ENHANCING LEARNING TRIALS: EXAMINING THE EFFECTS OF INCREASING OPPORTUNITIES TO RESPOND ON ACTIVE STUDENT RESPONDING AND STUDENT BEHAVIOR

By

TODD HAYDON

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2008

© 2008 Todd Haydon

To my wife Kathleen and son Christopher

ACKNOWLEDGMENTS

I would like to thank the following people for guiding and helping me through the process of obtaining a doctorate in Special Education. First, gratitude goes to Kathleen (wife) and Christopher (son) for allowing me to pursue my passion for learning and thinking. I appreciate the opportunity and resources Terry Scott provided me in attending the University of Florida. I valued the commitment, dedication, expertise, and support from Maureen Conroy; she is a great mentor and has allowed me the opportunities to be a researcher and writer, and has turned out to be a good friend. Thanks go to James McLeskey who provided insightful advice on writing, publishing, and job searches. Special thanks go to Paul Sindelar who agreed to help with my dissertation study and showed patience while I developed my writing style and asked questions about research methodology. I valued the input from and conversations with William Conwill on families with antisocial youth. I thank Rich Mancil for providing guidance throughout the doctoral program and for our conversations on single subject design, and applied behavior analysis. I appreciated all the help the office staff; Shaira Rivas-Otero, Michell York, and Vicki Tucker has provided for me. I will fondly remember my experience as a doctoral student at the University of Florida.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

ENHANCING LEARNING TRIALS: EXAMINING THE EFFECTS OF INCREASING OPPORTUNITIES TO RESPOND ON ACTIVE STUDENT RESPONDING AND STUDENT BEHAVIOR

By

Todd Haydon

August 2008

Chair: Terrance Scott
Major: Special Education

A key characteristic of students with or at-risk for emotional or behavioral disorders (EBD) is displaying off-task, disruptive, and aggressive classroom behaviors. Furthermore, many students with or at risk for EBD are behind academically, and over a period of time the discrepancy between their skill level and the level of their normally achieving peers widens. In addition, students with EBD may be part of numerous confrontations in the classroom, interrupt the flow of instruction, and may affect the behaviors of other students creating a chaotic environment for their teachers and all students in the classroom.

To address the academic and behavioral needs of students with or at-risk for EBD, this study utilized an alternating treatments design to investigate the effects of three types of opportunities to respond (OTR) procedures on the disruptive, off-task behavior, and active student responding (ASR) of high-risk students during group instruction in a 2nd grade general education classroom.

Results of this study suggest that choral responding is a more effective instructional strategy than individual responding in terms of decreasing disruptive and off-task behavior. In terms of disruptive behavior specifically, mixed responding appears to be a more effective instructional strategy than either choral or individual responding alone. Results for off-task

behavior and ASR are less clear. Results from this study replicate and extend earlier research in which authors found similar results for disruptive and off-task behavior. Future research should compare the three types of OTR with students of different ages and across various subject areas such as math and science, and with children identified with various learning disabilities or with autism.

CHAPTER 1
INTRODUCTION

The purpose of this chapter is to provide a brief overview of the literature and rationale for enhancing learning trials with students identified with or at-risk for emotional behavior disorders (EBD). Specifically, this literature overview highlights the importance of increasing the number of opportunities to respond (OTR) by using choral responding procedures (CR), error correction procedures, and decreasing the amount of time in between learning trials (an intertrial interval-ITT). Results from studies show a functional relation between increased rates of OTR and an increase in correct responses and a decrease in disruptive behavior and off-task behavior for students with or at risk for EBD. The introduction concludes with a discussion of the contributions this study makes to existing research and is followed by the study's research questions.

Overview of a Learning Trial

One way to conceptualize instructional practices and learning behaviors is to use a learning trial. A learning trial consists of a three term, stimulus-response-consequent contingency sequence (Skinner, Fletcher, & Hennington, 1996). An example of a learning trial is when a teacher presents a science word on a flash card (i.e., stimulus), the student recites the word aloud (i.e., response), and the teacher then says, "Good answer." (i.e., consequent) (Skinner et al., 1996). Researchers have shown that improving the quality and increasing the quantity of learning trials results in higher learning rates (Barbetta & Heward, 1993; Carnine, 1976; Miller, Hall, & Heward, 1995). A qualitatively stronger learning trial would require fewer repetitions to meet a criterion level, whereas increasing the quantity of a learning trial would result in the completion of more learning trials in a fixed amount of time resulting in an increase in student learning rates without increasing allocated time (Skinner et al.).

Skinner et al. (1996) claimed that previous research showed that increasing the number of learning trials could increase learning levels during the acquisition, fluency building, and maintenance stages of learning. However, the types of questions teachers ask their students also influence student outcomes. For example, students who have skill deficits are more likely to respond correctly to fact questions (questions that allow students to recall and practice previously learned material and typically require one to three word answers). Higher achieving students may respond to higher order questions that require time to process and assimilate new information (Sitko & Slemon, 1982).

Skinner et al. (1996) described four procedures that have been shown to increase both learning trial rates and learning rates during teacher-led instruction. Two of the four methods pertain to this study. The first strategy is to reduce an intertrial interval (ITI); that is, the time between the end of one trial (i.e., consequent or feedback delivered) and the beginning of the next trial (i.e., antecedent presented). Carnine (1976) demonstrated that reducing ITIs could lead to increased learning trial rates, correct answering rates, and increased on-task behavior levels. Furthermore, Carnine suggested that during longer ITIs, some students might misbehave and as a result not attend to later instruction. A second approach is to utilize choral responding. Choral responding occurs when all students are asked to actively respond following the presentation of an instructional stimulus. When teachers use choral responding, the number of students responding per learning trial increases (Miller, et al., 1995; Sindelar, Bursuck, & Halle, 1986).

In choral responding (CR), all students in the classroom respond in unison to the teacher's question (Heward, 1994). An example of CR is when students respond, "16" after the teacher asks the entire class, "What is 4 times 4?" Another example is when the students say, "Tallahassee" in response to the teacher's question, "What is the capital of Florida?" The

purpose of using CR is to increase the number of active student responses (ASR) and as a result increase the number of correct responses and the amount of time students are engaged during instruction.

Results from several studies indicate a positive relationship between an increased rate of choral responding on students' correct responses, on-task behavior, and disruptive behaviors of students (Carnine, 1976; McKenzie & Henry, 1979; Miller et al., 1995; Sainato, Strain, & Lyon, 1987; Sutherland, Alder, & Gunter, 2003). McKenzie and Henry claimed that "testlike events" (their term for choral responding) might be an effective practice in maintaining and sustaining attention of all students in a large setting while allowing the teacher to monitor each student's understanding of each question. The results of the literature indicate that engaging students during instruction by using choral responding increases their academic achievement and may help teachers reduce the rate of student disruptive behavior in their classrooms while keeping students on-task. Furthermore, researchers have demonstrated clear effects of using choral responding across students with varying characteristics (male/female, age groups, students with learning disabilities, differentiating IQ levels), settings (resource rooms, self-contained classrooms, and small groups in regular education classrooms), and subject areas, such as math, geography, and health science (Barbetta & Heward, 1993; Carnine, 1976; Skinner, Smith, & McLean, 1994).

One of the strengths of choral responding is that teachers can assess if students understand the content of the lesson, because they receive immediate feedback from student responses. Often students are hesitant to admit that they do not understand the content of the lesson in front of an entire class; therefore, a benefit of using CR is that a teacher can observe a particular student in the context of a group response and determine if a student has verbalized an incorrect

response. Then, the teacher can cue the entire class several times by saying, “Again class,” while providing additional practice and observing the responses of the particular student (Heward, 1994).

In summary, students are more likely to demonstrate correct responses and increases in academic achievement in a classroom environment where a teacher incorporates CR in their instructional activities (Heward, Courson, & Narayan, 1989). In addition, teachers can use CR during academic instruction to assess student understanding and provide immediate feedback to students’ responses. When students are engaged and actively responding to questions the teacher can focus on academic content rather than being concerned with inappropriate student behaviors. The result is that lessons are more engaging, delivered at a brisk pace, and reinforcing for students. Another positive outcome is that students are less likely to engage in disruptive behavior.

Statement of the Problem

A key characteristic of students with or at-risk for EBD is displaying off-task, disruptive, and aggressive classroom behaviors (Kauffman, 2005). Furthermore, many students with or at risk for EBD are behind academically and over a period of time the discrepancy between their skill level and the level of their normally achieving peers widens (Lambert, Cartledge, Heward, & Lo, 2006). In addition, students with EBD may be part of numerous confrontations in the classroom, interrupt the flow of instruction, and affect the behaviors of other students creating a chaotic environment for their teachers and students in the classroom (Sutherland, Wehby, & Yoder, 2002).

A few researchers (Gunter et al., 1993; Sutherland et al., 2002) hypothesize that some students with EBD may display disruptive behavior as a result of poor academic instruction, ineffective teacher feedback, and minimal positive feedback. Other students with EBD may

exhibit disruptive behavior before the development of academic difficulties (Gunter et al., 1994; Gunter & Coutinho, 1997; Sutherland et al., 2003). In addition, these researchers have suggested that there is a strong inverse relationship between high rates of problem behavior and low rates of instruction. Therefore, effective instruction is one instructional method available to reduce negative behavior in the classroom (Engelmann & Colvin, 1983). For example, teachers who are able to engage students and make them successful during instructional time may reduce these students' frustration, while increasing their participation and success in classroom instructional activities.

Significance of the Study

Eighteen studies were included in the review for the current study and can be divided into two broad categories based on the type of responses of the students (verbal or written) and further divided by arrangement of students (i.e., studies involving the entire class or a small group). The results of the literature review indicated that four studies were implemented with an entire class. In these 4 studies, researchers employed one experiment in a general education classroom (McKenzie & Henry, 1979), two in a special education classroom (Sainato et al., 1987; Sutherland et al., 2003), and one in a combination of both settings (Miller et al., 1995).

The proposed study extends the learning trial literature in several ways. First, the effectiveness of decreasing students' disruptive and off-task behavior as well as increasing students' ASR was examined by comparing three types of OTR (individual, choral and a mixture of 70 % choral responding and 30% individual responding) in a 2nd grade general education classroom setting. Secondly, the three types of OTR represented the use of an antecedent instructional strategy in the beginning of a learning trial as opposed to an error correction strategy at the end of a learning trial. Third, the three types of OTR were used with students identified as at-risk for EBD.

Purpose of the Study

The purpose of this study was to investigate the following research question: How does a choral responding procedure compare to an individual responding procedure and a mixture of choral and individual responding procedure during group instruction in a general education classroom on the disruptive, off-task behavior, and active student responding of high-risk students?

CHAPTER 2
LITERATURE REVIEW

The purpose of this chapter is to examine the literature and provide a critical review on the effects of opportunities to respond on academic and behavioral outcomes of students identified with disabilities or at-risk for emotional and behavioral disorders (EBD) in classroom settings. First, a conceptual model of OTR is presented and defined. Next, a discussion of two types (drill and higher cognitive) of teacher questions (i.e., opportunities to respond) is presented. Then, results from studies are analyzed and presented. Finally, the literature review concludes with a summary that synthesizes major trends and patterns on the topical strategy of increasing academic opportunities to respond (OTR).

Conceptual Model of Opportunity to Respond

Over the years, a number of researchers have defined opportunities to respond (OTR) in various ways. Greenwood, Delquadri, and Hall (1984) first defined opportunities to respond as " . . . the interaction between: (a) teacher formulated instructional antecedent (the materials presented, prompts, questions asked, signals to respond etc.), and (b) their success in establishing the academic responding desired or implied by the materials" (p.64). Sutherland, et al (2003) defined OTR as " . . . when the teacher asked a question (of an individual or the group) that required a specific response or was open-ended, with the purpose of having a student explain his or her thought process" (p.241). Heward et al (1989) stated that teachers give OTR by using choral responding (CR) and defined CR as " . . . all students in the groups orally responding in unison to a teacher-posed question . . . " (p.72). Stanley and Greenwood (1983) define OTR as "the rate of frequency at which students engage in specific academic responses" (p.370). Hall, Delquadri, Greenwood, and

Thurston (1982) described OTR as student's rate of responding during academic instruction.

Clearly, the above definitions vary in their descriptions, depending on whether OTR was defined as a teacher or student behavior. When OTR is defined as a teacher behavior, it is described as a type of questioning procedure, prompt, or cueing technique. When OTR is defined from the point of view of student behavior, it is defined as a type of response to a teacher question. For the purposes of this review OTR is defined as teacher questioning behavior and an instructional antecedent stimulus that begins a learning trial or ends a learning trial as an error correction technique (Ferkis, Belfiore, & Skinner, 1997; Sutherland et al., 2003). A schematic overview of this definition is provided (Figure 2-1).

Giving students OTR is an instructional strategy used in the direct-instruction model (Carnine, 1976). This model uses teacher explanations and modeling combined with student practice and feedback to teach concepts and procedural skills. According to Rosenshine (1986), direct instruction can be divided into six teacher functions: review of previous material, presentation of new material, guided practice, feedback and corrections, independent practice, and weekly and monthly reviews. Review of previous material checks prerequisite skills and knowledge. Presentation of new material gives students additional explanations and several examples, and checks for student understanding. Guided practice (via giving students OTR) permits teachers to supervise initial student practice. Providing feedback confirms student understanding. Independent practice provides the additional practice students need to acquire a skill. Weekly and monthly review offers additional successful practice and monitors student progress.

Ferkis et al. (1997) refers to the components of a learning trial as a three-term contingency–antecedent, response, and consequence (A-R-C). In this case, the OTR is the antecedent stimulus in the learning trial model. After an OTR, a verbal or written student response occurs (Figure 2-1). The learning trial concludes with corrective feedback given by the teacher, which becomes the consequence. Learning trials may be repeated and the latency between the end of one learning trial (i.e., the consequent stimulus) and the beginning of the next learning trial (i.e., antecedent stimulus) is called an intertrial interval (ITI) (Skinner et al., 1994). Because an OTR is delivered in a question format, it is important to understand if qualitative differences in teacher questions have been discussed in the literature. The following sections provide an overview of the teacher questioning literature.

Teacher Questioning

The topic of OTR has its origin in the teacher questioning literature. In 1912, Stevens (one of the early researchers to study teacher questions) (as cited in Brualdi, 1998) stated that approximately 80% of instruction consisted of teacher questions. Researchers have since defined and developed many systems for classifying teacher questioning (e.g., Gall, 1970; Samson, Sirykowski, Weinstein, & Walberg, 1987). Sitko and Slemon's taxonomy of teacher questions (developed in the 1970s) first consisted of seven categories: (a) affective judgment, (b) discrimination, (c) recall, (d) sequencing/paraphrasing, (e) conceptual relating, (f) inference, and (g) problem solving. However, Sitko and Slemon's taxonomy was later changed to four categories (i.e., discrimination, recall, relating concepts, and problem solving) when teachers had difficulty coding several cognitive categories (Sitko & Slemon, 1982). Since the 1980s,

researchers have simplified these existing coding systems and have classified teacher questions into two major categories: factual and higher cognitive questions (Gall, 1984).

Factual questions are types of questions that allow students to recall information that was previously presented. Examples of OTR that are factual questions are: “What is 4 times 4?” “What is kinetic energy?” Higher order questions are cognitive questions that require students to analyze, evaluate, or manipulate information and use independent thinking skills (Gall, 1984). An example of an OTR that is a higher cognitive question is: “What do you think can be done to slow down global warming?” “How did you arrive at that answer?”

The literature on the effectiveness of factual questions in comparison to higher cognitive questions has mixed results. In a review of three large correlational studies, Rosenshine (1976) (as cited in Gall, 1984) concluded that students learn best when they are provided “narrow” (his term for factual questions) questions. Winne (1979) reviewed the same studies as Rosenshine, plus two additional experiments and concluded that the type of question makes little difference on student achievement. However, Redfield and Rousseau (1981) concluded that lesson plans that consist of predominately higher cognitive questions have a positive effect on student achievement. In response to these contradictory results of earlier studies, Gall concluded that the contradiction could be resolved by examining the type of students who participated in these studies.

For example, in the Rosenshine study, participants consisted of low-income, primary grade level students, while participants in the other two studies represented a greater range of economic status, ability level, and grade level. Therefore, Gall (1984) concluded that: (a) elementary aged novice learners respond primarily to fact questions that promote basic

skill building; and (b) students with average or high cognitive ability respond to higher cognitive questions that foster independent thinking required for students to be successful at the secondary level.

Brualdi (1998) provided a descriptive analysis of teacher questions and divided teacher-questioning techniques into “good” and “bad” categories. According to Brualdi, teachers who use “good” questioning techniques: (1) elicit a high percentage of correct responses, (2) allow sufficient wait time, and (3) give feedback to student responses. The result is higher student achievement and a greater number of positive student-teacher interactions. “Bad” questioning techniques consist of: (1) asking vague questions (e.g., What do you think of the author of the story?), and (2) asking questions that are too abstract for student’s level of understanding (e.g., asking a kindergarten class the following question: Why do we use daylight savings time?). It is important that teachers are aware of the type of questions to ask students depending on whether new or previous information is being practiced (Gunter, Reffel, Barnett, Lee, & Patrick, 2004).

In summary, factual questions are questions that allow students to recall and practice previously learned material while higher order questioning allow students to process and assimilate new information, and require more elaborate and extensive answers. In addition, factual questions typically require one to three word answers. Students who have skill deficits are more likely to respond correctly to factual questions than higher order questions (Sitko & Slemon, 1982).

Importance of Increasing Students’ Opportunities to Respond

Giving students sufficient opportunities to respond is important because researchers suggest that OTR is linked to on-task behavior and engagement during instruction (Carnine, 1976; Sainato et al., 1987; Sutherland et al., 2003). When presented with OTR,

particularly in the form of factual questions, elementary aged students who are slow learners are more likely to answer a question and have a correct response in comparison to being asked higher cognitive type questions. As a result they are able to stay on-task and remain engaged during instruction (Gall, 1984; Rosenshine, 1980; Gunter, Shores, Jack, Denny, & DePaepe, 1994). In addition, when OTR occurs, teachers can give students practice and feedback by using factual questions and thereby quickly assess student understanding. During reading instruction, the use of OTR in the form of factual questions can cue students and help focus their attention on particular passages in textbooks. Finally, the call and response format used when teachers ask factual questions closely resembles the format of short answer and multiple choice questions of conventional tests that are used to determine the amount of learning at the end of a curriculum unit (Gall; McKenzie & Henry, 1979).

In summary, if teachers want to increase the active engagement, number of correct responses and decrease disruptive behaviors for students with skill deficits, providing OTR in the form of asking factual questions, which cover information that has recently been reviewed in textbooks, or providing students enough information within the question itself is an effective practice (Gunter et al., 1994).

Type of Students Who Benefit from Receiving Increased Opportunities to Respond

Although all students may benefit from receiving OTR, researchers suggest that students who have skill deficits benefit the most, because they receive increased chances to learn and demonstrate their understanding of instructional material (Gall, 1984). Good (1970) found that students, particularly students who are low achievers, are not provided equal opportunities to respond. Specifically, Good suggested that teachers may fear that low achieving students could experience criticism from their peers when they have an

incorrect response or teachers are concerned that low achieving students will not have the correct answer and in turn interrupt the flow of instruction. When the class is asked to volunteer to an opportunity to respond (e.g., “Class, can anyone give me the definition of photosynthesis?”), low achieving students are passed over by the teacher and higher achieving students are typically called on by the teacher. As a result, low achieving students may often fail to receive the practice and feedback that is necessary for achievement gains. Good makes an analogy of the above situation to a baseball team, where regular players (i.e., high achievers) get more playing time and reserve players (i.e., low achievers) get very little playing time. The former analogy is relevant to students with emotional or behavioral disorders (EBD) because they exhibit both academic and behavioral deficits, and these “dual deficits” can make it difficult for teachers to provide effective instruction (Kauffman, 2005).

Good and Brophy (2003) encouraged teachers to call on students who do not (volunteer) raise their hands when given an OTR, in order to help maintain their focus. Some support for the authors’ suggestion may be found in one study. Jones and Gerig (1994) used qualitative and quantitative methods to examine classroom interaction patterns among middle school students who were identified as silent (i.e., non-hand raisers) and non-silent (i.e., hand raisers). Results of their study showed that the four teachers who participated in the study directed their questions proportionally for both types of students to increase learning.

However, researchers have shown in other studies, that students “at risk” for developing more challenging behaviors did not receive equal chances to respond to teacher questions. Two studies using lag sequential analysis (a technique to study

interactions and behavior between individuals by calculating the probability of one event preceding or following another event) showed that students at-risk for EBD, received fewer OTR and made fewer academic responses (Gunter, Jack, Shores, Carrell, & Flowers, 1993; Van Acker, Grant, & Henry, 1996). A study by Carr, Taylor, and Robinson (1991) had similar results. These authors found that teachers provided less instruction to those children who engaged in problem behavior during instruction time than those children who typically did not demonstrate problem behaviors during instruction time.

Giving students OTR is an engaging teaching strategy that teachers can use to keep students on-task. In addition, when teachers give low achieving students OTR after an incorrect response, there is a greater probability that these students will emit a correct response. When students who are at-risk for school failure receive corrective feedback the implications are that they may experience more success in school, receive additional instruction time, have fewer disruptive behaviors, and experience additional positive interactions with their teachers. In the following section a review of the literature examining OTR will be presented and the implications for using this teaching strategy with students who have learning difficulties and challenging behavior were examined.

Opportunities to Respond: A Critical Synthesis of the Literature

Method Used to Select Reviewed Studies

Inclusion criteria. The purpose of this review is to provide a critical analysis on the effects of opportunities in response to academic requests on the academic and behavioral outcomes of students identified with disabilities or at-risk for EBD in classroom or analogue settings. The studies included in the review were selected based on a priori determined criteria of relevancy and methodological sufficiency. The criteria selected

included studies that examined increasing rates of OTR through choral responding or hand raising or comparing choral responding to individual responding.

The literature review consisted of peer reviewed, published studies that examined the effectiveness of increasing rates of teachers' use of OTR (independent variable) on students' academic and behavioral outcomes (dependent variables) (i.e., sight word mastery, written math problems, on-task behavior, correct responses, disruptive behavior). Participants in the studies included students, grades PK-12, with EBD, or who demonstrated problem behaviors that may place them at-risk for EBD (e.g., off-task, disruptive, or aggressive behavior), or Learning Disabilities (LD), or children identified with autism. Studies across a variety of settings were included (i.e., regular education classrooms, special education classrooms, or analog, clinical settings). Case studies and experiments using single subject methodology were included. Studies that examined teachers utilizing response cards (a different type of response behavior than verbal responding) to increase rates of OTR were excluded from the review. Thus, studies comparing response cards with hand raising or choral responding were also excluded.

Literature Search

To identify articles for inclusion in the review, several search strategies were used. First, the author searched the following computerized databases: ERIC, Academic Search Primer, PsycInfo, Psychology and Behavioral Sciences Collection, and Wilson Web. Keywords used to search the databases included: opportunities to respond, active teaching, teacher questioning, choral responding, unison responding, ordered responding, individual responding, active student responding, active learning, and academic responding. Next, the author conducted ancestral searches of reference lists to find other relevant studies that met inclusion criteria. In addition, an ancestral search of a reference list of an earlier

review on the topic of opportunities to respond (Sutherland & Wehby, 2001) was conducted. Third, a prominent book was examined to obtain references: *Behavior Analysis in Education*: *Focus on Measurably Superior Instruction* (Gardner, Sainato, Cooper, Heron, Heward, Eshleman, & Grossi, 1994). Fourth, a manual and online search of five journals was conducted. These journals were selected based on an earlier limited literature review on examining the effects of OTR by Sutherland and Wehby (2001), and because these journals contain articles on instructional strategies specifically with students with or at-risk for EBD. Because of their availability and access in the university library, the following journals were hand searched from January 1985 to November 2006: (a) *Education and Treatment of Children and* (b) *Behavioral Disorders*. The *Journal of Behavioral Education* was hand searched from years 1991 to 2006. The *Journal of Applied Behavior Analysis* was hand searched from Spring 1968 to November 2006, and *Preventing School Failure* was searched on-line from Winter 1990 to Fall 2006.

Eighteen studies met inclusion criteria and were included in this review. These studies can be divided into two categories based on the type of responses of the students (verbal and written) and further divided by format (i.e., studies involving the entire class or a small group) (Figure 2-2). Six of these studies were most relevant to the proposed investigation, because they were implemented with an entire class or compared choral and individual responding. Of these six, researchers implemented one in a general education classroom (McKenzie & Henry, 1979), three in a special education classroom (Sainato et al., 1987; Sutherland et al., 2003; Wolery, Ault, Gast, & Griffen, 1992), one in a combination of both types of settings (Miller et al., 1995), and one in a clinical setting (Sindelar et al., 1986).

Five studies (Barbetta, Heron, & Heward, 1993; Ferkis et al., 1997; Sindelar et al., 1986; Skinner & Shapiro, 1989; Skinner et al., 1994) examined the effects of increased rates of OTR on sight word mastery. Four studies (Carnine, 1976; Sainato et al., 1987; Sutherland et al., 2003; West & Sloane, 1986) examined the relationship of increased rates of OTR on student disruptive behavior, on-task behavior, and correct response performance. Three studies (Miller et al., 1995; Skinner, Belfiore, Mace, Williams-Wilson, & Johns, 1997; Skinner, Ford, & Yunker, 1991) examined the effects of increased rates of OTR on written multiplication performance. One study examined the effects of increased rates of OTR on acquisition and maintenance of health facts (Sterling, Barbetta, Heward, & Heron, 1997). One study examined the effects of increased rates of OTR by using an error correction procedure during a geography lesson (Barbetta & Heward, 1993). Another study examined the effects of improving the quality of OTR through a talk/mand procedure on student disruptive behavior (Gunter et al., 1994). Koegel, Dunlap, and Dyer (1980) examined the effects of increased rates of OTR on the performance of various tasks (verbal imitation, object discrimination etc.). One study (Wolery, et al., 1992) compared choral and individual responding on community-sign words. McKenzie and Henry (1979) examined the effects of teacher questions (testlike events) on attention and correct responses during a science lesson. Findings and key characteristics of these 18 studies are presented (Table 2-1).

Results

Participants. A total of 127 (55 in one experimental study and 72 across 17 single subject studies) served as participants across the 18 studies. Twenty-five subjects were female, 47 male, and 55 participants' gender was not reported. The number of participants in each study ranged from 1 to 55. Two studies reported race of each participant (i.e., 5

Non-white and 47 Caucasian; 8 African American and one Caucasian student) (McKenzie & Henry, 1979; Sutherland et al., 2003). Full-scale intelligence quotients (IQ) scores were reported in ten studies (i.e., Barbetta & Heward, 1993; Barbetta et al., 1993; Gunter et al., 1994; Koegel et al., 1980; Skinner et al., 1989; Skinner et al., 1991; Skinner et al., 1994; Sterling et al., 1997: West & Sloan, 1986; Wolery, et al., 1992). IQ scores were measured by the Kaufman Assessment Battery for Children, Standord-Binet or using the Wechsler Intelligence Scale for Children-Revised (WISC-R), and the range of IQ scores among the participants was 33 to 115 (M = 78.3). Twenty six students were identified as having an EBD, 9 as Learning Disabled (LD), 10 as Educable Mentally Retarded (EMR), 4 as moderate mental retardation (MMR), 3 were diagnosed with autism, 7 as Developmental Handicapped or Developmentally Delayed, one as Intellectually Handicapped, another as Attention Deficit Hyperactive Disordered (ADHD), and one student as Oppositional Defiant Disorder (ODD). Three students in the participant pool received special education services in reading in a self contained classroom according to their Individual Education Programs (IEP) and 6 students received part time reading resource services in a resource room. The grade level of the participants ranged from PK to 12th grade (M = 4th grade).

Setting of Studies. OTR research has been conducted across settings including self-contained classrooms, clinical settings and general education classrooms. Seven studies were conducted in self-contained classrooms for students with EBD, MMR, or students with reading disabilities (Barbetta & Heward, 1993; Barbetta et al., 1993; Gunter et al., 1994; Sainato, et al., 1987; Sterling et al., 1997; Sutherland et al., 2003; Wolery, et al., 1992). Six studies (Koegel, et al., 1980; Sindelar et al., 1986; Skinner et al., 1997; Skinner et al., 1991; Skinner et al., 1994; West & Sloane, 1986) were carried out in separate

rooms, such as a coatroom, testing room, observation room, or a classroom adjacent to the student's main classroom. In one study (Skinner & Shapiro, 1989), the setting was unspecified but was conducted in a location at a University Affiliated School for behaviorally disordered students. Only two studies (Carnine, 1976; Ferkis et al., 1997) were conducted in a general education classroom during small group or individual instruction, but not during large group instruction. One study (McKenzie & Henry, 1979) was conducted in a general education classroom setting. In another study (Miller et al., 1995) one experiment took place in a self-contained classroom and another in a general education classroom.

Dependent Variables

Researchers in two studies examined the rate of disruptive behavior (Gunter et al., 1994; West & Sloane, 1986). In addition to disruptive behavior, researchers measured on- or off-task task behavior in 6 of the 18 studies (Carnine, 1976; McKenzie & Henry, 1979; Miller et al., 1995; Sainato et al., 1987; Sindelar et al., 1986; Sutherland et al., 2003). Six of the 17 studies (Barbetta & Heward, 1993; Gunter et al., 1994; McKenzie & Henry, 1979; Sainato et al., 1987; Skinner et al., 1991; Sterling et al., 1997) measured active student responding. In 17 of the 18 studies, researchers measured the number of correct responses (i.e., the number of sight words mastered in various subjects as math, geography, and health science or community-sign words). Finally, researchers in one study (Koegel et al., 1980) measured various skills (e.g., verbal imitation, object discrimination, number discrimination etc.).

Independent Variable: Increased Rates of OTR

An opportunity to respond was the independent variable across all studies. However, researchers utilized several methods to increase teacher's rates of OTR during academic

lessons. For example, Sutherland et al. (2003) used an observation feedback procedure, consisting of several components to increase the classroom teacher's rate of OTR. Three studies (Ferkis, et al., 1997; Sainato, et al., 1987; West & Sloane, 1986) used a set criterion (pre-determined) rate and utilized a stop-watch and prompts as methods to increase the rate of OTR per minute during intervention phases in comparison to baseline phases. In four studies (Barbetta & Heward, 1993; Barbetta, et al., 1993; Gunter, et al., 1994; Sterling, et al., 1997), researchers implemented an error correction technique after a student's incorrect response as a strategy to increase the teachers' use of OTR and student correct responses. For example, researchers repeated questions (OTR) until the student responded with the correct response. In 8 studies (Carnine, 1976; Koegel et al., 1980; McKenzie & Henry, 1979; Sindelar, et al., 1986; Skinner & Shapiro, 1989; Skinner, et al., 1991; Skinner, et al., 1994; Skinner, et al., 1997), researchers manipulated the presentation rate of questions during lessons to increase the rate of OTR. In one study (Miller et al., 1995) the authors utilized a combination of a faster presentation rate and error correction procedure (choral responding). A faster presentation rate of OTR was achieved through (a) less delay or no delay between teacher questions, or (b) having less delay or no delay between student responses and introduction of the next teacher question. In addition, students may have more OTR when teachers used choral responding (i.e., every student simultaneously receives an OTR) compared to individual responding.

Description of Implementers

Classroom teachers were used to increase the rates of OTR (independent variable) in 7 studies (Gunter et al., 1994; McKenzie & Henry, 1979; Miller et al., 1995; Sainato et al., 1987; Sterling, et al., 1997; Sutherland et al., 2003; Wolery, et al., 1992), while in 11 studies (Barbetta & Heward, 1993; Barbetta et al., 1993; Carnine, 1976; Ferkis et al.,

1997; Koegel, et al., 1980; Sindelar et al., 1986; Skinner & Shapiro, 1989; Skinner et al., 1991; Skinner et al., 1994; Skinner et al., 1997; West & Sloane, 1986), the primary researcher or graduate students implemented the OTR intervention.

Research Designs

In one study (McKenzie & Henry, 1979) the researchers utilized a group design (i.e., random assignment procedures for two third-grade classrooms) to create two theoretically comparable treatment groups. In the other 17 studies, researchers used various single subject designs to demonstrate a functional relation between the independent variable and dependent variables. *Adapted alternating treatment* designs (Sindelar, Rosenberg, & Wilson, 1986) were used in 6 out of 17 studies (Sindelar et al., 1986; Skinner & Shapiro, 1989; Skinner et al., 1991; Skinner et al., 1994; Skinner, et al., 1997; Wolery, et al., 1992). *Withdrawal* designs (Kazdin, 1982) were used in 4 studies (Carnine, 1976; Gunter et al., 1994; Miller et al., 1995; Sutherland et al., 2003). An *alternating treatment design* (Kennedy, 2005) was employed in 4 studies (Barbetta & Heward, 1993; Barbetta et al., 1993; Ferkis et al., 1997; Sterling et al., 1997). One study (Sainato et al., 1987) made use of a *changing criterion design*. While another study (West & Sloane, 1986) used a *multi-element* single subject design and Koegel et al. (1980) utilized two multiple treatment reversal designs, an ABABCBC design in the first experiment and an ABABC design in the second.

To illustrate the use of different designs, consider the following examples. An alternating treatment design (ATD) was used to compare the effects of OTR and no OTR on student behavior. For example, Barbetta et al. (1993) compared the difference between active student response (ASR) error correction and no-response (NR) error correction on sight word acquisition. Adapted alternating treatment designs (AATD) (a modified version

of the alternating treatment design) were utilized to demonstrate the effects of two instructional methodologies on two different, but equivalent instructional sets with the same level of difficulty of items. Sindelar et al. (1986) also used an AATD design to determine the effects of a choral vs. an individual mode of questioning on two distinctive instructional sets. The two instructional sets were two sets of 5 sight words of equal difficulty. Different rates of acquisition on the two sets of words were compared to the two modes of responding. Wolery et al. (1992) used an adapted alternating treatments design in three experiments to evaluate the use of choral and individual responding in teaching word reading to students with moderate mental retardation. Eight community-sign words were targeted for instruction, four taught with choral responding and four with individual responding.

An ABAB withdrawal design was used to demonstrate two separate replications of the intervention. The first instance was when the baseline was reintroduced (A-B-A) and the second case was when the intervention was reintroduced (A-B-A-B) (Sutherland et al., 2003). A functional relation between the independent variable and dependent variable was demonstrated because there were two replications within the same study. For example, Sutherland and colleagues demonstrated that when the teacher increased the rate of OTR to a class of students with EBD, there was an increase in correct responses, and on-task behavior, and a decrease in disruptive behavior. When the intervention was withdrawn, there was a decrease in correct responses and on-task behavior, and an increase in disruptive behavior. When the intervention was presented a second time, the initial results were replicated.

A multi-element design was used to demonstrate a functional relation among independent and dependent variables by alternating between at least two different intervention conditions. For example, West and Sloane (1986) compared four treatment conditions (high point rate/fast presentation, high point rate/slow presentation, low point rate/fast presentation, low point rate/slow presentation) on the rate of student academic responses opportunities.

Changing criterion designs were used to demonstrate a change in behavior as it improved incrementally to match a specified performance level. For example, Sainato et al. (1987) assessed the effectiveness of choral responding on pre-school students' correct responses by changing the level of group responding from 3 OTR/minute to 5 OTR/minute.

Discussion

The results of all the studies indicated a positive relationship between an increased rate of OTR and ASR, on-task behavior, correct responses, and fewer disruptive behaviors of students. A synthesis of the 18 articles yielded 4 categories of OTR to codify the results of each study: (1) faster presentation rate, (2) choral responding, (3) error correction, and (4) errorless learning. Thus, the studies will be discussed in relation to these four categories.

Faster Presentation Rate

Carnine (1976) showed that a faster presentation rate of OTR (presenting a new question immediately following a student correct response) resulted in higher percentages of correct responses (from 41% to 85%) across students than a slower presentation rate (waiting 5 seconds after a student correct response before presenting the next question). The mean number of seconds per task for the three fast-rate phases was 5.0; the mean

number of seconds per task for the slow rate phases was 14.2. Therefore, during the fast pace condition the rate of OTR was 12/min and during the slow pace condition the rate of OTR was 4.26/min. Koegel et al. (1980) had similar results to the Carnine study and demonstrated that short intertrial intervals (1-second) produced higher levels of correct responding than longer intervals (minimum of 4 seconds) across all students identified with autism. In the first shorter intertrial interval condition, correct responding increased by an average of 20% (from 40% during the longer intertrial condition) across three students and in the second shorter phase correct responding increased by 40% (from 20% in the second longer intertrial condition). In addition, there were improving trends in student performance and rapid acquisition of tasks and words with the short intertrial intervals, in contrast to minimal or no change with the long intervals.

However, a study by Skinner et al. (1994) had results that conflicted with findings from the Carnine (1976) and Koegel et al. (1980) study. Skinner's findings did not support that increasing the pace of instruction was more effective than a slower pace instruction. In Skinner's study, the authors compared a rapid pacing intervention by using an immediate inter-trial interval (ITI) to a 5 second ITI. In the immediate ITI, the experimenter gave the next word to the student immediately after a learning trial, in the 5-second ITI, the experimenter waited 5 seconds before presenting the next word. Both conditions produced the same results for the number of reading words mastered; thus, there were no differences in student correct responses. However, the slower presentation rate took an average of 103 seconds longer per session than the faster presentation rate; and indicates a slightly less efficient use of instructional time. Therefore, teachers could cover more or review more material by utilizing a faster presentation rate.

Skinner et al. (1991) demonstrated that a faster presentation rate resulted in greater math fluency (digits correct per minute) and accuracy (percentage of problems correct). The authors compared a verbal cover, copy, and compare (VCCC) condition with a written cover, copy, and compare (WCCC) condition with two students with EBD. Although the length of time for each session was held constant across conditions (4 minutes), the VCCC condition yielded twice the number of correct responses than during the WCCC conditions. The findings showed that the increase in math accuracy and fluency was due to the faster presentation rate (increase rate of OTR) under the VCCC condition. The results of the Skinner study supports Carnine's (1976) findings that academic interventions with low levels of active responding (AR) are not as effective as instruction with higher levels of AR at a faster presentation rate.

Skinner et al. (1997) showed that two students had improved performance in mathematics during a VCCC condition compared to the WCCC. During a time held constant phase (204 sec.), the first student completed 86 learning trials using the VCCC intervention compared to an average of 26 learning trials during the WCCC procedure. The second student completed a mean of 83 learning trials during the VCCC intervention compared to 33 during the WCCC intervention. During the trials held constant phase, the first student took an average of 143 seconds longer using the WCCC intervention to complete the learning trials than the VCCC intervention. A second student had similar results and took 102 seconds longer to complete the learning trials using WCCC intervention than the VCCC intervention. The authors concluded that verbal responding was an efficient method of instruction, because the amount of learning trials was increased and students demonstrated an improvement in learning levels in less time.

Skinner and Shapiro (1989) set a faster presentation rate of OTR by using taped words and drill interventions (two OTR, the students read the list of words twice) and continuous and intermittent assessment (one OTR, the list of words were read once). For all 5 students, correct oral reading rates were higher during the taped word and drill condition than the continuous and intermittent assessment condition. During the taped-word condition, mean numbers of words read correctly was 78 words per minute and for the drill condition the mean was 78. For the continuous assessment condition, the mean number of words read correctly was 59 and for the intermittent assessment the mean was 50. Because reading rates were similar under the taped-word and drill condition, and higher in both conditions than the continuous and intermittent conditions, the authors stated that the improved performance was likely due to the increased rate of OTR, rather than the mode of intervention.

West and Sloane (1986) supported and extended the Carnine (1976) study by demonstrating that a faster presentation rate set at a criterion level of 3 OTR per minute was related to lower rates of disruptive behavior and more correct responses in comparison to a slower presentation rate (one OTR per minute). During the slow presentation rate (one OTR per minute), the mean percentage of intervals scored for all combined categories of disruptive behaviors across 5 participants was 33%, compared to 18% during the faster presentation rate. Students demonstrated 2.4 correct responses per minute (rpm) during the faster presentation condition and 0.9 rpm during the slower presentation rate condition. The authors noted, however, that there was no clear difference in the two conditions regarding percentage of correct responses (i.e., students in the fast presentation rate had more correct responses but all had more errors).

Opportunities to Respond and Choral Responding

Sutherland et al. (2003) utilized an observation feedback procedure to increase the teacher's rate of choral responding (OTR). The mean rate of OTR per minute for the baseline phase was 1.68 rpm and this rate increased to 3.52 rpm during the first intervention phase. During the withdrawal phase, the teacher's mean rate of OTR per minute decreased to 2.25 rpm and this rate increased to 3.49 rpm during the reintroduction of the intervention. The results of the study implied that there was a functional relation between an increased rate of OTR and more correct responses, fewer disruptions, and increases in on-task behavior. The authors demonstrated by using an ABAB withdrawal single subject design that during the first (B) and second intervention phases (B) students responded on average about 1.32 more correct responses per minute than during baseline (A) and withdrawal phases (A). The percentage of correct responses increased during the first intervention phases by 3.7 % compared to the baseline phase and increased by 18.3 % during the reintroduction of the intervention phase compared to the withdrawal phase. The mean rate of disruptive behaviors decreased by 0.63 per minute from the baseline to first intervention phase and 1.14 per minute from the withdrawal phase to reintroduction of the intervention phase. Finally, the percentage of on-task intervals for students increased by 23.5% from baseline to first intervention phase and by 17.2% from the withdrawal phase to the reintroduction of the intervention phase. The results of the study support instructional theory that hypothesizes that when teachers use fast paced instructional practices and give students high rates of OTR, the results are improved behavioral and academic outcomes for students with EBD.

Sainato et al. (1987) investigated the use of two rates of choral responding with preschool children with significant behavioral and developmental delays. The results of

the study were similar to Carnine (1976) and showed that at a faster presentation rate of 5 OTR per minute produced more student correct responding for three students than the 3 OTR per minute condition. Average rates across three students were 0.8 rpm for the baseline condition, 2.47 rpm for the 3 OTR per minute condition, and 4.58 rpm for the 5 OTR per minute condition. However, the 3 OTR per minute condition had slightly better results for on-task behavior than the 5 OTR per minute condition (90.3% compared to 81%).

McKenzie and Henry (1979) showed by using a chi-square test, $X^2(1) = 4.99$, $\alpha < .05$. that more pupils were off-task in the individually addressed question group than in the test-events (unison hand raising) group.

Sindelar et al. (1986) compared two modes of responding: ordered and choral. The authors found a slight but significant difference between sight words mastered across all three groups of students during the choral responding condition than the ordered response condition. On a post-instruction test, the students in the choral responding had a higher percentage of words read correctly than the students in the ordered responding condition (group 1 had 14% more, group 2 demonstrated 6% more, and group 3 displayed 15% more). There was not a substantial difference in the percentage of on-task behavior between conditions (83% for the choral responding condition and 79% for the ordered responding condition). These findings support the finding by McKenzie and Henry (1979).

In three experiments, Wolery et al. (1992) compared choral vs. individual responding in small group arrangements. In Experiment 1, the effects of the two conditions were compared where the number of exposures was equal across conditions but the number of OTR was greater in the choral responding mode. In Experiment 2, the

number of exposures was greater in the individual responding mode but the amount of OTR was equal across conditions. In Experiment 3, the more effective conditions from Experiment 1 and 2 were compared. In Experiment 1 the results indicated that choral responding was the more effective condition for 3 of the 4 students. In Experiment 2, individual responding was more effective for all students. In Experiment 3, when the more effective conditions were compared (exposures in the individual to choral conditions was 2:1 and the ratio of OTR in the individual to choral conditions was 1:2), the two types of responding produced relatively equal learning and only a slight difference in effectiveness and efficiency were found. Based on results from this study, the authors have some support to make the following recommendation to teachers–if all children in the group need to learn the same skills, then choral responding may be appropriate. However, if students are at different learning levels and learning different skills, then individual responding is more appropriate.

Error Correction

Ferkis et al. (1997) examined the efficiency of instruction on sight word mastery in two studies. In study 1, the authors compared a single response condition and a repeated response condition. The single response condition (ASR) consisted of one response opportunity (one OTR) per learning trial, while the repeated response condition was identical to the single response condition except for when the student made an error. When an error occurred, the investigator provided feedback until the student gave the correct response, then the investigator prompted the student to cite the correct word 4 more times. Therefore, the repeated response condition took more time to implement.

Results from study 1 indicated that there was an equivalent number of words mastered for three participants in the two conditions. However, the single response

condition was more efficient to implement because it took fewer training sessions to master an equivalent amount of sight words and the training time spent on each word was considerably less.

In study 2, the authors again compared two conditions involving variations of repeated sets of learning trials on sight word acquisition. Single learning trials repeated three times (i.e., 3 x A-R-C) were compared to three repeated sets of learning trials with repeated response opportunities at the end of the learning trial (i.e., 3 x A-R-C-R-R-R-R). The experimental procedures in this study were consistent with study 1 in that the ratio of response opportunities was the same only each condition was multiplied three times. The results of this study were also similar to study 1. That is, in the two conditions an equivalent number of sight words were mastered. The authors concluded from the results of the two studies that increasing the number of response opportunities (OTR) as in the repeated response condition does not increase the effectiveness of the instructional procedure because the repeated procedure takes more time to complete than the single response procedure.

Barbetta et al. (1993) used an alternating treatments design to compare the effects of active student response (ASR) followed by error correction with a no-response (NR) condition. In the ASR error-correction condition, each trial ended with the student responding with a correct response after a teacher prompt, while in the no-response condition the teacher provided the correct response and the student passively attended. Results of the study showed that students demonstrated more correct responses during the ASR error correction than in the NR error correction. For all 6 students, the mean of the same day test scores, mean of next-day test scores, number of correct responses, were

higher for all 6 students during the ASR error correction than the NR error correction. In all students but one, the maintenance of all learned words was higher in the ASR condition than the NR condition. For one student, the rate of maintenance was the same for both conditions (i.e., 78%). The results of this study supported research that showed a functional relation between ASR and academic achievement.

Similar to the Barbetta et al. (1993) study, Sterling et al. (1997) compared the effects of ASR and on-task (OT) instruction on the acquisition and maintenance of health facts by students identified as having learning disabilities. During ASR instruction, the student ended each learning trial by repeating the correct answer three times, while during OT instruction the student passively watched the teacher make a correct response. The results of the study indicated that the students learned and maintained more health facts taught under the ASR condition than the OT condition. The authors concluded that having students actively engaged during instruction through active responding was more effective than having students passively watch and hear the teacher give instruction. The results of the study support findings from earlier studies (Barbetta et al., 1993; Sindelar et al., 1986) and indicated that there is a functional relation between high rates of academic responding and achievement of learners with disabilities and that choral responding is an effective method to increase ASR.

Barbetta and Heward (1993) used an alternating treatments design to compare the effects of ASR error correction and NR error correction during a geography lesson with three students with learning disabilities. The procedure for the ASR and NR condition was the same as in the Barbetta et al. (1993) study. The mean number of ASR, across the three students, under the ASR error correction was 21, while the mean number for the NR

condition was 7.3. On same day tests, students had higher scores (66% of the time) under the ASR error correction instruction than under the NR error correction instruction. On next day assessments, students had higher scores (77% of the time) under the ASR error correction instruction than under the NR error correction instruction. Maintenance tests were given to the three students one week after instruction, and tests showed that maintenance under number of capitals learned for all three students overall was ASR = 83% in comparison to NR = 69%. The results of this study were similar to Barbetta et al. That is, students learned and maintained more capitals taught with ASR error correction than with NR error correction. The present study extended Barbetta's earlier study by including a different population of students. In this study the students were ages 10-11 years old with learning disabilities, while the Barbetta et al. study included students ages 8-9 years old with developmental disabilities.

Miller et al. (1995) used multiple treatment reversal designs (ABABCBC and ABABC) and demonstrated that the first grade and special education students wrote answers to the math facts at the highest correct rates and highest level of accuracy during the time trials with error-correction than time trials without error correction. For the first grade students, this rate was 13.3 correct answers per minute compared to 4.8 per minute in the baseline condition and 7.3 per minute compared to the time trial without error correction. Students in the special education classroom also had highest rates of correct responses during time trials with error-correction (17.3 per minute), compared to 8.4 per minute in the baseline condition and 13.2 per minute compared to the time trial without error correction condition.

Errorless Learning

Gunter et al. (1994) used an ABAB withdrawal design to evaluate the effects of a teacher using a talk/mand procedure on one student's disruptive behavior. The essential component of this procedure was that the teacher embedded the correct answer within the question so that the student had a greater probability of responding correctly. The results of the study indicated that the student had fewer disruptive behaviors during the intervention condition. For example, the mean rate of disruptive behavior was 0.28 per minute during the baseline and withdrawal conditions and this rate decreased to 0.09 per minute during the two intervention conditions. Gunter and colleagues hypothesized that the decrease in disruptive behavior was related to the teacher implementing the talk/mand procedure.

In sum, the results of the studies indicate that there is a positive relationship between an increased rate of OTR and on-task behavior, correct responses, and fewer disruptive behaviors of students. The following section will discuss the literature base according to social validity and treatment integrity.

Social Validity

Kennedy (2005) defines social validity as "the estimation of the importance, effectiveness, appropriateness, and/or satisfaction various people experience in relation to a particular intervention" (p. 219). According to Kennedy, social validity describes the procedures, or results of an experiment within a social context (i.e., instruction in a classroom, passenger's anxiety while flying in an airplane or player's performance on a basketball court). Kennedy suggests that in the early stages of developing an intervention, some researchers conduct experiments with the primary focus of analyzing the effectiveness of an intervention and may not always include social validity assessments in

their study. After positive results have been demonstrated in a few studies, researchers will then assess or estimate whether an experiment has social importance and determine if the participants' quality of life has improved.

In classroom-based research it is important to determine the most efficient method of instruction in order to increase the likelihood that teachers will use that strategy in the future. Comparing types of instructional strategies is one way to determine which instructional strategies produce the "best" results. All but one study (Gunter et al., 1994) compared two types of interventions (i.e., individual and choral, fast and slow presentation rate; higher criterion rate and lower criterion rate; WCCC and VCCC). Gunter et al. investigated a talk/mand procedure to verify a recent formulated hypothesis (i.e., when a teacher presents a challenging academic task, the task becomes an aversive stimulus to the student). The student may then become disruptive in order to avoid the teacher's task demands because the responses needed to answer the questions correctly are above the skill level of that student.

In this literature review, 9 of the 18 studies 50.0% (Barbetta & Heward, 1993; Carnine, 1976; Ferkis et al., 1997; Gunter et al., 1994; Skinner & Shapiro, 1989; Skinner et al., 1994; Skinner et al., 1997; Sterling et al., 1997; West & Sloane, 1996) did not assess social validity. In one study, Sainato et al. (1987) included a social validity assessment and asked 10 regular education kindergarten teachers (outside judges) to observe the three students during baseline condition, a 3 OTR per minute condition and a 5 OTR per minute condition. All 10 teachers rated the students' behavior at the highest appropriate level, during the 5 OTR per minute condition. In addition, the teachers stated that if the students

performed in their classroom as they did in the 5 OTR per minute condition, they could be mainstreamed into general education settings.

Sindelar et al. (1986) compared the effects of choral and ordered responding in a classroom environment and after reviewing the results discussed the feasibility and usefulness of incorporating choral responding into small group instruction using teacher prepared lesson plans. In addition, Sindelar and colleagues surveyed 24 special educators and asked them if the results of the study were significant enough to incorporate choral responding in their lesson plans. The mean response by the teachers indicated that choral responding did produce enough positive effects and that they would incorporate this strategy in their instructional strategies.

Sutherland et al. (2003) noted the increased rate of OTR may not be socially valid in special education classrooms, because the teacher in the study did not maintain an increased rate of OTR from the intervention phase over to the withdrawal phase in the experiment. Therefore, the authors concluded that most special education teachers would not easily adopt this strategy in their classroom environment. The authors also speculated that decreases in disruptive behavior and increases in correct responses and on-task behavior were not enough of a reinforcer for the teacher to incorporate higher rates of OTR into his teaching strategies.

In the study by McKenzie and Henry (1979), prior to the post test, students were asked to indicate on a 5-point Likert scale instrument (the anchors indicated by faces ranging from a broad smile to a deep frown), (a) how well they thought they would do on the test, (b) how hard they thought the test would be, and (c) how worried they were about

taking the test (a measure of anxiety). However, the researchers did not report results from this scale.

Miller et al. (1995) reported results from student opinion surveys given to the students in the general education classroom and special education classroom. Results from the surveys showed that in the general education classroom, the majority of students enjoyed grading their own paper, liked the 1-minute time-trial procedure with self-correction over the other two procedures, felt that procedure helped them the most, and that out of the three procedures they would prefer to do the 1-minute time trial with self-correction. Results from the survey given to the student in the special education classroom produced similar results.

In the study by Skinner et al. (1991), the procedure of VCCC was found to be more effective and efficient than the WCCC procedure. However, the authors claimed that the two procedures should be socially validated in a classroom environment because students work quietly under the WCCC procedures and do not emit loud responses like in the VCCC procedures. In another study, West and Sloane (1986) did not use social validity assessments however, they speculated that teachers would think that a faster presentation rate is a superior instructional strategy to using aversive consequences for students with disruptive and off-task behaviors during reading instruction. Barbetta et al. (1993) estimated that the results of their study were socially valid and concluded that because the results of using ASR error correction had positive results and was shown to be an efficient strategy, teachers could easily adapt ASR during various instructional activities in their classrooms.

It is important that researchers incorporate social validity assessments in future research studies because teachers can provide feedback on the feasibility and acceptance of implementing OTR. For example, a teacher who has a classroom with a history of high rates of disruptive behavior may prefer a WCCC procedure instead of a VCCC (even though VCCC is more efficient) because the WCCC does not require a verbal response and the teacher may fear that the class may become boisterous when the whole class responds. Therefore, if researchers use social validity assessments they may incorporate new information into their research questions and perhaps find more efficient and effective methods to implement OTR.

Treatment Integrity

Treatment integrity is the extent to which the independent variable is implemented according to the intention of the researchers (Gresham, Gansle, & Noell, 1993). The results of a synthesis of the 18 reviews showed that 11 out of 18 studies (61.1%) (Barbetta, et al., 1993; Barbetta & Heward, 1993; Ferkis, et al., 1997; Keogel et al., 1980; Sainato, et al., 1987; Skinner, et al., 1994; Skinner & Shapiro, 1989; Skinner, et al., 1997; Sindelar, et al., 1986; Sterling, et al., 1997; Sutherland et al., 2003; Wolery, et al., 1992) provided a discussion of treatment integrity in their studies. This percentage (61.1%) is high in comparison to the findings of a more general review conducted by Gresham et al. (1993). In their review of applied behavior analysis studies with children as subjects that had been published in the *Journal of Applied Behavior Analysis* between 1980 and 1990, treatment integrity had been measured in only 16% of the studies.

In this review, the authors used various terms (i.e., procedural reliability, procedural integrity, procedural fidelity, or teacher training) to indicate treatment integrity. Skinner et al. (1994) and Skinner and Shapiro (1989) used treatment integrity checklists to ensure

that the primary researcher engaged in the proper order of treatment procedures. In addition, trained independent observers recorded accuracy of time elapsed across each intervention session, the accuracy of words during assessments and across intervention sessions, materials used and instructions read as planned by the researchers.

The primary experimenters in the Skinner et al. (1997) study used event recording and verbal prompts to ensure students followed correct procedures. A second experimenter provided IOA on the time required for students to complete assessments and treatments. In the Sindelar et al. (1986) study, two observers ensured that the teachers for the three groups accurately presented instructions, feedback and type of responding mode (choral or ordered). Ferkis et al. (1997) merely stated that procedural integrity was 100%, but did not provide information about how treatment integrity was actually evaluated and measured. Barbetta et al. (1993) and Sterling et al. (1997) reported that a second observer used a frequency count to record the occurrence or nonoccurrence of the essential components of the instructional procedures implemented by the experimenter. Sainato et al. (1987) trained the teacher to implement an increased rate of OTR (3 OTR/min and 5 OTR/min) and provided feedback until a criterion level of 90% accuracy was achieved. In the Barbetta and Heward (1993) and Koegel et al. (1980) studies, trained independent scorers recorded the experimenter's implementation of the independent variable from video taped recorded sessions. Wolery et al. (1992) measured teacher behaviors (cueing students, providing wait time, asking the questions and waiting during the intertrial interval) for procedural fidelity during probe sessions and instructional sessions.

Unclear operational definitions of the independent variable limit the researchers' ability to conclude that the changes in the dependent variable was related to the

manipulation of the independent variable (Gresham et al., 1993). Gunter et al. (1994) reported that the operational definition of the *talk* code needed to be clarified and differentiated between talk related to instructional information and social talk therefore, this limitation was a threat to the internal validity of their study.

In 11 studies, researchers reported high IOA scores during treatment integrity checks. The scores ranged from 90% to 100%. Six studies (Koegel et al., 1980; Skinner et al. 1997; Skinner & Shapiro, 1989; Sterling et al., 1997; Sutherland et al., 2003; Wolery, et al., 1992) reported that treatment integrity was measured on 42%, 18%, 17%, 20%, 22%, and 37% of the sessions across conditions using a treatment integrity checklist.

Threats to Internal Validity

In a carefully designed experiment, researchers are able to demonstrate with a high degree of certainty that an independent variable was the primary influence in changing the dependent variable(s). The extent to which researchers are able to rule out alternative explanations for the change in the dependent variable is called internal validity (Kazdin, 1982). Alternative explanations other than the independent variable that could account for a deviation in the dependent variable is a threat to the internal validity of the study. Kazdin describes 8 threats to internal validity, and an interpretation of the synthesis of the 18 studies yielded 3 types of threats to internal validity (history, selection bias, and testing). These explanations will be discussed next.

History. Four studies (Carnine, 1976; Skinner et al., 1994; Skinner et al., 1997; Sutherland et al., 2003) describe history effects in their studies. History effects arise from events that occur at the same time of the intervention that have the potential to alter the results of the experiment. Sutherland et al. (2003) reported several historical events other than increased rates of OTR (i.e., a combination of OTR, teacher use of praise, and

increased rate of correct responses) that may have contributed to a decrease in student disruptive behavior. Skinner et al. (1994) and Skinner et al. (1997) reported that the increase in reading accuracy of three students might have been influenced by learning outside the experimental conditions, although Skinner does not provide enough detail to interpret this statement. Carnine (1976) suggested that students verbally copying one another during oral responding could impose a potential history threat to any study. He stated that in his study verbal copying was an incompatible behavior with on-task behavior (the primary dependent variable); therefore, it was unlikely to have occurred. However, researchers may want to consider investigating the effects of copying during student responding in future studies. Finally, Wolery et al. (1992) stated that in their study history was controlled for by implementing the individual and choral conditions in an alternating manner across days.

Selection bias. Two studies (Skinner, et al., 1997; West & Sloane, 1986) discussed that selection bias may have been a possible threat to the study's internal validity. Selection bias occurs when subjects differ from one another and the results of the dependent variables vary because of these initial differences. Skinner indicated that the increased learning rates during the verbal responding condition as opposed to the written responding condition may have been due to the strengths in the students' ability to verbally process information. West and Sloane indicated that the point delivery system (a schedule of reinforcement and a component of the intervention) had little effect on the student performance accuracy and response rate because of selection bias. The students selected for the study had high rates of disruptive behavior, and the point delivery system was not strong enough of a reinforcer to make an impact on on-task behavior.

Testing. Researchers in three studies (Skinner et al., 1991; Skinner et al., 1997; Skinner & Shapiro, 1989) discussed the possibility of testing as a threat to internal validity of their studies. During an experiment, testing takes place whenever a change occurs in the dependent variable that may be due to repeated assessment (i.e., behavior in a participant can change simply as a result from testing) (Kennedy, 2005). For example, Skinner & Shapiro (1989) and Skinner et al. (1991) and Skinner et al. (1997) cautioned that in their studies, continuous assessment may have influenced the participant's reading performance and increased accuracy of multiplication problems rather than the intervention. Finally, Sterling et al. (1997) indicated that for unknown reasons, intersubject variability existed in the data. For example, a student with a learning disability and who was frequently absent during the study performed better than three other students with developmental disabilities. Miller et al. (1995) reported that the unknown role of practice effects, the extent to which a student's performance improves as a function of the practice because of repeated measurement may have been a source of threat to internal validity.

In summary, threats to the internal validity of a study limit the extent researchers can demonstrate that the intervention accounted for a change in the dependent variable. If researchers cannot demonstrate that the intervention accounts for change in one study then it will be difficult to extend the results to other persons or settings.

Generality and Threats to External Validity

The purpose of external validity is to assess whether the results of an intervention in a sample are representative of results that would be found in a larger population. However, a study's external validity is based on its strength of internal validity, systematic replication, and the power of demonstrating a functional relation between the independent and dependent variable (Kennedy, 2005).

Kazdin (1982) summarizes 9 threats to external validity and five of these threats (generality across subjects, across settings, across times, across response measures, and across behavior change agents) are discussed in the section below. Six studies (Gunter et al., 1994; Koegel et al., 1980; Miller et al., 1995; Skinner et al., 1991; Skinner et al., 1997; Sterling et al., 1997) reported threats to *generality across subjects*. Gunter et al. (1994) reported that the findings of his study are difficult to generalize to a larger population, because there was only one participant. In addition, direct and systematic replication was needed to increase the generality of the findings, because the student left the study early during the second intervention phase. Koegel et al. (1980) discussed that the implications from the data of the study pertained to only those participants (children identified with autism) and task combinations. Miller et al. (1995) describe that the results of the study are confined to the participants' age (range 6-12 years old). Skinner et al. (1991) reported that the results favoring a VCCC over a WCCC instructional strategy could not generalize beyond the two elementary school aged children with EBD in the study and reported a need to conduct research with more and varied students. Skinner et al. (1997) hesitated to recommend VCCC over WCCC as an instructional strategy, because only two students participated in the study. Finally, Sterling et al. (1997) stated that additional studies are needed to ascertain if ASR would generalize beyond the participants in their study (i.e., students with developmental disabilities).

Two studies, McKenzie and Henry (1979) and Sutherland et al. (2003) reported threats to generality across settings. McKenzie and Henry recognized that their findings might not generalize to other settings and lessons, while Sutherland et al. claimed that generalizing the findings of the study (located in an inner-city community) to classrooms

with students with EBD in suburban or rural communities could be problematic. Sainato et al. (1987) stated threats to generality across times and discussed the limitations of generalizing the findings outside a 15-minute, pre-school “circle time” activity. Finally, two studies (Ferkis et al. 1997; Barbetta & Heward, 1993) described threats to generality across response measures and commented on limitations of extending error correction procedures beyond academic tasks that require one-word responses (i.e., sight words or names of capitals). The authors stated that the effects of error correction could not generalize to more complex tasks, such as, rules for mathematical computation, definitions of science concepts, and sight word mastery within a context of a reading excerpt.

In the study by Carnine (1976), two different types of teachers, a certified special education teacher and a non-certified university student were able to instruct using the fast-rate presentation. Therefore, Carnine suggested that the results of the study could extend beyond the conditions of the experiment and that various types of teachers could have the same results (generalizability across behavior change agents).

In conclusion, when researchers control for threats to internal and external validity, have clear and precise operational definitions, and collect data on the implementation of the independent variable, then the experiment has a high standard of rigor and the results of the study may have strong implications for practitioners (i.e., social validity).

Future Research Directions

A synthesis of future directions of research recommended by the authors in the 18 articles produced two noteworthy areas of future research: (1) systematic replications investigating characteristics related to instructional strategies used to increase rates of ASR and correct responses, and (2) systematic replications related to subject areas and populations.

Based on the literature, there is a need to examine alternative strategies to increase rates of ASR and correct responding. Particularly, the efficacy of teachers utilizing choral responding could be adapted from a small group setting to a large group setting and its effects on ASR and rates of correct responses could be investigated (Barbetta et al., 1993; Sindelar et al., 1986). Conducting choral responding or mixed responding in a large group setting is important because teachers would have the opportunity to assess for learning with all students in the classroom. Moreover, conducting further research to examine optimal ratios of responding modes is another area of further research. At present, an optimal ratio of choral and individual responding modes for teachers in applied settings has not been substantiated – although a ratio of 70:30 choral to individual responding has been suggested by Stevens and Rosenshine (1986). In their article, the authors hypothesized that target students could benefit from frequent practice of choral responding, while teachers could gain information on individual performance by using individual responding.

Testing the generalization of the effects OTR across subjects is another area of research that may be warranted. For example, researchers could examine the effects of ASR and NR error correction on correct responses that require more than one word (i.e., rules for math computation and science definitions and concepts) (Barbetta & Heward, 1993). Specifically, research is needed to determine how many ASR after incorrect responses are needed for each learning trial (i.e., one, two, or more) in order to achieve an optimal correct response rate (Sterling et al., 1997). Examining the implementation of ASR and error correction on a larger scale across various settings and populations is another needed area of research (Ferkis et al., 1997), and is discussed in the section below.

Subject areas and populations of participants. Systematic replications should also be conducted examining the effects of OTR on different subject areas as well as with different populations. Currently, there is a gap in the research in reading interventions and OTR, particularly with students with learning disabilities and examining the effects of error correction on sight word acquisition and reading comprehension (Ferkis et al., 1997; Skinner & Shapiro, 1989; Skinner, et al., 1991). Researchers may want to consider conducting studies investigating OTR across various content areas (math word problems), settings (general education classrooms) and populations (at-risk youth) (Carnine, 1976; Skinner et al., 1991). In summary, a future research direction could extend the learning trial literature by comparing the three types of OTR (individual, CR and a mixture of 70 % choral responding and 30% individual responding) on decreasing students' disruptive and off-task behavior, as well as increasing ASR with students identified at-risk for EBD.

Summary

In this chapter, the literature on the effects of increased opportunities to respond to academic requests was reviewed. Researchers investigated these effects on academic and behavioral outcomes of students identified with various disabilities in several different classroom settings. The majority (66.1%) of students in this literature review were male, and 43.3% of the students were identified as EBD. All the researchers were interested in measuring student academic outcomes, and 17 out of the 18 researchers measured the frequency of correct responses. Other dependent variables of interest were student on-task behavior and frequency of disruptive behaviors. Researchers manipulated these variables with various methods to increase rates of OTR (setting a criterion level, repeating learning trials, utilizing error correction, and faster presentation rates of OTR). In 7 of the 18 studies (38.8%), the teacher implemented the higher rate of OTR. Various single subject

designs (i.e, adapted alternating treatments, alternating treatments, withdrawal, changing criterion, and multi-element designs) were used in all of the studies.

Social validity assessments were reported in 9 of the 18 studies (50.0%), and there was a discussion of treatment integrity in 11 of the 18 studies (61.1%). History, selection bias, and testing were reported threats to internal validity, while generality across subjects, across settings (i.e., different types of instructional settings and classroom settings), across times, across response measures, and behavior change agents were reported threats to external validity.

Carnine (1976) and Skinner et al. (1994) suggested extending their studies by examining if “think time” (giving students 2-3 seconds after a teacher question) is an effective strategy in maintaining high rates of correct responses and minimizing off-task behavior. Researchers in two other studies (Barbetta et al., 1993; Sindelar et al., 1986) suggested investigating the use of choral responding in a large group format for future studies. Finally, researchers could examine increased rates of OTR in various subject areas as reading fluency and science.

Although researchers examining the effects of OTR on student academic and behavioral outcomes have shown positive effects, no clear trends in this line of research have been established because of the limitations of the studies. These limitations include: (a) settings of studies have been mostly analogue or small group, (b) the Wolery et al. (1992) and Sindelar et al. (1986) studies would be difficult to replicate in a natural setting because of the length of time and number of OTR involved, (c) systematic replications of earlier studies needs to be implemented so that effective teaching practices can be established, (d) validation of teacher use of choral vs. individual or mixed responding still

needs to be validated in natural settings; and (e) there currently exists no clear evidence of whether teachers are (or how often) spontaneously giving students high rates of OTR in school settings.

Statement of the Problem

Giving students high rates of OTR is an engaging practice that allows teachers to teach more in less time (Barbetta & Heward, 1993). Therefore, students at-risk for EBD (who are also likely to have academic delays) may increase their skill levels if this practiced is used. When students at-risk for EBD do not make sufficient academic progress, they are more likely to: disrupt environments, threaten others, fail to complete assignments, fight with peers, and argue with teachers (Nelson & Roberts, 2002). Therefore, from a negative reinforcement perspective (Gunter & Coutinho, 1997), when a teacher presents a challenging academic task, the task has a likelihood of becoming an aversive stimulus to the student; thus increasing the probability of the student engaging in problem behavior to avoid the task. If the student engages in problem behavior and continues to avoid the task, the result is loss of valuable instruction and in the long-term a higher probability of school failure.

Choral responding (CR) is one type of OTR that has been demonstrated to increase student engagement and correct responses, and decrease problem behaviors. To date, researchers primarily have investigated the use of CR in small group settings; however, instruction often occurs within a large group setting, particularly in general education classrooms. Currently there is a small body of literature that has investigated the use of CR in large group settings, and no researchers have compared choral with mixed responding. The results of this literature review indicated that only one of 18 studies examined CR in a large group and general education setting (Miller et al., 1995).

Moreover, only two studies (Carnine, 1976; Ferkis et al., 1997) were conducted in general education classroom settings, and one of these studies examined CR during small group or individual instruction (Carnine, 1976). Ferkis et al. utilized an error correction procedure during a small group setting. McKenzie and Henry (1979) examined unison hand raising (a nonverbal type of choral responding) and was the only study conducted in a general education classroom. The other studies employed CR in special education classrooms (Sainato et al, 1987; Sutherland et al., 2003) and one (Miller et al.) a combination of both settings.

Miller et al. (1995) utilized CR in a general education classroom in one experiment as an error correction procedure rather than as an antecedent strategy. In this study, students chorally responded after incorrect responses while grading worksheets. At present, there is some evidence to support the positive effects of CR as an antecedent procedure used in the beginning of a learning trial before errors are made. It is important to investigate CR as an antecedent strategy because manipulating antecedent events within learning trials involves maximizing the likelihood that the student will respond correctly when presented with a stimulus (in this study, a sight word). Furthermore, based on the results of this literature review, researchers have yet to examine the effects of CR in a general education classroom during large group instruction with students at-risk for EBD using single subject methodology.

This literature review did not consist of any studies that compared an optimal ratio of using a combination of individual or choral responding. Sindelar et al. (1986) compared the effects of individual and choral responding on the number of sight words mastered with a small group of students. Theses authors cited an earlier article by Stevens and

Rosenshine (1981) who suggested investigating whether 70% choral to 30 % individual is an optimal ratio for teachers to utilize during instruction. The purpose of the individual turns allows for testing specific children and gain information on individual performance. It is the purpose of this study is to investigate this area of research.

Finally, in a study by Anderson, Evertson, and Brophy (1979), the authors found that teachers achieving the highest scores on the choral responding (CR) variable utilized that CR once every four minutes. Still, there is a lack of evidence of teachers' natural rates of giving OTR, specifically CR during large group instruction. Determining this rate is important so that future researchers will have some idea of how much to contrast baseline rates of OTR to rates during intervention phases. At the moment, one study Sainato et al. (1987) has given some indication that 3 or 5 OTR per minute is sufficient to increase correct response rates and decrease disruptive behavior, however this study was conducted in a pre-school setting with children identified with developmental delay (DD) and future research is needed to determine if this rate is adequate for other settings and participants.

This study extended the OTR literature by comparing three types of OTR individual, choral and mixed responding in a 2nd grade classroom with 6 students identified at-risk for EBD. Researchers compared three types of responding procedures during the experimental phase of the study (individual, choral, and a mixed responding (70% choral and 30% individual). The rate of OTR per minute during the three procedures was 5 per minute and was based on the rate during the treatment phase of a previous study (Sainato et al., 1987).

Purpose of the Study

The purpose of this study is to investigate the following research question:

How does a choral responding procedure compare to an individual responding procedure and a mixture of choral and individual responding procedure during group

instruction in a general education classroom on the disruptive, off-task behavior, and active student responding of high-risk students?

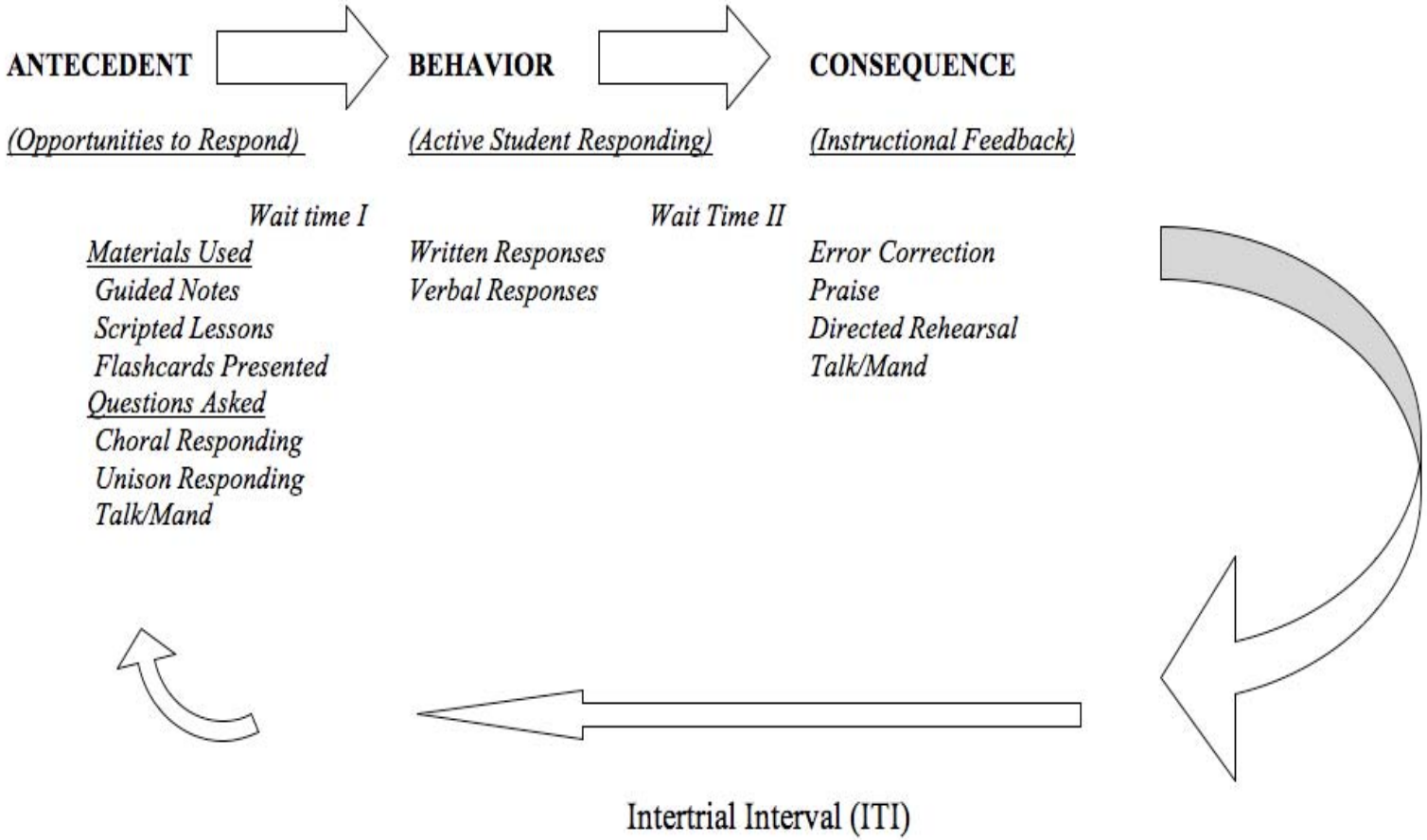

Figure 2-1. Learning trial

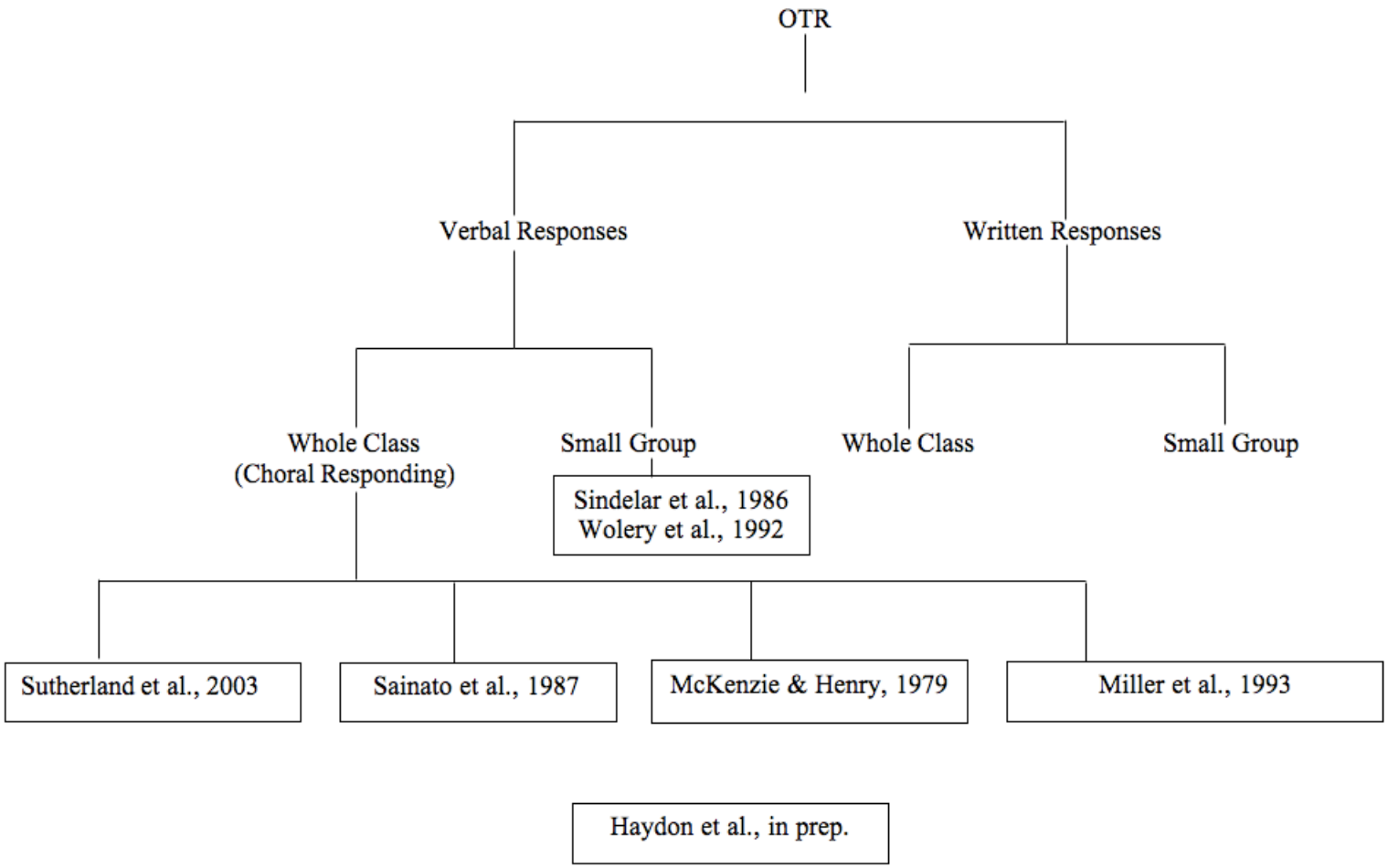

Figure 2-2. Classifications of studies in the literature review

Sutherland et al., 2003	Sainato et al., 1987	McKenzie & Henry, 1979	Miller et al., 1993
Choral Responding	Choral Responding	Unison Hand raising	Choral Responding
Antecedent Strategy	Antecedent Strategy	Antecedent Strategy	Error Correction
Self-contained	Self-contained	General Education	General Education/self-contained
2/3 OTR per min	3/5 OTR per min	Unison vs. Individual	ITT 1 min vs. 1 min w/error correction
Math	Morning circle	Geography facts	Math

Haydon et al.
Individual, Choral and Mixed Responding
Antecedent Strategy
General Education
Individual, Choral vs. 70:30 ratio
Sight words

Figure 2-3. Choral responding literature

Table 2-1. Description of studies examining effects of increased opportunities to respond

Reference	Sample	Single subject design	Independent variable(s)	Dependent variable(s)	Results
Carnine (1976)	Two students (boy and girl) identified by teacher as having high rates of off-task behavior, (ages N/A), 1st grade	A-B-A-B-A-B	Presentation rate (Baseline, 5 sec; Intervention, 1 sec)	Percentage of: participation, off-task and correct responses per session	Increased OTR resulted in increased percentages of correct responses and participation and decreased percentages of off-task behavior
West & Sloane (1986)	Five students with EBD (2 boys, 3 girls), ages 7-9	Multielement	Presentation rate (Fast, 20 sec; Slow, 60 sec); Point delivery rate fixed interval (High, [FI] [a] 60 sec; Low, [FI] [a] 240 sec)	Mean percentage of: intervals with disruptive behaviors and academic accuracy, and rate of correct response per minute	No difference among dependent variables between high and low point delivery; increased OTR resulted in lower disruptive behaviors and increased correct response rate; accuracy slight higher during slow presentation rate
Skinner, Smith, & McLean (1994)	Three students with EBD (2 boys, 1 girl), ages 9-11	Adapted alternating treatments	5-sec intertrial interval (ITT); 1-sec ITI, no treatment	Number of words mastered per session/ per condition	5-sec and 1-sec ITI resulted in more mastered words than no treatment condition

Table 2-1. Continued.

Skinner & Shapiro (1989)	Five students with EBD, (gender N/A) ages 14-18	Adapted alternating treatments	Continuous and intermittent assessment (one OTR per stimulus); taped words and drill (two OTR per stimulus)	Words read correctly and incorrectly per minute	Having 2 OTR resulted in more words read correctly and fewer read incorrectly, having 1 OTR resulted in fewer words read correctly and more read incorrectly
Skinner, Ford & Yunker (1991)	Two students with EBD, (boys), ages 9-11	Adapted alternating treatments	Verbal cover, copy, and compare (VCCC; increased OTR) written cover, copy, and compare (WCCC) and no treatment	Digits correct per minute (DCM); percentage of multiplica -tion problems correct per session	Increased OTR resulted in an increase in correct problems and DCM; [d]WCCC and no treatment resulted in fewer correct problems and [b]DCM
Skinner, Belfiore, Mace, Williams-Wilson, & Johns (1997)	Two students with EBD (boys), ages 10-11	Multiphase alternating treatments and multiphase adapted alternating treatments	[c]VCCC (increased OTR) and [d]WCCC	Number of multiplicatio n problems correct and [b]DCM per session	Accuracy and fluency higher for both students during [c]VCCC than [d]WCCC

Table 2-1. Continued.

Sutherland, Alder, & Gunter (2003)	Nine students with EBD (1 girl and 8 boys), ages 8-12	A-B-A-B withdrawal	Criterion level of 3 OTR/min	Mean rate of teacher praise per minute, rate of student correct responses per minute, mean percentage of correct responses per minute, rate of disruptive behaviors per minute, percentage of on-task intervals per session	Increased OTR resulted in fewer disruptions, more correct responses and increased task engagement

Table 2-1. Continued.

Miller, Hall, & Heward (1995)	Fourteen students, eleven identified as developmentally handicapped (8 males, 6 females). Three boys in a 1st grade regular education classroom, eleven students ages 9-12 years old in special education classroom.	ABABCBC design and an ABABC design	1-min time trials with next day feedback and 1 minute time trials with immediately followed by teacher directed feedback	Rate of correct answers, percentage of answers correct, on-task behavior	For the majority of students during the 1-minute time trial with next day feedback had the highest increase in rate of problems solved per minute without a decrease in accuracy, on-task behavior was also highest during this condition.
Gunter, Shores, Jack, Denny, & DePaepe (1994)	One student identified with severe behavior disorders (male), age 12	A-B-A-B withdrawal	Talk/mand procedure	Student disruptive behavior per minute	The talk/mand procedure resulted in decreased amount of disruptive behavior

Table 2-1. Continued.

Koegel, Dunlap, Dyer (1980)	Three student identified with autism (2 males, 1 female), ages 7-11	A multiple baseline design was used in one study and a reversal design used in the other	Long ITI (at least 4 seconds) and short ITI (one second)	Various tasks (sequencing, verbal imitation, object, verbal and number discriminatio n, prepositions and color labeling)	Shorter ITI resulted in increases in the average percent of correct responding across the various tasks
McKenzie & Henry (1979)	Fifty two 3rd grade students	Two comparabl e treatment groups; one group experiment al the other control	Individual question in control group; unison hand raising in experimental group	Number of students on-task, mean expressed test anxiety level and mean achievement scores for treatment	Results using a chi-square test, $X^2(1) = 4.99$, $\alpha < .05$.showed that more pupils were off-task in the individually addressed question group than in the test-events (unison hand raising) group.
Sindelar, Bursuck, & Halle (1986)	Eleven students with mild disabilities (5 boys, 6 girls) ages 6.9-11.0 Eight were identified as LD, three as EMR	Adapted alternating treatments	Two levels of questioning: ordered and unison	Number of sight words mastered daily under each condition	Students learned words at a faster rate with unison responding than ordered responding

Table 2-1. Continued.

Ferkis, Belfiore, & Skinner (1997)	Three students receiving specialized reading services according to their IEP (2 boys, 1 girl), ages 11-12	Alternating treatments	Study 1 (1 OTR per word; 5 OTR per word) Study 2 (3 x A-R-C; 3 x A-R-C-R-R-R-R)	Primary variable– number of sight words mastered in daily sessions	Single response condition led to word mastery in less time than repeated response condition
Sterling, Barbetta, Heward, & Heron (1997)	Five students one with LD, four with DD (3 boys, 2 girls), ages 9-11	Alternating treatments	ASR (3 OTR per/health fact); OT (no OTR per/health fact)	Mean number of health facts correctly identified on end of day tests	Students learned and maintained more health facts under ASR instruction than OT instruction
Barbetta, Heron, & Heward (1993)	Six students with DD (4 boys, 2 girls), ages 8-9	Alternating treatments	ASR (error correction after incorrect response); NR (no error correction)	Primary variable– number of correct responses per session	ASR error correction resulted in more student responses (M= 30 per session); NR error correction (M=12.6)
Sainato, Strain, & Lyon (1987)	Three students with DD (two boys, one girl), ages 2 to 4 years	Changing criterion	Presentation rate (3 OTR per/min); (5 OTR per/min)	Percentage of on-task behavior and rate of correct responding per/min	Increased OTR resulted in increased correct responding and on-task behavior

Table 2-1. Continued.

Barbetta & Heward (1993)	Three students with LD (two boys, 1 girl), ages 10-11	Alternating treatments	ASR (error correction after incorrect response); NR (no error correction)	Number of correct responses during instruction, same day and next day tests	ASR error correction resulted in more capitals learned and maintained than NR
Wolery, Ault, Doyle, Gast, & Griffin (1992)	Four students with moderate mental retardation (2 boys, 2 girls), ages 10-13	Adapted alternating treatments	Three experiments comparing individual and choral responding and controlling for interactional effects of number of exposures and OTR with each condition	Percentage of correct responses	The use of choral or individual responding interacts with the ratio of exposures and the ratio of OTR

Note. Adapted from Sutherland and Wehby, 2001
[a]FI= fixed interval
[b]DCM= digits correct per minute
[c]VCCC= verbal, cover, copy, compare
[d]WCCC= written, cover, copy, compare

CHAPTER 3
METHODS

The purpose of this chapter is to describe the procedures followed to conduct the current study. Specifically, this chapter describes: (a) criteria for selecting the participants; (b) settings, teachers, and materials used to carry out the study; (c) study procedures and research design; (d) dependent measures and behavioral coding definitions; and (e) data analysis methods, including procedures to collect interobserver agreement, treatment integrity, and social validity data. The intent of this study is to compare the effects of three opportunities to respond (OTR) strategies (i.e., individual responding, choral responding, and a mixture of choral [70%] and individual [30%] responding) delivered during group instruction in a general education classroom on high-risk students' disruptive behavior, off-task behavior, and active student responding. The study was conducted to answer the following research question: How does a choral responding procedure compare to an individual responding procedure and a combination of choral and individual responding procedure during group instruction in a general education classroom on the disruptive, off-task behavior, and active student responding of high-risk students?

The results from this study compare the effects of three types of OTR: individual responding, choral responding, and a mixture of choral and individual responding at a ratio of 70% choral responding and 30% individual responding on target students' disruptive, off-task behavior and active student responding.

Method

Participants

In accordance with the policies set forth by the University of Florida Institutional Review Board, the experimenter obtained informed consent from the teachers participating in the study and the parents of participating targeted students.

Students. Six students who were identified as having chronic disruptive behaviors that placed them at risk for emotional or behavioral disorders (EBD) participated in this study.

The following eligibility criteria were used to identify participants: (a) rated by the teachers as having high rates of disruptive behavior for more than one month according to the critical events index and combined frequency index on the Systematic Screening for Behavioral Disorders (SSBD), (b) enrolled in a 2nd grade general education class, (c) between the ages of 7-8 years old, and (d) parental consent to participate in the study.

Five students were male (four African American and one Caucasian) and one student was female (African American). At the time of the study, their ages ranged from 7 years 5 months to 8 years 1 month. Nominated students were screened using the SSBD (Walker & Severson, 1993). In stage one, the six students fell within the top 3 students in the classroom ranked by their teacher for externalizing behavior and were then selected to participate in this study. The total maladaptive behavior score in stage two did not exceed 35 and therefore, the six students did not need additional observations in other settings and were not considered at an elevated risk for EBD.

Teachers. Six teachers also served as participants in this study. Teacher participants: (a) had a minimum of 2 years of teaching experience, (b) used less than two OTR per minute during a pre-assessment condition, and (c) consented to participate in the study. All six teachers were Caucasian, five of the six teachers were female. The average years of teaching was 3.0 years (range: 2 – 6 years), and all six teachers had taken a behavior management class as undergraduate students.

Setting and Materials

Setting. The setting for the study was six 2nd grade general education classrooms in Alachua County, Florida. Two schools, one urban and the other suburban were selected. Class

size consisted of 18 – 22 students. The racial/ethnic make up of the classrooms in the urban school was approximately 70% African American and 30% Caucasian, while the percentage in the suburban school was roughly 50% African American and 50% Caucasian. This study took place during a large group instruction, teacher-directed academic activity that had the potential to have high rates of OTR (Skinner et al., 1996).

Materials. During the targeted activity, materials that are commonly used for language arts instruction were used in the study (e.g., flash cards). In order to control for potential sources of variability resulting from differences in material, all teachers in the study used similar instructional materials. The primary experimenter developed, along with teachers, consistent lesson plans and instructional materials to teach content vocabulary and syllable practice; thus, all six teachers used sight words that were at an equivalent level of difficulty. All teachers utilized similar grade level content lesson plans and the materials (flash cards) were the same for teachers one and three and teachers four, five, and six. Teacher two opted to use her own sight word cards, but the content of the cards covered the same stories and review of previous spelling tests (See Appendix A).

Measurement Procedures

Dependent measures. The dependent measures for this study included the following student behaviors: (1) disruption, (2) off-task behavior, and (3) active student responding (See Appendix B for definitions and coding guidelines).

Global operational definitions were used for each of the dependent measures. To ensure that all observers applied consistent judgments on the target behaviors, the same definitions applied to every target student.

Disruptive behavior was defined as any behavior demonstrated by the target child that interrupts the flow of instruction or was disruptive to the on-task behavior of other students. The

following behaviors are examples of disruptive behaviors: getting up from seat, touching others, speaking out loud without raising hand, taking things from others, throwing objects, making noise (tapping, banging), moving head up and down or from side to side, talking to others, rocking in chair, and so forth (Armendariz & Umbreit, 1999).

Off-task behavior was defined as when the target student is not actively directed (looking) toward the teacher (e.g., looking around the room, looking at another student, talking to another student, looking at or, drawing on the desk, playing with materials, hair, or clothes, etc.) (Miller, et al., 1995).

Active student response was defined as engaging in the behavior that was expected during that condition: (a) independent hand raising for the individual responding, (b) responding in unison with the group for choral responding, or (c) a mixture of both in the combination responding condition (Godfrey, Grisham-Brown, Schuster, & Hemmeter, 2003).

Recording procedures. To accurately capture the occurrence of both discrete and continuous behaviors, different types of measurement strategies were used. Student disruptive behaviors were measured using a frequency count and translated into rate per minute using the following formula: frequency of disruption/total number of minutes (i.e., 8-minutes). Active student responses were measured using a percentage formula derived from counting the number of ASR responses following a teacher's use of a specific OTR strategy (i.e., individual, choral or mixed responding) and dividing each of those numbers by the total number of questions the student was exposed to.

Student off-task behavior was measured using momentary time sampling. Momentary time sampling is a common measurement strategy used to accurately measure continuous variables with long durations, such as off-task. An additional advantage of using momentary time

sampling is when off-task behavior is observed for only a moment, the possibility of observing and collecting data on several behaviors increases (Skinner, Rhymer, & McDaniel, 2000). Off-task behavior was reported using a percentage formula: the total number of intervals of off-task behavior was divided by the total number of intervals observed.

All observations lasted a total of 8 minutes. During this time, the primary researcher served as the primary observer and collected real time data using direct sequential recording of the teachers' use of OTR followed by student active responding during the activity period. Student disruptive and off-task behaviors were also recorded during the activity period using direct recording. Data were collected using a paper/pencil data collection system (see Appendix C for a sample data sheet). On the data collection sheet, a plus (+) was used to indicate on-task behavior and a minus (-) was used to indicate off-task behavior. The sequence of teacher-student OTR and response behaviors was coded by circling the occurrence of the teacher's specific type of OTR followed by an active student response was written in as ASR. Disruption was coded as a check mark on the coding sheet. All behaviors were mutually exclusive.

During the 8-minute observation period, the observer(s) continuously observed the teacher and target student. The observers were cued every 20 seconds (by a taped tone) to look at the targeted student and code if the student was off-task at that moment (Gunter et al., 2003). Since the length of each session was 8 minutes, there were a total of 24 observations for off- task behavior. Student disruptive behavior and active student responding were measured using continuous, sequential recording.

Experimental Procedures

This study included two phases: teacher training, and comparison of the three interventions [i.e., individual responding vs. choral responding vs. mixed responding (70% choral responding and 30% individual)].

Teacher training. The teacher-training phase consisted of two stages: (a) information-sharing, and (b) practice until mastery occurred. Training was implemented during two 45-minute practice sessions on two separate days based on procedures employed by Sutherland et al. (2003).

First, the primary researcher reviewed the operational definition of OTR (including choral and individual responding) with each teacher individually and then discussed its rationale and purpose for decreasing disruptive and off-task behavior and increasing active student responses. Following this step, several video clips of teachers using high rates of OTR (both choral and individual responding) were shown.

In the second step, the teacher practiced and demonstrated using the choral responding, individual responding, and a mixture of choral and individual responding using appropriate materials (i.e., flash cards of sight words) in front of the primary experimenter and two adults serving the role of students. For the choral responding condition, teachers used the following sequence of instruction: (a) explain the expectations, procedures, and rules for the choral responding condition (specifically cueing procedures); (b) show a sight word card to the class; (c) cue the students verbally "5-4-3-2-1" to allow adequate wait time for all students respond and say "everyone"; (d) provide feedback on whether the answer was correct or incorrect (e.g., "that is correct" or "that is not correct. The correct answer is_____"); and (e) select another sight word card and begin the next learning trial (Heward et al., 1989).

In the individual mode of responding, the following sequence of instruction was used by the teacher: (a) review procedures, expectations, and rules for the mode of responding; (b) show a sight word card to the class and read the definition; (c) cue the students verbally "5-4-3-2-1" to allow adequate wait time for all students respond and select one student to respond; (d) provide

feedback on whether the answer was correct or incorrect (one error correction was made by the teacher), and (e) presented another sight word card and begin the next learning trial (Randolph, 2007).

Next, the teacher practiced and demonstrated using a mixture of both modes of responding at a ratio of 70 choral to 30 individual. Teachers used the following sequence of instruction: (a) explain the expectations, procedures, and rules for the choral responding condition (specifically cueing procedures); (b) for choral responding the teacher said “group,” showed a sight word card to the class, for a question that required an individual response, the teacher said “individual”; (c) cued the students verbally “5-4-3-2-1” to allow adequate wait time for all students to respond and said “everyone” (for a choral response) and called on one student for an individual response; (d) provide feedback on whether the answer was correct or incorrect (e.g., “that is correct” or “that is not correct the correct answer is_____”); and (e) select another sight word card and begin the next learning trial (Heward et al., 1989). An illustration of individual, choral responding only and the combination of choral and individual responding can be seen in sample lesson plans (see Appendix A).

The choral, individual, and combination responding mode training demonstration sessions lasted 8 minutes each as measured through the use of a stopwatch. The primary experimenter played the role of the student along with two other adults and responded to the flash card and also cued the teacher every 60-seconds to indicate that 5 OTR should have been given. Following each session, the researcher showed the teacher his or her rate of OTR (individual, choral, or mixed mode) for the 8-minute session. Once the teacher had demonstrated the ability to use three types of OTR (individual, choral, and a mixture of individual and choral) according to the sequence outlined and at a rate of 5 per minute for 8-minute training sessions, then mastery

had occurred and training was considered complete. The training took approximately two 45-minute practice sessions on two separate days for each teacher.

Comparison of three interventions. After teacher training, an experimental comparison of the three intervention conditions began. Based on a randomized schedule, the teacher was instructed to implement either: (a) choral responding, (b) mixed mode responding, or (c) individual responding – all at a rate of 5 per minute. This rate was selected based on findings from Sainato et al. (1987) that suggested only slight differences between rates of 3 vs. 5 OTR/minute; therefore the faster rate of 5 OTR per minute was selected. Using an alternating treatments design, a comparison of the three OTR conditions was examined. When implementing each mode of responding, the teachers were instructed to follow the guidelines and procedures described above. For example during choral responding, the teacher followed the above procedures and cued the entire class to respond and during individual responding the teacher cued one student at a time.

In the combined mode condition, the teacher read from a list indicating the type of OTR, either a choral or an individual OTR. Using a ratio of 70% choral to 30% individual at a rate of 5 OTR per minute yielded 28 choral responses to 12 individual responses per lesson. For each individual response, the teacher said “This is individual,” showed a sight word card, read the definition, counted down from five, called on a student, and asked: “What word?” The number of exposures to questions (40) was approximately equal between the three treatments; however, the number of opportunities to respond differed across the three conditions. In the choral responding condition, the number of OTR was 40, during individual responding the number of OTR was 3 (the teacher was prompted to give the targeted student 3 OTR), and during mixed responding the number of OTR was 31 (i.e., 28 choral plus 3 individual = 31 total). Each session lasted 8-

minutes in length. During this phase, the teacher's use of OTR and all student behaviors were observed and measured.

Because of the rapid alternating conditions that exist in this design and the possibility that the effects on a behavior in one condition may influence the behavior in another condition, the three conditions were randomly assigned to control for interaction effects (Kennedy, 2005). However, an apriori decision was made not to chose one condition three times in a row, and in a few instances, conditions were purposely selected to achieve stability at the end of the study phase.

Design

An alternating treatments design (Barlow & Hayes, 1979) was used for this study. In an alternating treatments design, at least two different treatments are implemented within a short time span (Barlow & Hayes). At least two treatments are randomly alternated with each other, and the effects on one or several behaviors are observed (Kennedy, 2005). An advantage to an alternating treatments design is that random assignment of conditions or counterbalancing can neutralize confounding factors, such as time of administration or setting, which may cause variability in the data.

Interobserver Agreement

Inter-observer agreement (IOA). To provide evidence that the measures of the dependent variables were accurate, secondary observer(s) collected interobserver agreement data on at least 25% of the sessions within each treatment of the study (Kennedy, 2005). IOA checks for the dependent variable of disruption were measured by exact event occurrence only formula. To calculate exact agreement, the interval agreement formula was used (i.e., $A / A + D \times 100\%$). An agreement was scored when two observers scored the same number of behavioral events during each interval of observation. Off-task behavior was also calculated using an interval agreement

formula. An agreement was scored when both observers recorded off-task behavior or on-task behavior during each momentary time sample and then the number of agreements was divided by the number of agreements plus disagreements and multiplied by 100 (i.e., A /A+ D × 100%). ASR interobserver agreement was calculated by using a total agreement method (S/L × 100%) where S is the smaller total and L is the larger total. Prior to beginning data collection and IOA data, the primary and secondary observer(s) were trained to a reliability of at least 85% for three consecutive sessions on each dependent measure.

To control for observer drift (i.e., the change in interpretation among observers on the occurrence of the target behavior), the primary observer met with the secondary observer(s) on a weekly basis and/or repeated the training exercises once every 5 sessions. This ensured all observers remained in agreement about the definitions of targeted behaviors (Cooper, Heron, & Heward, 1987).

Mean percentages of IOA across the three types of responding and the number of reliability checks are reported in table 3.2. Interobserver agreement was calculated on average during 33.8% of observations. Average interobserver agreement for disruption was 93.02% (range 75-100%), for off-task 91.5% (range 80.0- 100%) and for ASR 98.63% (range 90.47-100%).

Treatment Integrity

Data were collected on the teacher's use of OTR and student behaviors and visually displayed through graphs after each session. The teachers performed at a rate of at least 5 OTR per minute during each session with a high degree of fidelity. The primary experimenter utilized a behavioral consultant model described by Noell, Witt, Gilbertson, Rainer, and Freeland (1997) and Noell et al. (2005) after sessions to maintain the teachers rate of 5 OTR/minute and control for treatment drift. This model consists of giving teachers verbal feedback on their performance

(rate of OTR/min). Sessions continued until a stable three to five data point trend in disruption was obtained.

Direct measurement of the independent variable (i.e., teacher's implementation of the OTR procedure (i.e., individual, choral, or mixed mode at a rate of 5/minute) was conducted as a measure of treatment integrity on approximately 15% of the sessions by two secondary observers. A checklist sheet was used to record the occurrence or non-occurrence of each step of the OTR instructional sequence in the individual, choral, and mixed modes as described above (see Appendix E).

An OTR was recorded when the teacher asked a question to an individual student or to the entire group (i.e., choral responding). Teachers' rate of OTR was measured using a frequency count and recorded on the data collection sheet (see Appendix E). IOA for the fidelity of the teachers' use of OTR was measured during each treatment condition across six teachers on at least 15% of the sessions (Kennedy, 2005). The accuracy of the teachers' implementation of the individual, choral and mixed procedures (the four components- cueing students, allowing adequate wait time, (counting down by 5), asking questions, and providing feedback on student responses as well as the number of OTR per 8 minute session was calculated using the total agreement approach. In addition, the accuracy of the teachers' start of the implementation of syllable practice after 4 minutes (within 10-s) was also calculated. During mixed responding two observers followed the teachers' verbal prompt (i.e., "This is individual." "This is group"), and recorded on the treatment integrity checklist the accuracy with which the teacher implemented the 70:30 ratio (as well as the number of questions asked to the targeted student). .

Social Validity

After the completion of the study, the teachers was asked to complete three social validity surveys to obtain information about their perception of the acceptability and usefulness of each

intervention (see Appendix F). The questions on the survey are presented (Table 3-3). Teachers rated questions using a 4-point Likert scale, where (1) represents “not at all” and (4) “very much.”

Table 3-1. Descriptions of participants

Name	Gender	Ethnicity	Age	SSBD score
Frank	Male	African American	7 years 6 months	25/35
D'Andy	Male	African American	8 years 2 months	31/35
Monty	Male	African American	7 years 5 months	29/35
Teo	Male	African American	8 years 2 months	32/35
Amber	Female	African American	8 years 2 months	30/35
Mats	Male	Caucasian	7 years 6 months	27/35

Table 3-2 Interobserver agreement data

	Disruptive	Off-task	ASR
Percentage agreement	M= 93.0% (range 75-100%)	M= 91.5% (range 80.0-100%)	M= 98.6% (range 90.5-100%)
	Individual	Choral	Mixed
Percentage of reliability checks	M= 36.1% (range 28.6-50.0%)	M= 33.8% (range= 28.6-40.0%)	M= 31.5% (range= 25.0-40.0)

Table 3-3. Survey Questions

1. Which intervention was the most difficult to implement? (Individual, Choral, or Mixed)
2. How difficult was it to implement the intervention?
3. How time-consuming was it to implement the intervention?
4. How helpful was the training session?
5. How helpful to your teaching instruction was the intervention?
6. After implementing the intervention, did you see an increase in the student's on-task behavior?
7. After implementing the intervention, did you see a decrease in the student's disruptive behavior than what you normally observe?
8. After implementing the intervention, did you see an increase in the student's active responses?
9. How likely is it that you will use the intervention in the future?

CHAPTER 4
RESULTS

The purpose of this study was to examine the effects of three types of OTR (individual responding, choral responding, and mixed individual and choral responding) on the disruptive and off-task behavior and active student responding of six children identified at-risk for EBD. These effects were determined by collecting behavioral observation data on the students' academically related behaviors in a general education classroom using an alternating treatments design. Data were recorded and then visually displayed on graphs for analysis (Figures 4-1 - 4-3). Treatment integrity data were collected to validate implementation of the study's procedures, and social validity data were collected to assess the teachers' perceptions on three components of the study: social significance, social acceptability, and social importance of the interventions. This chapter reports the results of all of these efforts, beginning with the outcomes for each participant during the three conditions of the study.

Intervention Results

A summary of mean rates of disruptive behavior, percentage of intervals of off-task behavior, and percentage of active student responding (ASR) across conditions is presented for each participant (Table 4-1). Graphic displays were used to organize data during data collection, which helped in the analysis process by providing a detailed description, summary and comparison of the three different types of OTR for each participant (Tawney & Gast, 1984). Visual analysis was used to evaluate changes in trend, level, and variability (Figures 4-1 - 4-3). Trend lines were determined by using a split-middle trend estimation line (for lines with seven or more data points), visual analysis for lines with six or less, and by using regression trend lines in Microsoft Excel. Data collection continued until there was a clear separation (no overlap) in at least the last three data points of a data path and until there was a consistent pattern of low

variability across data points in the primary dependent variable (disruption) in each condition (type of OTR). Finally, the degree (slight, moderate, large) of magnitude of difference, trend, and variability of data paths were reviewed and determined.

Results for the six participants are summarized (Figures 4-1 - 4-3). These data allow for an examination of the overall performance between subjects as well as condition-by-condition comparisons within subjects. The results from the study indicate that mixed responding was associated with the lowest levels of disruptive behavior for five of the six students, and that none of the three types of responding consistently produced low levels of off-task behavior or high levels of active student responding (ASR) across all six participants. For one participant (Teo), the level of responding varied widely, and considerable variability was observed for the dependent variables of disruptive behavior and off-task behavior. In spite of the above differences, the data provide information on the effectiveness of the three types of OTR.

Rate of Disruptive Behavior

Disruptive student behaviors were measured using a frequency count and translated into rate per minute using the following formula: frequency of disruption/total number of minutes (i.e., 8-minutes). Disruptive behavior was defined as when the target student performed a behavior that interrupts, or has the potential to interrupt, the instruction in the classroom or the learning of another student. Five out of six students demonstrated a lower rate of disruptive behavior in the mixed responding condition in comparison to the individual and choral responding condition. Based on mean values, one student (Teo) demonstrated a slightly lower rate of disruptive behavior in the individual responding condition than the choral or mixed responding condition. Results for student disruptive behavior among the six participants are presented (Figure 4-1).

Participant 1: Frank. The mean rate of disruptive behavior for Frank during individual responding was 1.54/min (range = 1.25 – 1.88/min), the mean rate during choral responding was 0.71/min (range = 0.25 – 1.00/min), and during mixed responding the mean rate was 0.16/min (range = 0.00 – 0.38/min). The magnitude of difference in level of rate of disruptive behavior between individual and choral responding and choral and mixed responding was small, while the magnitude of difference in level of rate of disruptive behavior between individual and mixed responding was moderate. During individual responding, there was a small downward trend in disruptive behavior, with little variability, and no overlapping data points with choral and individual responding. During choral responding there was a slight upward trend in disruptive behavior, with little variability, and one data point overlapped with two data points in the mixed responding condition. During mixed responding there was a slight downward trend in disruptive behavior, with little variability.

Participant 2: D'Andy. The mean rate of disruptive behavior for D'Andy during individual responding was 0.89/min (range = 0.5 – 1.5/min), the mean rate during choral responding was 0.43/min (range = 0.25- 0.75/min), and during mixed responding the mean rate was 0.9/min (range = 0.00 – 0.38/min). The magnitude of difference in level of rate of disruptive behavior between individual and choral responding and choral and mixed responding was small, while the magnitude of difference in level of rate of disruptive behavior between individual and mixed responding was moderate. During individual responding there was a slight upward trend in disruptive behavior, with little variability, and one data point overlapped with three data points in choral responding. During choral responding there was a slight upward trend in disruptive behavior, with little variability, and three data points overlapped with four data points in mixed

responding. During mixed responding there was a slight downward trend in disruptive behavior, with little variability.

Participant 3: Monty. The mean rate of disruptive behavior for Monty during individual responding was 1.12/min (range = 1-1.5/min), the mean rate during choral responding was 0.81/min (range = 0.5 – 1.38/min), and during mixed responding the mean rate was 0.49/min (range = 0.25 – 0.75/min). The magnitude of difference in level of rate of disruptive behavior in the last three data points between individual and choral responding and choral and mixed responding was small, while the magnitude of difference in level of rate of disruptive behavior in the last three data points between individual and mixed responding was medium. During individual responding there was a very slight upward trend in disruptive behavior, with little variability, and three data points overlapped with three data points in choral responding. During choral responding there was a very slight upward trend in disruptive behavior, with little variability, and two data points overlapped with six data points in mixed responding. During mixed responding there was a very slight upward trend in disruptive behavior, with little variability.

Participant 4: Teo. The mean rate of disruptive behavior for Teo during individual responding was 1.52/min (Mdn= 1.5) (range = 0.625 – 2.75/min), the mean rate during choral responding was 1.65/min (Mdn= 1.5) (range = 0.38 - 4.13/min), and during mixed responding the mean rate was 1.61/min (Mdn= 1.375) (range = 0.88 – 2.75/min). Due to the variability in the data, no clear differences emerged in level of rate of disruptive behavior between individual, choral and mixed responding. During individual responding there was a moderate upward trend in disruptive behavior, with moderate variability. During choral responding there was a moderate

upward trend in disruptive behavior, with large variability. During mixed responding there was a moderate downward trend in disruptive behavior, with moderate variability.

Participant 5: Amber. The mean rate of disruptive behavior for Amber during individual responding was 1.36/min (range = 1.13 – 1.50/min), the mean rate during choral responding was 0.9/min (range = 0.75 – 1.13/min), and during mixed responding the mean rate was 0.44/min (range = 0.16 – 0.75/min). The magnitude of difference in level of rate of disruptive behavior in the last three data points between individual and choral responding and choral and mixed responding was small, while the magnitude of difference in level of rate of disruptive behavior in the last three data points between individual and mixed responding was moderate. During individual responding there was a flat trend in disruptive behavior, with very little variability, and one data point overlapped with one data point in choral responding. During choral responding there was a very slight downward trend in disruptive behavior, with very little variability, and one data point overlapped with one data point in the mixed responding condition. During mixed responding there was a very small downward trend in disruptive behavior, with little variability.

Participant 6: Mats. The mean rate of disruptive behavior for Mats during individual responding was 1.25/min (range = 1.00 -1.36/min), the mean rate during choral responding was 0.35/min (range = 0.25 – 0.50/min), and during mixed responding the mean rate was 0.08/min (range = 0.00 – 0.13/min). The magnitude of difference in level of rate of disruptive behavior in the last three data points between individual and choral responding was moderate while the magnitude of difference in level between choral and mixed responding was small, while the magnitude of difference in level of rate of disruptive behavior in the last three data points between individual and mixed responding was moderate. During individual responding there was

a flat trend in disruptive behavior, with very little variability. During choral responding there was a very slight upward trend in disruptive behavior, with very little variability. During mixed responding there was a very small downward trend in disruptive behavior, with little variability. There was no overlap in data points between the three types of responding.

Percentage of Off-Task Behavior

The percentage of target student off-task behavior was based on a momentary time sampling with 20-second intervals, collected during eight-minute instructional sessions. Off-task behavior was defined when the target student was not sitting in his or her seat and was not actively directed toward the teacher. Five out of six students demonstrated a lower mean percentage of off-task behavior in the mixed responding condition in comparison to the individual and choral responding condition. One student (Amber) demonstrated a slightly lower mean percentage of off-task behavior in the choral responding condition than the mixed responding condition. Results for student off-task behavior among the six participants are presented (Figure 4-2).

Participant 1: Frank. The mean percentage of intervals Frank was off-task during individual responding was 56.25% (range = 45.83% - 62.5%); similarly, the mean percentage of off-task behavior for choral responding was 32.73% (range = 25.00% - 41.66%), and the mean percentage for mixed responding was 16.55% (range = 8.32% - 25.00%). The magnitude of difference in level of off-task behavior in the last three data points between individual and choral responding and choral and mixed responding was moderate, while the magnitude of difference in level of rate of disruptive behavior between individual and mixed responding was large. During individual responding there was a slight downward trend in disruptive behavior, with little variability, and no overlapping data points with choral and mixed responding. During choral responding there was a slight downward trend in off-task behavior, with little variability, and one

data point overlapped with two data points in the mixed responding. During mixed responding there was a moderate downward trend in off-task behavior, with very little variability.

Participant 2: D'Andy. The mean percentage of intervals D'Andy was off-task during individual responding was 25.6% (range =16.66% - 33.33%); similarly, the mean percentage of off-task behavior for choral responding was 19.05% (range =12.50% - 25.00%), and the mean percentage for mixed responding was 9.89% (range = 4.17% - 16.66%). Due to the variability and overlap in the data, there was no clear differential effects in level of off-task behavior in the last three data points between individual and choral responding and the level of off-task behavior in the last three data points between individual and mixed responding and choral and mixed responding was moderate. During individual responding there was a slight upward trend in off-task behavior, with little variability, and one overlapping data point with four data points in choral responding and no overlapping data points with mixed responding. During choral responding there was a slight upward trend in off-task behavior, with little variability, and four data points overlapped with four data points in mixed responding. During mixed responding there was a slight upward trend in off-task behavior, with moderate variability.

Participant 3: Monty. The mean percentage of intervals Monty was off-task during individual responding was 40.27% (range = 29.16% - 62.50%); similarly, the mean percentage of off-task behavior for choral responding was 26.56% (range = 12.50% - 37.50%), the mean percentage for mixed responding was 16.67% (range = 8.33% - 37.50%). The magnitude of difference in level of off-task behavior in the last three data points between individual and choral responding and choral and mixed responding was moderate, while the magnitude of difference in level of rate of off-task behavior between individual and mixed responding was large. During individual responding there was a moderate upward trend in off-task behavior, with moderate

variability, and five overlapping data points with four data points in choral responding and five overlapping data points with one in mixed responding. During choral responding there was a slight upward trend in off-task behavior, with moderate variability, and all eight data points overlapped with one data point in mixed responding. During mixed responding there was a small upward trend in off-task behavior, with moderate variability.

Participant 4: Teo. Because there was a great deal of variability in Teo's, mean and median scores are reported. The mean percentage of intervals Teo was off-task during individual responding was 28.47% (Mdn= 22.92) (range = 4.16% - 62.50%); similarly, the mean percentage of off-task behavior for choral responding was 31.24% (Mdn= 27.08) (range = 8.30% - 62.50%), and the mean percentage for mixed responding was 22.02% (Mdn= 20.83) (range = 8.33% - 33.33%). Due to the variability in the data, there were no clear differential effects in level of off-task behavior between individual, choral and mixed responding. During individual responding there was a slight downward trend in off-task behavior, with large variability. During choral responding there was a moderate downward trend in disruptive behavior, with large variability. During mixed responding there was a small downward trend in disruptive behavior, with moderate variability.

Participant 5: Amber. The mean percentage of intervals Amber was off-task during individual responding was 47.50% (range = 25.00% - 66.70%); similarly, the mean percentage of off-task behavior for choral responding was 23.33% (range = 16.66% - 33.33%), and the mean percentage for mixed responding was 24.30% (range = 16.66% - 33.33%). The magnitude of difference in level of off-task behavior in the last three data points between individual and choral responding was large, while the magnitude of difference in level of rate of off-task behavior between choral and mixed responding and individual and mixed responding was moderate.

During individual responding there was a moderate upward trend in off-task behavior, with moderate variability, and one overlapping data point with two overlapping data points in choral responding and one overlapping data point with three data points in mixed responding. During choral responding there was a flat trend in off-task behavior, with small variability, and six data points overlapped with six data points in the mixed responding. During mixed responding there was a moderate upward trend in off-task behavior, with moderate variability.

Participant 6: Mats. The mean percentage of intervals Mats was off-task during individual responding was 54.17% (range = 45.83% - 66.67%); similarly, the mean percentage of off-task behavior for choral responding was 28.47% (range = 20.83% - 45.83%), and the mean percentage for mixed responding was 23.33% (range = 20.83% - 33.33%). The magnitude of difference in level of off-task behavior in the last three data points between individual and choral responding was moderate and the magnitude of difference in level of off-task behavior between choral and mixed responding was small, while the magnitude of difference in level of off-task behavior between individual and mixed responding was moderate. During individual responding there was a slight downward trend in off-task behavior, with moderate variability, and two overlapping data point with one data point in choral responding and no overlapping data points with mixed responding. During choral responding there was a small upward trend in off-task behavior, with moderate variability, and two data points overlapped with five data points in the mixed responding. During mixed responding there was a small downward trend in off-task behavior, with moderate variability.

Percentage of Active Student Responding

The percentage of active student responding was defined as the target student's hand raising during the 3-second wait time during individual responding, verbally responding with the class after the teacher prompt "everybody" during choral responding, and hand raising/verbal

responding during mixed responding. All six students demonstrated a higher percentage of ASR in the mixed responding condition in comparison to the individual responding condition. Three students (Frank, D'Andy, and Monty) demonstrated a higher percentage of ASR in the mixed responding condition in comparison to the choral responding condition. Three students (Teo, Amber, and Mats) demonstrated a higher percentage of ASR in the choral responding condition than in the mixed responding condition. Results for active student responses among the six participants are presented (Figure 4-3).

Participant 1: Frank. The mean percentage of Frank's active student responding during individual responding was 22.61% (range = 12.5% - 46.15%); similarly, and the mean percentage of active student responding for choral responding was 69.34% (range = 44.73% - 89.18%), the mean percentage of active student responding for mixed responding was 84.35% (range = 76.31% - 94.73%). The magnitude of difference in level of ASR in the last three data points between individual and choral responding was large, the magnitude of difference in level of ASR behavior between choral and mixed responding was small, while the magnitude of difference in level of ASR between individual and mixed responding was large. During individual responding there was a moderate upward trend of ASR, with moderate variability, and there were no overlapping data points between choral responding and mixed responding. During choral responding there was a moderate upward trend in ASR, with large variability, and four data points overlapped with five data points in the mixed responding and during the last data point (marked by an asterisk) Frank was noticeably sleepy. During mixed responding there was a slight upward trend in ASR, with small variability.

Participant 2: D'Andy. The mean percentage of D'Andy's active student responding during individual responding was 89.32% (range = 74.28 – 94.73%); similarly, the mean

percentage of active student responding for choral responding was 93.25% (range = 81.57% - 100.00%), and the mean percentage of active student responding for mixed responding was 97.28% (range = 88.88% - 100.00%). There were no clear differential effects in level of ASR between individual, choral and mixed responding. During individual responding there was a slight downward trend in ASR, with moderate variability. During choral responding there was a slight upward trend in ASR, with moderate variability. During mixed responding there was a slight downward trend in ASR, with small variability.

Participant 3: Monty. The mean percentage of Monty's active student responding during individual responding was 60.19% (range = 33.33% - 91.89%); similarly, the mean percentage of active student responding for choral responding was 84.20% (range = 71.42% - 91.66%), the mean percentage of active student responding for mixed responding was 90.50% (range = 77.77% - 100.00%). The magnitude of difference in level of ASR in the last three data points between individual and choral responding was large and the magnitude of difference in level of ASR behavior between choral and mixed responding was small, while the magnitude of difference in level of ASR between individual and mixed responding was large. During individual responding there was a steep downward trend of ASR, with large variability, and four overlapping data points with seven data points during choral responding and three overlapping data points with one data point in mixed responding. During choral responding there was a slight downward trend in ASR, with moderate variability, and seven data points overlapped with five data points in the mixed responding. During mixed responding there was a flat trend in ASR, with small variability.

Participant 4: Teo. The mean percentage of Teo's active student responding during individual responding was 82.20% (Mdn= 78.75) (range = 52.63% - 94.44%); similarly, the

mean percentage of active student responding for choral responding was 93.79% (Mdn= 96.24) (range = 82.60% - 100.00%), and the mean percentage of active student responding for mixed responding was 84.28% (Mdn= 85.29) (range = 72.72% - 94.17%). The magnitude of difference in level of ASR between individual, choral, and mixed responding was small. During individual responding there was a slight upward trend in ASR, with moderate variability. During choral responding there was a flat trend in ASR, with small variability. During mixed responding there was a slight upward trend in ASR, with small variability.

Participant 5: Amber. The mean percentage of Amber's active student responding during individual responding was 58.10% (range = 34.14 – 92.10%); similarly, the mean percentage of active student responding for choral responding was 96.38% (range = 94.87% - 100.00%), and the mean percentage of active student responding for mixed responding was 87.65% (range = 80.55% - 97.14%). The magnitude of difference in level of ASR in the last three data points between individual and choral responding was large, and the magnitude of difference in level of ASR behavior between choral and mixed responding was small, while the magnitude of difference in level of ASR between individual and mixed responding was large. During individual responding there was a large downward trend of ASR, with large variability, and one overlapping data point with one data point during choral responding and four overlapping data points with three data points in mixed responding. During choral responding there was a flat trend in ASR, with small variability, and four data points overlapped with two data points in mixed responding. During mixed responding there was a slight downward trend in ASR, with moderate variability.

Participant 6: Mats. The mean percentage of Mats' active student responding during individual responding was 42.24% (range = 13.04% - 67.50%); similarly, the mean percentage of

active student responding for choral responding was 75.27% (range = 40.00 – 94.44%), and the mean percentage of active student responding for mixed responding was 62.86% (range = 56.41% - 67.50%). There were no clear differential effects in level of ASR between individual and mixed responding. During individual responding there was a flat trend in ASR, with moderate variability. During choral responding there was a small downward trend in ASR, with large variability. During mixed responding there was a flat trend in ASR, with small variability.

Treatment Integrity

Treatment integrity is reported for the three types of treatment conditions (individual responding, choral responding, and mixed individual and choral responding). A checklist was used to measure: (a) rate of teacher's OTR per/min, (b) percentage of the 4 step instructional sequence completed (cue, wait time, question and feedback), (c) occurrence or non-occurrence of each step of the OTR instructional sequence, and (d) start of syllable practice (i.e., after 4 minutes teachers were cued to begin syllable practice). For each step in the procedure, a check was given if the teacher implemented the step correctly.

Teacher 1: Mrs. Pence. Treatment integrity was calculated on 1 of 6 individual responding sessions (16.7%), and 1 of 7 choral and mixed responding sessions (14.3%). The average integrity for rate of OTR = (100%). The mean rate of OTR/min = 4.80/min **(**range = 4.64 – 5.0 OTR/min). Integrity on sequence of steps averaged 98.5% (range = 94.03 – 100%), and integrity on steps in the sequence averaged 100% for cue, wait time, questions, and 94.03% for feedback (range = 90.0 – 100%).

Teacher 2: Mrs. Hill. Treatment integrity was calculated on 1 of 7 individual and choral responding sessions (14.3%), and 2 of 8 mixed responding sessions (25.0%). The average integrity for rate of OTR = (100%). The mean rate of OTR/min = 4.65/min **(**range = 4.64 – 5.0 OTR/min). Integrity on sequence of steps averaged 99.8% (range = 99.2 – 100%), and integrity

on steps in the sequence averaged 100% for cue, wait time, questions, and 99.2% for feedback (range = 97.6 – 100%).

Teacher 3: Mr. Clinton. Treatment integrity was calculated on 2 of 9 individual and mixed responding sessions (22.2%), and 2 of 8 choral responding sessions (25.0%). The average integrity for rate of OTR = (100%). The mean rate of OTR/min = 4.75/min **(**range = 4.64 – 5.0 OTR/min). Integrity on sequence of steps averaged 99.7% (range = 98.68 – 100%), and integrity on steps in the sequence averaged 100% for cue, wait time, questions, and 98.68 % for feedback (range = 97.36 – 100%).

Teacher 4: Mrs. Simpson. Treatment integrity was calculated on 1 of 6 individual and mixed responding sessions (16.7%), and 2 of 10 choral responding sessions (20.0%). The average integrity for rate of OTR = (100%). The mean rate of OTR/min = 4.76/min **(**range = 4.64 – 5.0 OTR/min). Integrity on sequence of steps = 100%, and integrity on steps in the sequence averaged 100% for cue, wait time, questions, and feedback.

Teacher 5: Ms. Mallory. Treatment integrity was calculated on 1 of 5 individual and choral responding sessions (20.0%), and 1 of 6 mixed responding sessions (16.7%). The average integrity for rate of OTR = (100%). The mean rate of OTR/min = 4.74/min **(**range = 4.38 – 5.0 OTR/min). Integrity on sequence of steps = 100%, and integrity on steps in the sequence averaged 100% for cue, wait time, questions, and feedback given.

Teacher 6: Ms. Orwell. Treatment integrity was calculated on 1 of 6 individual and choral responding sessions (16.7%), and 2 of 5 mixed responding sessions (40.0%). The average integrity for rate of OTR = (100%). The mean rate of OTR/min = 4.88/min **(**range = 4.5 – 5.0 OTR/min). Integrity on sequence of steps = 100%, and integrity on steps in the sequence averaged 100% for cue, wait time, questions, and feedback given.

Social Validity

The participants' teachers completed Likert-type rating scales to determine the social validity of the instructional process and outcomes, respectively. Likert values ranged from 1, indicating the process and outcomes were not at all useful or difficult to implement 2, indicating somewhat useful or difficult to implement, 3 indicating fairly useful or difficult to implement and 4, indicating the process and outcomes were very useful, or difficult to implement to the teacher.

Question 1. In response to which intervention was the most difficult to implement, four of six teachers thought the mixed responding was the most difficult to implement, one teacher believed choral responding was the most difficult, and one teacher replied that individual responding was most difficult to implement.

Question 2. In response to teachers' perceived difficulty with the study's procedures, all six teachers responded (1 = not at all) for individual and choral responding, and for the mixed responding responses averaged 2.33 (range: 1-3).

Question 3. In response to how much time teachers' perceived the study took away from their classroom instruction, the mean was 1.83 (range: 1-3; 1 = not at all and 4 = very).

Question 4. In response to teachers' perceived helpfulness of the training sessions, all six teachers responded (4 = very).

Question 5. In response to the usefulness of the study's findings to the teacher and student, the mean was 2.5 (between somewhat and fairly) (range: 2-4).

Question 6. In response to teachers' perceived decreases in off-task behavior, the mean was 2 (somewhat noticed) (range: 1-3) during individual responding and 2.5 (between somewhat and fairly noticed) (range: 1-4) during choral and mixed responding.

Question 7. In response to teachers' perceived decreases in disruptive behavior, the mean was 2 (somewhat noticed) (range: 1-4) for individual responding, 1.8 (somewhat noticed) (range: 1-4) for choral responding, and 2.17 (range: 1-4) for mixed responding.

Question 8. In response to teachers' perceived increases in active student responding (ASR), the mean was 1.83 (somewhat) (range: 1-4) for individual responding, 3.0 (fairly) (range: 1-4) for choral responding, and averaged 2.17 (somewhat) (range: 1-3) for mixed responding.

Question 9. In response to teachers' perceptions of how likely they will use the intervention in the future, the question was not applicable for individual responding because all six teachers stated that they use individual responding. The mean was 2.83 (3.0 = fairly) (range 1-4) for choral responding, and 2.5 (3.0 = fairly likely) (range: 1-4) for mixed responding.

Summary

Based on the reported results of individual participant's data, conclusions can be drawn across the six participants. With the exception of Teo, all participants demonstrated consistently fewer disruptive behaviors during the mixed responding condition in comparison to the choral or individual responding conditions. In addition, four out of six target children displayed in a smaller percentage of intervals of off-task behavior during mixed responding in comparison to the other two conditions. Results for active student responding are not as clear in that stable data paths were not obtained and the means of ASR were higher for participants one through three (Frank, D'Andy, and Monty) in the mixed responding condition when compared to the individual and choral responding conditions while the means of ASR were higher for participants four through six during choral responding compared to individual or mixed. However, for all six participants the percentages of ASR were higher during choral and mixed responding in comparison to individual responding, supporting earlier research findings (Sindelar et al., 1986).

For participants one through three, a decrease in disruptive behavior (lowest rate during mixed responding) covaried with decreases in percentages of intervals of off-task behavior and increases in ASR. For participants four through six, collateral behavior between disruptive behavior, and percentages of intervals off-task, and ASR are not as clear. For participant four, the mean rate of disruptive behavior was slightly lower during individual responding, while the mean percentages of intervals of off-task behavior was lowest during mixed responding and the highest percentage of ASR occurred during choral responding. For participant five, the mean rate of disruptive behavior was lowest during mixed responding while the mean percentage of off-task behavior was slightly lower during choral responding than during mixed responding. The mean percentage of ASR was highest during choral responding. Finally, for participant six, the lowest mean rate of disruptive behavior and percentage of off-task intervals was during mixed responding while ASR was highest during choral responding.

Treatment integrity data revealed that all six teachers were able to implement the three types of teaching strategies with a high degree of fidelity. Social validity data demonstrated that teachers perceived mixed responding as the most difficult to implement even though that teaching strategy was the most effective in decreasing disruptive behavior.

Table 4-1. Means of rate of disruptive behavior, percentages of intervals off-task and active student responding (ASR)

	Individual	Choral	Mixed
Participant 1 (Frank)			
Disruption (Rate)	1.54/min (range = 1.25 – 1.88/min)	0.71/min (range = 0.25 – 1.00/min)	0.16/min (range = 0.00 – 0.38/min)
Off-task (%)	56.25% (range = 45.83 – 62.5%)	32.73% (range = 25.00 – 41.66%)	16.55% (range = 8.32 – 25.00%)
ASR (%)	22.61% (range = 12.5 – 46.15%)	69.34% (range = 44.73 – 89.18%)	84.35% % (range = 76.31 – 94.73)
Participant 2 (D'Andy)			
Disruption (Rate)	0.89/min (range = 0.5 – 1.5/min)	0.43/min (range = 0.25 – 0.75)	0.19/min (range = 0.00 – 0.38)
Off-task (%)	25.6% 25(range =16.66 – 33.33%)	19.05% (range =12.50 – 25.00%)	9.89% (range = 4.17 – 16.66%)
ASR (%)	89.32% (range = 74.28 – 94.73%)	93.25% (range = 81.57 – 100.00%)	97.28% (range = 88.88 – 100.00%)
Participant 3 (Monty)			
Disruption (Rate)	1.21/min (range = 1-1.5/min)	0.81/min (range = 0.5 – 1.38)	0.49/min (range = 0.25 - 0.75)
Off-task (%)	40.27% (range = 29.16 – 62.50%)	26.56% (range = 12.50 – 37.50%)	16.67% (range = 8.33 - 37.50%)
ASR (%)	60.19% (range = 33.33 – 91.89%)	84.20% (range = 71.42 – 91.66%)	90.50% (range = 77.77 - 100.00%)

Table 4-1. Continued

Participant 4 (Teo)			
Disruption (Rate)	1.52/min (range = 0.625 - 2.75/min)	1.65/min (range = 0.38 - 4.13)	1.61/min (range = 0.88 - 2.75)
Off-task (%)	28.47% (range = 4.16 - 62.50%)	31.24% (range = 8.30 - 62.50%)	22.02% (range = 8.33 - 33.33%)
ASR (%)	82.20% (range = 52.63 - 94.44%)	93.79% (range = 82.60 - 100.00%)	84.28% (range = 72.72 - 94.17%)
Participant 5 (Amber)			
Disruption (Rate)	1.33/min (range = 1.13 - 1.50/min)	0.90/min (range = 0.75 - 1.13)	0.44/min (range = 0.16 - 0.75)
Off-task (%)	47.50% 47 (range = 25.00 - 66.70%)	23.33% (range = 16.66 - 33.33%)	24.30% (range = 16.66 - 33.33%)
ASR (%)	58.10% (range = 34.14 - 92.10%)	96.38% (range = 94.87 - 100%)	87.65% (range = 80.55 - 97.14%)
Participant 6 (Mats)			
Disruption (Rate)	1.25/min (range = 1.00 - 1.36/min)	0.35/min (range = 0.25 - 0.50)	0.08/min (range = 0.00 - 0.13)
Off-task (%)	54.17% (range = 45.83 - 66.67%)	28.47% (range = 20.83 - 45.83%),	23.33% (range = 20.83 - 33.33)
ASR (%)	42.2% (range = 13.04 - 67.5%)	75.27% (range = 40.00 - 94.44%)	62.80% (range = 56.41 - 67.50%)

Table 4-2. Social validity results

Question	Response
Question 1 Which intervention was the most difficult to implement?	Mixed (N = 4) Choral (N = 1) Individual (N = 1)
Question 2 Teachers' perceived difficulty with the study's procedures.	Mean = 2.33 (range: 1-3
Question 3 Teachers' perceived disruptiveness of the overall study to the classroom.	Mean = 1.83 (range: 1-3)
Question 4 Teachers' perceived helpfulness of the training sessions.	All responded with (4)
Question 5 Usefulness of the study's findings to the teacher and student.	Mean = 2.5 (range: 2-4)
Question 6 Teachers' perceived decreases in off-task behavior.	Mean = 2 (range: 1-3) individual responding Mean = 2.5 (range: 1-3) choral responding Mean = 2.5 (range: 1-3) mixed responding
Question 7 Teachers' perceived decreases in disruptive behavior.	Mean = 2 (range: 1-4) individual responding Mean = 1.8 (range: 1-4) choral responding Mean = 2.17 (range: 1-4) mixed responding
Question 8 Teachers' perceived increases in active student responding.	Mean = 1.8 (range: 1-4) individual responding Mean = 3.0 (range: 1-4) choral responding Mean = 2.17 (range: 1-3) mixed responding
Question 9 Teachers' perceptions of how likely they will use the intervention in the future.	Mean = N/A for individual responding Mean = 2.83 (range: 1-4) choral responding Mean = 2.5 (range: 1-4) mixed responding

Table 4-3. Treatment integrity results

Teacher	Number of OTR	% of 4 step instructional sequence		(3) OTR instructional sequence	4) Start of syllable practice.	Mean OTR rate
Mrs. Pence	100%	Cue WT Question Feedback	100% 100% 100% M= 94.03% (range = 90 - 100%)	M= 98.5% (range = 94.03 - 100%)	100%	M= 4.80/min (range = 4.64 - 5.0)
Mrs. Hill	100%	Cue WT Question Feedback	100% 100% 100% M= 99.21% (range = 97.63 - 100%)	M= 99.8% (range = 99.21 - 100%)	100%	M= 4.65/min (range = 4.64 - 5.0)
Mr. Clinton	100%	Cue WT Question Feedback	100% 100% 100% M= 98.68% (range = 97.36 - 100%).	M= 99.67% (range = 98.68 - 100%),	100%	M= 4.75/min (range = 4.64 - 5.0)

Table 4-3. Continued

Teacher	Number of OTR	% of 4 step instructional sequence		(3) OTR instructional sequence	4) Start of syllable practice.	Mean OTR rate
Mrs. Simpson	100%	Cue WT Question Feedback	100% 100% 100% 100%	100%	100%	M= 4.76/min (range = 4.64 - 5.0)
Ms. Mallory	100%	Cue WT Question Feedback	100% 100% 100% 100%	100%	100%	M= 4.74/min (range = 4.38 - 5.0)
Ms. Orwell	100%	Cue WT Question Feedback	100% 100% 100% 100%	100%	100%	M= 4.88/min (range = 4.5 - 5.0)

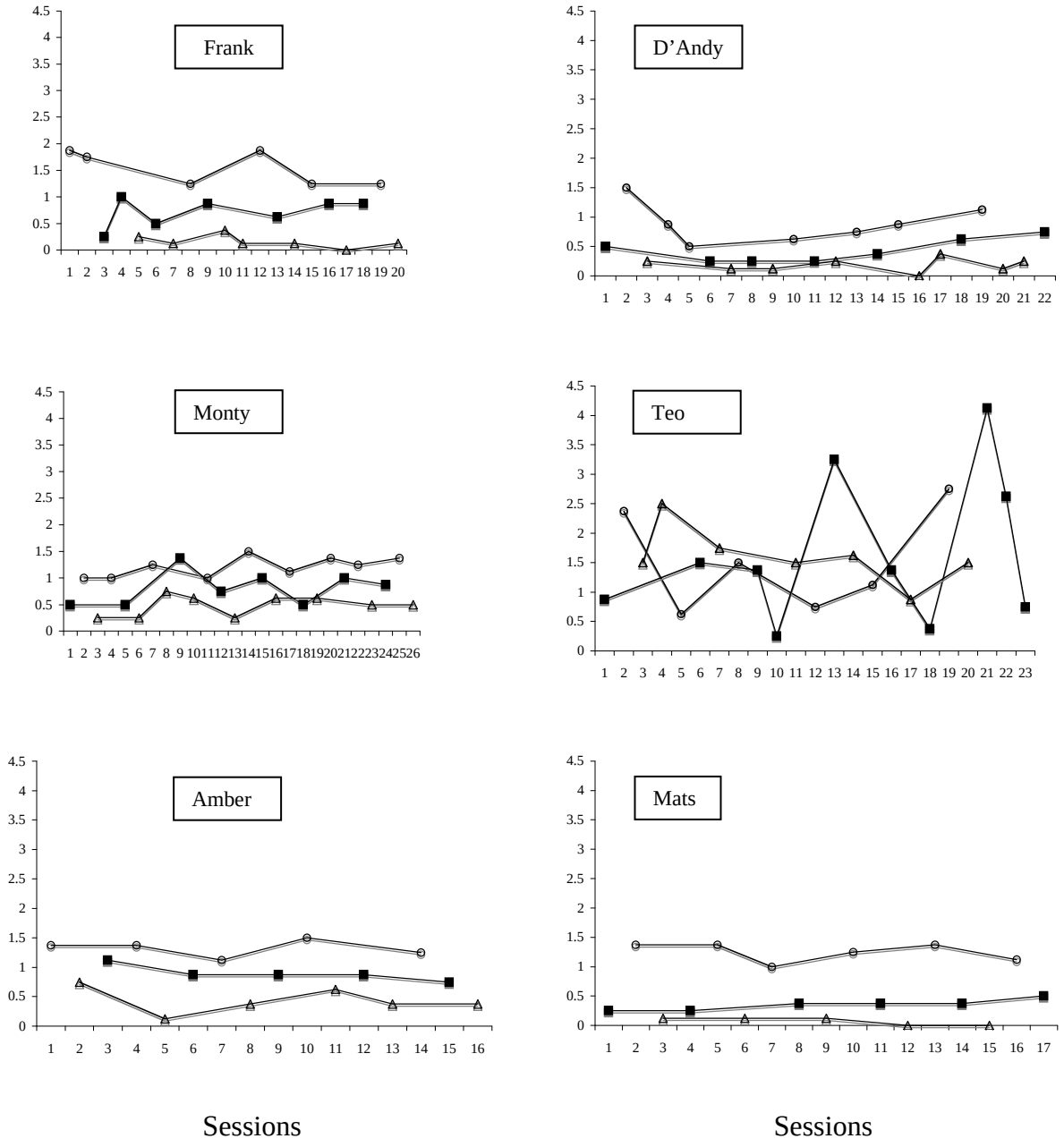

Figure 4-1. Rate of disruptive behavior per minute. Open circles =individual responding, closed squares = choral responding and open triangles = mixed responding.

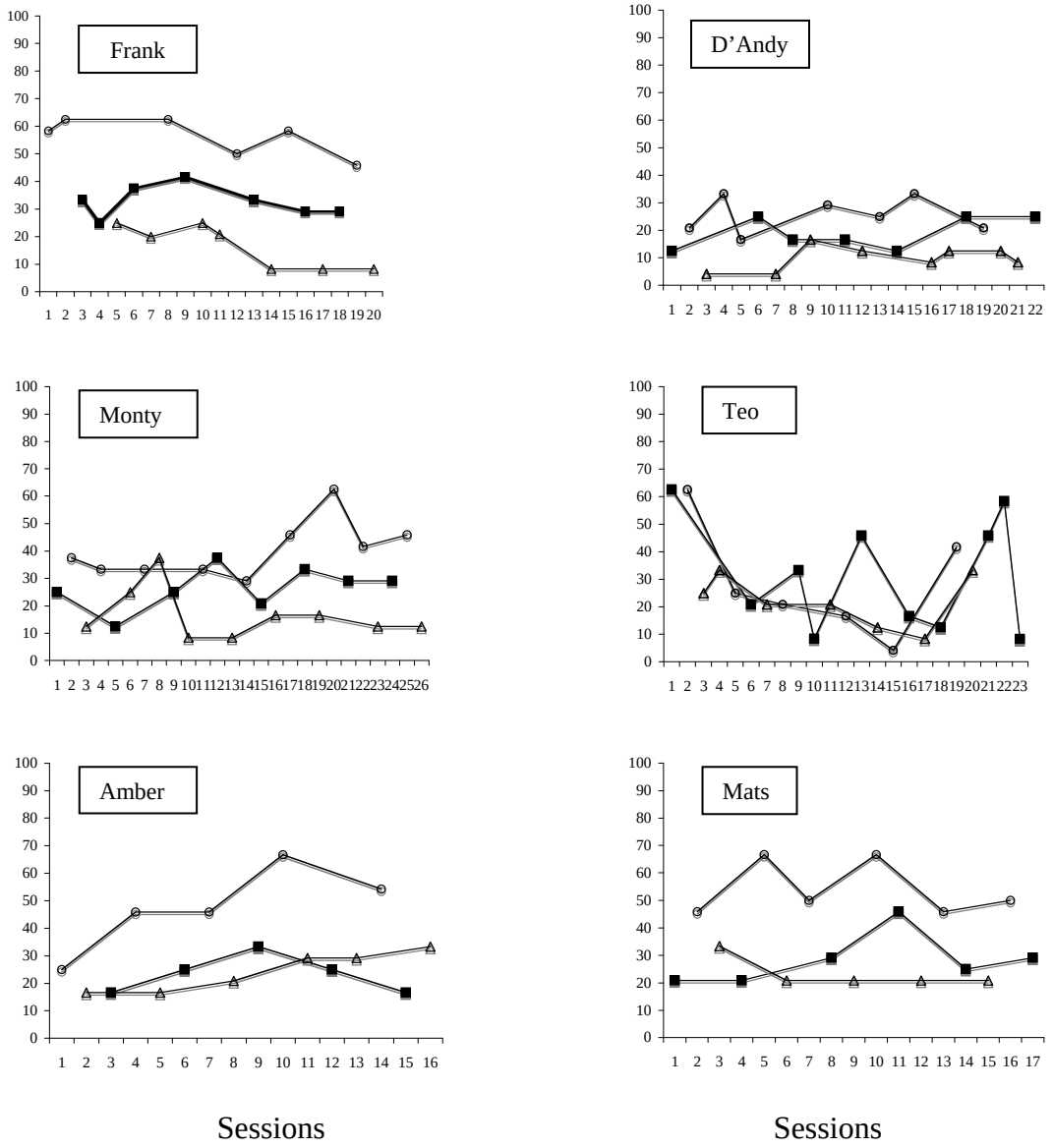

Figure 4-2. Percentage of intervals off-task. Open circles = individual responding, closed squares= choral responding and open triangles = mixed responding.

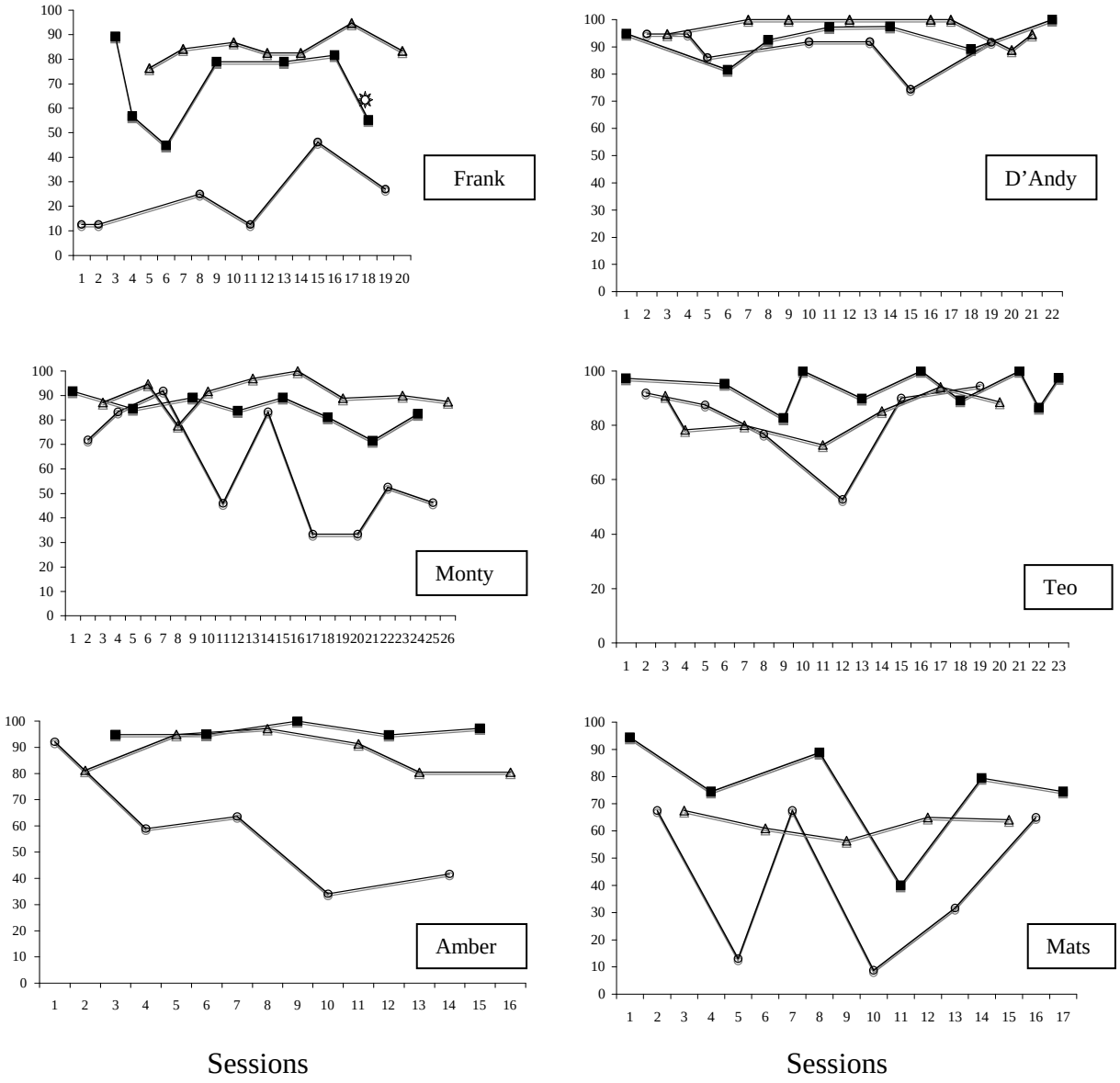

Figure 4-3. Percentage of active student responding. Open circles = individual responding, closed squares = choral responding and open triangles = mixed responding.

CHAPTER 5
DISCUSSION

The purpose of this chapter is to interpret and explain the results of the current study, which was designed to investigate three types of questioning procedures (individual responding, choral responding, and a mixture of 70% choral responding and 30% individual responding) on disruptive behavior, off-task behavior, and active student responding (ASR) with students at-risk for emotional behavioral disorders (EBD). The discussion focuses on how these findings contribute to theory and practice. Finally, the chapter concludes with a discussion of limitations and suggestions for future research.

The following research question was addressed:

How does a choral responding procedure compare to an individual responding procedure and a mixture of choral and individual responding procedure during group instruction in a general education classroom on the disruptive and, off-task behavior, and active student responding of high-risk students?

Six second-grade students and six second-grade teachers participated in this study. The students ranged in age from 7 years 6 months to 8 years 2 months and were nominated by their teachers as having had high rates of disruptive behavior for at least a month. The extent of problem behavior was verified as target students were then rated for externalizing problem behavior using the Systematic Screening for Behavioral Disorders (SSBD) (Walker & Seversen, 1993).

A single subject alternating treatments design was used to assess the effectiveness of three types of opportunities to respond (OTR) (individual responding, choral responding, and a mixture of individual and choral responding) on student disruptive behavior, and off-task behavior, and active student responding (ASR). There were two phases to this study: teacher

training and implementation of the three types of OTR. The teacher-training phase consisted of two stages: information-sharing and practice until mastery occurred. After teacher training, a comparison of the three types of OTR began. Based on a randomized schedule, the teacher was instructed to implement either choral responding, mixed mode responding, or individual responding. Teacher presentation occurred at a rate of five per minute.

Overview Findings

This study identifies several key findings. First, it appears that choral responding is a more effective instructional strategy than individual responding in terms of decreasing disruptive and off-task behavior. Five out of six participants had lower mean rates of disruptive behavior and lower mean percentages of intervals of off-task behavior during choral responding than during individual responding, replicating and extending earlier research. In this study, findings were similar to previous research (McKenzie & Henry, 1987; Sindelar et al., 1986; Wolery et al., 1992), however the dependent variables of disruptive behavior and ASR were introduced). In terms of disruptive behavior specifically, mixed responding appears to be a more effective and instructional strategy than either choral or individual responding alone. Five of six students had lower mean rates of disruptive behavior during mixed responding than during choral or individual responding.

However, differences between choral and mixed responding are less consistent for off-task behavior and ASR. Four students had fewer intervals of off-task behavior during mixed responding, and one student had fewer intervals of off-task behavior during choral responding. Similarly, three of six students had their highest mean percentages of ASR during mixed responding, while three students had their highest mean percentages during choral responding. Still, during individual responding, mean percentages of ASR were lowest for all six participants and mean percentages were highest for off-task behavior for all six participants.

Disruptive Behavior

Several conclusions from this study are especially clear. First, five of six participants demonstrated lower rates of disruptive behavior per minute during choral responding in comparison to individual responding. This finding extends earlier research on the effectiveness of choral over individual responding (McKenzie & Henry, 1987; Sindelar et al., 1986; Wolery et al., 1992), which had focused more on academic work. While the Sindelar et al. study found that 11 students with mild disabilities learned slightly more sight words during choral responding than during individual responding, the current study found that choral responding produced lower rates of problem behaviors compared to individual responding.

Second, for five of six participants, the mean rate of disruptive behavior was lowest during mixed responding in comparison to individual and choral responding. This finding supports Stevens and Rosenshine's (1986) strong recommendation for the use of mixed responding (70% choral, 30% individual). These authors suggested that target students benefit from frequent practice with choral responding, but teachers could gain information on individual performance during individual turns. The findings from this study support the use of mixed responding to gain information on target students' individual behavioral performance.

During mixed responding targeted students received 31 OTR, and during choral responding received 37 OTR. Results indicate that five of six students had lower rates of disruptive behavior with just 31 OTR per eight-minute session during mixed responding in contrast to 37 during choral responding. This finding supports previous research by Ferkis et al. (1997) who found that repeated practice while simply giving students more OTR (at the end of a learning trial) did not necessarily produce the highest number of cumulative words mastered and required more instructional time. Based on the above results, mixed responding appears to be a

more effective and efficient instructional strategy (in comparison to individual and choral responding) in reducing rates of disruptive behavior.

Off-Task Behavior

Another notable finding from this study is that five out of six participants had lower mean percentages of intervals of off-task behavior during choral responding than during individual responding. This finding again extends earlier research by Sindelar et al. (1986) and McKenzie and Henry (1979) who found that more students were off-task during individual than group responding. In the McKenzie and Henry study, those that were off-task were observed so twice as much during individual responding than during group responding. In comparison, five of six participants had the lowest mean percentage of intervals of off-task behavior during mixed responding. The group mean for intervals of off-task behavior during mixed responding was 18.8%, the group mean for off-task behavior during choral responding was 26.9%, and the group mean for off-task behavior during individual responding was 42.0%. Given the criterion of 90% for student on-task behavior by the Council for Exceptional Children (CEC, 1987), only the mixed responding condition (81.2%) somewhat approached CEC standards. Nevertheless, this finding lends some support to Stevens and Rosenshine's (1986) recommendation for the use of mixed responding (i.e., monitoring individual performance).

However, for one participant (Amber), the mean percentage of off-task behavior was very slightly lower during choral responding (23.33%) than during mixed responding (24.30%), and highest during individual responding (47.50%). One possible explanation for Amber's lower rate of off-task behavior during choral responding and mixed responding is that teacher feedback provided a stronger reinforcer for her than for the other participants. For example, after each choral response the teacher provided feedback to the entire class whether the response was correct (i.e., "yes that is correct" or "good answer"). As a result Amber may have been more

attentive and engaged so that she could respond to the next question. Her data indicate that, among all participants, she had the highest percentage of ASR and correct responses during choral (ASR, M= 96.38%, range= 94.87% - 100.00%; correct responses M= 93.31%, range = 90.00% - 94.87%). Therefore, Amber had a high-probability of responding to the sight word cards (i.e., responding verbally after each teacher question) and was at a low-probability of being off-task (i.e., emitting incompatible behaviors such as looking around the room etc.). Despite Amber's results, these findings generally support mixed responding as the most effective and efficient instructional strategy in reducing off-task behavior.

Active Student Responding (ASR)

Although percentages of ASR during individual responding were lowest for all six participants, results are less clear between choral and mixed responding in terms of effects on ASR. For example, three out of six students had highest mean percentages of ASR during mixed responding (M= 90.7%), than choral responding (M= 82.3%), while three students had highest mean percentages of ASR during choral responding than mixed responding (M= 88.5%; M= 78.2%, respectively). However, in light of recommendations by CEC (1987) during review of previous material, these percentages exceed or approach the 85% criterion for student correct responses (ASR). However, the group mean for ASR during individual responding was merely 59.1% and this percentage was well below the criterion set by CEC. In addition to intersubject variability and differences in mean percentages of ASR across participants, variability in data paths exists within subjects. For example, a visual analysis of the data paths during choral and mixed responding indicates several overlapping data points for each participant. The highest rates of ASR during choral responding suggest that, for some students, increased responding is most likely due to increased OTR and/or substantive teacher interaction (Sindelar et al., 1986). That is, during choral responding, students were given more OTR and thus responded more to

teacher questions and as a consequence teachers provided more feedback/reinforcement on student responses, which increased the probability of future student responses.

For students who had the highest percentage of ASR during mixed responding, there is at least one possible explanation. Perhaps the number of exposures to questions was a more critical variable than the number of OTR and, thus, observational learning may have occurred (Skinner & Shapiro, 1989; Sterling et al., 1997; Wolery et al., 1992). For example, during mixed responding the number of times the target student observed other students responding was approximately eight per 8-minute session, whereas during choral responding, the target student did not observe other students responding. In spite of this, these findings support previous research showing that instructional strategies that produce high rates of ASR are superior to those that produce low ASR in terms of decreasing disruptive and off-task behavior (Skinner et al., 1991).

Other Considerations

Although not evaluated as a dependent measure due to methodological considerations (i.e., unequal opportunities for correct responses across the three types of OTR), anecdotal data were collected on participants' correct responses because of the importance this variable receives in the literature. The anecdotal data suggests that all six participants responded correctly to OTR in the individual response condition, however, no conclusive differences were found in rate of correct responses between choral and mixed responding. In the future, researchers may compare individual, choral, and mixed responding using a design wherein the number of exposures is not held constant and teachers are encouraged to complete as many trials as possible in each condition and each session (Wolery et al., 1992).

Social Validity

Social validity data reveal that the six teachers felt the study did not disrupt their classroom environment, and that the training session was very helpful. All six teachers stated that they currently utilized individual responding and indicated that choral responding was easy to implement, supporting earlier research wherein teachers provided similar feedback (Sainato et al., 1987). Four of six teachers commented that mixed responding was the most difficult type of OTR to implement because they had to read a randomized list. Instead, these teachers endorsed approximating the 70% choral to 30% individual ratio from memory, indicating the acceptability of mixed responding as a teaching strategy (Schwartz & Baer, 1991).

Teachers Perceived Effectiveness of the Three Types of OTR

Interestingly, most teachers' perceptions of the effects of the three types of OTR on the dependent variables were not confirmed by the data. For example, among the five teachers where mixed responding produced the lowest rate of disruptive behavior, only Monty's teacher, Mr. Clinton, had noticed decreases in disruptive behavior after implementing the mixed responding procedure; the other four teachers believed choral responding produced the largest effect. Three teachers (Mrs. Pence/Frank, Mrs. Hill/D'Andy, Mr. Clinton/Monty) observed that the percentage of off-task behavior was lowest during mixed responding, while Mats' teacher (Ms. Orwell) did not notice the positive effect of choral responding on off-task behavior. She did, however observe, after implementation, a very noticeable increase in Mats' ASR during choral responding. Frank and Monty's teachers (Mrs. Pence and Mr. Clinton) observed that ASR was highest during mixed responding, while Mrs. Hill did not observe that the same was true for D'Andy. Amber's teacher, Ms. Mallory, responded that she did not observe any positive effects from any condition on any of the dependent variables. Teo's teacher, Mrs. Simpson, stated that his behavior during the study approximated his normal classroom behavior and that the 3 types

of OTR did not have an effect. The fact that the teachers did not reliably discern the differential effects of the three different teaching strategies makes a strong case for using data collection and using objective criteria to make decisions about student classroom behavior (Witt, VanDerHyeden, & Gilbertson, 2004).

Teachers' Likelihood of Using the Intervention in the Future

Teachers' likelihood for using the various responding strategies, particularly choral and mixed responding, in the future was not strongly predictable. First, all six teachers stated that they currently used individual responding, but at a lower rate than required in the study condition. The mean teacher response in favor of using choral responding in the future was only slightly higher than the mean response for using mixed responding and indicates that they may be slightly less than somewhat likely to use both types of responding in the future. However, two teachers reported that they would be very likely to use mixed responding in the future. Mats' teacher, Ms. Orwell, commented that the mixed responding had an "element of surprise" because students did not know if they were called upon individually until the "very last second." After a visual inspection of the data, Frank's teacher, Mrs. Pence, stated that that said she would be very likely to use mixed responding in the future. Implementing increased rates of OTR that fit within the details of day-to-day classroom instruction and that does not radically alter teachers curriculum are a few ways researchers can get teachers to maintain evidence based practices in their classrooms (Gersten, Vaughn, Deshler, & Schiller, 1997).

Interpretation of Findings

One of the study's findings, the lack of differential effects across the three types of OTR on disruptive behavior and off-task behavior for one student (Teo) and across choral and mixed responding for off-task behavior for one student (Amber), and across individual and choral responding for off-task behavior for one student (D'Andy) has several implications and deserves

further discussion. First, the results indicate that for Teo, the mean rate of disruptive behavior was approximately equal across the three types of OTR (individual responding= 1.52/min; choral responding = 1.65/min; mixed= 1.61/min). Secondly, there is a great deal of variability in the data for disruptive behavior during choral responding. Teo's data for disruptive and off-task behavior among the three conditions have a large amount of variability, and a great deal of overlap. The high rates of Teo's disruptive behavior and off-task behavior may indicate that the instructional intervention of mixed or choral responding was not powerful enough to decrease his disruptive and off-task behavior. A characteristic of Teo (impulsivity) may have prevented the effectiveness of the intervention. In addition, there were several undetected variables in the environment (teacher attention; peer attention) that influenced the stability in his behavior (Sidman, 1960). For example, incidental observations indicate that during the teacher feedback procedure, Teo talked with a peer sitting next to him and the peer responded.

Even though there were no clear effects, data collection was stopped for Teo because stability in the data could not be obtained. Even so, the findings from the other participants support earlier research that indicates choral/unison responding and increased rates of OTR decrease rates of disruptive behavior (McKenzie & Henry, 1979; Sutherland et al., 2003; West & Sloane, 1986).

Teo's disruptive and off-task behavior may have been altered by the presence of setting factors such as peer conflicts before entering the classroom (Davis & Fox, 1999). Setting factors, those biological and environmental components (i.e., headaches, fighting with peers) that in a given context affect reinforcement contingencies, could also provide a possible explanation for variability in data. For example, Teo suffered from migraine headaches and this was not discovered until half way through the study. Thus, migraines (or lack there of) could have set the

occasion for Teo to be more or less disruptive (depending on their effects on his behavior) during any of the three types of responding. In addition, teacher reports indicated that at times Teo had conflicts with his peers during transition time before entering the classroom for language arts instruction, which also may have served a setting factor function. Another likely explanation for Teo's behavior could be explained by the teacher's lack of providing effective consequences for Teo's behavior. His teacher informally reported that she could not implement and follow up on negative consequences for his disruptive and off-task behavior because Teo was in her class for only an hour and a half per day and she was not able to communicate with his homeroom teacher. Unfortunately, no systematic data was collected to evaluate the potential influence of these factors on Teo's behavior.

In addition to Teo's disruptive and off-task behavior there was a lack of differential effects across two types of OTR on the off-task behavior for two students (D'Andy and Amber). For example, D'Andy's data indicate overlap between individual and choral responding across the last two data points, while Amber's data show overlap between choral and mixed responding across the last two data points. Possible explanations for D'Andy's data could also be provided by setting factors (sleep deprivation, fighting with peers), ease of distractibility and competing stimuli in the classroom, or lack of impulse control (informal reports indicated he had Attention Deficit Hyperactivity Disorder-ADHD like symptoms) (Koegel et al., 1980; Skinner et al., 1994). Possible explanations for the overlap between choral and mixed responding in the data paths of Amber's off-task behavior could be explained by her self-stimulatory behavior, short attention span, and ease of distractibility (Koegel et al.). For example, incidental observations suggested that during mixed responding when other students had individual turns, Amber looked at and twirled her hair, stared out the window, or attended to any competing stimuli that occurred

in the classroom (i.e., students adjusting their seating position, squeaky chairs etc.). Informal reports by her teacher confirmed that the above behaviors occurred frequently but that she had not been aware of Amber having a history of seizures or taking medications for ADHD.

Implications for Practice

The current study has practical implications for many students because it provides additional evidence of the importance of using choral responding during large group instruction.

These findings lend initial support for the use of mixed responding during large group instruction in a general education setting. However, before implementing the mixed responding procedure, teachers could consider that mixed responding may be difficult to implement, while other teachers may prefer a less noisy instructional procedure such as individual responding. Furthermore, for some students who lack impulse control, choral responding may increase levels of excitement and off-task behavior, and therefore precorrection strategies (i.e., reminding students to remain quiet after each response) may need to be implemented before utilizing choral responding.

The long-term benefits of using a systematic questioning strategy may outweigh the initial time and effort involved to effectively implement mixed or choral responding. Some of the initial costs are using classroom management skills (reminding students of classroom rules, using inside voices), and learning to use wait time and feedback procedures. In general education classrooms, teachers are often compelled to instruct large numbers of students with considerable skill deficiencies, and may acknowledge a limited amount of available instruction time to reverse the academic deficiencies in their students (Barbetta & Heward, 1993). Depending on group size, students can respond up to three or four times more during choral responding than during individual responding (Sindelar et al., 1986). Because there is a relationship between high rates of OTR and ASR in previous research and because ASR may facilitate student learning, choral

or mixed responding may be the instructional strategy best suited to remedy skill deficiencies in students with academic deficits or learning disabilities. For example, choral and mixed responding allows teachers to monitor student understanding and gain immediate feedback during guided practice for all, if not most students in a classroom. When implemented over a period of time choral and mixed responding could allow teachers to informally assess areas of needed improvement for targeted students (Barbetta & Heward; Sterling et al., 1997). In addition, as a general practice, teachers could use mixed and choral responding to reduce the amount of time students passively attend during instruction (Sterling et al.).

Some additional implications for teachers are evident in the literature. The positive results on ASR associated with the use of choral and mixed responding in comparison to individual responding supports earlier findings of Sainato et al. (1987), indicating that the instructional behavior of the teacher may also be a critical factor leading to positive student outcomes across various settings, subjects, and grade levels. Furthermore, teachers can implement group responding with a large class size and reduce the amount of transition time needed to implement smaller instructional grouping formats (Sterling et al., 1997). Parents also could incorporate high rates of OTR during home instruction or when providing assistance for their children's homework. Finally, paraeducators could be trained in the use of group responding and implement these strategies during intensive small group instruction (Sterling et al.).

Limitations

Although mixed responding appeared to be more effective in reducing disruptive behavior than choral and individual responding, a few limitations may temper the power of the statements that can be made as result of this study. First, as is inherent in all single subject research designs, the small sample size limits the generalizability of the findings. Thus, generalization to other

academic activities and other settings, or to students by age, grade, gender, or learning histories, requires systematic replication (Kazdin, 1982).

Second, the procedures and the study's design did not allow for a comparison of correct responses across three conditions. This limitation is particularly important because the percentage of correct responses is considered a significant dimension of effective instructional practice (Gunter et al., 2004). However, an anecdotal report of correct responses between choral and mixed responding was inconclusive among choral and mixed responding.

Third, there are several overlapping data points among the participants' (Teo, Amber, and Mats) dependent variables, particularly with ASR. For these participants, choral responding resulted in a slightly higher mean percentage of ASR than mixed responding. In contrast, with Frank, D'Andy, and Monty, mixed responding resulted in a slightly higher mean percentage of ASR than choral responding. Thus, it is difficult to determine which instructional strategy is most effective in increasing active student responding. The fact that Teo, Amber, and Mats had a slightly higher rate of ASR during choral responding than mixed responding suggests that OTR and teacher feedback (37 of each during choral responding and 31 of each during mixed responding) may have provided prompts and reinforcers to help these students stay on-task when they may otherwise not attend because they have a short attention span or are easily distracted (Koegel et al., 1989; Skinner et al., 1994). Furthermore, these students may not have been motivated to pay attention to the individual turns during mixed responding. Teachers during mixed responding could therefore increase the number of individual turns towards the target student (from 3 to 5) and/or provide precorrection strategies and/or praise for the target student while attending to other students' answers during individual turns.

Fourth, data collection was stopped before a clear data path was established for the dependent variables of off-task behavior and ASR. The decision to end data collection was based on the implementation of the intervention in the applied setting and that continued data collection would be cumbersome and cause the experiment to require too many sessions to complete (Cooper, Heron, & Heward, 1987). While stability was achieved in the primary dependent variable of disruption, some of the data paths for some of the participants in the secondary dependent variables had not reached stability and it is difficult to establish a functional relation between the three types of OTR and those variables. It is also difficult to establish if there was covariation between the primary and secondary variables.

Fifth, teacher implementation of contingent consequences (i.e., use of rewards, teacher attention, punishment, and response cost activities such as moving a card, verbal warnings for non-participation) outside of the learning trial (teacher question, student response, and teacher feedback) was not recorded and it is impossible to infer what if any effects on the dependent measures might have been demonstrated (Carnine, 1976). Although informal observations noted that teachers used positive reinforcement and punishment very little throughout the study, no formal observations were used to collect this data. Therefore, the extent of teacher use of individual attention or extinction on the outcomes of the dependent variables is not known. For example, teacher attention may have affected the percentage of intervals of off-task behavior. Skinner et al. (1994) noted a similar limitation and reported in their study that tangible reinforcers and individual attention might have been functionally related to very high rates of attention to tasks and possibly caused students to learn at their maximum levels.

Sixth, a lack of a business as usual condition prohibits a comparison to student baseline rates on the dependent variables, and therefore the extent of improvement in student academic and social behavior cannot be determined.

Finally, maintenance data was not collected after the intervention phase of the study. The primary experimenter had been in the first three classrooms more than five weeks and believed that the teachers were tiring of the intervention and were not interested in maintenance data. Therefore, it is not possible to determine whether teachers continued to use choral or mixed responding (social validity assessments showed that teachers utilized individual responding before the onset of the study). Furthermore, it is not known whether students sustained improvements after the conclusion of the study. In the future, a maintenance phase could be built into the design of the study and researchers could determine if teachers were implementing choral or mixed responding at a rate of 5 OTR per minute.

Implications for Future Research

The findings from this study demonstrate a functional relation between mixed and choral responding in comparison to individual responding on the disruptive and off-task behavior of second grade students at risk for emotional and behavioral disorders (EBD). Furthermore, the findings replicate earlier research on the effectiveness of choral responding in terms of reducing disruptive and off-task behavior and increasing ASR. As a logical next step, researchers should compare choral responding and other ratios of mixed responding: (a) with students of different ages and across various subject areas such as math and science (Carnine, 1976), (b) across sessions of more than an 8-minutes (Sainato, 1987), and (c) with children identified with various learning disabilities or with autism (Koegel et al., 1980). These extensions would help establish and verify the conditions under which varying types of responding are more effective and efficient.

In addition, future research would do well to include summative assessments at the end of the study to measure the impact of the three types of OTR on individual student learning. For example, researchers could examine the influence of the three types of OTR on sight word acquisition and then measure increases in reading comprehension or sight word vocabulary (Skinner & Shapiro, 1989). Future research should also examine the relationship between the three types of OTR and teachers' use of praise on student disruptive and off-task behavior (Sutherland et al., 2003). In addition, researchers could examine the effects of the three kinds of OTR and praise on teachers' use of negative consequences (punishment, office referrals, and time out etc.) toward target students (Gunter et al., 1994). This is particularly important because students with EBD can be part of numerous confrontations in the classroom, interrupt the flow of instruction, and affect the behaviors of other students creating a chaotic environment for their teachers and all students in the classroom (Sutherland et al., 2002).

One potential concern with the results of this study is the lack of clear effects of any type of responding on the disruptive and off-task behavior for Teo. Because challenging behaviors are often predictable responses to antecedent and consequent events occurring in their environment, future research may use functional assessments to gather information on the antecedent and consequent events that are associated with the occurrence of challenging behavior (Scott & Kamps, 2007). That is, the impact of even the most powerful strategy or instructional method will be unlikely to be effective with every individual student. The idiosyncrasies of individual student preferences and needs are best determined in an individual manner. Functional behavior assessment is one method of assessing how the environment may interact with student behavior and suggest effective individualized strategies.

Researchers should continue to investigate an optimal rate of OTR on the percentage of correct responses and error rates (West & Sloane, 1986). For example, increasing the pace of instruction many not be desirable for all students. Some students with skill deficits may need adequate wait time to formulate responses during a fast paced learning trial (Skinner et al., 1994). In addition, researchers could investigate procedures used to decrease disruptive behavior, and increase on-task behavior and ASR, during slower paced instruction where some students may engage in high rates of disruptive behavior (i.e., during individual responding) (Skinner et al.).

Summary

Previous research has compared individual and choral responding with the acquisition of sight words among students with mild and moderate disabilities (Sindelar et al., 1986; Wolery et al., 1992). The present study extended the outcomes of this research by comparing individual and choral responding with mixed responding on the academic and social behavior of students at-risk for EBD during group instruction. As with previous studies, results showed a positive impact of choral responding in comparison to individual responding on the disruptive and off-task behavior with students identified at-risk for EBD. However, five of the six participants had lower rates of disruptive behavior during mixed responding in comparison to individual and choral responding, while five of the six participants had lower intervals of off-task behavior during mixed and choral responding than during individual responding. Furthermore, all six participants had higher rates of ASR during choral and mixed responding in comparison to individual responding.

Although positive results were found across five participants, for one participant there was a lack of clear results on his disruptive and off-task behavior among the three types of OTR. Future research could use functional behavior assessment to gather information on the antecedent and consequent events that are associated with the occurrence of challenging behaviors that are

not responsive to effective instructional practices. The current study adds to both research and practice on instructional strategies that reduce disruptive and off-task behavior and increase ASR for students identified at-risk for EBD.

APPENDIX A
SAMPLE LESSON TRIAL

Session Duration:	8 minutes
Setting:	General education classroom
Materials Needed:	Sight word cards
Participants Present:	Entire class and targeted student

Before the study the teacher selected words from previous stories. The words were divided into 3 categories; high frequency words from 5 stories in Basal reader, vocabulary words from stories previously read and names of States.

Choral responding mode

Step one: The teacher will explain the expectations, procedures, and rules for the choral responding condition. For example, the teacher will say; “After I show you the card, I will cue the class by saying “What word?” then I want you to say the word together.”

Step two: The teacher will show a sight word card to the class, count silently for three seconds read the definition and then say, “What word?”

Step three: The teacher will provide feedback on whether the answer was correct or incorrect by saying, “Yes, that is correct.” Or “No, the correct word is _____.”

Step four: The teacher will select another sight word card and begin the next learning trial.

Individual responding mode

Step one: The teacher will explain the expectations, procedures, and rules for the individual responding condition. For example, the teacher will say; “Today I will call on one student at a time. After I show you the card, I will say; “who can tell me the word?”

Step two: The teacher will show a sight word card to the class, count silently for three seconds read the definition and then say; “Who can tell me the word?”

Step three: The teacher will provide feedback on whether the answer was correct or incorrect by saying, “Yes, that is correct.” Or, “No, the correct word is _____.”

Step four: The teacher will select another sight word card and begin the next learning trial.

Combination of individual and choral: In this condition the teacher will use the choral responding for 70% of the time and individual responding mode 30% of the time. The procedure for individual responding follows.

Step one: The teacher will explain the expectations, procedures, and rules for each response condition: choral or individual. For individual responding the teacher will say; “After I show you the card and read the definition I will say, “Who can tell me what word?” I want you to raise your hand and if you are quiet you will have a chance to be called on.” For choral responding, the teacher will say; “This is for everyone.”

Step two: The teacher will show a sight word card to the class, read the definition and say, “Who can tell me what word?” (individual). Or, “Everyone.” (choral).

Step three: The teacher will count silently for three seconds and randomly select from a list of students, and call on that student. However, during this condition the teacher will call on the targeted student three times.

Step four: The teacher will provide feedback on whether the answer was correct or incorrect by saying, “Yes, that is correct.” Or “No, the correct word is _____.”

Step five: The teacher will select another sight word card and begin the next learning trial.

APPENDIX B
CODING MANUAL

Opportunity to respond (OTR): An OTR (*choral responding*) will be recorded when the teacher asks an academic question to the entire group that requires a *specific* response. An OTR (*individual responding*) will be recorded when the teacher asks an academic question to one student that requires a *specific* response. The question must seek a specific response that is related to the academic subject area being observed. Examples of OTR would be "What is this word?" during reading class. When the teacher repeats the same OTR – "What is this word?" only counts once.

1. Examples:

- "What is this word?"
- "Please say the word on the flash card."
- **"**OK, everyone, what is this word?" (teacher is pointing to the sight word/flash card)
- "Timmy, what is this word?" (individual OTR)
- "Who can tell me what this word is?" (This example is a question for one individual to respond and does not reflect choral responding).

2. Non-examples:

- "Do you think these words are helpful?"
- "Who finished their homework last night?"
- "What did we do yesterday?"
- "Everybody write this word."
- Teacher asks, "What does this word represent?" Students raise their hands, but they do not receive an opportunity to provide an answer (e.g., teacher asks another question immediately.)
- "Copy this word down."

Disruptive behavior: A disruptive behavior will be recorded when a student performs a behavior that interrupts, or has the potential to interrupt, the instruction in the classroom or the learning of another student.

1. Examples:

- Student calling out a response when the expectation is to raise a hand.

- Student is out of seat without permission. Permission being EXPLICIT permission from the teacher regarding reason for student being out of seat; the exception is the student going to sharpen pencil, unless teacher has restricted this activity.
- Student stands up at desk.
- In the middle of lesson, the student gets up and walks up in front of the teacher and or asks a question.
- Student moves desk or has foot or feet on desk.
- Student leans over from his seat and talks to a classmate.
- Student is banging/tapping his hands or object (e.g., pencil) on desk.
- Student is mocking the teacher as teacher talks (imitating voice and/or body language).
- Student is singing at desk.
- Student is talking or tells a joke while the teacher is talking.
- Student responds so loudly that other students look at him/her and do not answer the teacher.
- Student uses profanities.

2. Non-examples:

- Student mumbling at desk.
- Student is looking at another student while that student is looking at the teacher.
- Student involuntarily sneezes or coughs.
- Student is slowly rocking back and forth in chair.

Active student response: An active student response (ASR) is defined as engaging in the behavior that was expected during that condition: (a) independent hand raising for the individual responding, (b) responding in unison with the group for choral responding, or (c) a mixture of both in the mixed responding condition (Godfrey, Grisham-Brown, Schuster, & Hemmeter, 2003). ASR will be recorded when the student raises their hand during wait time (during individual responding) or verbally responds within 1-second during choral responding. The verbal response and the amount of fingers shown during syllable trials do not need to be accurate in order to record an ASR.

1. Examples:

- Student raises his hand to answer the teacher's question.
- Student verbally responds to the teacher questions.
- Student responds but incorrectly.
- Student raises 4 fingers to indicate a response for the number of syllables in the word—"no".

2. Non-examples:

- Student does not raise his hand.
- Student does not verbally respond.
- Student does not show any fingers.

Correct response: A correct response will be recorded when the targeted student along with other students, provides a specific, desired response to an OTR (choral responding*) or when the target student provides a specific, desired response to an OTR (individual responding) within 2 seconds from the teacher's prompt. An incorrect response will be recorded when the targeted student provides an answer that does not match the word on the flash card, answers after a 3 second time period, or looks at students' fingers during syllable practice or verbally responds after students in the choral condition and is also a non-example.

1. Examples:

- "Embarrassed" in response to "What is this word?" (the correct answer is embarrassed).
- "Tomato" in response to "OK everyone, what is this word?" (the word is tomato).

2. Non-examples:

- "Stop sign" in response to "What is this word?" (the correct answer is embarrassed).
- "Florida" in response to "OK everyone, what is this word?" (the word is tomato).
- Student answers correctly after more than 2 seconds.
- Student looks at another students' fingers then raises his fingers (during syllable drill).
- Student responds after the class during the choral responding (sight word practice).

* Note choral response will be the method that the teacher asks questions but observers will observe only the targeted child.

No-response: A no-response will be recorded when the targeted student does not answer the question verbally in the choral and individual responding condition or does not raise his hand to attempt to answer the question in the individual responding condition.

1. Examples:

- Teacher asks the entire class to chorally respond and the student does not verbally respond within 3 seconds.

- The student does not raise his hand to answer the question in the individual mode of responding.
- When the student is called on to answer individually even if he does not have his hand raised and does not respond with in 3-seconds.

On-task: On-task behavior will be coded when a target student is sitting in his or her seat and is actively directed toward the teacher (i.e., verbally answering questions after the teachers cue, eye contact toward the teacher or flash card, body is facing the teacher). An on-task behavior will be recorded for the targeted student when observed to be on-task when the time sample occurs. This behavior includes following directions given by the teacher and paying attention to the teacher. If the student being observed during the time sample does not meet the criteria for on-task behavior, the observer will record “off-task” (-) for that interval. The non-examples for on-task behavior are examples of off-task behavior.

1. Examples:

- Teacher talking, student looking at teacher.
- Student is answering the teacher question.
- Student is sitting at his or her desk and looking at the teacher.

2. Non-examples:

- Teacher talking, student looking at the floor.
- Teacher talking, student looking at and/or talking to a peer.
- Student looking at material that is not related to the lesson.
- Student talking to him or herself.
- Student looking at observer when it is time to record.
- Student looking at desk when it is time to record.
- Student standing up at desk when tone sounds.
- Student drops a pencil or touching any other object.
- Student is drawing while teacher talks.

APPENDIX C
CODING SHEET

Teacher_____ Observer_____ Time_____ Date_____ Data point_____

✓	1 (+) (-)		2 (+) (-)		3 (+) (-)
	4 (+) (-)		5 (+) (-)		6 (+) (-)

CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR
CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR

	7 (+) (-)		8 (+) (-)		9 (+) (-)
	10 (+) (-)		11 (+) (-)		12 (+) (-)

CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR
CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR

	13 (+) (-)		14 (+) (-)		15 (+) (-)
	16 (+) (-)		17 (+) (-)		18 (+) (-)

CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR
CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR

	19 (+) (-)		20 (+) (-)		21 (+) (-)
	22 (+) (-)		23 (+) (-)		24 (+) (-)

CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH NR Ind	CR NR ICR	CH Ind	CR NR ICR
CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR	CH Ind	CR NR ICR

+ = On-task -- = Off-task ✔ = Disruptive behavior

CH = Choral responding Ind = Individual responding CR = Correct responding ICR = Incorrect responding

NR = No response ASR= Active Student Response

☐ = Targeted student ✖ = Error correction (2nd chance)

APPENDIX D
TREATMENT INTEGRITY SHEET

1 min	CU-WT-FK-NQ*	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ
2 min	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ
3 min	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ
4 min	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ
5 min	CU-WT-FK-NQ **SYLLABLES**	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ
6 min	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ
7 min	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ
8 min	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ	CU-WT-FK-NQ

* CU = cue; WT = wait time; FK = feedback; NQ = next question

APPENDIX E
SOCIAL VALIDITY FORM

Date: _____

Teacher: _____

School: _____

Age of Student: _____ Grade of Student: 2nd

Intervention Type_____

Please complete the items below by circling the number under the question that best fits how you feel about the intervention.

1. **Which intervention was most difficult to implement? (Individual, Choral or Mixed)**

2. **How difficult was it to implement the intervention?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

3. **How time-consuming was the implementation of the intervention?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

4. **How helpful was the training session?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

5. **How helpful to your teaching instruction was the intervention?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

6. **After implementing the intervention, did you see a decrease in the student's off-task behavior?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

7. **After implementing the intervention, did you see a decrease in the student's disruptive behavior than what you normally observe?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

8. **After implementing the intervention, did you see an increase in the student's active responses?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

9. **How likely is it that you will use the intervention in the future?**

Not at all	Somewhat	Fairly	Very
1	2	3	4

(For questions 10-14 only need to answer once)

10. **Number of years teaching? _____**

11. **Have you taken a class in classroom management? Yes/No**

12. **What types of grades does _____ make?**

13. **Has _____ been suspended? Yes/No. If so how many times _____?**

14. **How many office discipline referrals (ODR) has _____ received?**

REFERENCES

Anderson, L. M., Evertson. C. M., & Brophy, J. E. (1979). An experimental study of effective teaching in first grade reading groups. *The Elementary School Journal, 79,* 193-223.

Armendariz, F., & Umbreit, J. (1999). Using active responding to reduce disruptive behavior in a general education classroom. *Journal of Positive Behavior Interventions, 1,* 152-158.

Barbetta, P. M., Heron, T. E., & Heward, W.L. (1993). Effects of active student response during error correction on the acquisition, maintenance, and generalization of sight words by students with developmental disabilities. *Journal of Applied Behavior Analysis, 26,* 111-119.

Barbetta, P. M., & Heward, W. L. (1993). Effects of active student response during error correction on the acquisition and maintenance of geography facts by elementary students with learning disabilities. *Journal of Behavioral Education, 3,* 217-233.

Barlow, D. H., & Hayes, S. C. (1979). Alternating treatments design: One strategy for comparing the effects of two treatments in a single subject. *Journal of Applied Behavior Analysis, 12,* 199-210.

Brualdi, A. C. (1998). Classroom questions. Washington, DC: ERIC Clearinghouse on Assessment and Evaluation.

Carnine, D. W. (1976). Effects of two teacher-presentation rates on off-task behavior, answering correctly, and participation. *Journal of Applied Behavior Analysis, 9,* 199-206.

Carr, E. G., Taylor, J. C., & Robinson, S. (1991). The effects of severe behavior problems in children on the teaching behavior of adults. *Journal of Applied Behavior Analysis, 24,* 523-535.

Council for Expectional Children (1987). *Academy for effective instruction: Working with mildly handicapped students.* Reston, Virginia: Author.

Cooper, J. O., Heron, T. E., & Heward, W. L. (1987). *Applied behavior analysis.* Columbus, OH: Merrill.

Davis, C. A., & Fox, J. (1999). Evaluating environmental arrangement as setting events: Review and Implications for Measurement. *Journal of Behavioral Education, 9,* 77-96.

Engelmann, S., & Colvin, G. (1983). *Generalized compliance training: A direct-instruction program for managing severe behavior problems*. Austin, TX: Pro-ed.

Ferkis, M. A., Belfiore, P. J., & Skinner, C. H. (1997). The effects of response repetitions on sight word acquisition for students with mild disabilities. *Journal of Behavioral Education, 7,* 307-324.

Gall, M. (1970). The use of questions in teaching. *Review of Educational Research, 40,* 707-721.

Gall, M. (1984). Synthesis of research on teachers' questioning. *Educational Leadership, 42,* 40-47.

Gardner, R., Sainato, D. M., Cooper, J. O., Heron, T. E., Heward, W. L., Eshleman, J., & Grossi, T. A. (Eds.). (1994). *Behavior analysis in education: Focus on measurably superior instruction.* Pacific Grove, CA: Brooks/Cole.

Gersten, R., Vaughn, S., Deschler, D., & Schiller, E. (1997). What we know about using research findings: Implications for improving special education practice. *Journal of Learning Disabilities, 30,* 466-476.

Godfrey, S. A., Grisham-Brown, J., Schuster, J. W., & Hemmeter, M. L. (2003). The effects of three techniques on student participation with preschool children with attending problems. *Education and Treatment of Children, 26,* 255-272.

Good, T. L. (1970). Which pupils do teachers call on? *The Elementary School Journal, 70,* 190-198.

Good, T. L., & Brophy, J. E. (2003). *Looking in classrooms* (9th ed). New York: Allyn & Bacon.

Greenwood, C. R., Delquadri, J., & Hall, R. V. (1984). Opportunity to respond and student academic achievement. In W.L. Heward, T. E. Heron, D. S. Hill, & Trap-Porter (Eds.), *Focus on behavior analysis in education* (pp. 58-88). Columbus, OH: Merrill.

Gresham, F. M., Gansle, K. A., & Noell, G. H. (1993). Treatment integrity in applied behavior analysis with children. *Journal of Applied Behavior Analysis, 26,* 257-263.

Gunter, P. L., & Coutinho, M. J. (1997). Negative reinforcement in classrooms: What we're beginning to learn. *Teacher Education and Special Education,* 20, 249-264.

Gunter, P. L., Hummel, J. H., & Conroy, M. A. (1998). Increasing correct academic responding; An effective intervention strategy to decrease behavior problems. *Effective School Practices, 17,* 55-62.

Gunter, P. L., Jack, S. L., Shores, R. E., Carrell, D. E., & Flowers, J. (1993). Lag sequential analysis as a tool for functional analysis of student disruptive behavior in classrooms. *Journal of Emotional and Behavioral Disorders, 1,* 138-148.

Gunter, P. L., Reffel, J. M., Barnett, C. A., Lee, J. M., & Patrick, J. (2004). Academic response rates in elementary-school classrooms. *Education and Treatment of Children, 27,* 105-113.

Gunter, P. L., Shores, R. E., Jack, S. L., Denny, R. K., & DePaepe, P. A. (1994). A case study of the effects of altering instructional interactions on the disruptive behavior of a child identified with severe behavior disorders. *Education and Treatment of Children, 17,* 435-444.

Gunter, P. L., Venn, M. L., Patrick, J., Miller, K. A., & Kelly. L. (2003). Efficacy of using momentary time samples to determine on-task behavior of students with emotional/behavioral disorders. *Education and Treatment of Children, 26,* 400-412.

Hall, R. V., Delquadri, J., Greenwood, C. R., & Thurston, L. (1982). The importance of opportunity to respond in children's academic success. In E. B. Edgar, N. G. Haring, J. R. Jenkins, & C. G. Pious (Eds.), *Mentally handicapped children: Education and training.* Baltimore: University Park Press.

Heward, W. L. (1994). Three "low tech" strategies for increasing the frequency of active student response during group instruction. In R. Gardner, III, D. M. Sainato, J. O. Cooper, & T. E. Heron (Eds.) *Behavior analysis in education. Focus on measurably superior instruction* (pp. 283-320). Monterey, CA: Brooks/Cole.

Heward, W. L., Courson, F. H., & Narayan, J. S. (1989). Using choral responding to increase active student response. *Teaching Exceptional Children, 21,* 72-75.

Jones, G. M., & Gerig, T. M. (1994). Silent sixth-grade students: Characteristics, achievement, and teacher expectations. *The Elementary School Journal, 95,* 162-182.

Kauffman, J. M. (2005). *Characteristics of children's behavior disorders* (7th ed.). Columbus, OH: Merrill.

Kazdin, A. E. (1982). *Single case research designs.* New York: Oxford University Press.

Kennedy, C. H. (2005). *Single-case designs for educational research.* Boston, MA; Allyn & Bacon.

Koegel, R. L., Dunlap, G., Dyer, K. (1980). Intertrial interval duration and learning in autistic children. *Journal of Applied Behavior Analysis, 13,* 91-99.

Lambert, M. C., Cartledge, G. Heward, W. L., & Lo, Y. (2006). Effects of response cards on disruptive behavior and academic responding during math lessons by fourth-grade urban students. *Journal of Positive Behavior Interventions, 8,* 88-99.

McKenzie, G. R., & Henry, M. (1979). Effects of testlike events on on-task behavior, test anxiety, and achievement in a classroom rule-learning task. *Journal of Educational Psychology, 71,* 370-374.

Miller, A. D., Hall, M. A., & Heward, W. L. (1995). Effects of sequential 1-minute time trials with and without inter-trial feedback and self-correction on general and special education students' fluency with math facts. *Journal of Behavioral Education, 5,* 319-345.

Nelson, J. R. & Roberts, M. L. (2002). Ongoing reciprocal teacher-student interactions involving disruptive behaviors in general education classrooms. *Journal of Emotional & Behavioral Disorders, 8,* 27-39.

Noell, G. H., Witt, J. C., Gilbertson, D. N., Rainer, D. D., & Freeland, J. T. (1997). Increasing teacher intervention implementation in general education settings through consultation and performance feedback. *School Psychology Quarterly, 12,* 77-88.

Noell, G. H., Witt, J. C., Slider, N. J., Connell, J. E., Gatti, S. L., Williams, K. L., Koenig, J. L., Resetar, J. L., & Duhon, G. J. (2005). Treatment implementation following behavioral consultation in schools: A comparison of three follow-up strategies. *School Psychology Review,* 34, 87-106.

Randolph, J. L. (2007). Meta-analysis of the research on response cards: Effects on test achievement, quiz achievement, participation, and off-task behavior. *Journal of Positive Behavior Interventions, 9,* 113-128.

Redfield, D. L., & Rousseau, E. W. (1981). A meta-analysis of experimental research on teacher questioning behavior. *Review of Education Research, 51,* 237-245.

Rosenshine, B. V. (1986). A synthesis of research on explicit teaching. *Educational Leadership, 43,* 60-69.

Sainato, D. M., Strain, P. S., & Lyon, S. R. (1987). Increasing academic responding of handicapped preschool children during group instruction. *Journal of the Division for Early Childhood, 12,* 23-30.

Samson, G. E., Sirykowski, B., Weinstein, T., & Walberg, H. J. (1987). The effects of teacher questioning level on student achievement: A quantitative synthesis. *Journal of Educational Research, 80,* 290-295.

Schwartz, I. S., & Baer, D. M. (1991). Social-validity assessments: Is current practice state of the art? *Journal of Applied Behavior Analysis, 24,* 189-204.

Sindelar, P. T., Bursuck, W. D., & Halle, J.W. (1986). The effects of two variations of teacher questioning on student performance. *Education and Treatment of Children, 9,* 56-66.

Sindelar, P. T., Rosenberg, M. S., & Wilson, R. J. (1985). An adapted alternating treatment design for instructional research. *Education and Treatment of Children, 8,* 67-76.

Sitko, M. C., & Slemon, A. G. (1982). Developing teachers' questioning skills: The effects of delayed feedback. *Canadian Journal of Education, 7,* 109-121.

Skinner, C. H., Belfiore, P. J., Mace, H. W., William-Wilson, S., & Johns, G. A. (1997). Altering response topography to increase response efficiency and learning rates. *School Psychology Quarterly, 12,* 54-64.

Skinner, C. H., Fletcher, P. A., & Henington, C. (1996). Increasing learning rates by increasing student responses rates: A summary of research. *School Psychology Quarterly, 11,* 313-325.

Skinner, C. H., Ford, J. M., & Yunker, B. D. (1991). A comparison of instructional response requirements on the multiplication performance of behaviorally disordered students. *Behavioral Disorders, 17,* 56-65.

Skinner, C. H., Rhymer, K. N., & McDaniel, E. C. (2000). Naturalistic observation in educational settings. In E. S. Shapiro & T. R. Kratochwill (Eds.) *Conducting school-based assessments of child and adolescent behavior* (pp. 21-54). New York: Guilford.

Skinner, C. H., & Shapiro, E. S. (1989). A comparison of taped-words and drill interventions on reading fluency in adolescents with behavior disorders. *Education and Treatment of Children, 12,* 123-133.

Skinner, C. H., Smith, E. S., & McLean, J. E. (1994). The effects of intertrial interval duration on sight-word learning rates in children with behavioral disorders. *Behavioral Disorders, 19,* 98-107.

Stanley, S. O., & Greenwood, C. R. (1983). Assessing opportunity to respond in classroom environments through direct observation: How much opportunity to respond does the minority, disadvantaged student receive in school? *Exceptional Children, 49,* 370-373.

Sterling, R. M., Barbetta, P. M., Heward, W. L., & Heron, T. E. (1997). A comparison of active student response and on-task instruction on the acquisition and maintenance of health facts by fourth grade special education students. *Journal of Behavioral Education, 7,* 151-165.

Stevens, R., & Rosenshine, B. (1981). Advances in research and teaching. *Exceptional Education Quarterly, 2,* 1-9.

Sutherland, K. S., Alder, N., & Gunter, P. L. (2003). The effect of increased rates of opportunities to respond on the classroom behavior of students with emotional/behavioral disorders. *Journal of Emotional and Behavioral Disorders, 11,* 239-248.

Sutherland, K. S., & Wehby, J. H (2001). Exploring the relationship between increased opportunities to respond to academic requests and the academic and behavioral outcomes of students with EBD: A review. *Remedial and Special Education, 22,* 113-121.

Sutherland, K. S., Wehby, J. H., & Yoder, P. J. (2002). Examination of the relationship between teacher praise and opportunities for students with EBD to respond to academic requests. *Journal of Emotional and Behavioral Disorders, 10,* 5-13.

Tawney, J. W., & Gast, D. L. (1984). *Single subject research in special education.* Columbus, OH: Merrill.

Van Acker, R., Grant, S. H., & Henry, D. (1996). Teacher and student behavior as a function of risk for aggression. *Education and Treatment of Children, 19,* 316-334.

Walker, H. M., & Severson, H. H. (1993). *Systematic screening for behavior disorders*. Longmont, CO: Sopris West.

West, R. P., & Sloane, H. N. (1986). Teacher presentation rate and point delivery rate: Effects on classroom disruption, performance accuracy, and response rate. *Behavior Modification, 10,* 267-286.

Winne, P. H. (1979). Experiments relating teachers' use of higher cognitive questions to student achievement. *Review of Educational Research, 49,* 13-49.

Witt, J. C., VanDerHyeden, A. M., & Gilbertson, D. (2004). Troubleshooting Behavioral Interventions: A Systematic Process for Finding and Eliminating Problems. *School Psychology Review, 33,* 363-383.

Wolery, M., Ault, M. J., Doyle, P. M., Gast, D. L., & Griffin, A. M. (1992). Choral and individual responding: Identification of interactional effects. *Education and Treatment of Children, 15,* 289-309

BIOGRAPHICAL SKETCH

Five years into my career as a school social worker, I was invited to attend trainings on Positive Behavior Intervention and Supports (PBIS). These trainings fascinated me because they incorporated concepts from the field of systems thinking and applied behavior analysis. I became a PBIS coach for our elementary school and would report the information to our PBIS team, and with their help, apply what I had learned to our school environment. We implemented PBIS principles at the school-wide, classroom, and individual level and over a six year period saw a decline in aggressive behaviors on the playground, bullying, office referrals, in-school suspensions and out-of-school suspensions, and the amount of over representation of minorities in office discipline referrals.

Wanting to learn more about PBIS, and getting the opportunity to study under an emotional and behavioral disorder grant, I applied to and was accepted into the Special Education program at the University of Florida in fall 2005. My current research interests include PBIS, functional behavior assessments, and the integration of instructional and behavioral interventions for students exhibiting behavioral difficulties. I have had my dissertation pilot study accepted for publication, and have four additional peer-reviewed articles published or in press. I have been a presenter at several national conferences. After graduation, I plan to continue my current line of research, while also teaching at the university level.