IMPROVING PARTICIPATION DURING CHORAL RESPONDING

by

Fernando R. Armendariz

A Dissertation Submitted to the Faculty of the
DEPARTMENT OF SPECIAL EDUCATION, REHABILITATION,
AND SCHOOL PSYCHOLOGY
In Partial Fulfillment of the Requirements
For the Degree of
DOCTOR OF PHILOSOPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

2005
THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Dissertation Committee, we certify that we have read the dissertation prepared by Fernando R. Armendariz entitled Improving Participation During Choral Responding and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

_________________________________________ Date: 11 – 09 – 05
Dr. John Umbreit

_________________________________________ Date: 11 – 09 – 05
Dr. John Bergan

_________________________________________ Date: 11 – 09 – 05
Dr. John Obrzut

_________________________________________ Date: 11 – 09 – 05
Dr. Carl Liaupsin

Final approval and acceptance of this dissertation is contingent upon the candidate’s submission of the final copies of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

_________________________________________ Date: 11 – 09 – 05
Dissertation Director: Dr. John Umbreit
STATEMENT BY AUTHOR

This dissertation has been submitted in partial fulfillment of requirements for an advanced degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this dissertation are allowable without special permission, provided that accurate acknowledgment of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the Graduate College when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

SIGNED: Fernando R. Armendariz
DEDICATION

To my wife, Maria Elena, and my children, Clara Maria, Valeria, and Fernando,
for their constant love and support
ACKNOWLEDGMENTS

I would like to offer special thanks to each of my committee members: to the chairman, Dr. John Umbreit, for his continuous encouragement and guidance throughout the process, and for eliminating all bumps on the road and making it an easy ride; to Dr. Carl Liaupsin for his constant positive remarks and swift technical assistance; to Dr. John Bergan for taking time from his busy schedule to return to the university and help me finish; and to Dr. John Obrzut for his participation and precise feedback.

I am also grateful to Cindy Diaz and Brenna Stahr for their arduous work in observing, coding and organizing the extensive data that was required for the study. Their skill and commitment is remarkable. I would also like to extend my appreciation to three teachers - Rachel Carpenter, Suzette Holt, and Jennifer McManus - for their extreme flexibility and dedication in assisting me with the study. Additionally, I would like to thank all the students who did such a great job on their choral review.
# TABLE OF CONTENTS

| LIST OF TABLES | ................................................................................................................. | 8 |
| LIST OF FIGURES | ................................................................................................................. | 9 |
| ABSTRACT | ................................................................................................................ | 10 |
| CHAPTER 1: INTRODUCTION | ........................................................................................................ | 11 |
| Statement of the Problem | ........................................................................................................ | 15 |
| CHAPTER 2: REVIEW OF THE LITERATURE | ......................................................................................................... | 16 |
| Opportunity to Respond and Academic Achievement | ........................................................................ | 16 |
| Instructional Strategies that Result in High Rates of Student Responding | ........................................................................ | 18 |
| Research on ChoralResponding | ........................................................................................................ | 19 |
| Components of Choral Responding | ........................................................................................................ | 21 |
| Findings from CR Research | ........................................................................................................ | 22 |
| Uses for Choral Responding | ........................................................................................................ | 24 |
| Summary | ................................................................................................................ | 25 |
| CHAPTER 3: METHOD | ......................................................................................................... | 27 |
| Participants and Setting | ........................................................................................................ | 27 |
| Behavioral Definitions | ........................................................................................................ | 30 |
| Design | ................................................................................................................ | 31 |
| Procedure | ................................................................................................................ | 31 |
| Baseline (Phases A1 and A2) | ........................................................................................................ | 31 |
| Intervention / Individual Questioning (Phases B1 and B2) | ........................................................................................................ | 32 |
| Data Collection and Analysis | ........................................................................................................ | 34 |
| Dependent Measures | ........................................................................................................ | 34 |
| Interobserver Agreement (IOA) | ........................................................................................................ | 35 |
| Treatment Integrity | ........................................................................................................ | 36 |
| Social Validity | ................................................................................................................ | 36 |
| CHAPTER 4: RESULTS | ......................................................................................................... | 38 |
| Teacher Questions | ........................................................................................................ | 38 |
| Student Responding | ........................................................................................................ | 38 |
| High Responders: Classroom 1 | ........................................................................................................ | 38 |
TABLE OF CONTENTS - Continued

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Responders: Classroom 1</td>
<td>39</td>
</tr>
<tr>
<td>High Responders: Classroom 2</td>
<td>42</td>
</tr>
<tr>
<td>Low Responders: Classroom 2</td>
<td>42</td>
</tr>
<tr>
<td>Response Accuracy</td>
<td>45</td>
</tr>
<tr>
<td>High Responders: Classroom 1</td>
<td>45</td>
</tr>
<tr>
<td>Low Responders: Classroom 1</td>
<td>45</td>
</tr>
<tr>
<td>High Responders: Classroom 2</td>
<td>48</td>
</tr>
<tr>
<td>Low Responders: Classroom 2</td>
<td>51</td>
</tr>
<tr>
<td>Disruptive Behavior</td>
<td>51</td>
</tr>
<tr>
<td>High Responders: Classroom 1</td>
<td>51</td>
</tr>
<tr>
<td>Low Responders: Classroom 1</td>
<td>52</td>
</tr>
<tr>
<td>High Responders: Classroom 2</td>
<td>52</td>
</tr>
<tr>
<td>Low Responders: Classroom 2</td>
<td>55</td>
</tr>
<tr>
<td>Social Validity</td>
<td>58</td>
</tr>
<tr>
<td>CHAPTER 5: DISCUSSION</td>
<td>59</td>
</tr>
<tr>
<td>Findings</td>
<td>59</td>
</tr>
<tr>
<td>Research Question One</td>
<td>59</td>
</tr>
<tr>
<td>Research Question Two</td>
<td>60</td>
</tr>
<tr>
<td>Research Question Three</td>
<td>60</td>
</tr>
<tr>
<td>Research Question Four</td>
<td>61</td>
</tr>
<tr>
<td>Relationship to the Existing Literature</td>
<td>61</td>
</tr>
<tr>
<td>Limitations of the Study</td>
<td>63</td>
</tr>
<tr>
<td>Implications for Research and Practice</td>
<td>65</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>67</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Descriptive Data for the Participating Classrooms</td>
<td>28</td>
</tr>
<tr>
<td>2. Descriptive Data for the Participating Students</td>
<td>29</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure | Page
-------|------
1. Tai: Student Responding | 40
2. Thomas: Student Responding | 41
3. Tiffany: Student Responding | 43
4. Tommy: Student Responding | 44
5. Tai: Response Accuracy | 46
6. Thomas: Response Accuracy | 47
7. Tiffany: Response Accuracy | 49
8. Tommy: Response Accuracy | 50
9. Tai: Disruptive Behavior | 53
10. Thomas: Disruptive Behavior | 54
11. Tiffany: Disruptive Behavior | 56
12. Tommy: Disruptive Behavior | 57
ABSTRACT

This study looked at whether a procedure of interspersing individual targeted questions would improve participation by low-responding students during a choral responding activity. Improved participation involved increased responding, increased accuracy, and decreased disruptive behavior. The study was conducted in two established elementary school classrooms. In each class, data were collected on two low-responding and two high-responding students. The choral activity was conducted in each classroom for 10 minutes a day. An ABAB reversal design was used. During baseline conditions, teachers conducted whole-group choral responding only. During the intervention conditions, teachers interspersed targeted questions to individuals who responded at low levels during the whole group choral responding activity. During the intervention (targeted questioning) conditions, the low-participating students in each classroom (a) responded to a higher percentage of the teacher’s questions, (b) maintained or increased response accuracy, and (c) decreased disruptive behavior. During these same conditions, the high participating students maintained or slightly increased their participation levels. Teachers gave high social validity ratings to the targeted questioning procedure, noting that it made choral responding more effective with unwilling responders.
CHAPTER 1
INTRODUCTION

Teachers today face the challenge of having to teach an exponentially increasing knowledge base while also fulfilling the accountability requirements imposed by No Child Left Behind. These demands require that they use instructional technologies that will enable them to teach students to be proficient with more concepts in a shorter amount of time.

To meet these challenges, many schools are resorting to one of two tactics: (a) lengthening the school day or (b) adding more days to the school year. Unfortunately, available research (e.g., Stallings, 1975; Stallings, Needels, & Stayrook, 1979) indicated that simply extending the time that children are in school may not result in greater student academic achievement. The most relevant factors for improving student performance seem to center on what the teacher and students do in the classroom. The critical element is not how much time is available, but how that time is used (Greenwood, Delquadri, & Hall, 1984; Stallings, 1980).

Many instructional practices have been reported to produce faster and more efficiently learning. A review of this literature quickly leads to instructional procedures that have certain common components. Regardless of whether investigations were conducted by mainstream educational researchers or behavior analytic researchers, investigators agree that the most effective instructional procedures are those that increase the frequency with which students engage or respond directly to the concepts being taught.
For several decades, researchers have concurred that student responding is one of the most critical factors that impacts academic achievement (Brophy, 1988; Fisher & Berliner, 1985; Greenwood, Delquadri, & Hall, 1984; Greenwood, Hart, Walker, & Risley, 1994; Pratton & Hales, 1986; Rosenshine, 1979; Rosenshine & Berliner, 1978). Although a substantial volume of research supports this conclusion, most students still spend much of their academic learning time passively listening to the teacher (Greenwood et al., 1984; Stanley & Greenwood, 1983).

For example, in a study of six inner-city classrooms, Hall, Delquadri, Greenwood, and Thurston (1982) reported that teachers spent 75% of the school day on academic instruction. However, their students spent less than 1% of the school day engaged in activities such as asking questions, answering, reading aloud, or reciting. In a follow-up comparison of Title 1 and non-Title 1 schools, Greenwood, Delquadri, and Hall (1984) reported that the non-Title 1 students engaged in academic responding an average of only 19% of the time (i.e., 73 minutes out of approximately 400 minutes per school day). The Title 1 students had an even a lower percentage, with active responding occurring only 16% of the time. If the percentages of student responding reported by these researchers are indicative of the situation throughout schools, the solution to increase academic performance should be relatively straightforward. Schools could increase student achievement many fold just by increasing the time that students are actively responding.

Although increasing students’ academic responding seems like a simple adjustment, carrying it out is much more complex than it seems. Stallings (1980) suggested that increasing responding requires more than just telling teachers to allocate
more time to academic activities and to keep students on task. Teachers need to be trained in how to conduct instructional activities that produce high student interaction. They also need to learn how to use strategies that keep every student engaged, how to carry out effective and rapid transitions, and how to establish management systems that take very little time.

To help teachers improve instruction and its outcomes, behavior analytic researchers have produced a body of knowledge supporting the importance of student responding during instruction (Delquadri, Greenwood, & Hall, 1979; Greenwood et al., 1984; Hall et al., 1982; Heward 1994). These and other behavioral investigations have generated a number of very practical instructional strategies such as peer tutoring (Delquadri, Greenwood, & Stretton, 1983; Greenwood, 1984; Greenwood, Delquadri, & Hall, 1989; Heron, Heward, Cooke & Hill, 1983; Miller, Barbetta, & Heron, 1994), teacher-delivered error correction (Barbetta, Heron, & Heward, 1993; Drevno, Kimball, & Possi, 1994), timed trials (Miller & Heward, 1992), response cards (Armendariz, & Umbreit, 1999; Gardner, Heward, & Grossi, 1994; Narayan, Heward, Gardner, Courson, & Omness, 1990;), choral responding (Heward, 1994; Wood & Heward, submitted for publication), and guided notes (Sweeny, Ehrhardt, Gardner, Jones, Greenfield, & Friebly, 1999). Through extensive field-testing, all of these strategies have effectively produced high rates of student responding and corresponding improvements in academic achievement.

Heward (1994) analyzed three of these strategies - choral responding, response cards, and guided notes - because they produce high rates of student academic
responding and require very little investment in technology and materials. Of the three procedures analyzed, choral responding (CR) was deemed the easiest method to implement. CR, which involves students orally responding in unison to a teacher’s questions, has had strong support in the literature because it is an essential component of the Direct Instruction (DISTAR) program (Englemann & Bruner, 1974). CR has also been studied as an independent instructional technique. For example, researchers (McKenzie & Henry, 1979; Sindelar, Bursuck, & Hale, 1986) reported that CR was superior to the traditional mode of questioning in which a single child is called on to respond to a teacher-posed question.

The internal components of choral responding also have been analyzed. Investigations have focused primarily on how presentation rate (pacing) affects student responding, on-task behavior, and academic achievement. Several researchers (e.g., Carnine, 1976; Cashman, 1990; Morgan, 1987; Sainato, Strain, & Lyon, 1988; Tincani, Ernsbarger, Harrison, & Heward, 2005; Williams, 1993) have compared the effects of fast and slow presentation rates. In every case, the faster pacing produced higher levels of participation, correct responding, and on-task behavior.

Although CR carried out at a brisk pace can produce some of the highest levels of participation, it still may not consistently engage every student to respond. If a student does not reliably and consistently participate, the benefits associated with student responding will be lost. If a child is allowed not to participate, he is technically being “left behind.”
How can we approach the ideal situation of every student responding to each and every question posed by the teacher?

Statement of the Problem

The procedure of interspersing individual questions (i.e., directing specific questions at individual students) during choral responding has been recommended as a procedure to check for understanding of the concepts being taught (Heward, Courson, Narajan, 1989; Heward, 1994). The purpose of this study is to expand the use of interspersing individual questions to a targeted questioning strategy aimed at shaping consistent responding in students who do not respond consistently during whole group choral responding. Specific questions addressed are

1. Will interspersing targeted individual questions result in higher levels of participation by low-responding students than whole-group choral responding without individual questioning?

2. Will the targeted individual questioning improve response accuracy in students who do not consistently respond?

3. Will the increased participation (if produced) result in reduced levels of disruptive behavior?

4. Will the teachers find the targeted individual questioning procedure to be socially valid?
CHAPTER 2
REVIEW OF THE LITERATURE

This chapter reviews behavioral research that has studied the relationship between (a) student responding and academic achievement, (b) instructional strategies that result in high rates of student responding, and (c) available data on the effects of Choral Responding (CR).

Opportunity to Respond and Academic Achievement

Behavioral research prior to the appearance of the term Opportunity To Respond (OTR) accentuated the role of consequences in establishing and maintaining desired behavior (Ferster & Parrott, 1968). At that time, the recommendations for intervention involved identifying a target behavior and then implementing a reinforcement schedule that would establish and strengthen the behavior. Descriptions of coincidental events that led researchers to coin the term “Opportunity To Respond” provide a glimpse of the state of affairs at that time. According to Greenwood, Delquadri, and Hall, (1984):

This term evolved during our early efforts to increase students’ responding by arranging reinforcement contingencies, and from the discovery that often, we could identify only minimal academic expectations for students during baseline instructional sessions (p.64).

Greenwood et al. (1984) found consequence-based interventions to be severely limited by the fact that the instructional environment was not occasioning enough student academic responding so these behaviors could be reinforced, shaped, and maintained.
This recognition led OTR researchers to identify antecedent variables as important and prominent components in behavioral analyses of academic instruction.

Initial research on OTR revealed a very bleak reality. For example, in one school, first-grade students averaged about 20 seconds of reading instruction and 5 seconds of math practice per day (Hall, Delquadri, & Harris, 1977). Similarly, Hall, Delquadri, Greenwood, and Thurston (1982) followed 12 students in six inner-city classrooms and reported that, although teachers used 75% of the school day for academic instruction, students spent most of that time passively watching the teacher. Activities that are now considered to be highly productive (e.g., reading aloud, answering questions, asking questions, and reciting) were observed to occur less than 1% of the school day.

Early descriptive and correlational studies of OTR began by observing how certain classroom activities used by teachers resulted in varying degrees of engagement by the students (Hall, Delquadri, Greenwood, & Thurson 1982; Stanley & Greenwood, 1983). These investigators analyzed components of the teaching environment such as how the students were grouped for instruction. They also examined the tasks that were selected for instruction. They concluded (a) that the instructional environment arranged by the teacher was responsible for the level of student academic responding and (b) that the category of academic response was strongly related to student achievement scores in reading and mathematics.

Single-subject and experimental group studies were also conducted to establish a clear functional relationship between active responding and student academic performance in spelling (Delquadri, Greenwood, Stretton, 1983), in reading fluency and
comprehension (Kamps, Barbetta, & Leonard, 1994), and in mathematics and vocabulary (Greenwood, 1984). All of these studies experimentally manipulated the amount of student responding. Peer tutoring was the instructional procedure used to increase student participation because the procedure had already been shown to effectively increase the opportunity to respond. The results of the experimental studies supported the previous results of the correlation studies and established a functional relationship between increased student responding and improved student academic achievement.

Instructional Strategies that Result in High Rates of Student Responding

Although initial studies of OTR increased active student responding primarily by using a variety of peer-tutoring strategies, behavior analytic researchers have since developed and field-tested a number of other strategies that reliably increase student academic responding and result in greater achievement gains. Some of these activities are

- **Guided notes**, which are handouts prepared by the teacher that organize and guide a student through a lecture. These notes include a prepared outline of the material that will be covered and space for students to write the critical concepts and details (Sweeny, Ehrhardt, Gardner, Jones, Greenfield, & Fribley, 1990).

- **Timed trials**, which are short (timed) review practice trials used to develop the student’s ability to respond quickly and accurately. The exercise also helps students develop fluency and retain learning over time (Miller & Heward, 1992).

- **Error Correction**, a procedure in which the student repeats a teacher’s model of the correct response after a student makes an error (Barbetta, Heron, & Heward, 1993; Drevno, Kimball, Possi, 1994).
• **Response cards**, which are small boards or signs that may be pre-printed with response options or left blank for the students to respond. In this format, students respond by holding up their boards simultaneously and showing their written or identified answer to a question or problem presented by the teacher. Response cards allow every student in a class to respond to each and every question posed by the teacher (Gardner, Heward, & Grossi, 1994; Narayan, Heward, Gardner, Courson, & Omness, 1990). The procedure can also require so much active responding from every student that it allows little opportunity for students to engage in disruptive behavior (Armendariz & Umbreit, 1999).

• **Choral responding**, a technique in which students orally respond in unison to a teacher’s questions. The technique also allows students to respond to *every* question presented by the teacher. CR can result in very high rates of active responding and requires no materials to be implemented (Heward, 1994).

All of the strategies mentioned above have effectively increased student responding and resulted in greater academic gains in areas such as science, mathematics, social studies, health, geography, spelling, and oral reading. Teachers may combine all of these practical instructional strategies to provide a variety of activities that keep students highly engaged during the school day (Wood & Heward, 2004).

**Research on Choral Responding**

As mentioned earlier, Heward (1994) analyzed three instructional procedures (choral responding, response cards, and guided notes) that produce high rates of active responding and require very little investment in technology and materials. Of the three
procedures analyzed, Heward identified choral responding (CR) as the easiest method to implement. The procedure generates high rates of active responding because it involves a quick oral question (or a signal), and a short (two- or three-word) oral response.

CR has had strong support in the literature because it is a key component of the *Direct Instruction* (DISTAR) program (Englemann & Bruner, 1974). DISTAR is made up of scripted lessons that teachers present to students through fast-paced questions to which the students respond individually or chorally.

Some research has compared CR to traditional modes of questioning. Traditional questioning strategies typically involve the teacher asking a question and then (a) calling on volunteers to respond or (b) asking individual students to respond in some established order. These strategies normally result in low levels of student participation, particularly for low-achieving students (Maheady, Mallette, Harper, & Sacca, 1991).

McKenzie and Henry (1979) compared a traditional questioning format, with one child being called upon to respond, to a CR procedure that used a pointing gesture instead of an oral question to cue the whole group to respond. The study was carried out with 52 third-grade students during a science lesson. Results showed that correct responses were higher for the CR group on a 30-item posttest. Off-task behavior was also measured and was found to occur twice as much with the individual-response group than with the CR procedure.

Sinderlar, Bursuck, and Hale (1986) compared CR to an ordered questioning strategy with 11 elementary students with learning disabilities or mild mental retardation. The study involved teaching sight words to groups of 3-to-4 students. For the ordered
questioning format, the teacher called on students in a pre-set order. In the CR condition, all of the students responded in unison after the teacher called out “everybody.” The researchers found that CR resulted in students learning to read more words, at a faster rate, and with greater retention than they did with the ordered questioning procedure.

Sterling, Barbetta, Heward, and Heron (1997) compared an active student response procedure in which the students repeated three times (in unison) the correct response after the teacher showed a health fact card and modeled the correct response, against an on-task procedure in which the teacher presented the health card and modeled the correct response but the students did not repeat it. This work was done with a small group of special education students (four with developmental disabilities, and one with a learning disability). Results showed that the health facts that had been repeated were more correctly answered on end of the day tests (learning) than the health facts that had not been repeated. Maintenance tests administered two weeks after instructions also showed better retention of the health facts that were repeated.

Components of Choral Responding

CR instruction includes a number of components that are briefly described below.

- *Instructional antecedent* refers to the teacher’s rate of talking and mode of presentation (e.g., ask orally, point to the board, or show a card).

- *Wait time* is the time between when the teacher poses a question and signals for a group or individual response.

- *Response delay* is the duration between presenting an instructional stimulus and the student’s response.
• *Student response* pertains to the mode (verbal or hand signal) the student uses to make a response.

• *Feedback delay* identifies the time that elapses between the student’s response and feedback from the teacher.

• *Feedback* refers to the reinforcing or corrective response made by the teacher.

• *Inter-trial interval* is the time between the teacher’s feedback for one response and the presentation of the next question or instruction.

*Findings from CR Research*

Much of the research on CR has focused on pacing (how quickly the procedure should be conducted). Among the components listed above, inter-trial interval has been the most widely researched variable. Several studies have focused on varying the time between teacher feedback and the presentation of the next item. In the first of these studies, Carnine (1976) manipulated the pacing of reading instruction with low-achieving first-grade students. Two inter-trial interval variations (fast & slow) were used. In the fast-pace condition, the teacher presented the next item immediately (0 inter-trial interval). In the slow-pace condition, the inter-trial interval was 5 seconds. Carnine reported that the faster pace presentation resulted in more learning trials, improved on-task behavior, and increased response accuracy. Other researchers replicated Carnine’s research and reported similar results (Cashman, 1990; Koegel, Dunlap, & Dyer, 1980; Morgan, 1987; Williams 1993).
In a similar study, Sainato, Strain, and Lyon (1988) looked at CR that used two different rates of presentation. This study reported the rate of items per-minute and did not identify a specific component of the choral trial that was being manipulated. The “slow” rate used presented three trials per minute, and the faster rate presented five trials per minute. These researchers reported higher rates of student participation, increased levels of correct responding, and decreased levels of off-task behavior with the faster presentation rate. This study also showed that very young preschool children with considerable developmental delays, who would typically receive one-to-one instruction, were able to participate and learn in a group choral activity.

Recently, Tincani, Ernsbarger, Harrison, and Heward (2005) manipulated the pace of instruction by varying the inter-trial interval and the rate of teacher talk. The fast-teaching condition used a teacher talk rate of 82-104 words-per minute and an inter-trial interval of 1 second or less. The slow-teaching condition used a teacher talk rate of 35-49 words-per minute and an inter-trial interval of 5 seconds. The results supported previous research in which faster pacing was found to improve student performance. The faster pacing provided the students nearly twice as many opportunities to respond and significantly decreased their off-task behavior.

Contrary to the notion that “slowing down” instruction allows students to learn better, it appears that speeding it up produces better results. Although researchers have used slightly different inter-trial intervals, their results have consistently shown that faster pacing produces greater academic achievement.
Uses for Choral Responding

CR is a versatile strategy that teachers may use throughout the day to meet a wide variety of needs, including:

- **To Teach**: Teachers may use choral responding to teach new material. The procedure includes the immediate feedback and positive practice required for shaping correct responding (Carnine, Silbert, & Kameenui, 1997). The low-risk situation that the whole-group responding format produces reportedly builds confidence in low achieving students (Heward, Courson, & Narayan, 1989; Tam & Scott, 1996).

- **To Review**: CR is commonly used to review material that has been previously taught. The strategy has been shown to produce greater fluency and better long-term retention (Heward 1994; Heward, Courson, & Narayan, 1989).

- **To Maximize Time**: The strategy can be used to maximize time by allowing group instruction of individuals who would traditionally require one-to-one instruction (Sainato, Strain, & Lyon, 1987; Wolery & Ault, 1992), by using paraprofessionals and students to provide instruction (Courson & Heward, 1988), and by effectively using transition or down times (Wood & Heward submitted for publication).

- **To Check for Understanding**: With CR, the teacher never needs to ask students if they understand. The procedure allows the teacher to quickly check what students know. Having this information prevents the teacher from moving on and leaving students behind or wasting time with material they
already know (Heward 1994; Rauschenbach, 1994; Wood & Heward, submitted for publication).

- **To Receive Teacher Feedback**: The procedure provides the teacher immediate feedback on the effectiveness of his or her teaching. Teachers may then modify their instruction as it occurs.

- **To Manage Behavior**: CR produces such high rates of student academic responding that it is practically incompatible with disruptive behavior (Carnine 1976; Morgan 1987; Sainato, Strain, & Lyon, 1987). CR can also be used in situations in which there is a high probability of disruptive behavior (e.g., down-times and transitions) (Heward 1994; Wood & Heward, submitted for publication).

**Summary**

Behavior analytic research has established a functional relationship between increased student responding and improved student academic achievement. A variety of instructional strategies that reliably increase student responding have been shown to improve academic achievement in several of the basic subject areas. Teachers may combine these practical instructional strategies to provide a variety of activities that keep students very productively engaged during the school day.

One of these high-response-producing instructional procedures is CR. It is presented as among the easiest instructional procedure to implement because it requires very little investment in technology and materials. Furthermore, research has shown that CR results in more learning, at a faster rate, and with greater retention than the traditional
questioning strategies of (a) calling on volunteers to respond or (b) asking individual students to respond in some established order.

CR is a very versatile instructional strategy that can be used for many instructional purposes. Even though the strategy, when conducted at a brisk pace, has been shown to produce some of the highest levels of student participation, it may still not consistently engage every student to respond. If a student does not reliably and consistently participate in the choral activity, the benefits associated with active responding will not occur.
CHAPTER 3

METHOD

This chapter describes the methodology used to conduct this study. It is organized into the following sections: participants and setting, behavioral definitions, design, procedure, and data collection and analysis.

Participants and Setting

This study was conducted in two established general education classrooms in an urban elementary charter school. Class 1 was a multi-grade classroom of 24 first, second, and third grade students. Class 2 was also a multi-grade classroom of 19 third, fourth, and fifth grade students.

All students in the classes participated in the research activities, but only four students from each class were targeted for data collection. For each classroom, the teacher nominated (a) two students considered to be consistent, high responders during Choral Responding (CR) and (b) two students considered to be inconsistent responders. The investigator verified the teacher’s perceptions of student response levels by conducting several video tests and using the same data collection procedures described later in this section. Table 1 presents information about gender, age, grade level, and ethnicity for each class.

Table 2 presents the same information for the target students in each classroom. In Class 1, Ramon and Rigo were identified as high responders during CR; Tai and Thomas were identified as low responders. In Class 2, Robby and Rett were the reliably high responders during CR; Tiffany and Tommy were the low responders. None of the
Table 1

*Descriptive Data for the Participating Classrooms*

<table>
<thead>
<tr>
<th></th>
<th>Classroom 1</th>
<th>Classroom 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td><strong>Age Range</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Youngest / Oldest</td>
<td>6yr-5mo / 9yr-0mo</td>
<td>8yr-3mo / 11yr-9mo</td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>White</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total Students</strong></td>
<td>24</td>
<td>19</td>
</tr>
</tbody>
</table>
Table 2

*Descriptive Data for the Participating Students*

<table>
<thead>
<tr>
<th>Classification</th>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
<th>Grade</th>
<th>Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Responder</td>
<td>Ramon</td>
<td>Male</td>
<td>7 years – 9 months</td>
<td>2nd</td>
<td>Latino</td>
</tr>
<tr>
<td>High Responder</td>
<td>Rigo</td>
<td>Male</td>
<td>7 years – 11 months</td>
<td>2nd</td>
<td>Latino</td>
</tr>
<tr>
<td>Targeted</td>
<td>Tai</td>
<td>Male</td>
<td>7 years – 2 months</td>
<td>1st</td>
<td>Asian</td>
</tr>
<tr>
<td>Targeted</td>
<td>Thomas</td>
<td>Male</td>
<td>6 years – 10 months</td>
<td>1st</td>
<td>White</td>
</tr>
<tr>
<td>High Responder</td>
<td>Robby</td>
<td>Male</td>
<td>9 years – 9 months</td>
<td>5th</td>
<td>Latino</td>
</tr>
<tr>
<td>High Responder</td>
<td>Rudd</td>
<td>Male</td>
<td>8 years – 3 months</td>
<td>4th</td>
<td>Latino</td>
</tr>
<tr>
<td>Targeted</td>
<td>Tiffany</td>
<td>Female</td>
<td>9 years – 2 months</td>
<td>3rd</td>
<td>White</td>
</tr>
<tr>
<td>Targeted</td>
<td>Tommy</td>
<td>Male</td>
<td>9 years – 7 months</td>
<td>3rd</td>
<td>White</td>
</tr>
</tbody>
</table>
students had been referred for special education and they were all performing at or above grade level in all their subjects.

The two participating teachers were Caucasian females who were certified in elementary education. Both had several years of experience conducting CR at the school. Teacher 1 had nine years of experience teaching, including five years at this school. Teacher 2 has five years experience, with all five at this school.

Each participating teacher conducted 10-minute CR activities in multiple subject areas every day. In this study, one of these daily sessions was targeted in each class. In Class 1, the content was science, math, and language; in Class 2, it was math; vocabulary, and geography.

During CR, all students were seated on a carpet at the front of the room. Seating assignments were kept constant to facilitate effective recording of data. The classroom was equipped with a large dry erase board that the teacher periodically used to prompt responses. The teacher stood in front of the class with a clear view of all the students.

Behavioral Definitions

Three dependent measures were targeted in this study. They are student responding, accuracy of student response, and disruptive behavior during response opportunities. *Student Responding* was defined as the number of responses made in relation to the number of teacher questions (percentage of responses over opportunities). *Accuracy of student responses* was defined as the percentage of correct responses over attempted responses. *Disruptive behavior during response opportunities* was defined as the occurrence of any of the following: getting up from seat, touching others, speaking
out of turn, voicing disapproval, laughing, taking things form others, throwing objects, making noise (tapping, babbling), talking to others, or flapping hands or any object during the time that the student should have been responding to a teacher question.

Design

An ABAB reversal design was used individually for each student. During Phase A1 (baseline condition), sessions involved the regular delivery of choral activity with all questions addressed to the whole group. During Phase B1 (intervention condition), the teacher again posed questions to the entire group, but interspersed individual questioning that appeared random (untargeted) to the students but, in reality, were differentially target at the low-responding students. During Phase A2 (return-to-baseline), the initial baseline condition was re-instated. During Phase B2 (return-to-intervention), the targeted questioning procedure used in Phase B1 was re-instated. Classroom 1 had 9 sessions in Phase A1, 8 in B1, 9 in A2, and 8 in B2. Classroom 2 had 8 sessions in Phase A1, 7 in B1, 9 in A2, and 8 in B2.

Procedure

Baseline (Phases A1 and A3)

During this condition, the teacher used a fast-paced questioning format with the whole class responding in unison (one voice). The teachers signaled the group to respond by using a visual cue, such as pointing to a figure on the board, or activity-specific verbal cues such as “what phase?” Students were expected to respond immediately. The goal of these choral responding sessions was to promote fluency with previously learned content. The following procedure was used. If all children in the class responded correctly (with a
harmonious one voice response), the teacher would intermittently praise (“Great,” “Good answer,” “Right on,” etc.) the entire class for correct responding, and immediately move on to the next question (i.e., no inter-trial interval). If most of the class responded correctly, but some children did not respond, the teacher then repeated the question. If the students responded correctly to the second question, then the teacher praised correct responding, as before, and moved on to the next question. However, if many of the students responded incorrectly, the teacher then asked a series of questions about already mastered material, and led the students to the correct answer for the missed response. Praise would then intermittently follow correct responding by the group.

*Intervention/Individual Questioning (Phases B1 and B2)*

During this condition, the teacher conducted choral responding in the same manner as in the Baseline condition, but now interspersed individual questions that appeared random to the students, but were actually differentially targeted at the selected low-responding students. The teacher did not exclusively target low responders, but directed the majority of the questions to them. The shaping process involved the following:

1. If a student did not respond correctly during whole-group CR, the teacher interspersed questions with lower-than-typical difficulty to that student.
2. If the student responded correctly, the teacher indicated approval with praise, and then continued with the CR activity with no inter-trial interval.
3. If the individual student responded incorrectly, the teacher acknowledged the effort, saying something like “Good try. Close” and then immediately
signaled (with hands or orally) the whole class or another (participating) student to provide the correct response.

4. If the target student did not respond, the teacher said, “Be with us” (to emphasize that the student needed to participate), then signaled the whole class or another student to respond by saying, “Help him/her out” (emphasizing that the target student should attend).

5. The teacher then capitalized on this opportunity and, after two or three group questions, again asked the target student another question of lower-than-typical difficulty. On this response, the target student was expected to provide a correct response.

6. If the student responded correctly, the teacher then praised and moved on with the activity. The teacher was allowed to target more than one low-responding student during each response opportunity. Following correct responses, the teacher gradually lengthened the delay before targeting any particular low-responding student (i.e., shaped longer active participation). Throughout, the teacher maintained a brisk pace of whole-group questions and responses.

7. If the student’s response was again incorrect, or if the student did not respond, the teacher repeated the process described in Step 3 or Step 4 (above), respectively.
Data Collection and Analysis

A video camera was placed at the front right corner of the classroom. Seating was arranged and kept constant so the four students targeted for data collection in each class were clearly captured by the recording. Data were obtained from the video recordings. Students at this school are often videotaped for teacher training purposes. In addition, sessions were taped for a week before the study began to fine-tune the recordings, verify the response levels of the students selected by the teachers, and minimize the chances of reactivity to the presence of the video camera.

Dependent Measures

The three dependent variables in this study -- active student responding, accuracy of student responses, and disruptive behavior – were measured as follows:

1. **Student responding** was measured by counting the number of responses emitted by the student during choral responding over the total number of teacher questions. Observations yielded the percentage of responses to questions during CR (i.e., percentage of opportunity to respond).

2. **Accuracy of student responses** was measured through direct observation of the each student’s voice and lip movements on the video. Frequencies of correct and incorrect responses were recorded. These observations yielded the frequency of correct and incorrect responses by each student and the percentage of responses over the total attempted responses to questions posed during CR.
3. *Disruptive behavior* was measured by counting the occurrence of disruptive behavior during an opportunity to respond for each one of the participating students. These observations yielded the frequency of disruptive behavior occurring during a response opportunity and the percentage of disruptive behavior occurring during the total number of opportunities to respond.

The same data were collected for all four children in each class (eight total) to enable a comparison between the performances of the low- and high-responding children across the various conditions of the study.

*Interobserver Agreement (IOA)*

A primary observer observed all videotaped sessions. A second observer independently observed and recorded data in the same manner to assess IOA. The second observer scored three sessions from each condition throughout the study. IOA for teacher questions, number of student responses, accurate responses, and instances of disruptive behavior was calculated by dividing the lower frequency by the higher frequency, and multiplying the result by 100%.

The mean percentage IOA for *total number of teacher questions* during the four conditions was 97.9% (range = 96% - 100%) for Classroom 1 and 98.3% (range = 98% - 99%) for Classroom 2. The mean percentage IOA for *student responding* was 97.9% (range = 96% - 99%) for Classroom 1 and 98.5% (range = 98% - 100%) for Classroom 2. The mean percentage IOA for *response accuracy* was 98.5% (range = 98% - 99%) for Classroom 1 and 98.4% (range = 98% - 99%) for Classroom 2. The mean percentage
IOA for disruptive behavior was 93.8% (range = 85% - 98%) for Classroom 1 and 90.4% (range = 87% - 97%) for Classroom 2.

Treatment Integrity

The degree to which each teacher implemented the prescribed procedures was assessed in the following manner. Each observer independently assessed the same sessions for each teacher; three sessions in each condition were assessed for each teacher. A 30-second whole-interval recording procedure was used. At the end of each interval, each observer recorded whether or not the teacher followed all stipulated procedures that were required during the interval. Percentage of implementation was determined by the primary observer based on the percentage of intervals with proper implementation. The secondary observer’s data were used to assess IOA for treatment integrity. Integrity IOA was assessed using the interval-by-interval calculation method (Kazdin, 1982) in which each interval scored identically by the two observers was considered an agreement. Then, the number of agreements was divided by the number of agreements + disagreements, and the result were multiplied by 100%.

Treatment integrity for Teacher 1 averaged 95.8%, with a range of 90% to 100%. Treatment integrity for Teacher 2 averaged 90.3%, with a range of 80% to 98%. IOA for treatment integrity for Teacher 1 averaged 96.4%, with a range of 88% to 100%. IOA for treatment integrity for Teacher 2 averaged 97.1%, with a range of 90% to 100%.

Social Validity

Each teacher responded to an Intervention Rating Profile (IRP-15) (Martens, Witt, Elliott, & Darveaux, 1985) near the end of baseline data collection and again at the end of
the study. The first survey was directed at evaluating the teacher’s perceptions of baseline condition (whole group questioning only). The survey at the end of the study was directed at evaluating the teacher’s perceptions of the intervention condition (interspersed targeted individual questioning). The IRP-15 consists of 15 questions rated on a 6 point Likert scale. Scores on this instrument can range from 15 to 90, with the higher score meaning higher acceptability.
CHAPTER 4

RESULTS

This chapter presents the results of the study. Data are reported for the number of teacher questions per session, student responding (the percentage of student responses to teacher-posed questions), accuracy of the responses, occurrences of disruptive behavior during response opportunities, and the teacher’s social validity ratings regarding the whole-group and targeted individual questioning procedures.

Teacher questions

Across the four phases of the study, the teacher in Classroom 1 presented questions at an average rate of 18 per minute (range: 12.9 – 22.7 per minute). The teacher in Classroom 2 presented questions at an average rate of 17.8 per minute (range: 10.9 - 24.5 per minute).

Student responding

This section presents data on student responding for the high responders and low responders in each Classroom. For convenience, data will be reported first for the high responders in Classroom 1 (Ramon and Rigo), followed by the low responders in Classroom 1 (Tai and Thomas). Data will then be reported for the high responders in Classroom 2 (Robby and Rett), followed by the low responders in Classroom 2 (Tiffany and Tommy).

High Responders: Classroom 1

Ramon participated in 27 of the 34 sessions. He responded to an average of 90.1% of the questions during A1 (range: 82 – 99%), to 93.4% of the questions during B1
(range: 78 – 98%), to 88.2% of the questions during A2 (range: 83 – 93%), and to 91.6% of the questions during B2 (range: 87 – 96%).

Rigo participated in 29 of the 34 sessions. He responded to an average of 88.6% of the questions during A1 (range: 85 – 94%), to 91.9% of the questions during B1 (range: 81 – 99%), to 92.8% of the questions during A2 (range: 89 – 97%), and to 93% of the questions during B2 (range: 85 – 97%).

The gray shaded areas in Figures 1 and 2 mark the entire range in which Ramon and Rigo responded to teacher-posed questions. All individual session data points for both students fell within the shaded areas. The shaded areas are identical in Figures 1 and 2 because they reflect the same data.

Low Responders: Classroom 1

Tai participated in 33 of the 34 sessions. Figure 1 shows his levels of responding during each Phase. Tai responded to an average of 54.2% of the teacher-posed questions during A1 (range: 16 - 76%), to 66% of the questions during B1 (range: 56 – 94%), to 56.8% of the questions during A2 (range: 40 – 67%), and to 72.6% of the questions during B2 (range: 62 – 86%).

Thomas participated in 34 of the 34 sessions. Figure 2 shows his levels of responding during each Phase. Thomas responded to an average of 52.1% of the teacher-posed questions during A1 (range: 5 - 88%), to 78.3% of the questions during B1 (range: 49 – 89%), to 76.4% of the questions during A2 (range: 56 – 92%), and to 80.1% of the questions during B2 (range: 54 – 92%).
Figure 1. Tai: Student Responding
Figure 2. Thomas: Student Responding.
High Responders: Classroom 2

Robby participated in 28 of the 32 sessions. He responded to an average of 85.8% of the questions during A1 (range: 68 – 100%), to 87.4% of the questions during B1 (range: 57 – 99%), to 83.5% of the questions during A2 (range: 61 – 94%), and to 87.8% of the questions during B2 (range: 75 – 96%).

Rett participated in 27 of the 32 sessions. He responded to an average of 92.3% of the questions during A1 (range: 79 – 99%), to 93.5% of the questions during B1 (range: 88 – 100%), to 90.1% of the questions during A2 (range: 67 – 99%), and to 96.4% of the questions during B2 (range: 90 – 100%).

The gray shaded areas in Figures 3 and 4 mark the entire range in which Robby and Rett responded to teacher-posed questions. All individual session data points for both students fell within the shaded areas. The shaded areas are identical in Figures 3 and 4 because they reflect the same data.

Low Responders: Classroom 2

Tiffany participated in 26 of the 32 sessions. Figure 3 shows her levels of responding during each Phase. Tiffany responded to an average of 61.8% of the teacher-posed questions during A1 (range: 33 - 96%), to 65.2% of the questions during B1 (range: 43 – 93%), to 70% of the questions during A2 (range: 8 – 90%), and to 85.7% of the questions during B2 (range: 75 – 96%).

Tommy participated in 31 of the 32 sessions. Figure 4 shows his levels of responding during each Phase. Thomas responded to an average of 37.1% of the teacher-posed questions during A1 (range: 5 - 99%), to 62.4% of the questions during B1...
Figure 3. Tiffany: Student Responding.
Figure 4. Tommy: Student Responding.
(range: 22 – 90%), to 50% of the questions during A2 (range: 6 – 92%), and to 84.9% of the questions during B2 (range: 65 – 96%).

Response Accuracy

This section presents data on response accuracy for the high responders and low responders in each Classroom.

High Responders: Classroom 1

Ramon participated in 27 of the 34 sessions. He responded accurately on 91.8% of his attempts during A1 (range: 85 – 95%), on 95.1% of his attempts during B1 (range: 87 – 99%), on 94% during A2 (range: 92 – 97%), and on 96.5% of his attempts during B2 (range: 93 – 98%).

Rigo participated in 29 of the 34 sessions. He responded accurately on 90.5% of his attempts during A1 (range: 86 – 94%), on 94.6% during B1 (range: 85 – 99%), on 92\1.9% during A2 (range: 88 – 94%), and on 95.4% of his attempts during B2 (range: 94 – 97%).

The gray shaded areas in Figures 5 and 6 mark the entire range of accuracy that Ramon and Rigo demonstrated when responding to teacher-posed questions. All individual session data points for both students fell within the shaded areas. The shaded areas are identical in Figures 5 and 6 because they reflect the same data.

Low Responders: Classroom 1

Tai participated in 33 of the 34 sessions. Figure 5 shows his levels of response accuracy during each Phase. Tai responded accurately on 92.6% of his attempts during
Figure 5. Tai: Response accuracy.
Figure 6. Thomas: Response accuracy.
A1 (range: 88 – 97%), on 88% during B1 (range: 83 – 95%), on 94.7% during A2 (range: 87 – 97%), and on 94.4% of his attempts during B2 (range: 91 – 98%).

Thomas participated in 34 of the 34 sessions. Figure 6 shows his levels of response accuracy during each Phase. Thomas responded accurately on 94.1% of his attempts during A1 (range: 87 – 100%), on 96% of his attempts during B1 (range: 92 – 100%), on 95.2% during A2 (range: 92 – 99%), and on 98.7% of his attempts during B2 (range: 97 – 100%).

*High Responders: Classroom 2*

Robby participated in 28 of the 32 sessions. His responded accurately on 92.3% of his attempts during A1 (range: 85 – 100%), on 96.3% during B1 (range: 91 – 99%), on 95.6% during A2 (range: 92 – 99%), and on 97.3% of his attempts during B2 (range: 96 – 99%).

Rett participated in 27 of the 32 sessions. His responded accurately on 90.7% of his attempts during A1 (range: 86 – 96%), on 94.5% during B1 (range: 88 – 99%), on 96.4% during A2 (range: 91 – 100%), and on 95.6% of his attempts during B2 (range: 94 – 98%).

The gray shaded areas in Figures 7 and 8 mark the entire range of accuracy that Robby and Rett demonstrated. All individual session data points for both students fell within the shaded areas. The shaded areas are identical in Figures 7 and 8 because they reflect the same data.
Figure 7. Tiffany: Response accuracy.
Figure 8. Tommy: Response accuracy.
Low Responders: Classroom 2

Tiffany participated in 26 of the 33 sessions. Figure 7 shows her levels of response accuracy during each Phase. Tiffany responded accurately on 96.3% of her attempts during A1 (range: 92 – 100%), on 90.3% during B1 (range: 80 – 97%), on 97.7% during A2 (range: 95 – 100%), and on 96.4% of her attempts during B2 (range: 86 – 99%).

Tommy participated in 31 of the 32 sessions. Figure 8 shows his levels of response accuracy during each Phase. Tommy responded accurately on 95.4% of his attempts during A1 (range: 92 – 100%), on 82.2% during B1 (range: 49 – 97%), on 96.3% during A2 (range: 86 – 100%), and on 94.1% of his attempts during B2 (range: 89 – 98%).

Disruptive Behavior

This section presents data on disruptive behavior for the high responders and low responders in each Classroom.

High Responders: Classroom 1

Ramon participated in 27 of the 34 sessions. He exhibited disruptive behavior during 1.4% of the response opportunities in A1 (range: 0 – 5%), during 2.9% in B1 (range: 0 – 9%), during 2.7% in A2 (range: 0 – 6%), and during 4.5% in B2 (range: 4 – 9%).

Rigo participated in 29 of the 34 sessions. He exhibited disruptive behavior during 3.2% of the response opportunities in A1 (range: 0 – 11%), during 4.7% in B1 (range: 1 – 8%), during 3.2% in A2 (range: 1 – 13%), and during 6% in B2 (range: 2 – 16%).
The gray shaded areas in Figures 9 and 10 mark the entire range of disruptive behavior that Ramon and Rigo exhibited during response opportunities to teacher-posed questions. All individual session data points for both students fell within the shaded areas. The shaded areas are identical in Figures 9 and 10 because they reflect the same data.

Low Responders: Classroom 1

Tai participated in 33 of the 34 sessions. Figure 9 shows his levels of disruptive behavior during each Phase. Tai exhibited disruptive behavior during 18.9% of the response opportunities in A1 (range: 0 – 69%), during 27.4% in B1 (range: 10 – 41%), during 29.1% of the response opportunities in A2 (range: 17 – 58%), and during 25.9% in B2 (range: 15 – 46%).

Thomas participated in 34 of the 34 sessions. Figure 10 shows his levels of disruptive behavior during each Phase. Thomas exhibited disruptive behavior during 29.2% of the response opportunities during A1 (range: 7 – 63%), during 21.3% in B1 (range: 7 – 41%), during 29.6% in A2 (range: 6 – 44%), and during 25.4% in B2 (range: 12 – 36%).

High Responders: Classroom 2

Robby participated in 28 of the 32 sessions. He exhibited disruptive behavior during 2.5% of the response opportunities in A1 (range: 0 – 10%), during 1.6% in B1
Figure 9. Tai: Disruptive behavior.
Figure 10. Thomas: Disruptive behavior
(range: 0 – 4%), during 11.5% in A2 (range: 1 – 36%), and during 5.2% of the response opportunities during B2 (range: 0 – 9%).

Rett participated in 27 of the 32 sessions. He exhibited disruptive behavior during 3.7% of the response opportunities in A1 (range: 0 – 18%), during 2.1% in B1 (range: 0 – 6%), during 8.3% in A2 (range: 0 – 40%), and during 1.1% of the response opportunities in B2 (range: 0 – 2%).

The gray shaded areas in Figures 11 and 12 mark the entire range of disruptive behavior that Robby and Rett exhibited during response opportunities to teacher-posed questions. All individual session data points for both students fell within the shaded areas. The shaded areas are identical in Figures 11 and 12 because they reflect the same data.

Low Responders: Classroom 2

Tiffany participated in 26 of the 33 sessions. Figure 11 shows her levels of disruptive behavior during each Phase. Tiffany exhibited disruptive behavior during 1.1% of the response opportunities in A1 (range: 0 – 4%), during 2.1% in B1 (range: 0 – 6%), during 4.6% in A2 (range: 0 – 17%), and during 3.4% of the response opportunities in B2 (range: 1 – 7%).

Tommy participated in 31 of the 32 sessions. Figure 12 shows his levels of disruptive behavior during each Phase. Tommy exhibited disruptive behavior during 23.9% of the response opportunities in A1 (range: 0 – 63%), during 9.8% in B1 (range: 1 – 56%), during 30.7% in A2 (range: 16 – 57%), and during 8.5% of the response in B2 (range: 3 – 17%).
Figure 11. Tiffany: Disruptive behavior.
Figure 12. Tommy: Disruptive behavior.
Social Validity

Teacher 1’s score on the Intervention Rating Profile-15 (Martens, Witt, Elliott, & Darveaux, 1985), completed at the end of A1 (whole-group responding), was 49. Her score for the individual targeted questioning procedure, completed at the end of B2, was 86. Teacher 2’s scores were 75 and 90, respectively.
CHAPTER 5
DISCUSSION

The purpose of this study was to determine whether interspersing individual targeted questioning during whole group CR would improve participation by low-responding students. The study focused on the variables of student responding, response accuracy, and disruptive behavior. This chapter will discuss the results with respect to the four research questions and relate these findings to the existing literature. The chapter will also identify and discuss the limitations of the study, and present this study’s implications for both research and practice.

Findings

Research Question One

*Will interspersing targeted individual questions result in higher levels of participation by low-responding students than whole-group CR without individual questioning?*

The mean responding levels for two low-responding students (Tai in Classroom 1 and Tommy in Classroom 2) demonstrate a clear functional relationship between the independent variable (targeted individual questioning) and the dependent variable (student responding). Thomas (Classroom 1) improved his responding during B1 but did not reverse during A2. Tiffany showed just a slight improvement during B1, and also did not reverse.

All four low-responders had considerably higher mean levels of responding in B2 (second intervention). In addition, the session levels during B2 showed less variability than in A1 and A2. It is noteworthy that the high-responders in each classroom were not
negatively impacted by the intervention. They also showed improvement in B1 and B2, and their responding was high and stable throughout the study.

Research Question Two

*Will the targeted individual questioning improve response accuracy in students who do not consistently respond?* All eight students (high- and low-responders) showed relatively high mean levels of accuracy in all four conditions. Three of the four low-responders (Tai, Tiffany, and Tommy) showed a slight decrease in the mean level of response accuracy, but only when B1 was first introduced. This same pattern did not continue in the later sessions in B1 and did not recur when B2 was introduced. Furthermore, during B2, their mean level of response accuracy remained stable. This was particularly impressive considering that, during B2, the students demonstrated their highest level of responding. Thus, the procedure ultimately increased responding to very high percentages with very high accuracy.

Thomas and the four high-responders showed an increase in their mean levels of response accuracy when B1 was introduced. Again, it is noteworthy that the intervention did not negatively impact the high responders; in fact, the accuracy of all four high-responders improved.

Research Question Three

*Will the increased participation (if produced) result in reduced levels of disruptive behavior?* For two of the four low-responders (Thomas and Tommy), increases in their mean levels of responding corresponded perfectly to decreased levels of disruptive behavior during both B1 and B2. For one low-responder (Tai), the
corresponding relationship appeared to hold for the means of three of the four phases. For the last low responder (Tiffany), the level of disruptive behavior was low and stable regardless of her level of responding.

All four high-responding students, as expected, had high mean levels of responding and corresponding low mean levels of disruptive behavior. In many cases, the level of disruptive behavior and responding showed a close inverse relationship. For example, Thomas (low responder) showed sessions with high levels of responding that coincided with low levels of disruptive behavior, and low levels of responding that corresponded with increases in disruptive behavior.

Research Question Four

Will the teachers find the targeted individual questioning procedure to be socially valid? Both teachers gave the targeted individual questioning procedure higher acceptability scores than the whole-group CR on its own. Both teachers gave the targeted individual questioning an acceptability score at or near the top of the scale because, they reported, they felt that the added component made CR more effective with unwilling responders.

Relationship to the Existing Literature

This results of this study support existing literature that present CR as a procedure that results in high levels of student responding (Heward, 1994; Tincani, Ernsbarger, Harrison, & Heward, 2005). The fast pace attained through CR is particularly important when connected to other research indicating that fast response rates generate increased participation (e.g., Cashman, 1990; Carnine, 1979; Morgan, 1987; Tincani et al., 2005).
The present study adds a component to the existing literature by presenting data on a procedure that enhances the effectiveness of an already effective technique by increasing participation by those students who do not respond optimally to whole-group CR.

This study also extends previous research indicating that fast rates of responding produce greater response accuracy (Carnine, 1979; Morgan, 1987; Tincani et al., 2005). The interspersed targeted questioning strategy resulted in an initial decrease in the response accuracy of some students. However, this result was expected due to the induced higher level of responding and possible tension from being “put on the spot” with individual questions. Furthermore, during B2, these students’ accuracy remained high while responding increased to its highest levels.

The argument can be made that high levels of accurate practice result in greater academic achievement, as measured by follow-up tests applied to students who participate in fast-paced choral activities (Cashman, 1990; Carnine 1979; Morgan, 1987; Sainato, Strain, & Lyon, 1987; Williams, 1993). Theoretically, if we induce every child to participate, we may be helping every child to achieve.

The current study showed that increased responding decreased levels of disruptive behavior by the low-responding students. This finding adds a new concept to the literature. Previous work has primarily measured and reported the effects of fast-paced choraling on decreased off-task behavior or increased on-task behavior (Cashman, 1990; Carnine 1979; Morgan, 1987; Sainato Strain, & Lyon, 1987; Tincani et al., 2005). The current data provide direct support for previous research that reduced disruptive behavior
by increasing student responding through the use of response boards (Armendariz & Umbreit, 1999).

The social validity data are consistent with previous reports that teachers favorably rate the impact that CR has on their students (Sainato Strain, & Lyon, 1987). Both teachers in this study reported that CR was an effective technique by itself, but added that the targeted individual questioning component made it more effective with unwilling responders.

Finally, the treatment integrity data in this study confirms that the intervention was implemented at a high level. Only a few previous studies in this area (e.g., Sindelar, Bursuck, & Halle, 1986; Sterling, Barbetta, Heward, & Heron, 1997) have reported such data.

Limitations of the Study

Limitations have been identified in three areas. First, the number of sessions per phase was determined a priori and not upon reaching stable responding. The amount of time required to extract the data from the video recording did not allow for timely decision making. More sessions per phase may have produced more consistent results across all students. The process of shaping students to respond can take time. Losing the effects of shaping (i.e., to see a full reversal in A2) may take more sessions than were conducted. Many of the phases indicated increasing or decreasing trends that may not have fully run their course. Creating substantial and lasting reductions in disruptive behavior may require maintaining consistently high responding for a longer period of time.
Second, no follow-up measures were collected because it was not possible to have students take follow-up tests on identical content. This limitation is made less critical by the numerous studies with CR that have documented the functional relationship between increased student responding and academic achievement.

Third, CR activities in this study involved a choral review of material that had been learned previously. Different outcomes may result if the choral activity is carried out while teaching new material because the pace may be considerably slower when new material is being introduced.

Fourth, teachers in this study had considerable experience implementing CR with and without individual targeted questions. Inexperienced or less experienced teachers may not achieve the same levels of treatment integrity and, thus, may not produce the same results.

Fifth, the possibility of reactivity to the videotaping cannot be ignored. Students in this school are often videotaped for teacher training purposes and steps were taken to minimize the possibility of reactivity by using the video camera in the classroom for a week prior to the start of data collection. Nevertheless, the student’s behavior may have been influenced by the fact that they were being recorded.

Finally, none of the students who participated in this study had been identified as having significant attention or learning problems. The effects of this procedure on such students remains to be examined.
Implications for Research and Practice

In future research, additional work could be conducted with a different research design (e.g., multiple baseline) that would facilitate extend phase lengths and eliminate the need to reverse well-shaped responding. Future studies also could include immediate quizzes and follow-up tests to document the impact that increased participation may have on low-responders’ learning and retention.

To extend the applicability of the strategy, future research could be conducted with inexperienced teachers to determine if they can quickly reach acceptable levels of treatment integrity. Research also could be conducted with younger children who often have shorter attention spans, with older (middle and high school) students who may be resistant to the procedure, and with special education students who may have significant attention or learning difficulties.

In practice, the results from this study indicate that interspersing targeted individual questions during CR may help classroom teachers to increase participation by students who are not consistent responders. CR may be used on multiple occasions throughout the school day for a variety of purposes, including teaching new material, reviewing previously learned material, and even controlling disruptive behavior during a transition. Teachers would need to prepare their material in advance and use short questions or gestures that serve as quick questions to generate fast-paced instruction. The procedure of interspersing individual questions requires practice. Feedback from an experienced teacher may be beneficial, but not an absolute necessity. The students themselves may provide the feedback required to shape appropriate implementation by
their teachers. If CR is maintained with whole group for too long, some students may
decrease their participation (hide in the crowd). Similarly, if individual questions are
asked too often, the class may lose its momentum and participation may diminish.
Practice should help teachers find and maintain that fine balance.
REFERENCES


