback for incorrect responses. Tutees identified the word and it’s definition for each card presented by the tutor. After each student had practiced, the students turned over their tutoring folders and began the testing phase of CWPT. The tutee was presented each card in their current word set once. The tutor determined if the tutee response was correct or incorrect and placed the word card on either a happy face (correct) or an X (incorrect).
students had completed the testing phase, students recorded the location of each word card on a grid on the back of each card and began to sort the cards. Word cards that had two (or later three) happy faces in a row were placed in a “Stop” pocket and were considered acquired. Words cards that had any other combination of X’s and happy faces were returned to the “Go” pocket for more practice. Next, students plotted how many words cards moved from the “Go” pocket to the “Stop” pocket during that session on a plotting chart located inside their folder. Students switched folders again and returned Star Cards to the appropriate pocket. This concluded the tutoring session. After a word set was acquired, students completed a written posttest and weekly maintenance probes to determine if words and definitions were generalized and/or maintained by the students.

Results indicated all 14 students were able to acquire science vocabulary words taught using CWPT. This finding supports Al-Hassan (2003), Barbetta, Miller, Peters, Heron, and Cochran (1991), Franke, 2001, Welsch, 1998, Welsch, 1995, and Wright, Cavanaugh, Sainato, and Heward (1995). Maintenance results were mixed during the two happy face acquisition criterion, but improved during the three happy face acquisition criterion. This finding supports Wright et al. (1995), but stands in contrast to Al-Hassan (2003) and Barbetta et al., (1991). Generalization results were poor for most students ranging from 1 to 7 correct on a 10 question written posttest. This finding supports Moore (1996) and Welsch (1998) and stands in contrast to Barbetta et al., (1991). All students reported satisfaction with CWPT procedures, a finding that supports Al-Hassan (2003), Barbetta et al., (1991), and Wright, et al., (1995). Finally, teachers reported a high satisfaction with CWPT procedures as well. This finding supports Al-Hassan (2003), and
partially supports Barbetta et al. (1991) and Wright et al. (1995), and stands in contrast to Allsopp (1997).

In conclusion, CWPT can be used by middle school students to acquire and maintain science words and definitions. Maintenance improved to a higher level when a three day acquisition criterion was used. CWPT alone may not be enough to generalize science words and definitions to a written test. Many of the study’s findings support or partially support previous studies that used CWPT to teach vocabulary. This study can be extended by further investigation of the acquisition criterion and the return of maintenance cards to the system when they are incorrect. Overall, this study supports the use of CWPT to teach science words and definitions to students at-risk for failure in general education science.
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APPENDIX A

CONSENT TO CONDUCT RESEARCH AT JACKSON MIDDLE SCHOOL
January 20, 2005

To whom it may concern:

I have received the information regarding Michele Nobel’s proposed research study to be conducted with seventh grade students at Jackson Middle School. I understand Ms. Nobel’s research will investigate the differential effects of classwide peer tutoring on students’ acquisition, maintenance, and generalization of science vocabulary words. I have also received copies of the recruitment letters and consent/assent forms, including the consent for videotaping that will be distributed to parents and students. I believe that this research study is in accordance with standard teaching practices and in no way places students at our school at risk or compromises confidentiality. I understand the value of conducting such research and give my permission and support to Michele Nobel to conduct this study at Jackson Middle School.

Please feel free to contact me at 614-801-3800 if additional information is needed.

Sincerely,

[Signature]
Elizabeth Watkins
Principal

cc. Ms. Michele Nobel
    Dr. Ralph Garner, III
    Dr. Timothy E. Heron
APPENDIX B

RECRUITMENT SCRIPT FOR INTERVENTION TEACHER
Recruitment Script for Intervention Teacher

The experimenter will use the following script to invite teacher participation, obtain teacher consent, and provide an explanation of the proposed research study during winter and spring 2005.

Experimenter:

I would like to invite you to participate in a research study that I will conduct under the supervision of my advisors, Ralph Gardner, III and Timothy E. Heron, this winter and spring at Jackson Middle School. The research study will investigate the differential effects of classwide peer tutoring on the acquisition, maintenance, and generalization of science vocabulary of seventh grade students enrolled in an intervention class.

Your participation in this study is voluntary. As part of the instructional procedure, your intervention class will be conducted as you normally would for half of the class period. During the second half of the class period, however, I would like for you to help monitor a classwide peer tutoring program for 20 minutes a day, 4 times a week. Videotaping will be conducted for the purpose of training future teachers how to design, implement, and evaluate classwide peer tutoring.

Your consent to participate in the study will allow me to train your students in the procedures for conducting classwide peer tutoring, assist you in monitoring classwide peer tutoring sessions, and collect acquisition, maintenance, and generalization data. It also provides an opportunity for you to complete an evaluation form at the completion of the study.

(Hand recruitment letter, consent letter and envelope to teacher.)

Here is a letter explaining the study in more detail and a consent form for you to read. If you choose to give consent to participate in the research study, I will need the permission form signed and returned to me through the school office at Jackson by February _____, 2005. A return envelope is provided for your convenience. There is a copy of the permission form for you to keep in your records as well.

Do you have any questions or concerns about this study that I could answer right now?

(Answer any questions posed by the teacher.)

Please feel free to contact me (378-9553), or Dr. Gardner (292-3308), by phone or by email (nobel.4@osu.edu or gardner.4@osu.edu) if other questions arise after you have reviewed these documents. Thanks for your involvement!
APPENDIX C

TEACHER RECRUITMENT LETTER
February ____, 2005

Dear Teacher:

My name is Michele Nobel and I am a third year doctoral candidate at The Ohio State University. I was a member of the Jackson Middle School staff for several years before returning to OSU to complete my degree. I know the staff at Jackson strive to provide the best education for students and that is why I have returned to Jackson to conduct a research study.

I hope to conduct this research study in your classroom during intervention class starting in February and ending with the school year in June. This research study is under the direction of my academic advisors, Professors Ralph Gardner, III and Timothy Heron. Currently, your students use intervention time to review their assignments. This study will still allow your students to review their nightly assignments. In addition, this study will enhance intervention time by allowing students to learn science vocabulary. The classwide peer tutoring procedures will provide information to the teacher regarding acquisition, maintenance, and generalization of science vocabulary. Finally, by videotaping training and daily sessions, future teachers enrolled in OSU’s teacher training program will have a chance to see a viable implementation of CWPT.

Your participation in this study is voluntary. As part of the instructional procedure, your intervention class will be conducted as you normally would for half of the class period. During the second half of the class period, however, I would like for you to help monitor a classwide peer tutoring program for 20 minutes a day, 4 times a week. Your consent to participate in the study will allow me to train your students in the procedures for conducting classwide peer tutoring, assist you in monitoring classwide peer tutoring sessions, and collect acquisition, maintenance, and generalization data. It also provides an opportunity for you to complete an evaluation form at the completion of the study.

If you choose to give consent to participate in the research study to be conducted during your intervention class, I need the enclosed permission form signed and returned to me through the school office at Jackson by February ____, 2005. A return envelope is provided for your convenience. There is a copy of this permission form for you to keep in your records as well.

If you have any questions or concerns about this study, please feel free to contact Michele by phone (317-9535) or by email (noble4@osu.edu), or by advisor Dr. Gardner by phone (292-3308) or email (gardner4@osu.edu). We would be happy to explain the study in more detail. Thanks for your involvement!

Sincerely,

Michele Noble, M.A.
Doctoral Candidate

Cc: Ralph Gardner, III, Ph.D., Advisor
Timothy E. Heron, Ed. D., Advisor
Elizabeth Watkins, Principal
APPENDIX D

CONSENT FORM FOR TEACHER PARTICIPATION
Consent for Participation in Research

I consent to participate in research titled: Effects of Classwide Peer Tutoring on the Acquisition, Maintenance, and Generalization of Science Vocabulary Words for Seventh Grade Students in an Intervention Class.

Ralph Gardner, III, Ph.D., Principal Investigator, or his authorized representative, Michele M. Nobel, has explained the purpose of the study, the procedures to be followed, and the expected duration of my participation. Also, possible benefits of the study have been described to me.

I acknowledge that I have had the opportunity to obtain additional information regarding this study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw consent for participation at any time and to discontinue participation in the study without prejudice.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _______________  Signed: ____________________________

          (Participant)

Signed: __________________

          (Principal Investigator)

Signed: __________________

          (Witness)
APPENDIX E

RECRUITMENT LETTER TO PARENTS
February ____, 2005

Dear Parent/Guardian:

My name is Michele Nobel and I am a third year doctoral candidate at The Ohio State University. I was a member of the Jackson Middle School staff for several years before returning to OSU to complete my Ph.D. degree. I know the staff at Jackson strive to provide the best education for your children and that is why I have returned to Jackson to conduct a research study.

This research study will be conducted in Ms. Lester's classroom during intervention class starting in February and is planned to end with the school year in June. This research study is under the direction of my academic advisors, Professors Ralph Gardner, III and Timothy Heron. Currently, your child uses intervention time to review his/her science assignments. This study will still allow your child to review his/her nightly assignments. In addition, this study will enhance intervention time by allowing students to learn science vocabulary using classwide peer tutoring. The classwide peer tutoring procedures will provide information to the teacher regarding acquisition, maintenance, and generalization of science vocabulary. Videotaping will be conducted for the purpose of training future teachers how to design, implement, and evaluate classwide peer tutoring, and a second consent form is attached for that purpose.

Student participation in this study is voluntary; however, students will be expected to participate in classwide peer tutoring as a typical classroom activity. Consent to participate in the study will allow the investigator to obtain your child's science grades each six weeks to help determine if classwide peer tutoring has been effective in improving your child's science grade. Consent will also allow your child to complete an evaluation form at the completion of the study. To protect your child's identity, names will not appear on any document. Once a student gives consent to be included in this study, they will be assigned a coded number to protect confidentiality. Throughout the entire study only the coded number will be used as identification on any paperwork completed by the student or the general education science teacher.

If you choose to give consent for your child to participate in the research study and to be videotaped in Ms. Lester's intervention class, I need the enclosed permission forms signed and returned to me at Jackson by February ____, 2005. A return stamped envelope is provided for your convenience. There are copies of these permission forms for you to keep in your records as well.

If you have any questions or concerns about this study, please feel free to contact Michele by phone (378-9553) or by email (n nobel.4@osu.edu), or my advisor Dr. Gardner by phone (292-3308) or email (gardner.4@osu.edu). We would be happy to explain the study in more detail. Thanks for your involvement!

Sincerely,

Michele Nobel, M.A.
Doctoral Candidate

Cc: Timothy E. Heron, Ed. D., Advisor
    Ralph Gardner, III, Ph.D., Advisor
    Elizabeth Watkins, Principal
    Paige Lester, Teacher

Two attachments: Parent Consent Form; Videotape Release Form
APPENDIX F
CONSENT FORM FOR PARENT
Consent for Participation in Research

I consent for my child to participate in research titled: Effects Of Classwide Peer Tutoring On The Acquisition, Maintenance, And Generalization Of Science Vocabulary Words For Seventh Grade Students In An Intervention Class

Ralph Gardner, III, Ph.D., Principal Investigator, or his authorized representative, Michele M. Nobel, has explained the purpose of the study, the procedures to be followed, and the expected duration of my participation. Also, possible benefits of the study have been described to me.

I acknowledge that I have had the opportunity to obtain additional information regarding this study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw consent for my child’s participation at any time and to discontinue participation in the study without prejudice.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ______________

Signed: ___________________  Signed: ___________________
(Principal Investigator)          (Parent of Participant)

Signed: ___________________
(Witness)
APPENDIX G

CONSENT FOR PERMISSION TO VIDEOTAPE/PHOTOGRAPH
CONSENT FOR PERMISSION TO VIDEOTAPE/PHOTOGRAPH

February ____, 2005

Dear Parent:

Your child attends seventh grade invention class at the Jackson Middle School taught by Mrs. Paige Lester. As an educator at The Ohio State University, I request your permission to videotape and/or photograph your child while the class is engaged in a tutoring program that Ms. Lester will conduct during winter and spring quarters in association with me and my doctoral candidate Michele Nobel.

The purpose of the videotape/photographs is to show future teachers at Ohio State how to implement tutoring methods on a classwide basis. Mrs. Elizabeth Watkins, principal, has provided her approval for this project.

Please know that your child’s last name shall not be identified or used on the videotape. I merely would like to show future teachers how to conduct systematic peer tutoring.

I am writing to ask your permission by checking the appropriate box and signing the form attached. Please return the form when your child comes to school next. Keep a copy for your records. If you would like to discuss any aspect of my request, I would be happy to do so. Please call me at my office (292-3308).

Thank you for your consideration.

Sincerely,

Ralph Gardner, III, Ph.D.
Associate Professor
The Ohio State University

Cc: Mrs. Elizabeth Watkins

[Box to be checked]
I grant permission for my child to be videotaped/photographed at the Jackson Middle School as per the purpose stated above. I understand that the purpose of the videotape/photograph is to train future teachers in how to establish effective tutoring programs to teach science vocabulary words. I understand the need for such videotaping/photographing and that there are statutes and regulations protecting the confidentiality of authorized information. I hereby understand that I may revoke my consent at any time by giving written notice to The Ohio State University. Such revocation does not affect the validity of my consent for the information disclosed prior to revocation.

[Box to be checked]
I do not grant permission for my child to be videotaped at the Jackson Middle School per the purpose stated above.

Parent signature ___________________ Date ___________________

School of Physical Activity and Educational Services
College of Education
Special Education
375 Aepp Hall
1945 North High Street
Columbus, OH 43210-1172

Phone (614) 292-8148
Fax (614) 292-4255
APPENDIX H

RECRUITMENT LETTER TO STUDENTS
February ____, 2005

Dear Student:

My name is Michele Nobel and I am a third year doctoral candidate at The Ohio State University. I was a member of the Jackson Middle School staff for several years before returning to OSU to complete my degree. I know the staff at Jackson strive to provide the best education for you and that is why I have returned to Jackson to conduct a research study.

This research study will be conducted in Ms. Lester’s classroom during your intervention class starting in February and is planned to end with the school year in June. This research study is under the direction of my academic advisors, Professors Ralph Gardner, III and Timothy Heron. Currently, you use intervention time to review your science assignments. This study will still allow you to review your nightly assignments. In addition, this study will enhance intervention time by allowing students to learn science vocabulary using classwide peer tutoring. The classwide peer tutoring procedures will provide information to the teacher regarding acquisition, maintenance, and generalization of science vocabulary. Videotaping will be conducted for the purpose of training future teachers how to design, implement, and evaluation classwide peer tutoring, and a second consent form is attached for this purpose.

Your participation in this study is voluntary; however, you will be expected to participate in classwide peer tutoring as a typical classroom activity. Assent to participate in the study will allow the investigator to observe tutoring sessions and record data on vocabulary knowledge. It will also allow the experimenter to obtain your science grades each six weeks to help determine if classwide peer tutoring has been effective in improving your science grade. Assent will also allow you to complete an evaluation form at the completion of the study. To protect your identity, names will not appear on any document. Once you give assent to be included in this study, you will be assigned a coded number to protect confidentiality. Throughout the entire study only the coded number will be used as identification on any paperwork completed by you or the general education science teacher.

If you choose to give assent to participate in the research study and to be videotaped in Ms. Lester’s intervention class, I need the enclosed permission forms signed and returned to me at Jackson by February ____, 2005. A return stamped envelope is provided for your convenience. There are copies of these permission forms for you to keep in your records as well.

If you have any questions or concerns about this study, please feel free to contact Michele by phone (378-9553) or by email (mnobel4@osu.edu), or my advisor Dr. Gardner by phone (292-3308) or email (gardner4@osu.edu). We would be happy to explain the study in more detail. Thanks for your involvement!

Sincerely,

Michele Nobel, M.A.
Doctoral Candidate

Cc: Ralph Gardner, III, Ph.D., Advisor
    Timothy E. Heron, Ed. D., Advisor
    Elizabeth Watkins, Principal
    Paige Lester, Teacher
APPENDIX I

ASSENT LETTER FOR STUDENTS
Assent for Participation in Research

I assent to participate in research titled: The Effects Of Classwide Peer Tutoring On The Acquisition, Maintenance, And Generalization Of Science Vocabulary Words For Seventh Grade Students In An Intervention Class.

Ralph Gardner, III, Ph.D., Principal Investigator, or his authorized representative, Michele M. Nobel, has explained the purpose of the study, the procedures to be followed, and the expected duration of my participation. Also, possible benefits of the study have been described to me.

I acknowledge that I have had the opportunity to obtain additional information regarding this study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw my assent at any time and to discontinue participation in the study without prejudice.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ________________  Signed: ____________________________
(Student Participant)

Signed: ______________________
(Principal Investigator)

Signed: ______________________
(Witness)
APPENDIX J

ASSENT FOR PERMISSION TO VIDEOTAPE/PHOTOGRAPH
February _____, 2005

Dear Student:

You attend seventh grade invention class at the Jackson Middle School taught by Ms. Paige Lester. As an educator at The Ohio State University, I request your permission to videotape and/or photograph you while the class is engaged in a tutoring program that Ms. Lester will conduct during winter and spring quarters in association with me and my doctoral candidate Michele Notel.

The purpose of the videotape/photographs is to show future teachers at Ohio State how to implement tutoring methods on a classwide basis. Mrs. Elizabeth Watkins, principal, has provided her approval for this project.

Please know that your last name shall not be identified or used on the videotape. I merely would like to show future teachers how to conduct systematic peer tutoring.

I am writing to ask your permission by checking the appropriate box and signing the form attached. Please return the form when you come to school next. Keep a copy for your records. If you would like to discuss any aspect of my request, I would be happy to do so. Please call me at my office (292-3088).

Thank you for your consideration.

Sincerely,

Ralph Garrett, III, Ph.D.
Associate Professor
The Ohio State University

C: Mrs. Elizabeth Watkins

_____ I grant permission to be videotaped/photographed at the Jackson Middle School as per the purpose stated above. I understand that the purpose of the videotape/photograph is to train future teachers in how to establish effective tutoring programs to teach science vocabulary words. I understand the need for such videotaping/photographing and that there are statutes and regulations protecting the confidentiality of authorized information. I hereby understand that I may revoke my consent at any time by giving written notice to The Ohio State University. Such revocation does not affect the validity of my consent for the information disclosed prior to revocation.

_____ I do not grant permission to be videotaped at the Jackson Middle School per the purpose stated above.

__________________________
Student signature

__________________________
Date

Special Education • Sport & Exercise Education, Humanities, Management & Science
Counselor Education, Rehabilitation Services & School Psychology • Workforce Development & Education
APPENDIX K

SAMPLE CLASSWIDE PEER TUTORING FOLDER
Sample Classwide Peer Tutoring Folder

Front

Back
APPENDIX L

SAMPLE TUTORING CARD
Evaporation

Word - Evaporation

Definition - Vaporization that takes place at the surface of the liquid
APPENDIX M

GENERALIZATION PRE/POST TEST
Generalization Pre/Post Test

Generalization Test Number _____  Student # _____  Date _________

Questions 1-5: Write the vocabulary word for each definition.
Questions 6-10: Write the definition for each vocabulary word.

1. ____________________  Condition of Earth’s atmosphere
2. ____________________  Layer of gases that surround the planet
3. ____________________  Form of oxygen that has 3 oxygen atoms in one molecule
4. ____________________  Water in the form of a gas
5. ____________________  Harmful substances in air, water, or soil

6. Photochemical Smog

7. Temperature Inversion

8. Acid rain

9. Density

10. Pressure
APPENDIX N

STUDENTS SOCIAL VALIDITY QUESTIONNAIRE - BEFORE
Students Social Validity Questionnaire - Before

Please give your honest opinion regarding the Classwide Peer Tutoring (CWPT) Project by circling YES if you agree with the statement, NO if you disagree with the statement, or NO OPINION if you are unsure if you agree or disagree with the statement.

Thank you for your time and opinion.

1) I think the Classwide Peer Tutoring Project will be easy to implement with my partner.

   YES  NO  NO OPINION

2) I think I will have success with the Classwide Peer Tutoring Project with my partner.

   YES  NO  NO OPINION

3) I might want to use Classwide Peer Tutoring with other subjects (e.g., math, social studies).

   YES  NO  NO OPINION

4) I believe that Classwide Peer Tutoring will help me to learn new Science Words.

   YES  NO  NO OPINION

5) Please write any other comments, criticisms, questions, or suggestions:

   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
APPENDIX O

STUDENTS SOCIAL VALIDITY QUESTIONNAIRE – DURING
Students Social Validity Questionnaire – During

Please give your honest opinion regarding the Classwide Peer Tutoring (CWPT) Project by circling YES if you agree with the statement, NO if you disagree with the statement, or NO OPINION if you are unsure if you agree or disagree with the statement.

Thank you for your time and opinion.

1) I am finding the Classwide Peer Tutoring Project easy to implement with my partner.
   
   YES   NO   NO OPINION

2) I am having success with the Classwide Peer Tutoring Project with my partner.
   
   YES   NO   NO OPINION

3) I would like to use Classwide Peer Tutoring with other subjects (e.g., math, social studies).
   
   YES   NO   NO OPINION

4) I believe that Classwide Peer Tutoring is helping me to learn new Science Words.
   
   YES   NO   NO OPINION

5) Please write any other comments, criticisms, questions, or suggestions:
   
   _______________________________________________________________________
   
   _______________________________________________________________________
   
   _______________________________________________________________________
   
   _______________________________________________________________________


APPENDIX P

STUDENTS SOCIAL VALIDITY QUESTIONNAIRE – AFTER
Students Social Validity Questionnaire – After

Please give your honest opinion regarding the Classwide Peer Tutoring (CWPT) Project by circling YES if you agree with the statement, NO if you disagree with the statement, or NO OPINION if you are unsure if you agree or disagree with the statement.

Thank you for your time and opinion.

6) I found the Classwide Peer Tutoring Project easy to implement with my partner.
   YES    NO    NO OPINION

7) I had success with the Classwide Peer Tutoring Project with my partner.
   YES    NO    NO OPINION

8) I wish I could use Classwide Peer Tutoring with other subjects (e.g., math, social studies).
   YES    NO    NO OPINION

9) I believe that Classwide Peer Tutoring helped me to learn new Science Words.
   YES    NO    NO OPINION

10) Please write any other comments, criticisms, questions, or suggestions:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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APPENDIX Q

SOCIAL VALIDITY QUESTIONNAIRE – EXTENDED RESPONSE
1. Did you recognize words and/or definitions from tutoring during your science class?
   YES    NO    DON’T REMEMBER

2. How did learning word/definitions in tutoring help you in science?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

3. Did you like your partner?
   YES    NO    DON’T REMEMBER

4. Was your partner helpful or not? How? Why?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

5. Would you have liked to switch partners or did you like having the same partner the whole time?

SAME WHOLE TIME     SWITCH AFTER 6 WEEKS

6. What would make tutoring better?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

7. What was the best part of tutoring?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

8. What was your least favorite part of tutoring?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
9. If you could tutor next year during intervention would you? In which subjects would you like to use tutoring?

YES TUTOR NEXT YEAR   NO TUTOR NEXT YEAR

Circle the subjects in which you would like tutoring to be used:

MATH  PE (GYM)
SCIENCE  ART
LANGUAGE ARTS  TECHNOLOGY
SOCIAL STUDIES  COMPUTER KEYBOARDING
INTERVENTION  BAND/CHOIR
HEALTH

10. Did tutoring help you feel smarter in science class? Why or why not?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

11. Anything you would like Ms. Nobel to know about tutoring or this project?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

12. Any additional comments for Ms. Nobel?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

THANK YOU FOR ALL YOUR HELP THIS YEAR! YOU ARE THE BEST! 😊
APPENDIX R

CLASSROOM TEACHER SOCIAL VALIDITY QUESTIONNAIRE
Classroom Teacher Social Validity Questionnaire

Please give your honest opinion regarding the Classwide Peer Tutoring (CWPT) intervention by circling 1 if your response is extremely positive through 7 extremely negative. A ranking of 4 would indicate a neutral position.

Thank you for your time and opinion.

1) I found the CWPT intervention easy to implement for the students in my class.

1 2 3 4 5 6 7

2) The students in my class had success learning science vocabulary using the CWPT intervention.

1 2 3 4 5 6 7

3) I plan on using the CWPT intervention with other students in the future.

1 2 3 4 5 6 7

4) I will consider using the CWPT intervention with other subjects that I teach.

1 2 3 4 5 6 7

5) I would recommend CWPT to others.

1 2 3 4 5 6 7

6) Please write any other comments, criticisms, questions, or suggestions:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
APPENDIX S

GENERAL EDUCATION SCIENCE TEACHER SOCIAL VALIDITY QUESTIONNAIRE
General Education Science Teacher Social Validity Questionnaire

Please give your honest opinion regarding the Classwide Peer Tutoring (CWPT) intervention by circling YES if you agree with the statement, NO if you disagree with the statement, or NO OPINION if you are unsure if you agree or disagree with the statement.

Thank you for your time and opinion.

1) The students in my class appeared to have success learning science vocabulary using the CWPT intervention.

   YES  NO  NO OPINION

2) I am interested in using the CWPT intervention with my students in the future.

   YES  NO  NO OPINION

3) Please write any other comments, criticisms, questions, or suggestions:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

________________________________________________________________________
APPENDIX T

OBSERVER AND SCORER TRAINING PROTOCOL
Observer and Scorer Training Protocol

Training of Primary and Secondary Observer

The primary and secondary observer will watch a video demonstrating what a classwide peer tutoring program should look like in practice. While watching the video, both observers will have a copy of the two procedural integrity checklists. The experimenter will stop the video as each step on checklists is portrayed, and will discuss what salient features encompass each step. For example, when the practice phase is being implemented, the observers will need to discriminate situations when a praise statement or corrective feedback sequence should be implemented.

For any steps that will occur as a part of this study that are not portrayed on the video examples (e.g., stating definition versus only reading sight word as shown on video), the experimenter will demonstrate those steps for the observers.

Once the observers have seen the tape and discussed the steps on the procedural integrity checklists with the experimenter, the training is complete. Observers will be expected to be present during four training sessions to observe the examples and practice recording as the students complete guided and independent practice of each step of the intervention.

Training of Primary and Secondary Scorers

Primary and secondary scorers will be given the definitions for correct and incorrect responses on the generalization tests. A sample generalization test with several examples and nonexamples will be provided along with an answer key. The experimenter will discuss each question with both scorers and will answer any questions that occur about examples or the correct and incorrect definitions.

After the two scorers have discussed the sample test with the experimenter, a second practice test will be given to each scorer. This second test will be scored independently by both scorers. Once both scorers have completed the second sample test, the experimenter will compare the scorers’ correct and incorrect responses and will determine percent of agreement. If the scorers achieve 90% agreement or better on the sample test, training will be finished. If the scorers achieve below 90% agreement, several more sample tests will be completed until the scorers have 90% agreement or better.
APPENDIX U

TEACHER PROCEDURAL INTEGRITY CHECKLIST
Teacher Procedural Integrity Checklist

<table>
<thead>
<tr>
<th>Activity</th>
<th>Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher directs students to begin tutoring</td>
<td></td>
</tr>
<tr>
<td>Teacher sets timer for five minutes and says “Begin practice now”</td>
<td></td>
</tr>
<tr>
<td>When timer dings, teacher directs students to switch roles</td>
<td></td>
</tr>
<tr>
<td>Teacher resets timer for five minutes and says “Begin practice now.”</td>
<td></td>
</tr>
<tr>
<td>When timer dings, teacher directs students to turn over their folders and says “Begin testing now”</td>
<td></td>
</tr>
<tr>
<td>When testing is complete, teacher directs all students to mark their cards</td>
<td></td>
</tr>
<tr>
<td>Teacher directs students to sort cards into “Go” and “Stop” pockets</td>
<td></td>
</tr>
<tr>
<td>Teacher directs students to color one square on the graph for each card that moved to the “Stop” pocket or draw a line if no cards moved</td>
<td></td>
</tr>
<tr>
<td>When students are finished, teacher directs students to switch folders and return folders front table</td>
<td></td>
</tr>
</tbody>
</table>

Comments:
APPENDIX V

STUDENT PROCEDURAL INTEGRITY CHECKLIST
Student Procedural Integrity Checklist

Name of observer: ___________

Date: ___________      Time lesson begins: _____________

IOA: Y N      Time lesson ends: _______________

Place a checkmark in the box as the following steps are completed by the students. If more than one activity is described within a box, all activities must occur for a checkmark to be placed in the box.

- Folders are on tables as students enter classroom and students sit with partner
- Star Cards are placed on table and folders are switched
- Tutor shuffles set of cards.
- Tutor asks “what word?”
- Tutor provides praise for correct responses or error correction for incorrect responses or no response.
- Tutor asks “what is the definition?”
- Tutor provides praise for correct responses or error correction for incorrect responses or no response.
- Practice continues until timer dings.
- Partners switch roles
- Tutor shuffles set of cards.
- Tutor asks “what word?”
- Tutor provides praise for correct responses or error correction for incorrect responses or no response.
- Tutor asks “what is the definition?”
- Tutor provides praise for correct responses or error correction for incorrect responses or no response.
- Practice continues until timer dings.
- Both students turn over folders for testing
- Testing is conducted for first tutee without feedback
- Cards are placed correctly on happy face or X contingent on student response
- Testing is conducted for second tutee without feedback
- Cards are placed correctly on happy face or X contingent on student response
- Students mark and sort cards
- Students color graphs or mark line on graph
- Students switch folders and place Star Cards in folder
- Students return folders to front table

Comments:
APPENDIX W

VOCABULARY PRE-ASSESSMENT DATA COLLECTION SHEET
<table>
<thead>
<tr>
<th>Vocabulary Word</th>
<th>Definition (Key words underlined)</th>
<th>Word</th>
<th>Def.</th>
<th>Word</th>
<th>Def.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Weather</td>
<td><strong>Condition</strong> of Earth’s atmosphere</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Atmosphere</td>
<td><strong>Layer of gases</strong> that surround the planet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Ozone</td>
<td><strong>Form of oxygen</strong> that has 3 oxygen atoms in one molecule</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Water Vapor</td>
<td><strong>Water in the form of a gas</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Pollutants</td>
<td><strong>Harmful substances</strong> in air, water, or soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Photochemical Smog</td>
<td><strong>Brown haze</strong> that forms in cities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Temperature Inversion</td>
<td><strong>Layer of warm air prevents the rising air from escaping</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Acid Rain</td>
<td><strong>Rain that contains more acid than normal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Density</td>
<td><strong>Amount of mass</strong> in a given volume of air</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Pressure</td>
<td><strong>Force pushing on an area or surface</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Air Pressure</td>
<td><strong>Result of the weight of a column of air pushing down on an area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Barometer</td>
<td><strong>Instrument used to measure changes in air pressure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Mercury Barometer</td>
<td>Has a <strong>glass tube open at the bottom partially filled with mercury</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Aneroid Barometer</td>
<td>Has <strong>airtight metal chamber</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Altitude</td>
<td><strong>Distance above sea level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Troposphere</td>
<td><strong>Lowest layer of the Earth’s atmosphere</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Stratosphere</td>
<td><strong>Layer of the</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>atmosphere</strong> from the <strong>troposphere</strong> to 50 km above the surface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>18</strong> Mesosphere</td>
<td><strong>Middle layer of the atmosphere</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19</strong> Thermosphere</td>
<td><strong>Outermost layer of the atmosphere</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>20</strong> Ionosphere</td>
<td><strong>Lower layer of thermosphere</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>21</strong> Aurora Borealis</td>
<td><strong>Brilliant light displays</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>22</strong> Exosphere</td>
<td><strong>Outer layer of thermosphere</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>23</strong> Electromagnetic Waves</td>
<td><strong>Form of energy that can travel through space</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>24</strong> Radiation</td>
<td><strong>Direct transfer of energy by electromagnetic waves</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>25</strong> Infrared Radiation</td>
<td><strong>Form of energy with wavelengths that are longer than red</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>26</strong> Ultraviolet Radiation</td>
<td><strong>Wavelengths that are shorter than violet light</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>27</strong> Scattering</td>
<td><strong>Reflection of light in all directions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>28</strong> Greenhouse Effect</td>
<td><strong>Process by which gases hold heat in the air</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>29</strong> Thermal Energy</td>
<td><strong>Total energy of motion in molecules of a substance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>30</strong> Temperature</td>
<td><strong>Average amount of energy of motion in molecules of a substance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>31</strong> Thermometer</td>
<td><strong>Thin glass tube with a bulb on one end that contains a liquid</strong></td>
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<tr>
<td><strong>32</strong> Heat</td>
<td><strong>Energy transferred from a hotter object to a cooler one</strong></td>
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<td><strong>33</strong> Conduction</td>
<td><strong>Direct transfer of heat from one substance to another substance that it is touching</strong></td>
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<td></td>
<td>Term</td>
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<td>34</td>
<td>Convection</td>
<td>Transfer of heat from movement of a fluid</td>
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<td>35</td>
<td>Wind</td>
<td>Horizontal movement of air from areas of high pressure to areas of low pressure</td>
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<tr>
<td>36</td>
<td>Anemometer</td>
<td>Measures wind speed</td>
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<td>37</td>
<td>Wind-chill factor</td>
<td>Increased cooling that wind can cause</td>
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<td>38</td>
<td>Local Winds</td>
<td>Winds that blow over short distances</td>
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<tr>
<td>39</td>
<td>Sea breeze</td>
<td>Wind that blows from an ocean or lake onto land</td>
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<td>40</td>
<td>Land breeze</td>
<td>Flow of air from land to a body of water</td>
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<td>41</td>
<td>Monsoon</td>
<td>Sea and land breezes over a large region that change direction with the seasons</td>
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<td>42</td>
<td>Global Winds</td>
<td>Winds that blow steadily from specific directions over long distances</td>
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<td>43</td>
<td>Coriolis Effect</td>
<td>The way the Earth’s rotation makes the winds curve</td>
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<td>44</td>
<td>Latitude</td>
<td>Distance from equator</td>
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<td>45</td>
<td>Jet Stream</td>
<td>Bands of high speed winds</td>
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<td>46</td>
<td>Evaporation</td>
<td>Process by which water molecules escape into the air as water vapor</td>
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<td>47</td>
<td>Humidity</td>
<td>Measure of the amount of water vapor in the air</td>
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<td>48</td>
<td>Relative Humidity</td>
<td>Percentage of water vapor in the air compared to maximum amount the air could hold</td>
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<td>49</td>
<td>Psychrometer</td>
<td>Measures relative humidity</td>
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<td>50</td>
<td>Condensation</td>
<td>Process by which</td>
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<td><strong>molecules of water vapor in the air become liquid</strong></td>
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<td><strong>Dew Point</strong></td>
<td>Temperature when condensation begins</td>
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<tr>
<td><strong>Cumulus</strong></td>
<td>Clouds that look like rounded piles of cotton</td>
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<tr>
<td><strong>Stratus</strong></td>
<td>Clouds that form in flat layers</td>
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<td><strong>Cirrus</strong></td>
<td>Wispy, feathery clouds</td>
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<tr>
<td><strong>Precipitation</strong></td>
<td>Any form of water that falls from clouds and reaches Earth’s surface</td>
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<tr>
<td><strong>Rain Gauge</strong></td>
<td>Open-ended can or tube that collects rainfall</td>
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<tr>
<td><strong>Droughts</strong></td>
<td>Low periods of unusually low precipitation</td>
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<tr>
<td><strong>Air Mass</strong></td>
<td>Huge body of air that has a similar temperature, humidity, and air pressure</td>
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<tr>
<td><strong>Tropical Air Mass</strong></td>
<td>Warm air masses that form in the tropics</td>
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<td><strong>Polar Air Mass</strong></td>
<td>Cold air masses from the North</td>
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<tr>
<td><strong>Maritime Air Mass</strong></td>
<td>Air masses form over the oceans</td>
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<tr>
<td><strong>Continental Air Mass</strong></td>
<td>Air masses form over land</td>
<td></td>
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<tr>
<td><strong>Front</strong></td>
<td>Area where air masses meet and do not mix</td>
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<tr>
<td><strong>Occluded</strong></td>
<td>Cut off from the ground</td>
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<tr>
<td><strong>Cyclone</strong></td>
<td>Swirling center of low air pressure</td>
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<td><strong>Anticyclones</strong></td>
<td>High pressure centers of dry air</td>
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<tr>
<td><strong>Storm</strong></td>
<td>Violent disturbance in the atmosphere</td>
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<tr>
<td><strong>Lightning</strong></td>
<td>Sudden spark as charges jump between parts of a cloud</td>
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<tr>
<td></td>
<td>Term</td>
<td>Definition</td>
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<tr>
<td>69</td>
<td>Tornado</td>
<td>Rapidly whirling funnel-shaped cloud that reaches down from a storm cloud to touch the Earth’s surface</td>
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<tr>
<td>70</td>
<td>Hurricane</td>
<td>Tropical storm that has winds of 119 km per hour or higher</td>
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<tr>
<td>71</td>
<td>Storm surge</td>
<td>A dome of water that sweeps across the coast where hurricane lands</td>
<td></td>
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<tr>
<td>72</td>
<td>Evacuate</td>
<td>Move away temporarily</td>
<td></td>
<td></td>
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<tr>
<td>73</td>
<td>Flash Flood</td>
<td>Sudden violent flood that occurs within a few hours of a storm</td>
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<td></td>
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</tr>
<tr>
<td>74</td>
<td>Meteorologists</td>
<td>Scientists who study the causes of weather and try to predict it</td>
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<tr>
<td>75</td>
<td>El Nino</td>
<td>A warm-water event that occurs in the Pacific Ocean</td>
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<td>76</td>
<td>Isobars</td>
<td>Lines joining places on the map that have the same air pressure</td>
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<tr>
<td>77</td>
<td>Isotherms</td>
<td>Lines joining places that have the same temperature</td>
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<td></td>
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<tr>
<td>78</td>
<td>Climate</td>
<td>Average year after year conditions of temperature, precipitation, winds, and clouds in an area</td>
<td></td>
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<tr>
<td>79</td>
<td>Tropical zone</td>
<td>Area near the equator between 23.5 degrees North to 23.5 degrees South latitude</td>
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<tr>
<td>80</td>
<td>Polar zone</td>
<td>Area near poles extends from 66.5 degrees North to 90 degrees North and 66.5 degrees South to 90 degrees South latitude</td>
<td></td>
<td></td>
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<tr>
<td>81</td>
<td>Temperate zone</td>
<td>Between the tropical</td>
<td></td>
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</table>
and polar zones from 23.5 degrees to 66.5 degrees North and South latitude

<table>
<thead>
<tr>
<th></th>
<th>Marine Climates</th>
<th>Relatively warm winters and cool summers</th>
</tr>
</thead>
<tbody>
<tr>
<td>82</td>
<td>Continental Climates</td>
<td>Winters are cold and summers are warm or hot</td>
</tr>
<tr>
<td>83</td>
<td>Windward</td>
<td>The side of a mountain that oncoming winds hit</td>
</tr>
<tr>
<td>84</td>
<td>Leeward</td>
<td>The side of the mountain that little rain hits</td>
</tr>
<tr>
<td>85</td>
<td>Microclimate</td>
<td>Small area with specific climate conditions</td>
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<tr>
<td>86</td>
<td>Rain forests</td>
<td>Forests in which plenty of rain falls all year-round</td>
</tr>
<tr>
<td>87</td>
<td>Savannas</td>
<td>Tropical grasslands</td>
</tr>
<tr>
<td>88</td>
<td>Deserts</td>
<td>Areas that get less than 25 cm of rain</td>
</tr>
<tr>
<td>89</td>
<td>Steppe</td>
<td>Dry area that gets enough rain for grasses to grow</td>
</tr>
<tr>
<td>90</td>
<td>Humid Subtropical</td>
<td>Climate is wet and warm but not as hot as tropics</td>
</tr>
<tr>
<td>91</td>
<td>Subarctic</td>
<td>Areas north of humid continental climates</td>
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<tr>
<td>92</td>
<td>Tundra</td>
<td>Cold areas where some layers of soil are always frozen</td>
</tr>
<tr>
<td>93</td>
<td>Permafrost</td>
<td>Permanently frozen tundra soil</td>
</tr>
<tr>
<td>94</td>
<td>Ice ages</td>
<td>Glaciers cover large parts of Earth’s surface</td>
</tr>
<tr>
<td>95</td>
<td>Glacier</td>
<td>Large sheets of ice</td>
</tr>
<tr>
<td>96</td>
<td>Sunspots</td>
<td>Dark, cooler regions on the surface of the sun</td>
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<tr>
<td>97</td>
<td>Greenhouse Gases</td>
<td>Gases in the</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
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<tr>
<td>atmosphere that trap solar energy</td>
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<tr>
<td>Global Warming</td>
<td>A gradual increase in the temperature in the Earth’s atmosphere</td>
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<tr>
<td>Chlorofluorocarbons</td>
<td>Group of chlorine compounds that is the main cause of ozone depletion</td>
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<tr>
<td>Motion</td>
<td>When one object’s distance from another changes</td>
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<tr>
<td>Reference Point</td>
<td>Place or object used for comparison to determine if something is in motion</td>
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<tr>
<td>International System of Units</td>
<td>Measurement system based on the number ten</td>
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</tr>
<tr>
<td>Meter</td>
<td>Basic unit of length</td>
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<tr>
<td>Speed</td>
<td>The distance an object travels in one unit of time</td>
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<tr>
<td>Velocity</td>
<td>Speed in a given direction</td>
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<tr>
<td>Plates</td>
<td>Upper layer of the Earth’s crust broken into a dozen major pieces</td>
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<tr>
<td>Acceleration</td>
<td>Rate at which velocity changes</td>
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<tr>
<td>Force</td>
<td>A push or pull</td>
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<tr>
<td>Net Force</td>
<td>Overall force of an object after all the forces are added together</td>
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</tr>
<tr>
<td>Unbalanced Force</td>
<td>Can cause an object to start moving, stop moving, or change direction</td>
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</tr>
<tr>
<td>Balanced Forces</td>
<td>Equal forces acting on one object in opposite directions</td>
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<tr>
<td>Inertia</td>
<td>The tendency of object</td>
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302
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>to resist a change in motion</td>
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<tr>
<td>Mass</td>
<td>Amount of matter in an object</td>
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<tr>
<td>Newton</td>
<td>Unit of measurement that equals the force required to accelerate one kilogram of mass</td>
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<tr>
<td>Friction</td>
<td>The force that one surface exerts on another when the to rub together</td>
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<tr>
<td>Sliding friction</td>
<td>This kind of friction occurs when solid surfaces slide over each other</td>
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<tr>
<td>Rolling Friction</td>
<td>This kind of friction occurs when an object rolls over another</td>
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<tr>
<td>Fluid Friction</td>
<td>Friction occurs when an object moves through a fluid</td>
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<tr>
<td>Gravity</td>
<td>Force that pulls objects to the Earth</td>
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<tr>
<td>Free Fall</td>
<td>When the only force acting on an object is gravity</td>
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<tr>
<td>Projectile</td>
<td>An object that is thrown</td>
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<tr>
<td>Air resistance</td>
<td>Upward force of friction that acts on objects falling through the air</td>
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<tr>
<td>Terminal velocity</td>
<td>Greatest velocity the object reaches</td>
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<tr>
<td>Weight</td>
<td>Force of gravity on a person or object at the surface</td>
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<tr>
<td>Momentum</td>
<td>The product of an object’s mass and velocity</td>
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<tr>
<td>Law of Conservation of Momentum</td>
<td>Total momentum of any group of objects that interact does not</td>
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<td>128</td>
<td>Satellite</td>
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<tr>
<td>129</td>
<td>Centripetal force</td>
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<td>130</td>
<td>Pressure</td>
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<td>Pascal</td>
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<td>Pascal’s Principle</td>
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<td>Hydraulic systems</td>
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<td>Buoyant Force</td>
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<td>136</td>
<td>Archimedes’ Principle</td>
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<td>Density</td>
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<td>Bernoulli’s Principle</td>
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<td>Input Force</td>
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<td>Output Force</td>
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<td>Mechanical Advantage</td>
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<td>Efficiency</td>
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<td>Actual mechanical advantage</td>
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<td>Ideal mechanical advantage</td>
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<td>Inclined Plane</td>
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<td>Fulcrum</td>
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<td>Wheel and Axel</td>
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<td>Compound machines</td>
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<td>Potential Energy</td>
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<td>Elastic potential energy</td>
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<td>Gravitational potential energy</td>
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<td>Thermal energy</td>
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<td>168</td>
<td>Nuclear energy</td>
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<td>169</td>
<td>Energy conversion</td>
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<td>170</td>
<td>Law of conservation of energy</td>
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<td>Fossil Fuels</td>
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<td>172</td>
<td>Power</td>
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<td>173</td>
<td>Fahrenheit Scale</td>
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<td>Celsius Scale</td>
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<td>Kelvin Scale</td>
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<td>176</td>
<td>Absolute Zero</td>
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<td>177</td>
<td>Heat</td>
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<td>Insulator</td>
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<td>Specific Heat</td>
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<td>States</td>
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<td>Change of State</td>
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<td>184</td>
<td>Melting</td>
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<td>Melting point</td>
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<td>198</td>
<td>Internal combustion</td>
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APPENDIX X

CLASSWIDE PEER TUTORING
ORIENTATION TRAINING SCRIPT - INTRODUCTION TO TUTORING
Classwide Peer Tutoring
Orientation Training Script

Introduction to Tutoring

I. Introduction of the Term "Tutoring"

A. "Today and for the next several sessions, I'm going to show you how you can be teacher for your partner. I think that you can learn how to teach your partner science vocabulary words." "I've divided you into teams: some of the time, you will be a tutor, and some of you will be the student. When you're a tutor, you'll be showing cards to your partner. When you're a partner, you'll be saying the answers. You'll switch between being a tutor and a partner each day. We'll practice in just a few minutes."

[Key points: you can teach your partner; you'll switch roles during tutoring.]

II. Folder Presentation

A. "Each tutor and partner will get a folder like this one. It will have your name and a number on it. The inside will look like this. It will have a graph on this side. It will have a pocket that will have a card with stars. [Key points: show folder.]

B. "Notice that there are three pockets, a GO pocket, a STOP pocket, and a Star Card pocket. (Point to each pocket as label is announced.) In our folder the GO means to go to work on these cards and the STOP means stop working on these cards. (Point out cards). So, when it's time to tutor we'll do the following: [Key Points: Review the pockets.]

1. Take out your Star Card and place it next to where you sit.

2. Exchange folders with your partner. You will have your partner’s folder, and your partner will have yours (demonstrate).

3. Take cards from the GO pocket only.
“Where will we take cards from? (My turn— from the GO pocket.) Where will we take cards from? Your turn . . . (the GO pocket)”. [Key points: review the 3 steps: take out Star Card, exchange folders, take cards from GO pocket]

C. Let’s practice:

Model: Teacher models the three steps with a single student (Teacher pretends to be a partner). Others watch and receive reinforcement.

Lead: Each pair practices the three steps once w/ teacher under teacher supervision—and the teacher and the other students—providing reinforcement for correct steps.

Test: All pairs practice the three steps simultaneously. [Key points model, lead, test steps executed in that order]

[END OF TRAINING SESSION 1 ]
I. Let’s Review
   
   A. Call tutoring teams

   B. “Recall that we’re going to practice science vocabulary in teams. Each person on the team will have a folder. When you come to practice, remember take out your Star Card, exchange folders, and be ready to start using the vocabulary in the GO pocket when it’s your turn.

   [Key points: review last session’s remarks.]

II. "As Many Times As We Can."

   A. "So that your partner will learn vocabulary quickly, I want you to have him/her say the vocabulary correctly as “many times as we can”. How many times do I want you to have your student say the vocabulary correctly? (My turn: As many times as we can.) How many times? Your turn:" (As many times as we can)

   B. "Show the vocabulary card to your student so he can see them." Like this: (Show a correct way.) What's wrong here?" (Show a card that’s concealed to simulate a poor way to show a card).

   C. “If your student does not look at the vocabulary card, this is what I want you to say, 'Say their name and ask them to look at the vocabulary card.”

   D. When you show a card, show one at a time and place it to the side (Show how to hold cards when presenting them to the partner.)

   [Key points: Practice as many times as you can. Show partners how to hold and present cards.]
III. Helping your Partner (“Try Again”)

A. "Sometimes your partner will not know the vocabulary card or the definition that you show him and this could slow you down. This is what I want you to do. . . . ."

B. Say, “Try again!"

C. "What do you say if you show a vocabulary word and your partner doesn’t know it?" (Point to vocabulary: Say, “Try again”).

D. When you give your partner a second chance and still don’t happen to know it, tell him. For example, when you say, “Try again”, and your partner still does not know the vocabulary word, tell them the answer by saying word, and have them repeat the whole word.

E. "Make sure your partner looks at the vocabulary card when he says it.”

[Key points: Try again plus say science vocabulary correctly.]

IV. Role play teacher as student.

A. "Let's practice. I’ll be the tutor and one of you will be the partner.

V. Role play teacher as student. (Model, Lead, Test)

A. "Let's practice again.

[Key points: Role play using model, lead, test format.]

[END OF TRAINING SESSION 2]

[Session 3 Begins Here]

VI. Repeat process using definitions of vocabulary.

A. "Sometimes your partner will not know the vocabulary definition that you show him and this could slow you down. This is what I want you to do. . . . ."

B. Say, “Try again!”
C. "What do you say if you show a vocabulary word and your partner doesn’t know the definition?" (Point to vocabulary: Say, “Try again”).

D. When you give your partner a second chance and still don’t happen to know it, tell him. For example, when you say, “Try again”, and your partner still does not know the vocabulary definition, tell them the answer by reading the definition, and have them repeat what you read.

E. "Make sure your partner looks at the vocabulary card when he says the definition.”

F. Explain the underlined words in the definition are key words and your partner must say those words for a definition to be correct.

[Key points: Try again plus say science vocabulary definitions correctly.]

VII. Role play teacher as student.

A. "Let's practice. I’ll be the tutor and one of you will be the partner.

VIII. Role play teacher as student. (Model, Lead, Test)

B. "Let's practice again.

[Key points: Role play using model, lead, test format.]

[END OF TRAINING SESSION 3]
APPENDIX Z

CLASSWIDE PEER TUTORING
TESTING TRAINING SCRIPT
Classwide Peer Tutoring  
Testing Training Script

Session 4

I. Review of Past Skills/Training Sessions
   A. Review key elements of “Prompting” including “try again,” “Try again-say vocabulary word” procedures.

   [Key point: review the previous training session.]

   B. Award stars for students who respond correctly or who try to answer the question: What do I do if I show a card to my partner and he (or she) doesn’t know it or gets it wrong the first time (Prompt the students to say, “Try Again” What do I do if I show a card to my partner again, and he (or she) still doesn’t know it or gets it wrong the second time? Prompt them to say, “I’ll tell them the answer and have them repeat it.”

   [Key point: stars awarded for participation.]

II. Explain Testing Procedure
   A. Say: “Good!” Now, I want to teach you how to test your partner. "After you've practiced vocabulary with your partner for 5 minutes, a timer will go off. When you hear it, it's time for testing."

   B. Say: “Here’s what you’ll do. Turn your folder over to the side with the smile ☺ and the “X”

   C. Next, say: "Show every card that you practiced from the GO pocket just one time."

   D. "If your partner says the vocabulary word and definition correctly, place it on the happy face. If your partner happens to say the vocabulary word or definition incorrectly or doesn't know it and doesn't say anything, put it on the X sign."

   E. "Tutors, remember to be real quiet during testing. Do not say anything, just show the cards to your partner, and put the cards down on the happy face (☺) if it’s correct or X if it is not. You help your partner during practice, but not during testing. Do you help your partner during practice? (Have students say “yes!”) Do you help your student during testing?” (Have students say “No...”).
III. Model Testing:
A. Choose a student.

B. Say: “Let’s pretend that I’m a tutor and you are my partner (Pick a child to be your partner). Say: Let’s pretend that we're just finished our practice with the vocabulary words and the timer went off.” It's now time to test.”

C. Model the testing procedure showing students how to turn their folders over, and where to place the cards on the happy face ☺ or X depending if the vocabulary word is said correctly or not. Pick another student and repeat.

[Key point: Teacher chooses a single child to demonstrate. Repeats the process with another students. The group watches, provides comments as the teacher and the partner demonstrate.]

IV. Students Practice Testing (Lead)
A. Hand out folders to pairs. Have timer sound. Say: Pretend that practice is over. Now, it's time to test your partner."

B. Prompt and praise students while they test each other one at a time.

C. Check to ensure that some cards are on the ☺ and some on the X.

[Key point: Student pairs engage in simulated testing, placing cards on the ☺ and X.]

V. Criterion for Moving Cards
A. Say: After you’re finished testing, Ms. Lester or I will check your cards on the ☺ or X pile. Then, you’ll put the cards back in either the GO pocket or the STOP pocket.

B. "If a card goes into the stop pocket you can stop working on it on tomorrow. Remember, cards only move if they have two happy faces in a row."

C. “If a card goes in the GO pocket, you can practice it the next day.”

[Key point: Teacher models placing cards in GO or STOP pocket, directs students to do the same.]

[End of Session 4: Testing Component]
APPENDIX AA

CLASSWIDE PEER TUTORING
PLOTTING TRAINING SCRIPT
Classwide Peer Tutoring
PLOTTING TRAINING SCRIPT

Session 5

I. HOW TO RECORD NUMBER OF CARDS MOVED TO THE STOP POCKET

A. Review testing procedure from last session. Say, “Remember when you test your partner, you turn your folder over to the ☺ and the X. Give your partner one chance to say it, and then place it on the ☺ if it correct and the X if it is not.

[Key point: Review of testing procedure occurred.]

A. Say: "Today I'm going to show you how the graph in your folder works."

B. Say: "We will use the squares on this graph to keep track of the number of vocabulary cards that move to the STOP pocket. We'll color in one square for every card that moves."

C. Say: “Let’s pretend that I've finished testing my partner. If your teacher says that a card can move, you get to place the cards in the STOP pocket and then color in a square. If 2 cards move, place 2 cards in the STOP pocket and color in two squares.

[Key point: Teacher says how card movement and coloring will occur.]

D. Say: “WATCH ME.” (Pretending say:) The teacher told me that I can move two cards. Watch what I do. I’ll move the two cards to the STOP pocket and I’ll color in two squares. [REPEAT THIS STEP using 3 cards as the next example.]

[Key point: Teacher SHOWS how card movement and coloring will occur using 2 cards and then 3 cards.]

E. Say: “WATCH ME AGAIN WITH (CHOOSE A STUDENT).” (HAVE OTHER STUDENTS WATCH) (Pretending say:) The teacher told me that I can move two cards. Watch what I do. I’ll move the two cards to the STOP pocket and I’ll color in two squares. (NAME OF STUDENT), the teacher told YOU that YOU can move two cards. What will YOU do? If necessary, prompt the student to move the two cards to the STOP pocket and then color in two squares. [REPEAT THIS STEP using 3 cards as the next example.]
[Key point: Teacher provides one model, and then has another student show how card movement and coloring will occur using 2 cards and then 3 cards.]

G. Say: Let’s ALL practice with our graph. Here are some practice sheets. {Hand out practice sheets.} Pretend that 3 cards moved, how many squares will move to the STOP pocket? (That’s right, 3 cards move to the STOP pocket. How many squares do you color? (Good! Color in 3 squares.).

H. Say: “Let’s try another one Pretend that 4 cards moved, how many squares will you color? (Good! Color in 4 squares.).

I. Say: Let's pretend that it is the next day. We’ve finished testing, and I say, that you have 2 cards to move." Have the students move 2 cards to the STOP pocket and have them color in two squares). [Repeat this step, indicating that 4 cards will move.] [ALL STUDENTS PRACTICE.]

[Key point: ALL students show how card movement and coloring will occur using multiple examples.]

II. HOW TO RECORD NO MOVEMENT.

A. Say: “On some sessions, it may happen that no cards will move. To show that no cards move, I'll draw a line next to the last square I colored." WATCH ME. (Draw a straight line right on top of the last box you colored) (See example below that shows one card moved [shaded square] but the next day, none moved (line through the top of the box). "Be sure to make it straight."

[Key point: Teacher shows what happens when no cards move.]

B. Say: “Let’s try another one together. Pretend that no cards moved, how many squares will you color? (Good! NONE. WE’LL DRAW A STRAIGHT LINE OVER OUR BOX.).

[Key point: Teacher has students draw a straight line showing that no cards move.]

B. Remind students to draw the line on the top of the box. [Using a different color crayon/marker each day will help.
C. Let’s review. If 1 card moves, color in 1 square. If 2 cards move, color in 2 squares, if 3 cards move, color in 3 squares. If no cards move, WE’LL DRAW A STRAIGHT LINE OVER OUR BOX.

[Key point: Teacher reviews lesson.]

[End of Session 5: Plotting Performance.]
APPENDIX BB

DAILY TESTING RECORDING SHEET
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APPENDIX CC

MAINTENANCE RECORDING SHEET
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APPENDIX DD

GENERALIZATION PROBES RECORDING SHEET
Generalization Probes Recording Sheet

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