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Effect of Response Cards on Academic Outcomes

Ellen L. Duchaine
Georgia State University

ACCEPTANCE

This dissertation, EFFECT OF RESPONSE CARDS ON ACADEMIC OUTCOMES FOR HIGH SCHOOL STUDENTS WITHOUT DISABILITIES AND HIGH SCHOOL STUDENTS WITH DISABILITIES WHO EXHIBIT CHALLENGING BEHAVIORS, ELLEN L. DUCHAINE, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in the College of Education, Georgia State University. The Dissertation Advisory Committee and the student's Department Chair, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty. The Dean of the College concurs.

Kristine Jolivette, Ph.D.
Committee Chair

Laura Fredrick, Ph.D.
Committee Member

Paul Alberto, Ph.D.
Committee Member

Brenda Scheuermann, Ph.D.
Committee Member

Date

Peggy L. Gallagher, Ph.D.
Chair, Department of Educational Psychology and Special Education

R. W. Kamphaus, Ph.D.
Dean and Distinguished Research Professor
College of Education

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Ellen L. Duchaine
7002A Treasure Cove
Austin, TX 78745

The director of this dissertation is:

Dr. Kristine Jolivette
Department of Educational Psychology and Special Education
College of Education
Georgia State University Atlanta, GA 30303

CURRICULUM VITAE

Ellen L. Duchaine

ADDRESS: 7002 A Treasure Cove
Austin, TX 78745

EDUCATION

Ph.D.	2011	Georgia State University Education of Exceptional Students
M.Ed.	2004	University of South Florida Educational Leadership
B.S.	1991	Georgia State University Education for Mental Retardation

PROFESSIONAL EXPERIENCE

2010-present	Special Education Behavior Coach, Positive Behavior Interventions and Supports, Texas Youth Commission, Austin, TX
2008-2010	Graduate Research Assistant, Georgia State University, Atlanta
2005-2008	Special Education Coordinator, Beaufort County, SC
1994-2005	Special and General Education Teacher, Pinellas County Schools, Largo, FL
1991-1994	Special Education Teacher, Cobb County School District, Marietta, GA
2011-present	Adjunct Instructor, Texas State University
2010-present	Senior Grant Coordinator, Texas State University
2009-2010	Part Time Instructor, Georgia State University, Atlanta

PUBLICATIONS

De Fazio, C. M., Fain, A. C., & Duchaine, E. L. (in press). Using treatment integrity in the classroom to bring research and practice together. *Beyond Behavior*.

Duchaine, E. L., Green, K. B., & Jolivette, K. (in press). Using response cards as a class-wide intervention to decrease challenging behavior. *Beyond Behavior.*

Duchaine, E. L., Jolivette, K., & Fredrick, L. D. (2011, May). The effect of teacher coaching with performance feedback on behavior-specific praise in inclusion classrooms. *Education and Treatment of Children.*

McDaniel, S., Kristen, M., Heil, K. M., Houchins, D. E., & Duchaine, E. L. (2011, May). A guide to implementing response to intervention in long-term residential juvenile justice schools. *Journal of Correctional Education.*

McDaniel, S. C., Duchaine, E. L., & Jolivette, K. (2010). Adolescent struggling readers with emotional and behavioral disorders and their teachers: Perceptions of corrective reading. *Education and Treatment of Children.*

PRESENTATIONS

Duchaine, E. L. (2011, June). *Classwide secondary tier interventions for teachers: Overlapping strategies to increase student engagement.* Texas Behavior Support Statewide Conference, Houston, TX.

Duchaine, E. L., & Hansen, A. (2011, April). *Response cards: A secondary tier intervention for academics and behaviors.* Council for Exceptional Children, National Harbor, Maryland.

Duchaine, E. L., Kearly, R., & Nomvete, P. T. (2011, March). *Classwide secondary interventions for secondary teachers: Overlapping strategies to increase student engagement.* 8th International Conference on Positive Behavior Support, Denver, Colorado.

Nomvete, P. T., & Duchaine, E. L. (2011, March). *Classwide secondary tier reading interventions: Increasing reading comprehension/engagement with secondary students.* 8th International Conference on Positive Behavior Support, Denver, CO.

Duchaine, E.L., & De Fazio, C. (2010, December). *Behavior specific praise statements: Small teacher change leads to big classroom changes.* Positive Behavior Interventions and Supports: Making a Difference in Students' Lives, Atlanta, GA.

Duchaine, E. L., & Nomvete, P. T. (2010, December). *Universal implementation with secondary tier interventions: Teaching challenging students in alternative classrooms.* Positive Behavior Interventions and Supports: Making a Difference in Students' Lives, Atlanta, GA.

Duchaine, E. L., & Green, K. B., (2010, December). *Response cards: A secondary tier intervention.* Positive Behavior Interventions and Supports: Making a Difference in Students' Lives, Atlanta, GA.

Nomvete, P. & Duchaine, E.L., (2010, December). *Check-in/Check-out: Effectively implementing a targeted secondary tier intervention.* Positive Behavior Interventions and Supports: Making a Difference in Students' Lives, Atlanta, GA.

Green, K. B. & Duchaine, E. L. (2010, December). *Choice making: A secondary tier intervention.* Positive Behavior Interventions and Supports: Making a Difference in Students' Lives, Atlanta, GA.

Duchaine, E. L., & De Fazio, C. (2010, October). *Response cards: Increase student engagement & decrease challenging behaviors in juvenile justice settings.* Teacher Education for Children with Behavior Disorders, Tempe, AZ.

Fain, A. C., Duchaine, E.L., & Jolivette, K. (2010, October). *Using CBM with self-graphing to improve academic and behavioral skills.* Teacher Education for Children with Behavior Disorders, Tempe, AZ.

ABSTRACT

EFFECT OF RESPONSE CARDS ON ACADEMIC OUTCOMES FOR HIGH SCHOOL STUDENTS WITHOUT DISABILITIES AND HIGH SCHOOL STUDENTS WITH DISABILITIES WHO EXHIBIT CHALLENGING BEHAVIORS

by
Ellen L. Duchaine

Response cards (RC) support effective teaching strategies such as maintaining a brisk pace of instruction, increased opportunities to respond, immediate and frequent corrective feedback, and high rates of behavior specific praise statements; all of which have been effective in increasing student engagement for students with and without emotional and behavioral disorders (E/BD) (Emmer & Stough, 2001; Simonsen et al., 2008; Sutherland, Wehby, & Copeland, 2000). RC during academic instruction are successful in decreasing disruptive behavior, increasing student participation, and increasing academic achievement from the elementary school level to the university level. This study examined teacher implementation of RC at the high school level for students without disabilities and students with disabilities with a history of challenging behaviors (i.e., students with a disability and a behavior intervention plan) in general education classes required for high school graduation. The purpose of this study was to evaluate the effect of RC compared to hand raising (HR) in inclusive general education classrooms. An alternating treatment design was implemented to examine the potential functional relation between the use of RC, student engagement, and academic achievement. RC (i.e., 8" x 11" laminated write-on cards) were randomly alternated with the more traditional method of HR which allows one student to respond to each question asked by the teacher. Intervals of time on-task, attempted responses, next day quiz scores, and bi-weekly probe

scores were measured and analyzed for target students without disabilities and target students with disabilities. In addition, individual scores of all students in the class were calculated to provide a class mean, allowing further analysis. All sessions were conducted by classroom teachers during daily reviews of academic content. The findings from this study support prior research indicating RC increases student engagement by increasing intervals of time on-task and attempted responses for the majority of students. In one class, three of four target students increased daily quiz scores by 10% or more using RC; and in the second class the mean for daily quiz scores was higher using RC. Although results on next-day quizzes were inconsistent, bi-weekly probes indicate RC increased retention of material learned over time.

EFFECT OF RESPONSE CARDS ON ACADEMIC OUTCOMES FOR HIGH SCHOOL STUDENTS WITHOUT DISABILITIES AND HIGH SCHOOL STUDENTS WITH DISABILITIES WHO EXHIBIT CHALLENGING BEHAVIORS

by
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allowed me to meet my goal of graduation a year ahead of schedule. Dr. Jolivette, I cannot appropriately express my thanks to you, so let me just say that I will do my best to follow your lead and I look forward to working with you in the future.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

EFFECT OF RESPONSE CARDS ON ACADEMIC OUTCOMES FOR HIGH SCHOOL STUDENTS WITH AND WITHOUT CHALLENGING BEHAVIORS

Nearly a half million students are identified with emotional and behavioral disorders (E/BD) in schools across the nation (Wagner, Kutash, Duchnowski, Epstein, & Sumi, 2005). These students exhibit deficits in behavioral performance, academic achievement, and social skills (Rutherford, Quinn, & Mathur, 2004). Those with E/BD are generally identified after repeated academic failure and/or chronic disruptive behavior (Bradley, 2001; Kauffman, 2001) and their deficits tend to maintain across grade levels and content areas (Nelson, Brenner, Lane, & Smith, 2004).

Educational Characteristics of Students with E/BD

The Individuals with Disabilities Education Act (IDEA, 2004) defines an emotional disability with five possible components. A student meets IDEA eligibility criteria for an emotional or behavioral disability if exhibiting one or more of the following characteristics to a marked degree, over an extended period of time: (a) an inability to learn not explained by intellectual, sensory, or health factors; (b) an inability to build or maintain satisfactory relationships with peers and teachers; (c) inappropriate behaviors or feelings under normal circumstances; (d) a pervasive mood of unhappiness or depression; and/or (e) a tendency to develop physical symptoms or fears associated with personal or school problems. These eligibility criterion define students who have already experienced repeated school failure in one or more of three critical school skills (i.e., behavior, academics, and social interactions) before the disability is identified and supportive services provided (Bradley, 2001; Kauffman, 2001).

Chronic problematic behavior is the characteristic most often associated with students with E/BD (Kauffman, 2001; Lane, Carter, Pierson, & Glaeser, 2006). These challenging behaviors may be either internalizing or externalizing and are observed across environments and classrooms. Students become noncompliant, disrupt classes by making noises, argue, throw items, and/or bully or threaten peers or adults (Scott, Nelson, & Liaupsin, 2001). Rutherford et al. (2004) report externalizing behaviors also may include inattentiveness, deceitfulness, rule violations, aggression, destruction of property, and theft. Kauffman (2001) reported internalizing behaviors as including anxiety disorders, depression, phobias, adjustment disorders, eating disorders, and post-traumatic stress disorder. Being extremely active or lethargic, withdrawn from or resisting interactions with peers or adults, or frequent psychosomatic complaints also are indicators of internalizing behaviors (Cullinan & Sabornie, 2004; Rutherford et al., 2004) as well as poor problem-solving skills (Rutherford et al., 2004) and unfounded fears (Cullinan & Sabornie, 2004; Kauffman, 2001).

In addition to challenging behavior, students with E/BD often have academic deficits (Lane et al., 2006) performing well below grade level across subject areas, and (Nelson et al., 2004), earning lower grade point averages (Bullock & Gable, 2006); thus, being retained more often (Mayer, 2001), not graduating after the standard four years in high school (Bullock & Gable, 2006), and dropping out of school at a higher rate (Jolivette, Stichter, Nelson, Scott, & Liaupsin, 2000). Academic deficits in reading, writing, and mathematics that surface in elementary school often extend into other content areas such as social studies and science as students advance from elementary

school to middle school to high school (Nelson et al., 2004) increasing academic challenges as students become older.

There is evidence that poor academic achievement and behavior problems go hand-in-hand (Gunter, Jack, DePaepe, Reed, & Harrison, 1994; Scott et al., 2001; Shores, 1992). Academic demands may be aversive to students who do not have the skills to perform an expected task (Colvin, 2004; Sutherland, Lewis-Palmer, Stichter, & Morgan, 2008). The student's perception that the task is difficult may be displayed through avoidance by either disruptive or noncompliant behaviors to which teachers typically react with disciplinary action (Mayer, 2001; Van Acker, 2002). The behaviors of both the teacher and the student create a repeatable negative cycle resulting in lower expectations for the student, removal of tasks or opportunities to participate, or removal from the learning environment entirely (Colvin, 2004; Nelson, 1997; Scott et al., 2001; Van Acker, 2002).

Another characteristic associated with students with E/BD is social skill deficits. Social skill deficits are defined in IDEA (2004) as 'an inability to build or maintain relationships with peers or adults.' Generally, students with E/BD miss social cues that their peers observe such as cues for turn-taking, interactive conversations, raising one's hand to gain teacher attention, and responding appropriately to adult direction (Cook et al., 2008; Cullinan & Sabornie, 2004; Kauffman, 2001). Social skills are a key component of school success and include academic skills, compliance skills, peer relations, self-management, and assertion skills (Landrum, Tankersley, & Kauffman, 2003; Patterson, Jolivette, & Crosby, 2006). Fortunately, social skills, like academic skills, are learned so they can be taught (Cook et al., 2008; Patterson et al., 2006).

Intervention for social skills is influenced by the severity of the student's behavior, the skills of both the general and special education teachers, and the school structure and resources (Jackson & Neel, 2006). Regardless of the specific deficit skill (i.e., behavior, academic, or social skills), schools provide a continuum of services and placements for students with disabilities to meet their individual needs, with most high school students with E/BD receiving about 80% of their academic content instruction in general education classrooms (Idol, 2006; Wagner & Cameto, 2004).

Least Restrictive Environments

IDEA (2004) and No Child Left Behind (NCLB, 2001) mandate all students have access to the general education curriculum within a least restrictive environment (LRE). It states that students will be educated to the maximum extent appropriate with those who are not disabled. Removal of students to special classes or separate schools may only occur when the nature or severity of the disability is such that education in general classes with supplementary aids and services cannot be achieved satisfactorily. Although the continuum of educational placements for students with special needs continues to result in some students being educated in self-contained classrooms or segregated schools (Lane, Wehby, Little, & Cooley, 2005a), most students with disabilities are currently educated in general education classrooms inclusive of students with disabilities most of the day with consultative or resource services (IDEA, 2004; Idol, 2006; Kauffman, 2001). According to the National Center for Educational Statistics (NCES, 2007) there are 442,000 students with E/BD and 75% of those students in public schools spend more than 75% of the school day in general education classrooms. In a study on inclusion practices in four high schools in different geographical regions represented by Miami, Brooklyn,

Franklin, TN, and Flagstaff, AZ, Wallace, Anderson, Bartholomay, and Hupp (2002) found students with E/BD ranged from 3% to 18% of total student enrollment. Those students with E/BD received instruction in general education classes between 66% and 100% of the day. However, part of each placement decision needs to be based on effective instructional strategies determined on an individual basis. Understanding IDEA and NCLB requirements of providing special education services in LRE for students with E/BD is left to the interpretation of educators (Kauffman, 2003). In 2007, 19,733 of 46,016 students (i.e., 42.9%) with E/BD graduated with a high school diploma, 5,654 aged out or earned a certificate of attendance, and 20,458 (45%) dropped out of school (NCES, 2007). Low high school graduation rates for students with E/BD leads to poor life outcomes with increased chances they will experience negative interactions within communities (Jolivette et al., 2000; Robinson & Rapport, 1999; Wagner & Cameto, 2004). Many will find it difficult to secure and maintain employment as an adult (Cullinan & Sabornie, 2004; Thurlow, Sinclair, & Johnson, 2002) and one in three will become involved with the legal system (Kauffman, 2001; Thurlow et al., 2002).

Guetzloe (2001) emphasized that students with E/BD in high schools need everything their peers need and more. The purpose of special education is to meet the individualized needs of a student (IDEA, 2004); thus, for students with E/BD this specifically means providing behavioral, academic, and social interventions (Dunlap, Hieneman, Kincaid, & Duchnowski, 2001; Guetzloe, 2001; Gunter et al., 1994). Therefore, educators need to implement evidence-based, effective instructional methods when teaching students with E/BD so they have the opportunity to achieve academically

while at the same time being provided behavioral support and social skills interventions (Landrum et al., 2003; Rutherford et al., 2004).

General Education Placement of Students with E/BD

In a three year qualitative study using descriptive statistical analyses, Mastropieri and Scruggs (2001) found students with disabilities in high school inclusion classes face specific educational challenges such as organizing materials from numerous courses, listening to lectures and taking proficient notes, completing assignments for more than one class, actively participating during classes, mastering a wide variety of required academic content, and studying for taking tests. These challenges in inclusion classrooms may lead to inconsistent academic success for students with E/BD (Nelson et al., 2004). However, students with E/BD in self-contained classes and segregated schools seem to make little to no progress and tend to fall further behind academically and socially each year (Dunlap et al., 2001; Lane, Wehby, Little, & Cooley, 2005b).

In an analysis of eight schools with a continuum of special education services, Idol (2006) found the majority of faculty and administrators varied from being in favor of inclusion to being willing to try inclusion; and 77% of the high school educators interviewed felt students with disabilities should be included in general education classes. In addition, 24% of these high school educators reported including students with disabilities improved the learning of their peers without disabilities when grouping students heterogeneously and implementing strategies learned through collaboration with special education teachers. So although the overall effectiveness of inclusion has been inconsistent (Mastropieri & Scruggs, 2001) educators reported that with support from administrators and special education teachers, appropriate curriculum, effective teaching

strategies, and positive classroom environments, students with disabilities can succeed in inclusive classrooms in middle and high schools (Mastropieri & Scruggs, 2001; Villa, Thousand, Nevin, & Liston, 2005). However, because students with E/BD have such poor educational outcomes across educational settings resulting in a low rate of high school graduation (Jolivette et al., 2000; Wagner & Cameto, 2004; Zigmund, 2005), further exploration of instructional methods used in inclusive classrooms to increase student engagement and improve academic achievement of these students seems especially important (Guetzloe, 2001; Landrum et al., 2003). However, the evidence-based literature on academic interventions for students with E/BD in inclusion settings is sparse with much of the academic research involving learning strategies for students rather than instructional strategies for teachers (Griffith, Trout, Hagaman, & Harper, 2008; Hodge, Riccomini, Buford, & Herbst, 2006; Vannest, Temple-Harvey, & Mason, 2008).

Currently researchers are examining school environments and instructional interventions in an effort to find effective instructional approaches for students with E/BD (Conroy, Stichter, Daunic, & Hayden, 2008). For teachers in inclusion classrooms to effectively meet the academic and behavioral needs of all students at once, providing classwide interventions may be an efficient way to address the needs of multiple students with specific needs without individualizing each intervention (Kern & Clemens, 2007; Sugai, Horner, & Gresham, 2002). One factor directly related to academic achievement that may be addressed classwide is active student engagement during the learning process (Bost & Riccomini, 2006; Greenwood, Horton, & Utley, 2002).

Student Engagement

Student engagement, also known as time on-task and student participation, is defined as engagement with the learning process, occurring when a student focuses on the teacher or materials, participates in the lesson by responding to and asking questions, and performs specific activities and/or assignments related to the lesson (Greenwood et al., 2002; Moore, 1983). Learning is an interactive process between the teacher, the material, and the student. Student engagement is an essential component to learning (Brophy, 1979; CEC, 1987; Cotton, 1995; Druian & Butler, 1987; Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008). Strategies that increase student engagement during instruction are directly associated with academic achievement for students across grade levels and ability levels including students with disabilities in segregated educational settings (CEC, 1987; Coffey & Gemignani, 1994), students with E/BD (Sutherland, Alder, & Gunter, 2003; Sutherland & Wehby, 2001), high school students (Colvin, Flannery, Sugai, & Monegan, 2008; Cotton, 1995), and high school students with disabilities at-risk for dropping-out of school (Druian & Butler, 1987; Finn, 1993). One strategy that increases student engagement is opportunities to respond (OTR; Sutherland & Wehby, 2001). Opportunities to respond are questions or activities presented by a teacher that allow the student to actively participate through verbal or written communication (CEC, 1987; Sutherland et al., 2003).

Reviewing the literature dating 1976–1997, Sutherland and Wehby (2001) found six studies examining the effect of instructional strategies on the rate of OTR with students with E/BD or students exhibiting behavior characteristics similar to students with E/BD. The findings indicate that increased OTR results in increased academic

outcomes and task engagement, and decreased disruptive and off-task behaviors. The increased rates of task engagement and correct responding resulted in the teachers responding with behavior specific praise statements (BSPS), leading to more positive teacher/student interactions and improving the classroom environment. In a follow-up study in a self-contained class with 9 students with E/BD, Sutherland et al. (2003) found that when the teacher increased OTR from a rate of 1.68 per minute to a rate of 3.49 per minute, correct responses doubled from a rate of 1.24 to a rate of 2.6 per minute, indicating that participation allowed students to learn at a higher rate. Other researchers have found that each student's level of engagement varies based on a multitude of factors (Crooks, 1988; Van Acker, 2002).

Investigating student engagement (i.e., participation) and academic achievement factors Finn (1993) conducted two studies to determine (1) if an association existed between student engagement and academic achievement, and (2) if a difference existed within the group of students considered 'at-risk' in a comparison between students labeled 'at-risk and unsuccessful' and students labeled 'at-risk and successful.' In the first study, data used in the MANOVA included student, parent, administrator, and teacher surveys, socio-economic status, school engagement, student identification with school, participation in academic and non-academic school-related activities, parent involvement, and measures of academic performance in math, reading, social studies, and science from 18,307 eighth grade students in 800 public schools. The results of this first study indicated academic achievement increases as student participation in school events and student engagement in the classroom rises.

The second study investigated a sample of 5,945 of the 18,307 students who were considered ‘at-risk’ based on urban minority, language minority, and low socioeconomic status. The results of the second study support the results of the first study: being an active participant in the classroom precedes success, and the more appropriately the student behaves in classes, the higher the student achievement. The factors determined to have significant differences when comparing the students ‘at-risk and successful’ to the students ‘at-risk and unsuccessful’ were (a) class and school participation, (b) class preparation, (c) appropriate classroom behavior, (d) completion of homework assignments, and (e) amount of television watched. These findings support the importance of actively engaging students in the learning process. However, students with E/BD who exhibit chronic school problems often lack the basic skills that successful students exhibit such as intrinsic motivation, self-regulation, and social skills (Scheuermann, 2000).

In a series of studies on teaching and learning, Brophy (1979) specified that students who struggle due to lower ability levels or special needs require teachers to “supply greater warmth, encouragement, and personalized teaching.” In addition, when teaching students who are anxious, easily distracted, or behind academically, teachers should use direct instruction and closely monitor student understanding. Brophy (1979) reported the most effective method of teaching at the high school level is whole class instruction with material presented using a rapid-paced lecture, or direct instruction format that moves efficiently through the curriculum, allowing students repeated OTR, and providing them with corrective feedback and specific praise for effort. Brophy (1979) stressed the need to implement a predictable pattern of asking questions, and to

allow everyone to answer an equal number of questions. Current literature continues to support direct instruction at a brisk pace, frequent corrective feedback, increased OTR, and behavior specific praise as effective strategies for increasing student engagement for students with and without E/BD (Emmer & Stough, 2001; Simonsen et al., 2008; Sutherland et al., 2000).

Antecedent Strategies as Classwide Interventions

Teachers manage classroom behaviors most effectively by adjusting instructional factors (Witt, VanDerHeyden, & Gilbertson, 2004) to increase student participation. Focusing on instruction creates an environment that supports academics while increasing student success and decreasing disruptive behavior (Scott et al., 2001; Van Acker, 2005; Wallace et al., 2002). Implementing antecedent strategies with the focus on instruction allows teachers to concentrate on the academic content (Kern & Clemens, 2007; Sutherland et al., 2008). Being proactive by using antecedent strategies reduces or eliminates problem behavior creating a safe learning environment by addressing environmental factors that contribute to misbehavior (Dunlap et al., 2001; Witt et al., 2004).

Antecedent strategies are most efficient when implemented classwide (Blackwell & McLaughlin, 2005; Kern & Clemens, 2007) because the teacher is able to focus on the entire class and not on a few students with challenging behaviors. Research supports multiple classwide evidence-based strategies that overlap and are effective across populations (Bost & Riccomini, 2005; Conroy et al., 2008; Oudeans, 2002). An example of overlapping, evidence-based strategies incorporated classwide is teacher-directed instruction maintained at a brisk pace (Huitt, Monetti, & Hummel, 2009), with high

levels of OTR and behavior specific praise (Conroy, Sutherland, Snyder, Al-Hendsawi, & Vo, 2009; Moore Partin, Robertson, Maggin, Oliver, & Wehby, 2010; Sutherland, Wehby, & Yoder, 2002), and immediate corrective feedback (Lingo, Jolivette, & Barton-Arwood, 2009).

Each of these teaching strategies increases the amount of interaction between students and the curriculum being taught. Wallace et al. (2002) observed 118 inclusive high school classrooms and found that whole class instruction occurred 68% of class time; however, students spent most of their time on task listening. Students with disabilities were observed to be engaged in learning 34% of the time, while students without disabilities were observed to be engaged 39% of the time. Based on evidence that students learn more when actively engaged (Bost & Riccomini, 2005; Finn, 1993; Gardner, Heward, & Grossi, 1994; Sutherland & Wehby, 2001), this indicates a need to increase student engagement at the high school level.

Classwide antecedent interventions increase student engagement using minimal time to implement while offering support to all students (Fairbanks, Simonsen, & Sugai, 2008). High school teachers incorporating overlapping strategies into teacher-directed instruction (Grossen, 2002) can increase OTR using a variety of methods such as guided notes (Blackwell & McLaughlin, 2005), frequent checks for understanding (Colvin et al., 2008; Hayden, Mancil, & Van Loan, 2009), regular assessments (Shirvani, 2009; Wolf, 2007), immediate feedback (Brosvic & Epstein, 2007), and/or response cards (Cavanaugh, Heward, & Donelson, 1996).

Response cards (RC) are a strategy that engages the learner, requiring students to take an active role in their instruction (Christle & Schuster, 2003; Lambert, Cartledge,

Heward, & Lo, 2006). It is a strategy effective for increasing OTR that improves both academic and social outcomes, across grade levels from early childhood classes to university courses for students with and without E/BD in multiple content areas including calendar, science, math, and psychology (Randolph, 2007). When students are actively involved they tend to be less distracted and less likely to disrupt class activities (Lambert et al., 2006). Teachers using RC are able to employ a lecture format (i.e., teacher-directed instruction), incorporating frequent questioning, allowing all students to participate, and monitoring for accuracy while providing frequent corrective feedback and behavior specific praise for academic participation.

Response Cards

Response cards are reusable cards that allow all students to independently answer all questions posed by the teacher (Cavanaugh et al., 1996; Gardner et al., 1994). The cards are either pre-printed with letters for answering true/false or multiple choice questions, or are a blank laminated surface to be written-on for open-ended questions. When the teacher directs a question to the class, students are given time to think about the answer (e.g., 3-second wait time), time to write the answer, and then simultaneously on cue everyone holds up their response together, allowing the teacher to quickly scan the room and assess each student's understanding (Duchaine, Green, & Jolivette, in press). This provides increased opportunities for students to interact while learning new material or reviewing previously learned material (Randolph, 2007; Sutherland et al., 2002). RC allows teachers to assess student understanding, give immediate feedback (Christle & Schuster, 2003), and adjust the lesson accordingly (Kellum, Carr, & Dozier, 2001). When students provide the correct response, the teacher praises the students' learning

(George, 2010). When students present incorrect responses, the teacher provides corrective feedback by reminding the students of previously learned material, or by offering new information to increase their understanding (Lambert et al., 2006). Although RC have been investigated to reduce disruptive behaviors, increase time on-task, and increase student achievement from the elementary school level to the university level, very few studies have included students with E/BD.

Response Cards across Grade Levels

The first four studies examining RC occurred in the intermediate grades of elementary schools in math and science measuring disruptive behavior, attempted responses, on-task behavior, and quiz scores. In an urban elementary school third grade class of 22 bilingual students, Armendariz and Umbreit (1999) implemented write-on RC during 20-minute math lectures three days a week. During the math lecture, the teacher would pose verbal questions or write problems on the board. During baseline one student volunteer would be called on to answer the question. If the student provided an incorrect response the teacher would call on other students until the correct answer was provided. During the RC intervention, each student had a write-on RC. The teacher used the same questioning procedures but required all students to provide a written answer. Students displayed their answers simultaneously on cue.

Using an ABA reversal design the authors used 2-minute, time-sampling intervals to measure disruptive behavior for the whole class and for individual students. The classroom was scanned in a predetermined order at the end of each 2-minute interval, totaling 10 times per session. Each student was observed for approximately 1-second and an event was noted if the student was observed to be disruptive during the 1-second

observation. During the RC condition, the mean percentage of intervals with disruptive behavior decreased for both the class and individuals. Disruptive behavior for the class decreased from *M* = 43.3% (range, 4% to 74%) to *M* = 8.3% (range, 0% to 30%) which is an overall decrease for the class *M* = 86%. With the return to baseline condition with one student called on to answer each question, disruptive behaviors increased for 15 of the 21 students.

Limitations of the Armendariz and Umbreit (1999) study include the class was slightly smaller than many general education classrooms, the disruptive behavior observed was not severe or aggressive, a lack of rigorous control over the instructional content, response reliability data were only collected during one baseline and one RC session, and no teacher acceptability was assessed. Future researchers should increase interobserver reliability, investigate in typical size general education classrooms where the disruptive behavior is more severe, and control the instructional content. The teacher in this study did not continue the use of RC so future researchers may consider assessing teacher acceptability to determine validity of RC during instruction.

In a second study examining the disruptive behavior of nine fifth grade students in two urban classrooms with 15 and 16 students, Lambert et al. (2006) also measured the rate of attempted responses per minute during instruction using RC and hand raise (HR) conditions in an ABAB reversal design during math instruction. The nine target students were selected by the teachers as the most disruptive, the least attentive during math lessons, and the worst academic performances in math. All nine students received free or reduced-priced lunch. Each math lesson included 10-minutes of lecture, 10-minutes of question and answers, and 20-30 minutes of independent practice. During all conditions,

the teachers asked 12 questions per 10-minute session. Disruptive behavior was measured during the question and answer portion of math instruction using partial-interval recording by observing each student for 10-seconds, followed by 5-seconds of recording, with all target students being observed for 10 intervals per session. Disruptive behavior decreased from a *M* = 6.8% (range, 5.6% to 8.0%) during HR condition to a *M* = 1.3% (range, 0% to 2.7%) during RC condition, for an overall average decrease of 5.5% disruptive.

Academic response data were recorded with event recording when a student answered a question after being called on by the teacher or when a student wrote the answer on the white board following a teacher prompt. Academic responses increased from a *M* = 0.12 (range, 0 to 0.68) per minute during HR condition to a *M* = 0.94 (range, .07 to 1.08) per minute during RC condition. Correct responses were recorded by the teacher during both conditions by marking a check each time a target student raised his or her hand after a question (during HR condition), a plus sign for a correct answer, a minus sign for an incorrect answer, and a zero for no answer (during RC condition). Percentage of correct answers varied across students and did not increase for all students; however, it is likely the students may have only raised their hand when they were sure they knew the correct response during HR condition, yet made an attempt to answer all questions during the RC condition.

One limitation of this study was the method of measuring the intervals of disruptive behavior. The use of the observers' wristwatch to time intervals may have distracted the observer from noting misbehaviors of the target students. The use of an audio signal may provide more accurate information. In addition, the authors used 10-

second intervals and recommend future researchers use 5-second intervals for more precise behavior measurement. Other limitations include that data were only collected on the target students and not the class, functional behavioral assessments (FBA) were not conducted prior to the RC intervention to determine the function of the disruptive behaviors, and the difficulty level of the questions varied from session to session. Future researchers may include the collection of class data, the use of FBA, and an attempt to control the difficulty level of questions.

Examining the academic effects of RC during science instruction, Gardner et al. (1994) measured the number of times students raised their hand during 45-55 minutes of daily instruction to answer a question and the number of times they were actually called on to answer the question during HR condition using an ABAB reversal design. With five target students in a fifth grade science class of 22 students, the average number of times target students raised their hand to respond was 9.9 (range, 0.7-21.3) per session, with an average of 1.5 (range, 0-2.8) opportunities to actually answer a question per session. During the RC condition, the five target students each responded an average of 21.8 (range, 5.8-28.3) times per session. Gardner et al. (1994) reported that of 1,103 teacher-posed questions during the HR condition, target students answered 53 of the questions for a participation total of 4%. During RC condition, 1,015 questions were asked with 678 responses by the target students for a participation total of 68%. Accuracy of answers during instruction resulted in 92% correct during HR condition and 93% correct during RC condition. In addition to participation, mean quiz scores were examined. The overall class means for next-day quiz scores during HR condition was 59% and during RC condition was 70%. Information learned during the RC condition

was retained on both next-day quizzes and biweekly review tests, indicating that increased student engagement increases academic achievement and the ability to retain academic material learned.

Limitations of this study include implementation of the RC by the experimenters, limited data on the functional relation of RC on recall questions on quizzes and tests, and limited maintenance data. Additional research is needed to determine if classroom teachers can implement RC effectively, if student performance on recall questions on quizzes and tests are affected by the use of write-on RC, and if students will retain information learned using RC over time.

In a fourth grade class in an urban elementary school, Christle and Schuster (2003) measured the number of times students raised their hand to answer a question during 60-minute math instruction, the number of times the student was called on to respond, weekly quiz scores, and intervals of on-task behavior for five target students during mathematics instruction. During the HR condition, the five students raised their hand to answer questions from not at all (one student) to 100% of the opportunities. They were called on to answer the questions between 0 and 3 times, with an average of 15 questions asked per session during the HR condition. During the RC condition, the student who never raised his hand answered 97% of the questions. The other four students answered 100% of the questions asked. The teacher asked an average of 22 questions during the RC condition. Percentage of intervals of on-task behavior increased for all five students with one student increasing from 12.5% during HR condition to 100% during the RC condition. Weekly quiz scores improved for all five students ranging from a 3% to a 30% increase, with the student who increased participation from

12.5% to 100%, increasing his quiz scores from a 63% to a 93%. This supports that increasing student interaction with the learning process increases student learning. The results of this study indicate more research is needed with students who have a low participation rate.

Limitations of the Christle and Schuster (2003) study include the short duration of the study which lasted only 12 sessions and included only three conditions (ABA), a lack of maintenance data, and an inconsistent number of questions asked by the teacher during instruction. Future researchers should include more sessions per condition, maintenance probes, consistency in the number of questions per session, and an extension of RC with different student populations.

In the next three studies, RC were investigated in post-secondary settings with undergraduate students: one community college, one public university, and one small private university. All three studies measured student participation and quiz scores for all students in the classes. The community college and the private university used an alternating treatment design (ATD) as opposed to the ABAB withdrawal design presented thus far.

Kellum et al. (2001) expanded the research to the college level by examining the frequency of student responses and daily quiz scores in an introductory special education course. This study at a community college used an alternating treatment design (i.e., flipped a coin each class session to determine whether HR or RC would be used) to assess the effect of preprinted RC on the frequency of student participation and daily quiz scores. The class met weekly for one 2 hour and 45 minute session, with attendance ranging from 30-40 students per class. Each class began with a short essay based on the

reading assignments, followed by a class lecture with questions interspersed with 15 prewritten review questions for the students to answer, and concluding with a quiz based on the lecture, readings, and review questions. During the RC condition, the students used a red RC to indicate 'false,' and a green RC to indicate 'true.' Fifteen minutes were allowed for the end of class quizzes which consisted of two multiple choice questions, two short-answer questions, one true/false statement, and one essay question. When RC were used for the review questions, student participation was higher and more students earned an "A" on the end of day quiz.

Limitations of their study include the use of quiz and test scores as the primary dependent variable and limited evidence that RC directly increased student quiz scores. Future researchers might evaluate other measures of learning for long-term retention, and investigate if increased quiz scores are related to student participation or if student responding allows teachers to tailor their lectures to student learning needs.

Marmolejo, Wilder, and Bradley (2004) expanded the Kellum et al. (2001) research at the college level using preprinted RC with both a true/false choice and a multiple choice option with four answers A-D. The students in this study ranged in age from 18-23 and were enrolled in an undergraduate Psychology of Learning course. An alternating treatment design (i.e., using the flip of a coin each class) with a baseline was used to examine the incidents of participation per class and end of class quiz scores. Classes were video recorded for data collection purposes. Participation was measured by counting each hand raise, call out, and RC each time a question was posed. The total number of students who answered each question was divided by the total number in attendance to obtain a mean number of student responses for each class session. Student

participation was almost three times higher during the RC condition. During baseline (i.e., normal lecture) the mean number of student responses was 2 (range, 1.6 to 2.6), during RC the mean number of student responses was 7.2 (range, 5.6 to 8.9), and during normal lecture in the intervention phase the mean number of student responses was 2.6 (range, 2.2 to 3). The daily quiz scores reflect academic achievement similar to participation. During baseline, quiz scores had a *M* = 61% (range, 50%-71%), during RC quiz scores had a *M* = 73.4% (range, 69%-85%), and during normal lecture in the intervention phase quiz scores had a *M* = 63.6% (range, 57%-76%). A detailed analysis of the individual quiz scores indicates 96% of the students had an increase in quiz scores during the RC condition.

One limitation noted in their study is the 10% difference between mean quiz scores for the two conditions (63.3% vs. 73.4%), somewhat limiting the conclusion of the relative effectiveness of RC. However, the authors note that 10% is a letter grade change (e.g., from a D to a C). Future researchers should investigate the optimal number of questions asked when using RC to improve student engagement and learning.

Clayton and Woodard (2007) extended the investigation of RC by changing the setting to a large lecture hall with about 60 students per class (120 students in all), by adapting the RC with a corner cut off for one option and the squared end for the other option due to visibility in the large hall, and by comparing groups using an ABA reversal design. Classes were video taped for data collection purposes. The average age for students in both classes was 20.2 and 20.9, respectively. The class met three times a week for 60 minutes. In class one, student participation varied very little with the rate of participation per 60-minute session during baseline a *M* = 9.1, during RC a *M* = 11, and

during the return to baseline a *M* = 12.2. However, in class two the rate of student participation per 60-minute session increased from a baseline *M* = 8.9, to RC *M* = 93.1, and the return to baseline *M* = 13.3. Quiz scores increased more for students already scoring a "B" on quizzes by moving them up to an "A" under RC conditions (in both classes). RC condition did not seem to help increase students' quiz scores if they were earning "C's" or "D's" on quizzes. A replication of the RC condition was not possible due to time constraints.

Limitations noted by the authors in this study include a lack of repetition due to time constraints, a lack of assessment regarding long-term retention, no control for teacher enthusiasm on student participation, and limited increase in quiz grades. Future researchers might use a more rigorous research design to include repetition, investigate measures of retention of material learned using RC, and include several teacher participants to account for the influence of teacher enthusiasm. For the limited increase in quiz grades, future researchers might consider student attendance patterns, as attendance was not a requirement of this course and attendance records were not recorded.

Response Cards with Students with E/BD

George (2010) conducted a cross over design with 22 middle school students with E/BD in self-contained social studies classrooms (i.e., grades 6-8) with five special education teachers. The students ranged in age from 11.7 to 15 years old and exhibited a wide range of reading scores ranging from a 2.6 grade level to an 8.5 grade level with 50% reading below the sixth grade level. On-task behavior, attempted responses, correct responses, chapter posttest scores, and student satisfaction were measured. Students

scored slightly higher with on-task behavior using RC with a *M* = 93% (range, 83%-100%) compared to using HR with a *M* = 84% (range, 71%-97%). Attempted responses increased during the RC condition with a *M* = 84% (range, 66%-98%) during RC and a *M* = 31% (range, 22%-52%) during HR condition. Correct responses increased also during the RC condition with a *M* = 60% (range, 56%-83%) and a *M* = 24% (range, 16%-41%) during HR condition. Chapter posttests followed the same pattern of increased scores with a *M* = 75.82 (range, 34-110) during RC condition and a *M* = 66.27 (range, 18-100) during HR condition. Students' surveys indicated that 82% of the students with E/BD marked strongly agree or somewhat agree to 'liked using RC' and most reported they remembered more information from class, did better on quizzes and tests when using RC, and 36% reported they would like to use RC in other classes.

The results of this study indicate that RC is an effective instructional strategy for middle school students with E/BD. During the RC condition, the students in this study increased participation by making more responses, the responses were correct more often, and 88% of the students had increased quiz scores. The limitations of this study include that the posttest scores were not significant (p = .054, two-tailed), problems existed with interobserver agreement (IOA) when recording off-task behavior, and the psychometric properties of the student satisfaction instrument are unknown. The author suggests future researchers increase the duration of the study with students with E/BD to document long-term effects, measure transition times to see if opening the lesson with RC will decrease transition to new lessons, and examine the rates of teacher praise in the RC versus HR conditions.

Cavanaugh et al. (1996) used an ATD in a high school 9th grade science class with 23 students, eight of whom were identified with learning disabilities, E/BD, and mental retardation. Next day quizzes and weekly tests were used to compare an 'active review' using RC and a 'passive review' with the instructor reading each review statement twice during the review. Both reviews included 12 content review statements presented on the overhead and read to the class. The RC condition had the statements presented first with a fill-in-the-blank format. After students wrote their response, the instructor provided brief praise or correction, wrote the word in the blank and repeated the statement before moving quickly on to the next statement. Three quiz formats were examined in this study in three phases. Format one had 12 review questions read once each during the reviews (1x12). Format two had 12 review questions read twice each during the review (2x12). And format three had six review question read twice using RC and 6 review questions read twice using passive review (2x12). For all RC questions, next-day quiz scores were higher for all of the students with disabilities and for 13 of the 15 students without disabilities. The RC mean score for the 1x12 format was 12 percentage points higher than mean scores on passive reviews. The RC mean score for the 2x12 format was 23.3 percentage points higher than the 1x12 format. The RC mean score for the 2x6 format was 17.6 percentage points higher than the 2x12 format. Weekly test scores were similar to the quiz scores. For weekly tests, the RC mean score for the 1x12 format was 9.2 percentage points higher than weekly tests scores on passive reviews. The RC mean score for the 2x12 format was 11 percentage points higher than the 1x12 format And the RC mean score for the 2x6 format was 2.8 percentage points higher. The 2x12 format.

One limitation noted from their study is that students were not pretested prior to the study so it is not possible to determine if all the material was new to all the students as prior knowledge may account for some of the increased scores. Future researchers might investigate variables such as preprinted RC and the number and sequence of learning trials that contribute to student learning.

The literature on RC indicates students with and without disabilities increased their ability to learn when actively engaged during instruction. Researchers studying the effect of implementing RC have found decreases in disruptive behavior (Armendariz & Umbreit, 1999; Lambert et al., 2006), increases in time on-task (Christle & Schuster, 2003; George, 2010), increases in students' attempt to respond to teacher questions (George, 2010; Kellum et al., 2001; Marmolejo et al., 2004), increases in the number of correct responses (Gardner et al., 1994; George, 2010; Lambert et al., 2006), improved quiz scores (Kellum et al., 2001; Marmolejo et al., 2004), and improved test scores (Cavanaugh et al., 1996; Gardner et al., 1994). Students with E/BD require extra help to be successful in the classroom (Blackwell & McLaughlin, 2005; Villa et al., 2005; Wagner et al., 2005). They are reported by their teachers to respond less often to teacher questions during instruction than their nondisabled peers (Wagner et al., 2005). Using RC as a classwide instructional strategy in inclusive classrooms with students with E/BD may increase student responding for students with E/BD (Cavanaugh et al., 1996), reducing the time these students spend off-task or disrupting the learning environment, and increasing their academic achievement (George, 2010). Although other studies such as Sutherland et al. (2003) and Sutherland and Wehby (2001) found increasing opportunities for students with E/BD to respond decreased disruptive behavior and

increased student participation and academic learning, only two RC studies included students with E/BD (Cavanaugh et al., 1996; George, 2010). More research is needed using RC as a classwide intervention with students with E/BD to examine both academic and behavioral benefits in general education inclusion classrooms.

Extending the Research

RC have shown repeated success in decreasing disruptive behavior, increasing student participation or engagement in the learning process, and increasing student achievement; yet, the research is incomplete. Although all of the reported studies implemented RC during academic instruction, four of the studies reported were with elementary school students and three were with college students. One study was with middle school students and one with high school students. One elementary study had students who were bi-lingual, the one high school study included eight students with various disabilities including E/BD, and the middle school study had 29 students with E/BD in self-contained settings. Likewise, in a meta-analysis of 18 studies on RC since 2003, Randolph (2007) reported an additional eleven studies, two at the pre-school level, two at the elementary school level, four at the middle school level, three at the high school level, and one at the college level. Two of the middle school studies addressed students with learning disabilities, one was unpublished and one combined RC with two interventions as a package. None of the studies addressed implementing RC in a high school general education class with students with and without E/BD. Research to decrease disruptive behavior and increase academic achievement for high school students with E/BD in general education classrooms is critical for the following reasons: (a) the majority of high school students with E/BD are taught in general education classrooms

(Conderman & Katsiyannis, 2002; Wagner et al., 2005); (b) 64% of high school office discipline referrals are due to classroom disruption (Spaulding et al., 2010); (c) students with E/BD have more discipline problems than their peers (Lane et al., 2006); (d) inclusion is more successful when teachers use evidence-based strategies (Idol, 2006); and (e) high school students with E/BD demonstrate low rates of participation (Wagner et al., 2005), high rates of academic deficits (Nelson et al., 2004), and high rates of school failure (Bullock & Gable, 2006). High school teachers lecture or use direct instruction for 70% -78% of their teaching (Bost & Riccomini, 2006; McKinney & Frazier, 2008) and RC have been effectively incorporated into lecture-style teaching to provide increased opportunities for students to be actively engaged during instruction with minimal change in teaching style (Cavanaugh et al., 1996; Kellum et al., 2001; Marmolejo et al., 2004).

Future research on the effectiveness of RC as a classwide intervention should maintain scientific rigor throughout the study (Christle & Schuster, 2003). The research design should increase the duration of the study (George, 2010), including multiple phases and maintenance probes with enough time to complete repetition of the RC intervention (Christle & Schuster, 2003), and control for the types of questions asked and their level of difficulty (Lambert et al., 2006). Equally important to the study design is fidelity of implementation and high rates of interobserver agreement of treatment fidelity and data collection (Armendariz & Umbreit, 1999). In investigating the effect of RC as an effective classwide teaching strategy it is important to design studies in which the classroom teacher implements the RC intervention (Gardner et al., 1994) and performs student assessment of newly learned material and the retention of material learned

(Kellum et al., 2001). Other important dependent variables to consider in examining the efficacy of RC as a teaching strategy are levels of student participation, disruptive behavior, academic achievement, and social validity. Past studies have measured social validity from the student perspective (Cavanaugh et al., 1996), but there remains a gap in whether teachers value RC as a useful class strategy.

This review of the literature provides evidence from multiple studies supporting the positive effect of RC as a teaching strategy across grade levels. Many questions remain unanswered. One question is whether RC will be an effective teaching strategy to increase student engagement for students with E/BD and students with other disabilities and challenging behaviors in general education classrooms. Another question is if RC would be an effective teaching strategy to increase academic achievement for students with E/BD in general education classrooms. And finally, if RC are effective in improving student engagement and academic achievement, will high school teachers teaching in general education classrooms be willing to implement RC as a teaching strategy?

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CHAPTER 2

USING RESPONSE CARDS TO INCREASE STUDENT PARTICIPATION AND ACADEMIC ACHIEVEMENT FOR HIGH SCHOOL STUDENTS WITHOUT DISABILITIES AND HIGH SCHOOL STUDENTS WITH DISABILITIES WHO EXHIBIT CHALLENGING BEHAVIORS IN GENERAL CLASSROOMS

Students with disabilities experience a high school drop out rate of about 43% (NCES; National Center for Educational Statistics, 2008) rarely continuing with post-secondary education, have difficulty finding jobs, and are arrested at the rate of one in eight (Marder & D'Amico, 1992). The outcomes for youth with emotional and behavioral disorders (E/BD) are more disturbing. Fewer than one student with E/BD graduates high school for every one student with E/BD who drops out (NCES, 2007; Nelson, Benner, Lane, & Smith, 2004), employment is most often part time and inconsistent (Cullinan & Sabornie, 2004; Jolivette, Stichter, Nelson, Scott, & Liaupsin, 2000), and the arrest rate of youth with E/BD is one in three (Kauffman, 2001; Thurlow, Sinclair, & Johnson, 2002). Youth correctional facilities report up to 70% of incarcerated youth have been identified with disabilities (Jolivette & Nelson, 2010; Quinn, Rutherford, Leone, Osher, & Poirier, 2005).

Of the six million students with disabilities taught in public schools, 45% are students with learning disabilities (LD), 8% are students with E/BD, and 3% are students with autism spectrum disorders (ASD) with approximately 75% of the students taught in general education classrooms with nondisabled peers (NCES, 2007). Common links listed among the characteristics of students with LD, E/BD, and autism (AU) are

academic deficits and challenging behaviors (Heward, 2009; Individual with Disabilities Education Act: IDEA, 2004; Steele, 2007). Students with these three disabilities struggle throughout their school years academically, behaviorally, and socially (Lane, Carter, Pierson, & Glaeser, 2006; Osborne & Reed, 2011; Rutherford, Quinn, & Mathur, 2004). With or without federal legislation, such as IDEA (2004) and No Child Left Behind (NCLB, 2001), it is imperative educators find evidence-based educational practices to increase engagement in the classroom and improve the chance these students will graduate from high school for students with disabilities who exhibit challenging behavior (Druian & Butler, 1987; Finn, 1993). Although a continuum of special education services and placements are mandated by IDEA (2004), the majority of high school students with LD, AU, and E/BD are in general education classes for more than 75% of their instructional time (Idol, 2006; NCES, 2007). Because students with disabilities may be difficult to teach due to challenging behavior, efficient teaching strategies that promote active engagement and increased learning for students with disabilities is critical (Carnahan, Musti-Rao, & Bailey, 2009; Steele, 2007).

Students with Disabilities and Challenging Behaviors

The IDEA definitions of students with LD, E/BD, and AU differ in criteria, but the characteristics of secondary students with LD, E/BD, and AU may present similarly with an inability to learn without accommodations, inappropriate and disruptive classroom behaviors, and deficits in social skills and the ability to self-manage (Heward, 2009; IDEA, 2004). Chronic behavior problems, academic deficits, and a lack of social skills all contribute to the difficulty these students may have in the classroom (Bradley, 2001; Nelson et al., 2004). Challenging behavior and academic difficulties co-exist

(Colvin, 2004; Scott, Nelson, & Liaupsin, 2001; Steele, 2007) and the lack of social skills makes it that much more difficult for students to communicate their needs (Cook et al., 2008; Landrum, Tankersley, & Kauffman, 2003). With as much as 18% of high school student enrollment identified as students with disabilities (Wallace, Anderson, Bartholomay, & Hupp, 2002), the mandates of NCLB (2001), and the reauthorization of IDEA (2004) almost all general education teachers have students with disabilities enrolled in their classes. Yet research on effective teaching strategies in high school general education classes for students with disabilities and/or challenging behaviors is sparse (Griffith, Trout, Hagaman, & Harper, 2008; Hodge, Riccomini, Buford, and Herbst, 2006; Vannest, Temple-Harvey, & Mason, 2008).

Mastropieri and Scruggs (2001) found inclusion is most successful for students when teachers using appropriate curricula implemented effective teaching strategies learned from special education teachers. And one-fourth of the 77% of high school teachers who reported that students with disabilities should be included in general education classes said students without disabilities learned more when their peers with disabilities were included (Idol, 2006). Using classwide interventions may increase opportunities for student participation thereby increasing student learning by actively involving the students (Carnahan et al., 2009; Greenwood, Horton, & Utley, 2002). Student participation, also known as active student engagement and time on-task is essential to learning (Brophy, 1979; Council for Exceptional Children (CEC), 1987; Cotton, 1995). Iovanne, Dunlap, Huber, and Kincaid (2003) reported a correlation between active student participation and academic achievement. Purposeful classwide implementation of effective teaching strategies to increase participation may be an

efficient way to address the needs of students both with and without E/BD in general education classrooms (Kern & Clemens, 2007; Sugai, Horner, & Gresham, 2002).

Student Engagement

Van Acker (2005) found that half of each class period is spent on nonacademic activities and that by increasing student engagement time off-task behavior decreases. Finn (1993) reported that the one factor most related to student achievement was student engagement during class regardless of social economic status, gender, or ethnicity. Student engagement is defined as a student focusing on the teacher or materials, responding to and/or asking questions, and completing specific activities and assignments related to the lesson (Moore, 1983). Strategies that increase active engagement directly impact student achievement for all students across ability levels and ages (Coffey & Gemignani, 1994; Colvin, Flannery, Sugai, & Monegan, 2008). Opportunities to respond (OTR) are a form of practice or rehearsal which helps students organize and store information; therefore, asking questions, checking for understanding, and providing and monitoring independent work while offering corrective feedback ensures proper learning and allows for correction of errors before faulty learning becomes established (Schunk, 2008). Haydon, Mancil, and Van Loan (2009) found that increasing student OTR to academic tasks during instruction resulted in almost a 30% increase in on-task behavior with a decrease in disruptions from 1.9 per minute to .25 per minute in a middle school general education science classroom indicating that increasing student engagement reduced time spent off-task. Sutherland, Adler, and Gunter (2003) found increasing OTR during instruction resulted in twice as many correct responses in a self-contained

elementary class for students with E/BD, LD, and AU indicating that more time on-task increases learning.

When considering increasing student OTR during instruction, it is important for teachers to understand that students with challenging behaviors experience a more negative school situation then their peers and are unintentionally treated differently by teachers (Shores, 1992; Sutherland, Lewis-Palmer, Stichter, & Morgan, 2008; Van Acker, & Grant, 1996). Therefore, teachers must become aware of their own behaviors (Mayer, 2001; Van Acker, & Grant, 1996) and intentionally create environments for students with E/BD, LD, and AU that maximize both academic and social success by teaching appropriate academic and social skills, purposefully providing frequent opportunities for students to use the skills, and then reinforcing both the academic and social skills exhibited by students (Moore-Partin, Robertson, Maggin, Oliver, & Wehby, 2010; Scott et al., 2001; Van Acker, 2002). All students can learn when educators create positive classroom environments, provide quality education, increase successful learning experiences, and ultimately reduce the sense of alienation students with E/BD experience (Druian & Butler, 1987).

Teachers' use of empirically-based effective teaching strategies such as modeling, checking for understanding, increasing OTR, and providing corrective feedback are antecedents for contingent praise which improves the classroom environment and increases student participation (Gunter, Jack, DePaepe, Reed, & Harrison, 1994). The interactive relationship between academic deficits and challenging behaviors for students with E/BD, LD, and AU may be averted when students are supported before the failure cycle begins (Colvin, 2004; Scott et al., 2001). The failure cycle occurs when a student

exhibits challenging behaviors to avoid work resulting in removal from the classroom as a means of discipline. This removal from class negatively reinforces the student's behavior by allowing the student to avoid the work and negatively reinforces the teacher's behavior by allowing the teacher to continue without disruption (Colvin, 2004; Scott et al., 2001). Interventions that provide social interaction skills may be useful in learning academic skills. Likewise instructional strategies that allow for immediate feedback and additional instruction reduce problem behaviors associated with skill deficits (Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008; Scott et al., 2001; Sutherland & Wehby, 2001). Effective instructional strategies implemented as classwide interventions by teachers may maximize student engagement for students with and without E/BD, LD, or AU. High school students struggling academically and behaviorally respond to teacher-directed instruction provided at a brisk pace with frequent OTR, followed by immediate corrective feedback and behavior specific praise statements, provided within a predictable pattern of questioning that allows every student to answer an equal number of questions (Brophy, 1979; Landrum et al., 2003). Response cards (RC) are one way for teachers to incorporate each of these strategies into their instruction (Cavanaugh, Heward, & Donelson, 1996; Christle & Schuster, 2003).

Response Cards

Response cards (RC) are preprinted or write-on cards provided to students that allow each student to answer all questions posed by the teacher during instruction (Gardner, Heward, Grossi, 1994; Kellum, Carr, & Dozier, 2001). High school teachers using a lecture format may easily incorporate RC into instruction by having all students respond each time the teacher interjects a question to check for understanding or to

review a concept (Cavanaugh et al., 1996; Clayton & Woodard, 2007; Marmolejo, Wilder, & Bradley, 2004). Incorporating RC into a lecture allows teachers to provide instruction at a brisk pace using continuous formative assessment and allowing the teacher to adjust the lesson during instruction (Kellum et al., 2001; Randolph, 2007). Following student responses teachers immediately provide behavior specific praise statements and/or corrective feedback reinforcing students' participation and providing added instruction by reinforcing the correct response and repeating the correct answer (George, 2010; Lambert, Cartledge, Heward, & Lo, 2006; Moore Partin et al., 2010).

RC are a strategy that engages the learner, requiring students to take an active role during instruction (Christle & Schuster, 2004; Lambert et al., 2006). High school teachers lecture or use direct instruction for 70%-78% of their teaching (Bost & Riccomini, 2006; McKinney & Frazier, 2008) and RC are easily incorporated into lecture-style teaching, providing an opportunity for students to be actively engaged during instruction with minimal change in teaching style (Cavanaugh et al., 1996; Kellum et al., 2001; Marmolejo et al., 2004). The following two studies indicate RC may be an effective strategy for high school students with and without E/BD and LD.

George (2010) conducted a cross-over design with 22 middle school students with E/BD in self-contained social studies classrooms (i.e., grades 6-8) with five special education teachers. The students ranged in age from 11.7 to 15 years old and exhibited a wide range of reading scores with half the students reading below the sixth grade level. On-task behavior, attempted responses, correct responses, chapter posttest scores, and student satisfaction were measured. Student time on-task, attempted responses, correct responses, and chapter posttests all increased when using RC compared to using the more

traditional method of hand raising (HR) with one student selected to respond. Also, student surveys indicated that 82% of the students with E/BD reported enjoying using RC, remembering more information from class, and improving on quizzes and tests when using RCs compared to HR. Thirty-six percent agreed they would like to use RC in other classes. The results indicated that RC are an effective instructional strategy for middle school students with E/BD. During the RC Condition, the students in this study increased participation by making more responses and 88% of the students had increased quiz scores.

Cavanaugh et al. (1996) used an alternating treatment design with 23 students in the ninth grade, eight of whom were identified with LD, E/BD, or mental retardation. Using next-day quizzes and weekly tests, Cavanaugh et al. (1996) compared using RC during daily review sessions with the instructor reading each review statement twice during the review. The reviews were held constant for each type of review with 12 statements presented on the overhead and read to the class. When using RC the students responded by writing the term missing from statements presented with a fill-in-the-blank format. All students with disabilities scored higher on next-day quizzes after using RC to review as compared to listening to the review, and 13 of the 15 students without disabilities scored higher on next-day quizzes when using RC. Weekly test scores also increased when using RC. The results of this study indicate RC are an effective instructional strategy for high school students with and without disabilities.

Although much of the research has shown RC to be effective with students at the elementary school level these studies indicate RC may be effective in increasing student engagement and academic achievement in middle schools and high schools. Because RC

were found to be effective in multiple settings with middle school students with challenging behaviors (George, 2010) and in high school with students with and without disabilities in general education (Cavanaugh et al., 1996), researchers might extend the implementation of RC to high school general education classrooms serving students without disabilities and students with disabilities who exhibit challenging behaviors in academic classes. When investigating the use of RC in high school general education classrooms limitations in the current research should be taken into consideration.

Limitations and Future Research

In addition to limitations regarding student populations examined using RC, the literature includes limitations in scientific rigor. Two such examples are the lack of repetition and maintenance data due to time constraints (Armendariz & Umbreit, 1999; Christle & Schuster, 2003; Clayton &Woodard, 2007) and the lack of instructional control on the number, length, and difficulty of questions during instruction and on quizzes (Armendariz & Umbreit, 1999; Christle & Schuster, 2003; Lambert et al., 2006). Future researchers should consider implementing RC for longer periods of time and build in repetition to determine if a functional relation exists between RC and increased academic achievement. Control over the number and difficulty of questions asked during all conditions should be built into the study design.

Other limitations of the research using RC include the lack of data comparing target students to the class mean (Lambert et al., 2006) and a lack of retention data. Researchers reported on dependent variables as class means only (Cavanaugh et al., 1996; Clayton & Woodard, 2007; Marmolejo et al., 2004), individual target students only (Christle & Schuster, 2003; Lambert et al., 2006), or different students randomly chosen

each session (Kellum et al., 2001). For teachers to value the implementation of RC as a classwide intervention, data will need to support improvement in academic achievement and social behaviors for both individuals and the class as a whole. Reporting comparison data may provide information on the extent of effectiveness. In addition to the effect on individual students in comparison to the whole class, evidence is needed regarding the ability of students to retain the information learned (i.e., will using RC help students process material learned and increase retention of material learned over time). Armendariz and Umbreit (1999), Clayton and Woodard (2007), Gardner et al. (1994), George (2010), and Kellum et al. (2001) suggested future researchers examine the retention of content learned when using RC. Most studies assessed the effectiveness of RC with daily or next-day quizzes, but the question of whether students retain the information learned over time remains.

Two final limitations found in the current literature are concerns regarding the implementation of RC by the researcher (Clayton & Woodard, 2007; Gardner et al., 1994; Kellum et al., 2001; Marmelojo et al., 2004) and a lack of social validity data from the teacher's perspective (Armendariz & Umbreit, 1999; Christle & Schuster, 2003; Lambert et al., 2006). Future researchers should design studies that allow the classroom teacher to implement RC and evaluate the teachers' perception regarding the usefulness and efficiency of using RC to increase student engagement and academic achievement. Several of the studies surveyed the students to determine if the students believed RC were an effective strategy and if they liked using them. However, for RC to be sustained as an effective intervention strategy teacher surveys regarding social validity are important.

Using Response Cards in High School Inclusion Classes

Although RC have been shown effective for reducing disruptive behavior (Armendariz & Umbreit, 1999), increasing student engagement (Marmolejo et al., 2004), and increasing student achievement (Christle & Schuster, 2003; George, 2010) from the preschool level (Randolph, 2007) to the college level (Kellum et al., 2001), in general education high school classes (Cavanaugh et al., 1996), and self-contained classes for students with E/BD (George, 2010); no studies have used RC with high school students without disabilities and students with high-incidence disabilities (i.e., E/BD, LD, AU) who exhibit challenging behaviors in high school in general education academic classrooms.

There are approximately three million students with LD, a half million students with E/BD, and 200,000 students with AU in public schools spending more than 75% of the school day in general education classrooms (NCES, 2007). It is important to investigate interventions such as RC that previous research has indicated effective across other populations. RC may provide the opportunity for students with disabilities who exhibit challenging behaviors to achieve academically while at the same time being provided behavioral support and social skills interventions (Cavanaugh et al., 1996; Landrum et al., 2003; Rutherford et al., 2004). The purpose of this study was to examine the effect of using RC to actively engage high school students without disabilities and students with disabilities who exhibit challenging behaviors during daily reviews of content instruction. The research questions investigated are: (a) What effect will RC have on student engagement (i.e., attempted responses and time on task) for students without disabilities and students with disabilities who exhibit challenging behaviors in

high school academic classes; (b) What effect will RC have on academic achievement (i.e., next-day quizzes and biweekly probe scores) for students without disabilities and students with disabilities who exhibit challenging behaviors in high school academic classes; (c) Will the effect of RC differ for student engagement (i.e., attempted responses and time on-task) and academic achievement (i.e., mean scores on next-day quizzes, biweekly probe scores, and attendance) between students without disabilities and students with disabilities who exhibit challenging behaviors; (d) What effect will RC have on overall class achievement (i.e., mean scores on next-day quizzes and biweekly probe scores) in high school academic classes; (e) Will high school students without disabilities and students with disabilities who exhibit challenging behaviors report RC to be a valuable learning tool for academic courses; and (f) Will high school teachers report RC to be a valuable instructional tool for students without disabilities and students with disabilities who exhibit challenging behaviors?

Methods

Participants

This study occurred in two high school classes in a suburban school district in the southwestern United States (see Table 1). Both classes were academic content courses required for graduation, taught by certified high school teachers, and inclusive of students with disabilities who had a history of challenging behaviors and current individual behavior intervention plans (BIPs). Participants included two teachers, three students with disabilities who had a behavior intervention plan as part of their IEP, and three students without disabilities. Attendance and permanent product data were collected from

Table 1

School and Classroom Demographics

Unit	Enrollment	Grade Levels	Gender Distribution	Ethnicity Distribution	Students Eligible for Free or Reduced-Price Lunch Program
School	1,970	9-12	51% female 49% male	48.7% Hispanic 41.4% Caucasian 7.3% African American	39.9%
Class A	22	9-12	59% female 41% male	45% Caucasian 41% Hispanic 14% African American	31.8%
Class B	18	9-11	50% female 50% male	56% Hispanic 33% Caucasian 11% African American	11.0%

Note. Students at the school ranged in age from 14 to 21 years, including 175 students with disabilities distributed as follows: learning disabilities (107), emotional disorder (13), mental retardation (13), other health impaired (13), autism (11), multiple disabilities (10), communication disorders (2), orthopedically impaired (2), hearing impaired (2), visually impaired (1), & traumatic brain injury (1).

all students in each class, allowing class mean data to be compared with data from the target students. Class data were provided without identification of individual students.

Teachers. The two teacher participants, who were certified in secondary education in their content areas (see Table 2), consented to participate on a voluntary basis, and agreed to attend two training sessions. Both teacher-participants were White, and the highest degree earned for each of them was a master's degree.

Students with Disabilities. In Class A, two students with a disability and a BIP consented to participate as the "target students" for the purpose of data collection. Wayne was an 18-year-old male with ED, and Jaime was a 19-year-old male with LD. In Class B, one student with a disability and a BIP assented to participate as a target student. Eric

Table 2

Teacher Demographics

Teacher	Certification Field	Years of Experience	Years at School
Robert	Math/Technology Education	2	2
Lillian	Secondary Science Composite	4	1

Table 3

Student Demographics

Name	Class	Age	Gender	Ethnicity	Disability
Wayne	A	18	Male	Caucasian	ED
Jaime	A	19	Female	Hispanic	LD
Kathy	A	16	Female	Caucasian	None
Drew	A	17	Male	African American	None
Eric	B	16	Female	Hispanic	AU
Kyle	B	15	Male	Caucasian	None

Note. ED = emotional disorder; LD = learning disability; AU = autism.

was a 16-year-old male with AU (see Table 3). These target students with disabilities exhibited off-task and disruptive classroom behaviors that interfered with their learning and the learning of others (i.e., loss of temper, shouting out, arguing with teacher and peers, refusal to comply, not completing assignments, leaving the class, and gazing into space). As a result of these behaviors, all three students had a BIP by the time they entered sixth grade. The three students shared a number of similar BIP goals (see Table 4). Each of these students was supported by the school behavior specialist team.

Table 4

Challenging Behaviors and Behavior Improvement Plan Goals for Student-Participants with Disabilities

Name	Class	Challenging Behaviors	Behavior Intervention Plan Goals
Wayne	A	*Behaviors that disrupt student's learning*: • Extended amount of time off-task • Incomplete assignments • Leaving class without permission *Behaviors that disrupt other's learning:* • Socializing with peers • Blurting out comments loudly • Refusal to comply to redirection • Loss of temper when redirected • Argumentative with teachers/peers	• Demonstrate appropriate participation and work completion. • Demonstrate self-control during non-preferred activities. • Improve compliance. • Demonstrate appropriate interactions with adults. • Refrain from arguing.
Jaime	A	*Behaviors that disrupt student's learning*: • Extended amount of time off-task • Incomplete assignments • Leaving class without permission *Behaviors that disrupt other's learning:* • Socializing with peers • Refusal to comply with directions	• Demonstrate appropriate participation and work completion. • Respond appropriately to new circumstances. • Improve compliance.
Eric	B	*Behaviors that disrupt student's learning*: • Extended amount of time off-task • Incomplete assignments *Behaviors that disrupt other's learning:* • Shouting out comments/ answers • Loss of temper when redirected, followed by arguing • Easily frustrated followed by statements of self-depreciation • Lengthy explanations justifying refusal to comply • Verbalizing "better" ideas (repeatedly)	• Demonstrate appropriate participation and work completion. • Respond appropriately to new circumstances. • Demonstrate self-control during non-preferred activities. • Refrain from blurting out. • Refrain from arguing.

Students without Disabilities. The purpose of including a set of target students without a disability was to provide a means of normative comparison (Kazdin, 2011). Normative comparison helps to define whether the behaviors of the students with disabilities and challenging behaviors are distinguishable during daily reviews, on next-day quizzes, and on biweekly probes from the behavior of their peers and classmates without disabilities and challenging behaviors after the implementation of RC. These target students without disabilities were teacher selected. They were perceived by their teacher to be students with average class participation, a history of passing grades, and no history of misbehaviors; therefore, being socially and academically representative of the class population (Christle & Schuster, 2003; Gardner et al., 1994).

Setting

This study took place in two general education content area courses required for students to earn a state issued high school diploma. In addition to being college preparation courses, both courses were designed to support student preparation for state assessments by incorporating material from various course subjects (i.e., algebra and geometry; physics and chemistry).

Robert taught Class A, Math Models with Applications. This class provided students instructional opportunity to (a) build on their K-8 and Algebra I foundations; (b) expand their understanding through additional mathematical experiences using algebraic, graphical, and geometric reasoning; (c) recognize patterns and structure; (d) model information; and (e) solve problems from various disciplines. There were 22 students enrolled in this class ranging from ninth through twelfth grades (see Table 1). Robert used teacher-directed instruction (i.e., lecture) to present essential course material directly

to the students with students writing notes in composition books. The classroom was set up with desks in rows and columns and computers along all four walls. For the duration of this study, students were assigned seats by the teacher.

Lillian taught Class B, Integrated Physics and Chemistry. This class allowed students to (a) conduct laboratory and field investigations; (b) use scientific methods during investigation; and (c) make informed decisions using critical thinking and scientific problem solving. The class integrated the disciplines of physics and chemistry in the topics of force, motion, energy, and matter. There were 18 students enrolled in this class ranging from ninth through eleventh grades (see Table 1). Lillian used teacher-directed instruction (i.e., lecture) to present essential course material directly to the students in combination with one-day labs, independent and small group practice, and regular assessments. The classroom was set up with desks in rows and columns at one end of the room and science lab tables at the other end of the room with cabinets lining three of the four walls. For the duration of this study, students sat in seats assigned by the teacher.

Dependent Variables

Data were collected for academic variables which included student engagement measured by on-task behavior and attempted responses (Appendix A), and academic achievement measured by accuracy of responses on next-day quizzes and biweekly probes. In addition to data collected for the defined target students, class achievement data from all students in the class were collected to provide comparison on attendance, mean quiz scores, and mean scores on biweekly probes (Appendix B).

Student engagement. Student engagement, also referred to as participation or time on-task, was defined as looking at the teacher while the statement is being read, looking at the statement on the overhead screen, raising a hand and/or giving a verbal or written response when requested by the teacher, and looking at a peer responding to a question (e.g., when a classmate is responding to an academic question posed by the teacher, student engagement is defined as looking at the student who is speaking). Student engagement data were collected on target students during daily review sessions, measured using partial-interval recording, and reported as a mean percentage of total intervals of time on-task (Cooper, Heron, & Heward, 2007). During the review as the teacher read the first word of each fill-in-the-blank statement, the observer(s) looked up for 10 seconds (Armendariz & Umbreit, 1999) to observe the target students. A tally was marked on the data collection sheet for each student on-task during any portion of the 10-second observation (Armendariz & Umbreit, 1999; Cooper et al., 2007; George, 2010). The number of intervals marked on-task were divided by the number of intervals presented (e.g., one observation for each statement presented) and multiplied by 100%.

Attempted responses. Attempted responses were defined during the hand raise (HR) condition as any time a student raised a hand indicating a desire to provide a response when the teacher read a review statement with a blank (Kellum et al., 2001) and any time a target student attempted to answer a question when called on by the teacher (i.e., the teacher sometimes heard a student respond without raising his/her hand and would call on the student, encouraging him/her to answer). During the RC condition, an attempted response was counted whenever a target student wrote an academic response on the card and held it up for the teacher to read. Responses were not counted when a

student wrote about a topic not related to the current instruction. Attempted responses were marked for target students during daily review sessions using event recording and reported as percentages of attempted responses by adding the total number of attempts made, dividing by the total number of student opportunities to respond, and then multiplying by 100%.

Next-day quiz scores. To assess the effect each condition had on student achievement, each class period began with a 10-minute quiz (Appendix C) from material reviewed at the end of the previous class session (Gardner et al., 1994; Kellum et al., 2001). Quizzes were monitored by the researcher for equivalency. Next-day quiz permanent products were scored as event recording and reported as percentage correct for each of the target students. Percentage correct were calculated by the total number of correct answers, divided by the total possible answers (e.g., 10), then multiplied by 100%. In addition, individual scores of all students in the class were combined to calculate a class mean by totaling the scores, dividing by the number of scores, and multiplying by 100%.

Biweekly probes. Biweekly probes were used to evaluate the generality of academic achievement effects over time (Kazdin, 2011) and to assess academic retention (Gardner et al., 1994). A 40-item comprehensive probe was given at the conclusion of the baseline phase in each class and again every tenth class session in place of the next-day quiz. The probes assessed student ability to retain material learned during the previous two weeks (Gardner et al., 1994) using three types of items. The items on each probe were chosen to represent items from each condition (i.e., HR and RC) by randomly selecting an equal number of statements from each review/quiz set and including 15

items that were an exact match to quiz statements, 15 items that were rewritten to be similar to quiz statements, and 10 items that were an exact match to reviews statements that were never used on quizzes. All items were written in the fill-in-the-blank format to prevent differences based on question format (Appendix D). Thirty minutes were provided for students to take the biweekly probe. Biweekly probe permanent products were scored as event recording and are reported as percentage correct in each category for the class mean and for each target student. Percentage correct were calculated for each category by adding the total number of correct answers, dividing by the total number of items, then multiplied by 100% for both the class mean and the target students.

Attendance. Attendance data were collected to assist in the verification of a relationship between class attendance and class achievement. Attendance was measured using fixed momentary time sampling. Students sitting in their assigned seats were marked as being in attendance by the observer at the start of the quiz, five minutes into quiz completion, at the start of teacher instruction, fifteen minutes into teacher instruction, at the start of the review session, and at the conclusion of the review session (Appendix A). Percentage of students in attendance was calculated by dividing the number of students in attendance (i.e., for each quiz, instructional session, and review), by the total number of students enrolled in the class, and then multiplying by 100%.

Design and Independent Variables

An alternating treatment design (ATD) was used to examine the effect of single student responding using student hand raise (HR) and classwide responding using write-on response cards (RC). Both interventions were implemented by the classroom teachers

during daily review sessions using a randomized schedule prepared in advance (Cavanaugh et al., 1996; Kazdin, 2011; Marmolejo et al., 2004).

Baseline/Hand Raise (HR). Beginning on day one in baseline, the teachers concluded the class session with a 10-minute review of the material taught during that class (Cavanaugh et al., 1996; Shirvani, 2009). The teachers read a statement to the class with a blank towards the end of each statement and then called on one student who had raised a hand (HR) to provide the answer. Teachers were instructed to provide either brief corrective feedback or praise before moving on to the next item. The review process continued through 15 fill-in-the-blank statements with the teachers systematically presenting an academic fact aloud to the class with a missing word using an LCD projector, randomly selecting one student to provide a response, providing feedback, and then rereading the statement with no blank, allowing students to hear each correct answer twice for each review statement (Gardner et al., 1994).

Beginning on day two of baseline, teachers assessed the students' learning with a next-day quiz (Appendix B). In Class A, the quizzes began immediately following the school's morning announcements. In Class B, the quizzes began after a short silent warm-up generally consisting of one short scientific problem to solve independently which was part of the daily routine. Teachers set a timer allowing students a maximum of 10 minutes (Shirvani, 2009) to complete the 10 fill-in-the-blank statements using the 15-term word bank. Students arriving late to class after the 10-minutes did not take the quiz; however, students arriving during the 10-minute time limit were permitted to complete as much of the quiz as time permitted. A 40-item probe was completed by each class the last day of baseline.

Alternating Treatments/HR and RC. Prior to the alternating treatment phase, Robert and Lillian attended a training session for implementing RC. Teachers introduced the RC to their respective classes on the same day the students took the 40-item probe. During this phase, the HR condition continued as described in baseline, randomly alternating with the RC condition. Conditions were randomly assigned with the teachers opening an envelope prior to each review session. Before day one of implementation, a two-week randomized schedule was created to reduce situations of bias that may occur during quiz preparation and to ensure an equal number of daily reviews would occur for each condition (Cooper et al., 2007; Kazdin, 2011). Therefore, each condition occurred five times over every two week period.

The alternating treatment phase remained in place for Class A for 10 class sessions when the RC condition demonstrated a higher degree of effectiveness based on individual next-day-quiz scores demonstrated by mean scores of 10% or higher on quizzes following RC reviews compared to quizzes following HR reviews (Marmolejo et al., 2004) for three of the four target students. Class B remained in the alternating treatment phase for an additional 10 class sessions because based on percentage correct on next-day quizzes, one treatment did not emerge as more effective than the other. By the end of the second alternating treatment phase the school year had ended.

More Effective Treatment. A third phase was implemented in Class A to provide replication of the more effective condition based on improved quiz scores during alternating conditions (Cooper et al., 2007; Kazdin, 2011; Kennedy, 2005). Data were collected in Phase Three until stability of next-day quiz scores occurred for two of the

four target students in Class A over 3 consecutive data points (Alberto & Troutman, 2009).

Maintenance. The researcher observed Class A one week after the more effective treatment phase ended to assess if the teacher had continued implementing daily quizzes or reviews using RC. In addition to this scheduled maintenance observation, a more natural maintenance observation occurred when the school behavior specialist, who worked with the target students with disabilities, stopped by the class on one separate occasion to observe for continued use of next-day quizzes and RC reviews.

Social Validity. To measure participant satisfaction, students and teachers completed the *Treatment Acceptability Rating Form—Revised* (TARF-R; Reimers & Wacker, 1988) at the conclusion of the study. On the last day of data collection, the researcher administered the student TARF-R to the class (Appendix E). The student TARF-R took approximately 10 minutes to complete and students were asked to provide details of how participation in this study affected their daily work habits and overall achievement. Using a 7-point Likert scale, students rated (1) how effective they perceive using RC compared to HR was on class participation and learning; (2) how effective they perceive using RC compared to HR was on quiz scores and biweekly tests' and (3) if they enjoyed using RC, would they like to continue using RC, and would they want to use RC in other classes.

Teachers also were asked to complete the TARF-R on the last day of intervention. Both teachers completed it while the researcher administered the student TARF-R. The teacher TARF-R (Appendix F) consisted of three categories assessing treatment acceptability, perceived effectiveness, and perceived disadvantages using a 7-point Likert

scale. Teachers were asked to provide details of how participation in this study affected their daily class schedule and overall routine and how using response cards could be made more efficient.

Fidelity

An observation checklist was used to assess 70 components of fidelity of intervention implementation during the first 10 minutes and the final 10 minutes of each class session by the researcher (Appendix G). Fidelity of implementation was recorded as event recording and reported as percentage of fidelity of implementation by dividing the total number of components completed by 70, then multiplying by 100%. Prior to baseline, two graduate research assistants (GRA) were trained on all data collection instruments. During interobserver agreement (IOA) observations of fidelity, the observers independently and simultaneously observed the first 10 minutes and the final 10-minutes of each class session throughout the study using the observation checklist. IOA was determined using point-by-point agreement, calculated by dividing the total agreements by the agreements plus disagreements and multiplying by 100%.

Fidelity of implementation was assessed in Class A for 63.6% of sessions across all phases resulting in a M = 98% (range, 91% to 100%). Fidelity of implementation was assessed in Class B for 46% of sessions across all phases resulting in a M = 92% (range, 66% to 99%). For Class A, IOA of fidelity of implementation was measured for 35.7% of sessions across phases with agreement at a M = 99% (range, 99% to 100%). For Class B, IOA of fidelity of implementation was measured for 57% of sessions across phases with agreement at 100%.

Interobserver Agreement

IOA of the dependent variables (a) intervals of time on-task, (b) attempted responses, (c) attendance, and (d) permanent products (e.g., next-day quizzes and biweekly probes) were completed during sessions across all phases. IOA for all dependent variables were determined using point-by-point agreement, calculated by dividing the total agreements by the agreements plus disagreements and multiplying by 100%. In Class A, IOA were collected for 33.3% of all dependent variables resulting in overall IOA for time on-task a *M* =90.6% (range, 85% to 97.5%), attempted responses a *M* = 97.8% (range, 93.3% to 100%), attendance a *M* = 99.9% (range, 99.5% to 100%), next-day quizzes a *M* = 99% (range, 99% to 100%), and biweekly probes a *M* = 100%. IOA data for Wayne was assessed for 36.9% of sessions for time on-task, attempted responses, and attendance, for 35.3% of next-day quizzes, and 33% of biweekly probes. IOA data for Wayne for time on-task was a *M* = 91.4% (range, 73% to 100%), attempted responses was a *M* = 99.8% (range, 98.6% to 100%), attendance, next-day quizzes, and biweekly probes a *M* = 100%. IOA data for Jaime were assessed for 31.6% of sessions for time on-task, attempted responses, and attendance, 36.8% of next-day quizzes, and 33.3% of biweekly probes. IOA data for Jaime for time on-task was a *M* = 86.2% (range, 73.3% to 100%), attempted responses was a *M* = 98.1% (range, 86.7% to 100%), attendance, next-day quizzes, and biweekly probes a *M* = 100%. IOA data for Kathy were assessed for 30% of sessions for time on-task, attempted responses, and attendance, for 25% of next-day quizzes, and 33.3% of biweekly probes. IOA data for Kathy for time on-task was a *M* = 86.8% (range, 60% to 100%), attempted responses was a *M* = 98.8% (range, 93.3% to 100%), attendance was a *M* = 97.8% (range, 83.3% to 100%),

and next-day quizzes and biweekly probes a *M* = 100%. IOA data for Drew were assessed for 33.3% of sessions for time on-task, attempted responses, and attendance, next-day quizzes, and biweekly probes. IOA data for Drew for time on-task was a *M* = 93.4% (range, 83.37% to 100%), attempted responses was a *M* = 96.1% (range, 86.7% to 100%), attendance, next-day quizzes, and for biweekly probes a *M* = 100%.

In Class B, IOA were collected 33.3% of sessions for time on-task, attempted responses, and attendance, 37.5% of next-day quizzes, and 66.7% of biweekly probes resulting in IOA for time on-task as a *M* = 90.6% (range, 85% to 97.5%), attempted responses a *M* = 97.8% (range, 93.3% to 100%), attendance a *M* = 100%, next-day quizzes a *M* = 99.5% (range, 97.3% to 100%), and biweekly probes a *M* = 99.5% (range, 98.6% to 100%). IOA data for Eric were assessed for 34.8% of all dependent variables except for biweekly probes at 66.7%. IOA data for Eric for time on-task resulted in a *M* = 88.4% (range, 76.7% to 96.7%), attempted responses was a *M* = 98.4% (range, 93.3% to 100%), attendance, next-day quizzes, and biweekly probes a *M* = 100%. IOA data for Kyle was assessed for 33.3% of sessions for time on-task, attempted responses, and attendance, for 37.5% of next-day quizzes, and 66.7% of biweekly probes. IOA data for Kyle for time on-task was a *M* = 94.6% (range, 83.3% to 100%), attempted responses, was a *M* = 97.4% (range, 92.9% to 100%), attendance, next-day quizzes, and biweekly probes a *M* = 100%.

Results

Student Engagement

Student engagement was measured by time on-task and attempted responses to answer the first question regarding the effect RC would have on student engagement for

students without disabilities and students with disabilities who exhibit challenging behaviors in high school academic classes. The implementation of RC resulted in improved student participation during daily review sessions increasing both the percentage of time on-task and the percentage of questions students attempted to answer during daily review sessions.

Intervals of Time On-task. Intervals of time spent on-task was the first variable measured to examine student engagement (see Figures 1 and 2). All target students with disabilities and challenging behavior and students without disabilities showed increased time on-task during RC condition. In Class A, Wayne, a student with ED and a BIP, demonstrated on-task behavior during baseline/HR condition a *M* = 44% (range, 23% to 83%). During the alternating treatments, Wayne demonstrated on-task behavior during RC condition a *M* = 47.8% (range, 13.3% to 85.7%) and during HR condition a *M* = 24.9 % (range, 0% to 43%). During the more effective/RC condition, Wayne demonstrated on-task behavior a *M* = 29.5% (range, 0%-60%). While Jaime, a student with LD and a BIP, in the same class demonstrated on-task behavior during baseline/HR condition a *M* = 48.2% (range, 10% to 87%). During the alternating treatments, Jaime demonstrated on-task behavior during RC condition a *M* = 63.3% (range, 50% to 75%) and during HR condition a *M* = 48.4% (range, 30% to 70%). During the more effective/RC condition, Jaime demonstrated on-task behavior a *M* = 49.5% (range, 0%-86.7%). Also in Class A, Kathy, one target student without disabilities demonstrated on-task behavior during HR condition a *M* = 37.5% (range, 10% to 73%). During the alternating treatments, Kathy demonstrated on-task behavior during RC condition a *M* = 47.5% (range, 0% to 73%) and during HR condition a *M* = 24.2% (range, 3.3% to 70%). During the more effective/RC

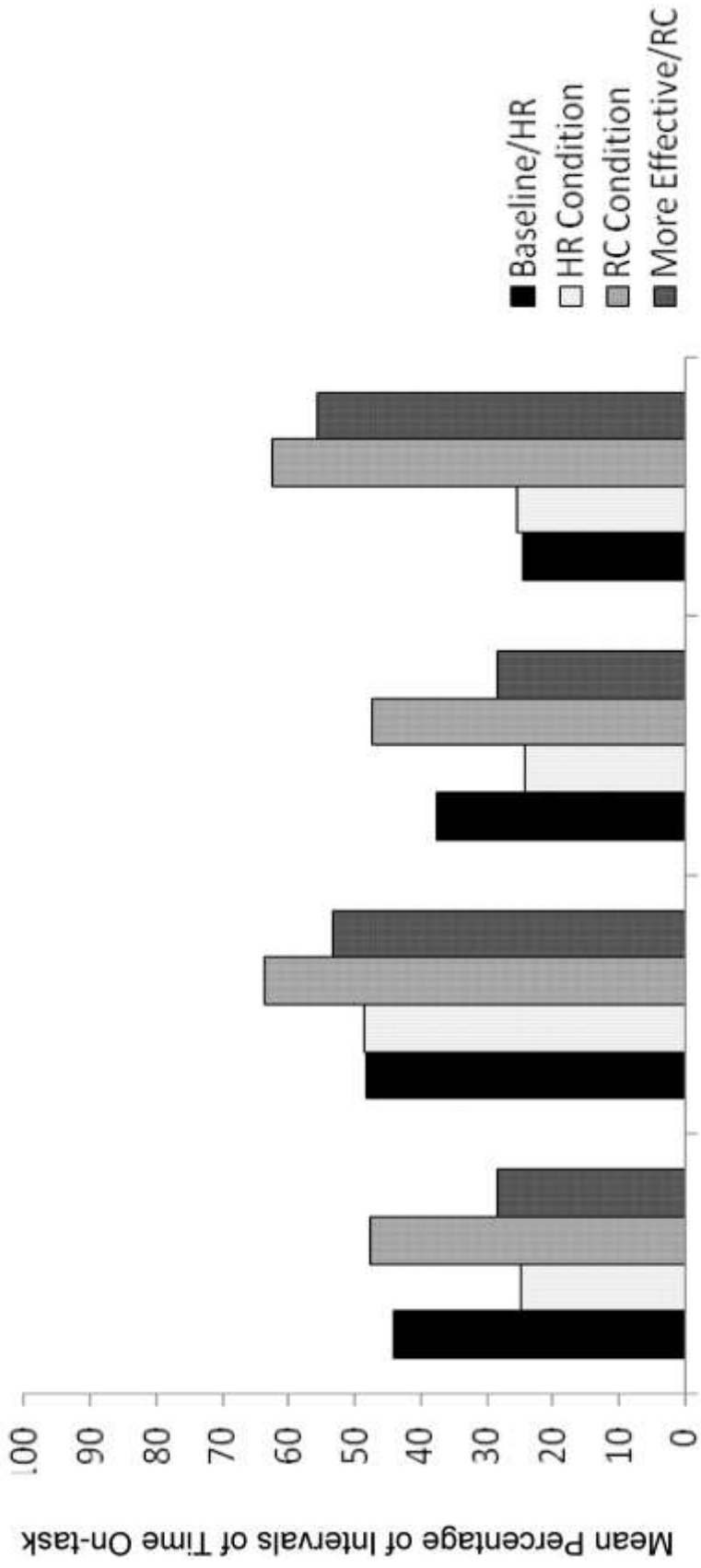

Figure 1. Time On-task across Phases: Class A.

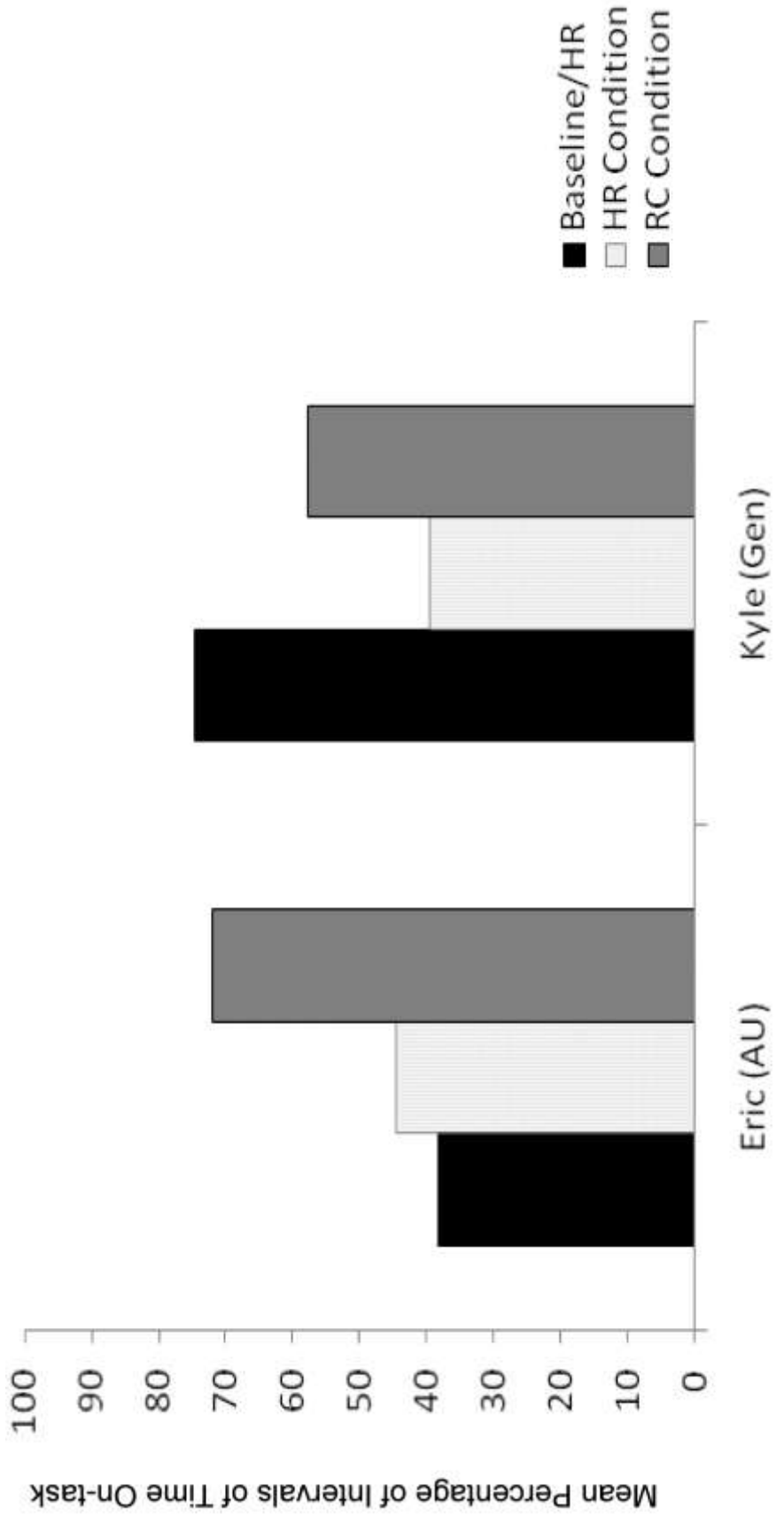

Figure 2. Time On-task across Phases: Class B.

condition, Kathy demonstrated on-task behavior a *M* = 28.5% (range, 0%-63.3%). Drew, the other target student without disabilities, demonstrated on-task behavior during baseline/HR condition a *M* = 24.6% (range, 10% to 83%). During the alternating treatments, Drew demonstrated on-task behavior during RC condition a *M* = 62.6% (range, 35.7% to 86.7%) and during HR condition a *M* = 25.3% (range, 0% to 86.70%). During the more effective/RC condition, Drew demonstrated on-task behavior a *M* = 54.2% (range, 13.3%-80%). During the alternating treatment phase, the overall difference in Class A for intervals of time on-task when using RC compared to using HR for students with disabilities was 18.9% higher using RC and for students without disabilities 30.3% higher using RC.

Similar results were observed in Class B. Eric, a student with AU and a BIP, demonstrated on-task behavior during baseline/HR condition a *M* = 38.2% (range, 23% to 80%). During the alternating treatments, Eric demonstrated on-task behavior during RC condition a *M* = 71.9% (range, 60% to 95%) and during HR condition a *M* = 44.5% (range, 30% to 80%) resulting in a *M* = 27.4% more time on-task when using RC compared to HR. While Kyle, a target student without a disability, in the same class demonstrated on-task behavior during baseline/HR condition a *M* = 74.7% (range, 57% to 87%). During the alternating treatments, Kyle demonstrated on-task behavior during RC condition a *M* = 57.8% (range, 45% to 75%) and during HR condition a *M* = 39.6% (range, 20% to 56.7%) resulting in a *M* = 18.2% more time on-task when using RC compared to HR.

Attempted Responses. Attempted responses for target students are presented in Figures 3 and 4. All of the target students with disabilities and challenging behavior and

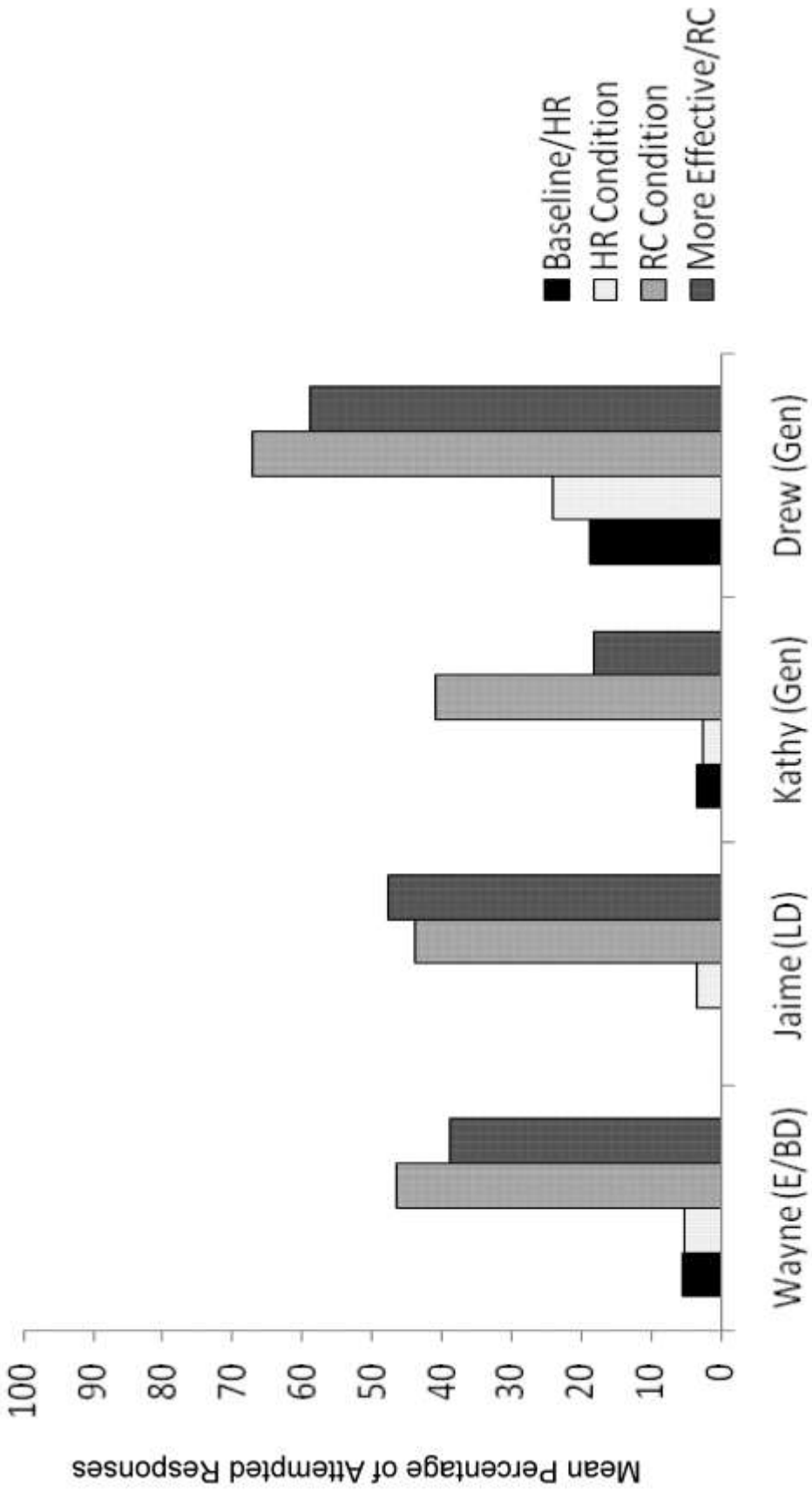

Figure 3. Attempted Responses across Phases: Class A.

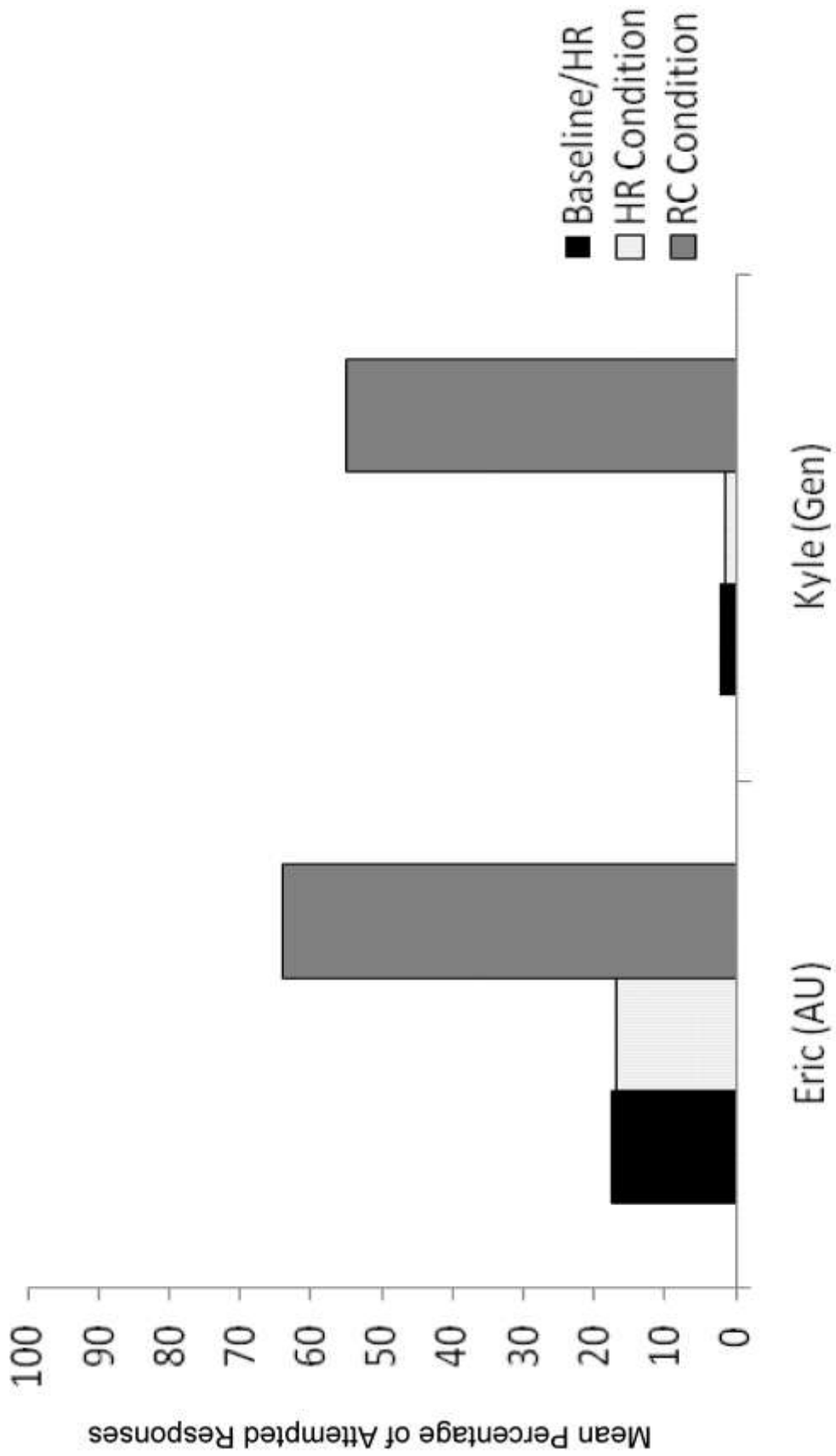

Figure 4. Attempted Responses Across Phases: Class B.

students without disabilities increased attempted responses during RC condition. In Class A, Wayne, the student with ED and a BIP attempted responses a *M* = 5.4% (range, 0% to 13%) during baseline/HR. During alternating treatments, Wayne demonstrated an increase in attempted responses from a *M* = 5.1% (range, 0% to 13.3%) during HR condition to a *M* = 46.4% (range, 7% to 71.4%) during RC condition. During the more effective/RC phase, Wayne attempted responses a *M* = 38.9% (range, 0% to 6.7%). Jaime, the student with LD and a BIP in the same class, did not attempt to respond during baseline/HR (0%). During alternating treatments, Jaime demonstrated an increase in attempted responses from a *M* = 3.5% (range, 0% to 7%) during HR condition to a *M* = 43.8% (range, 33.3% to 53.3%) during RC condition. During the more effective/RC phase Jaime attempted responses a *M* = 47.6% (range, 0% to 66.7%). Kathy, one target student without disabilities, attempted responses a *M* = 3.5% during baseline/HR condition. During alternating treatments, Kathy demonstrated an increase in attempted responses from a *M* = 2.6% (range, 0% to 13.3%) during HR condition to a *M* = 40.8% (range, 0% to 87%) during RC condition. During the more effective/RC phase, Kathy attempted responses a *M* = 18.1% (range, 0% to 46.7%). And Drew, the other target student without disabilities, attempted responses a *M* = 18.7% (range, 0% to 26.7%) during baseline/HR condition. During alternating treatments, Drew demonstrated an increase in attempted responses from a *M* = 24.1% (range, 0% to 86.7%) during HR condition to a *M* = 67.1% (range, 50% to 93.3%) during RC condition. During the more effective/RC phase Drew attempted responses a *M* = 59% (range, 33.3% to 80%). In Class A, the overall difference for attempted responses during the alternating treatment

phase for students with disabilities was 40.8% and for students without disabilities was 40.6%.

In Class B, Eric, the student with AU and a BIP attempted responses a *M* = 17.5% (range, 0% to 43.3%) during baseline/HR condition. During alternating treatments, Eric demonstrated an increase in attempted responses from a *M* =16.9% (range, 13% to 33.3%) during HR condition to a *M* = 63.9% (range, 33.3% to 100%) during RC condition for an overall increase of a *M* = 47%; while Kyle, the student without a disability, attempted responses a *M* = 2.2% (range, 0% to 13.3%) during baseline/HR condition. During alternating treatments, Kyle demonstrated an increase in attempted responses from a *M* = 1.5% (range, 0% to 13.3%) during HR condition to a *M* = 55% (range, 40% to 88.9%) during RC condition for an overall increase of a *M* = 53.5%.

Attendance. Attendance data were collected during next-day quizzes, instruction, and daily reviews. In Class A, although a few students 'excused' themselves for various reasons during class, most students in attendance for the quizzes remained for the class session. Attendance during baseline/HR was a *M* = 88% (range 77.3% to 95.5%); during the alternating treatment phase the class was a *M* = 83.2% (range, 54.5% to 91%); and during the more effective/RC phase class attendance was a *M* = 83% (range, 81.8% to 91%). Wayne was in attendance during baseline/HR every session (100%); he attended 9 of the 10 (90%) alternating treatment sessions; and during the more effective/RC phase Wayne missed 3 of the 6 sessions (50%). Like Wayne, Jaime attended all the baseline/HR sessions (100%) and 9 of the 10 alternating treatment sessions (90%); however, Jaime attended 5 of the 6 (83.3%) of the more effective/RC sessions. Kathy missed the most days, attending 60% of the baseline/HR sessions, 70% of the

alternating treatment sessions, and 100% of the more effective/RC sessions. Drew attended all sessions in all phases (100%). In Class B, students who came to class, generally remained in class. Attendance during baseline/HR for the class was a *M* = 88% (range 83.3% to 94%) and during the alternating treatment phase was a *M* = 89% (range, 77.7% to 100%). Eric was in attendance 100% of the baseline/HR sessions, and missed one session during the alternating treatment phase (89%). Kyle attended all sessions in all phases (100%).

Academic Achievement

Academic achievement was measured by accuracy of responses on next-day quizzes and biweekly probes (see Figures 5 and 6). However, improved participation during daily reviews produced inconsistent academic achievement on next-day quiz scores in Table 5.

Next-day Quiz Scores. In Class A during baseline Wayne, the student with ED and a BIP, scored a *M* = 51% (range, 30% to 95%) on next-day quizzes. During the alternating conditions phase Wayne, scored a *M* = 60% (range, 50% to 70%) during HR condition and a *M* = 70% (range, 30% to 100%) during RC condition. During the more effective condition phase/RC, on next-day quizzes Wayne scored a *M* = 33.8% (range, 15% to 40%). Jaime, the student with LD and a BIP, scored a *M* = 37% (range, 15% to 50%) on next-day quizzes. During the alternating conditions phase Jaime scored a *M* = 32.5% (range, 30% to 40%) during HR condition and a *M* = 42.5% (range, 20% to 70%) during RC condition. During the more effective condition phase/RC, on next-day quizzes Jaime scored a *M* = 20.5% (range, 0% to 40%). Kathy, one target student without disabilities, scored a *M* = 73.3% on next-day quizzes during baseline. During the

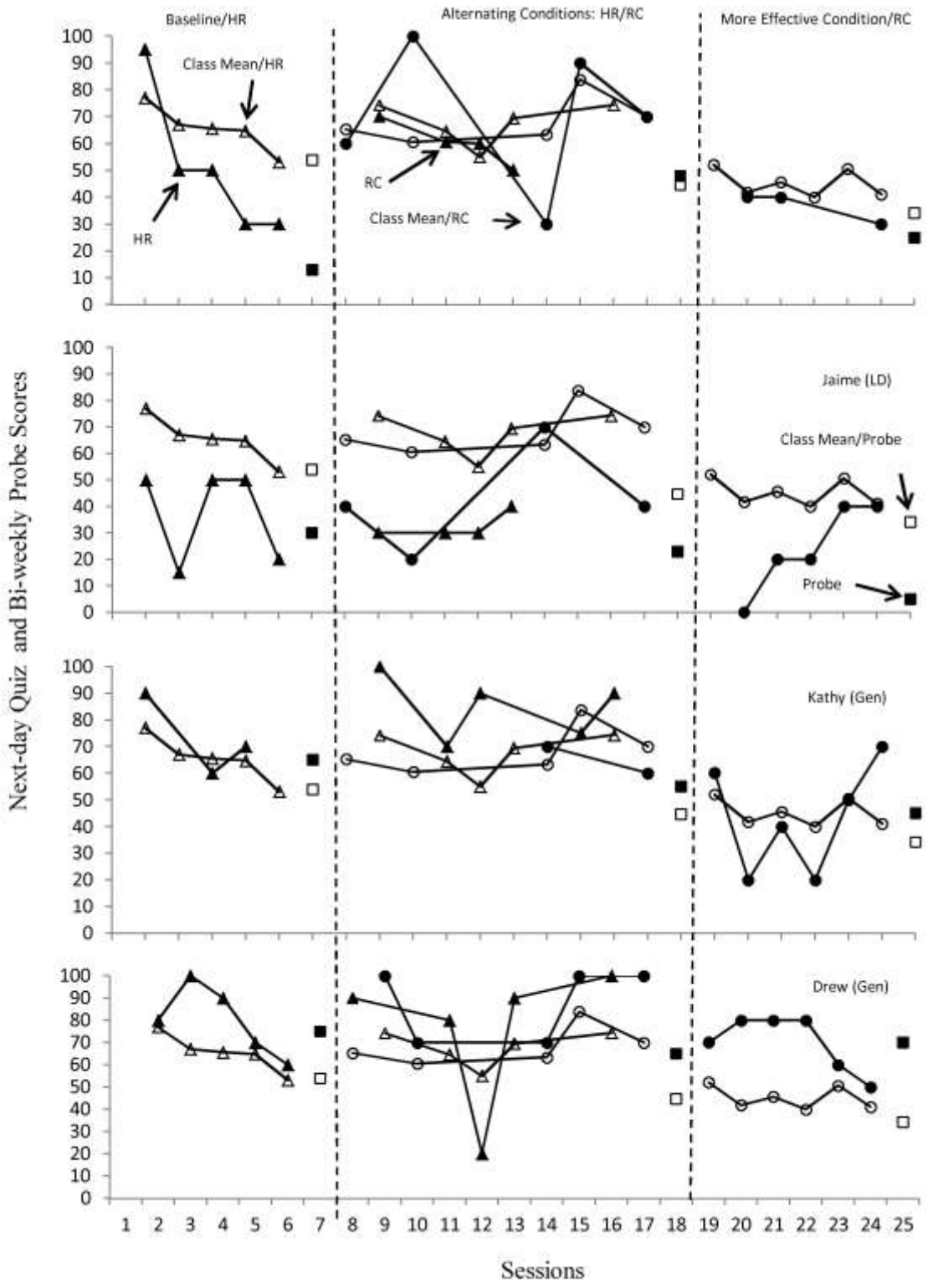

Figure 5. Next-Day Quiz Scores and Class A Means

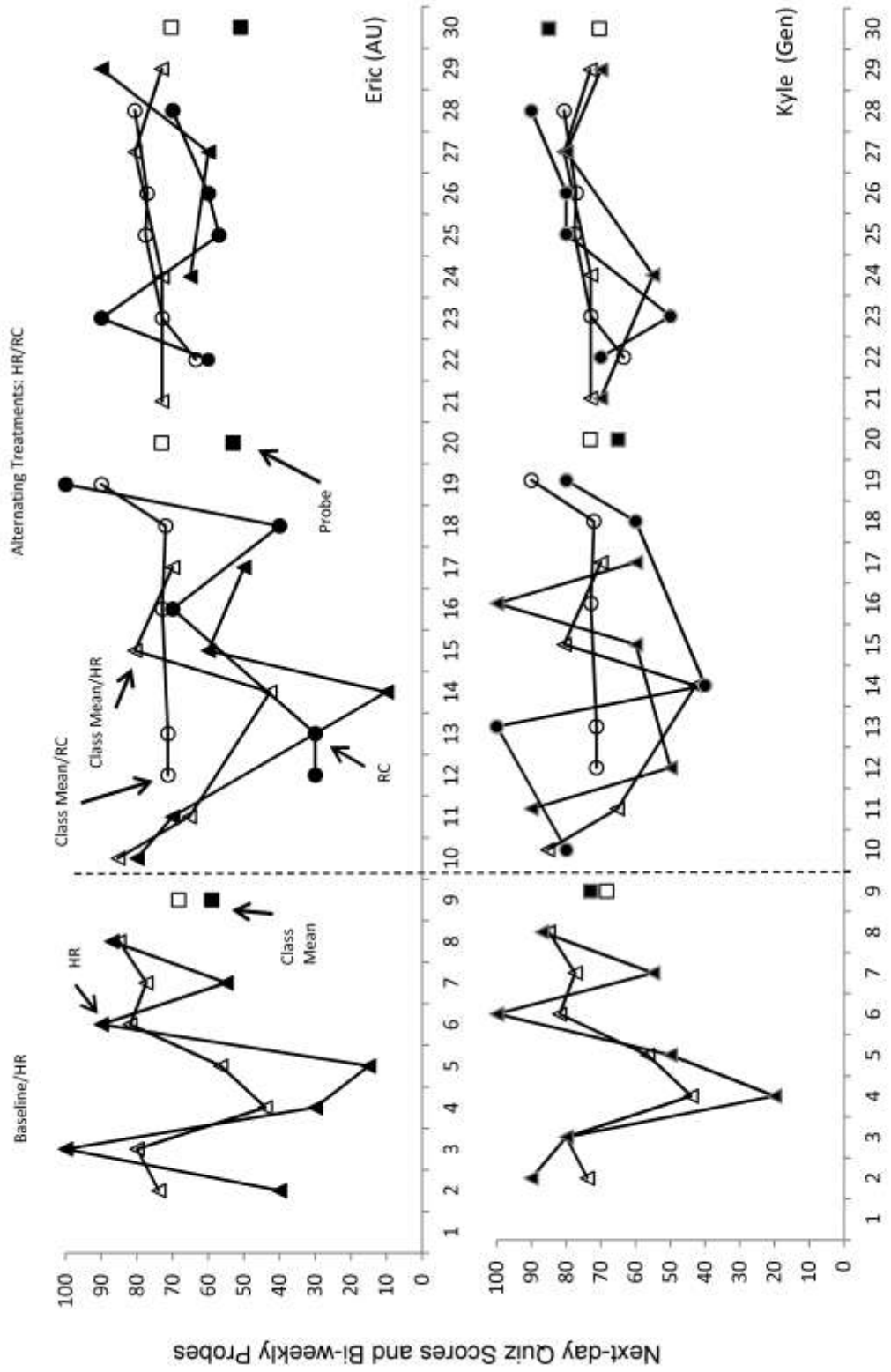

Figure 6. Next-day Quiz Scores and Class B Means

Table 5

Percentage of Attempted Responses and Next-Day Quiz Scores for Target Students

Category	Mean % Attempted Responses (range)	Mean % Correct: Next Day Quiz (range)
Wayne (E/BD; Class A)		
Baseline	5.4% (0.0-13.3)	51.0% (30-95)
Hand Raise	5.1% (0.0-13.3)	60.0% (50-70)
Response Cards	46.4% (7.0-71.4)	70.0% (30-100)
More Effective	38.9% (0.0-66.7)	33.8% (15-40)
Jaime (LD; Class A)		
Baseline	0.0%	37.0% (15-50)
Hand Raise	3.5% (0.0-7.0)	32.5% (30-40)
Response Cards	43.8% (33.3-53.0)	42.5% (20-70)
More Effective	47.6% (0.0-66.7)	20.5% (0-40)
Kathy (Gen Ed; Class A)		
Baseline	3.5% (0.0-7.0)	73.3% (66-90)
Hand Raise	2.6% (0.0-13.3)	85.0% (70-100)
Response Cards	40.8% (0.0-87.0)	65.0% (60-70)
More Effective	18.8% (0.0-46.7)	43.6% (20-70)
Drew (Gen Ed; Class A)		
Baseline	18.7% (0.0-26.7)	80% (60-100)
Hand Raise	24.1% (0.0-86.7)	76% (20-100)
Response Cards	67.1% (50.0-93.3)	88% (70-100)
More Effective	59.0% (33.3-73.3)	70% (50-80)
Eric (E/BD; Class B)		
Baseline	17.5% (0.0-43.0)	59.6% (15-100)
Hand Raise	16.9% (13.0-33.0)	62.8% (10-90)
Response Cards	63.9% (33.0-100)	60.7% (30-100)
Kyle (Gen Ed; Class B)		
Baseline	2.2% (0.0-13.0)	68.9% (20-100)
Hand Raise	1.5% (0.0-13.0)	70.4% (50-100)
Response Cards	55.0% (40.0-89.0)	73.0% (40-100)

alternating conditions phase, Kathy scored a *M* = 85% (70% to 100%) during HR condition and a *M* = 65% (range, 20% to 70%) during the RC condition. During the more effective condition phase/RC, on next-day quizzes Kathy scored a *M* = 43.6% (range, 20% to 70%). And Drew, the other target student without disabilities, scored a *M* = 80% during baseline/HR phase on next-day quizzes. During alternating conditions phase, Drew scored a *M* = 76% (20% to 100%) during HR condition and a *M* = 88% (range, 70% to 100%) during the RC condition. During the more effective condition phase/RC, on next-day quizzes Drew scored a *M* = 70% (range, 50% to 80%).

In Class B, Eric, the student with AU and a BIP, scored a *M* = 59.6% (range, 15% to 100%) on next-day quizzes during baseline/HR phase. During alternating conditions, Eric scored a *M* = 62.8% (range, 10% to 90%) during HR condition and a *M* = 59.6% (range, 30% to 100%) during RC condition. While Kyle, the student without a disability, scored a *M* = 68.9% (range, 20% to 100%) on next-day quizzes during baseline/HR phase. During alternating conditions, Kyle scored a *M* = 70.4% (range, 40% to 100%) during HR condition and a *M* = 73% (range, 40% to 100%) during RC condition.

Thus, two out of three students with disabilities and challenging behaviors presented with higher quiz scores during the alternating treatments condition and two of the three students without disabilities demonstrated higher quiz scores during the alternating treatments condition. However, the students in Class A showed quiz scores reduced by a M = 18.5% (range, 10% to 29.7%) during the final 'more effective' phase. Next-day quiz scores are presented in Tables 6 and 7 where results of target students are provided with the class mean.

Table 6

Next-Day Quiz Scores and Attendance: Class A

Baseline	Quiz 1 HR	Quiz 2 HR	Quiz 3 HR	Quiz 4 HR	Quiz 5 HR	Mean	Probe
Class							
Mean	74	67	66	65	53	65	54
Range	10-100	10-100	40-100	30-100	20-100	10-100	3-95
Attendance	96%	96%	91%	86%	77%	89%	96%
Wayne (EBD)	95	50	50	30	30	51	13
Jaime (LD)	50	15	50	50	20	37	25
Kathy (GE)	90	Absent	60	70	Absent	73	80
Drew (GE)	80	100	90	70	60	80	75

Alternating Treatment	Quiz 6 RC	Quiz 7 HR	Quiz 8 RC	Quiz 9 HR	Quiz 10 HR	Quiz 11 HR	Quiz 12 RC	Quiz 13 RC	Quiz 14 HR	Quiz 15 RC	Mean RC%	Mean HR%	Probe RC%	Probe HR%
Class														
Mean	65	74	61	65	55	69	63	84	74	70	69	67	45	35
Range	20-100	30-100	30-100	20-100	20-100	0-90	10-90	60-100	40-100	40-100	61-84 RC		55-74 HR	
Attendance	86%	86%	86%	91%	91%	82%	82%	55%	91%	82%				
Wayne (EBD)	60	70	100	Absent	60	50	30	90	Absent	70	70	60	55	40
Jaime (LD)	40	30	20	30	30	40	70	Absent	Absent	40	43	33	35	10
Kathy (GE)	Absent	100	Absent	Absent	90	Absent	70	Absent	90	60	65	93	70	40
Drew (GE)	90	100	70	80	20	90	70	100	100	100	88	76	75	65

More Effect-ive Condition	Quiz 16 RC	Quiz 17 RC	Quiz 18 RC	Quiz 19 RC	Quiz 20 RC	Quiz 21 RC	Mean	Probe
Class								
Mean	51	42	46	40	51	41	53	32
Range	20-80	0-80	20-100	0-80	0-100	10-90	41-51	0-90
Attendance	86%	77%	82%	86%	77%	86%	82%	82%
Wayne (EBD)	Absent	40	40	Absent	Absent	30	37%	25
Jaime (LD)	Absent	Absent	20	20	40	40	24%	5
Kathy (GE)	60	20	40	20	50	70	43%	Absent
Drew (GE)	70	40	80	80	60	50	70%	45

Note. Class statistics include all students participating in quiz for that day. Total number of students enrolled in Class A was 25. EBD = emotional/behavior disorder. LD = learning disability. GE = general education. HR = hand raise. RC = response cards. "Absent" identifies students for whom data was not available for that particular day because of absence, tardiness, or not attending the review.

Table 7

Next-Day Quiz Scores and Attendance: Class B

Baseline	Quiz 1 HR	Quiz 2 HR	Quiz 3 HR	Quiz 4 HR	Quiz 5 HR	Quiz 6 HR	Quiz 7 HR	Mean	Probe
Class									
Mean	74	80	44	57	84	77	85	72	47
Range	10-100	40-100	10-100	15-80	20-100	60-90	30-100	10-100	25-85
Attendance	100%	94%	83%	94%	89%	100%	89%	93%	89%
Eric (AU)	40	100	30	15	90	55	87	59.6	59
Kyle (GE)	90	80	20	50	100	55	70	66.4	73

Alternating Treatment	Quiz 8 HR	Quiz 9 HR	Quiz 10 RC	Quiz 11 RC	Quiz 12 HR	Quiz 13 HR	Quiz 14 RC	Quiz 15 HR	Quiz 16 RC	Quiz 17 RC	Mean RC%	Mean HR%	Probe RC%	Probe HR%
Class														
Mean	85	65	71	71	43	81	73	70	72	90	76	69	82.3	71.3
Range	20-100	30-100	10-100	20-100	10-80	20-100	0-100	50-100	30-100	50-100	71-90 RC		43-85 HR	
Attendance	83%	94%	89%	83%	83%	94%	94%	94%	83%	94%				
Eric (AU)	80	70	30	30	10	60	50	50	40	100	50	54	60	45
Kyle (GE)	90	50	100	40	60	100	60	60	60	90	78	72	71	60

Alternating Treatment	Quiz 18 HR	Quiz 19 RC	Quiz 20 RC	Quiz 21 HR	Quiz 22 RC	Quiz 23 RC	Quiz 24 HR	Quiz 25 RC	Quiz 26 HR	Mean		Probe	
Class													
Mean	73	64	73	72	78	78	81	81	73	75	75	73.6	71.0
Range	20-100	30-100	30-100	20-100	10-100	10-100	40-100	10-100	60-95	64-81 RC		72-81 HR	
Attendance	89%	94%	89%	94%	78%	78%	89%	94%	100%				
Eric (AU)	Absent	60	90	65	57	60	60	70	90	67	72	60	48
Kyle (GE)	70	70	50	55	80	80	80	90	60	74	66	90	85

Note. Class statistics include all students participating in quiz for that day. Total number of students enrolled in Class A was 25. AU = autism. GE = general education. HR = hand raise. RC = response cards. "Absent" identifies students for whom data was not available for that particular day because of his not attending the review.

Biweekly Probes. The biweekly probes provide information on the ability of students with and without disabilities to retain content learned over an extended time (see Tables 8 and 9). On the alternating conditions probe half the items were from each condition (i.e., HR and RC) with 40% of the items copied from the quizzes, 40% of the items similar from the quizzes, and 20% exact items from the reviews, not previously quizzed. Although Class A was administered a final probe with only RC items at the conclusion of the more effective condition phase, Class B was administered two mixed probes. On the baseline/HR probe, Wayne (E/BD) answered 13% of both exact and similar statements previously quizzed correctly and 11% of previously reviewed but never quizzed statements correctly. On the alternating treatments probe Wayne answered 55% of the RC items correctly and 40% of the HR items correctly. And on the more effective treatment/RC probe, Wayne answered 31% of the exact and 31% similar items correctly, but none of the previously reviewed but never quizzed statements correctly. On the baseline/HR probe, Jaime (LD) answered 31% of the exact items previously quizzed correctly, 20% of the similar statements previously quizzed correctly, and 11% of the reviewed but never quizzed statements correctly. On the alternating treatments probe Jaime answered 35% of the RC items correctly and 10% of the HR items correctly. And on the more effective treatment/RC probe, Jaime answered 13% of the similar items correctly, but none of the exact or previously reviewed but never quizzed statements correctly. Kathy (Gen) answered 50% of the exact statements previously quizzed correctly, 66.7% of the similar statements previously quizzed correct, and 88.9% of the reviewed but never quizzed statements correctly. On the alternating treatments probe, Kathy answered 70% of the RC items correctly and 40% of the HR items correctly, and

Table 8

Bi-weekly Probe Scores for Class Mean and Target Students: Class A.

Baseline Probe	HR Quizzed	HR Similar	HR Reviewed	Percent Total (40) Correct
Class	54.2%	51.7%	69.8%	53.9%
Wayne (E/BD)	13.0%	13.0%	11.0%	13.0%
Jaime (LD)	31.2%	20.0%	11.0%	25.0%
Kathy (Gen)	50.0%	66.7%	88.9%	65.0%
Drew (Gen)	68.8%	66.7%	100%	75.0%

Alternating Treatments Probe	RC Quizzed	RC Similar	RC Reviewed	Percent RC Correct	HR Quizzed	HR Similar	HR Reviewed	Percent HR Correct	Percent Total (40) Correct
Class	47%	45%	42%	46%	36%	45%	24%	37%	45%
Wayne (E/BD)	50%	63%	25%	55%	25%	50%	50%	40%	48%
Jaime (LD)	38%	25%	50%	35%	0%	25%	0%	10%	23%
Kathy (Gen)	88%	50%	75%	70%	50%	50%	0%	40%	55%
Drew (Gen)	63%	88%	100%	75%	63%	50%	100%	65%	68%

More Effective Condition (RC) Probe	RC Quizzed	RC Similar	RC Reviewed	Percent Total (40) Correct
Class	41%	38%	16%	34%
Wayne (E/BD)	31%	31%	0%	25%
Jaime (LD)	0%	13%	0%	5%
Kathy (Gen)	44%	56%	25%	45%
Drew (Gen)	81%	69%	50%	70%

Note. Shaded areas highlight comparison of the two strategies. Both class mean and target students show more RC items remembered than HR items over time.

Table 9

Bi-weekly Probe Scores for Class Mean and Target Students: Class B

Baseline Probe	HR Quizzed	HR Similar	HR Reviewed	Percent Total (40) Correct
Class Mean	71.2%	75%	65%	68.3%
Eric (AU)	73.3%	60%	50%	59%
Kyle (Gen)	86.7%	73.3%	70%	73%

Alternating Treatments Probe 1	RC Quizzed	RC Similar	RC Reviewed	Percent RC Correct	HR Quizzed	HR Similar	HR Reviewed	Percent HR Correct	Percent Total (40) Correct
Class Mean	90%	82.3%	66.7%	82.3%	75%	65%	76.7%	71.3%	70%
Eric (AU)	75%	63%	66.7%	60%	50%	25%	75%	45%	53%
Kyle (Gen)	75%	75%	12.5%	71%	50%	75%	12.5%	60%	65%

Alternating Treatments Probe 2	RC Quizzed	RC Similar	RC Reviewed	Percent RC Correct	HR Quizzed	HR Similar	HR Reviewed	Percent HR Correct	Percent Total (40) Correct
Class Mean	83.3%	70%	61%	73.9%	63.9%	78.5%	70.8%	71.0%	70.4%
Eric (AU)	75%	50%	50%	60%	37.5%	50%	50%	45%	51%
Kyle (Gen)	100%	75%	100%	90%	87.5%	87.5%	75%	85%	85%

Note. Shaded areas highlight comparison of the two strategies. Both class mean and target students show more RC items remembered than HR items over time.

on the more effective treatment/RC probe, Kathy answered 44% of the exact statements previously quizzed correctly, 56% of the similar items previously quizzed correctly, and 25% of the exact statements previously reviewed but never quizzed statements correctly. Drew answered 68.8% of the exact statements previously quizzed correct, 67.7% of the similar statements previously quizzed correct, and 100% of the reviewed but never quizzed statements correctly. On the alternating treatments probe Drew answered 75% of the RC items correctly and 65% of the HR items correctly.

In Class B, Eric (AU) answered 73% of the exact statements previously quizzed correctly, 60% of the similar statements previously quizzed correctly, and 50% of the reviewed but never quizzed statements correctly. On the first alternating treatments probe Eric answered 60% of the RC items correctly and 45% of the HR items correctly. On the second alternating treatments probe Eric answered 60% of the RC items correctly and 51% of the HR items correctly. Kyle (Gen) answered 86.7% of the exact statements previously quizzed correct, 73.3% of the similar statements previously quizzed correctly, and 70% of the reviewed but never quizzed statements correctly. On the first alternating treatments probe Kyle answered 71% of the RC items correctly and 60% of the HR items correctly. On the second alternating treatments probe Kyle answered 90% of the RC items correctly and 85% of the HR items correctly.

Overall, the target students in Class A scored a M = 58.8% of RC items correctly compared to a M = 48.5% of HR items correctly, remembering 10.3% (range, 7% to 15%) more RC items over time. Overall, the target students in Class B scored a M = 70.3% RC items correctly compared to a M = 63.5% of HR items correctly, remembering 7.2 % more RC items over time.

Social Validity

Social validation was measured by normative comparisons, sustainability (Kennedy, 2005), and subjective evaluations (Alberto & Troutman, 2009; Kazdin, 2011; Kennedy, 2005). Each area was assessed differently, yet each is an equally important social variable which is an important part of behavioral research in applied settings (Alberto & Troutman, 2009; Kazdin, 2011). Normative comparisons were assessed throughout each phase using behavioral data from students with disabilities who have a BIP and their peers as well as whole class data. Sustainability was measured with direct observations defined in the maintenance section. The maintenance data indicate that although Robert reported throughout the study he preferred RC to HR, after the study was completed he did not continue to use RC. This may be linked to end of year activities and student lack of willingness to work the last few weeks of classes. Interesting, yet not part of the current study, each teacher mentioned several times during the course of this study they were using RC in other courses they were currently teaching.

As previously described, the TARF-R (Reimers & Wacker, 1988) was completed by both teacher participants and their classes, including the target students. This measure was used to determine what, if any benefits may come from using RC as a classwide teaching strategy.

Both teachers rated RC as a very acceptable teaching strategy for high school students and a very valuable instructional tool to be used during instruction as well as reviews. Both teachers credited RC for increasing participation for students with and without disabilities and reported they would continue to use RC in future classes. Robert reported preparing questions to use with RC helped him organize and focus instruction.

He also noted using RC helped him see immediately what material needed reteaching. Lillian reported the increased review time with RC provided more material overlap allowing increased reinforcement. Both teachers noted RC increased next-day and biweekly quiz scores for some students, and while Robert reported improved scores for Wayne (ED) and Jaime (LD), Lillian noted RC did not have an effect on next-day quiz scores for Eric (AU). Neither teacher reported any negative outcomes from using RC and both reported they would be very willing to share information on using RC with other teachers at their school.

The students in Class A responded favorably to using RC. All 19 students completing the survey reported that daily reviews at the end of class were helpful in learning; and 88% reported daily quizzes were helpful for learning. Sixty-eight percent of the students reported RC increased their time on-task, 89.4% reported their quiz grades went up, and 50% reported RC helped them learn. Although only 35% of the students rated RC as a strategy they liked to use, 41% reported RC might be helpful in other classes. Of the 19 students completing the survey, 13 wrote comments in favor of RC, daily reviews, and daily quizzes. Five of the 13 students reported RC helped them be more active, participate more, or pay attention more than ever before; and 6 of the 13 wrote they learned more (or learned a lot). Nine comments were written listing negative aspects of the study. Four stated 'it' was boring and took forever, two suggested not doing 'it' everyday, and two complained 'it' was difficult because some students would not pay attention or 'shut-up' therefore causing disruption.

Of the students in Class B, 94.4% of the students reported daily reviews at the end of class were helpful in learning; and 88.9% reported daily quizzes were helpful for

learning. Seventy-two percent of the students reported RC increased their time on-task, 76% reported their quiz grades went up, and 99% reported RC changed how much they learn. In regards to whether the students liked using RC to learn, 66.7% reported they liked using RC, 40% reported they liked using RC very much, and 76.5% reported RC might be helpful in other classes. Of the 17 students completing the survey, 13 students wrote favorable comments reporting they had fun, learned easier, learned more, earned higher grades, paid more attention in class, and remembered more for tests.

Discussion

RC are supported in the literature as an effective teaching strategy to increase attempted responses (Christle & Schuster, 2003; Gardner et al., 1994), time on-task (George, 2010), and academic achievement (Cavanaugh et al., 1996; Kellum et al., 2001). By increasing student participation during instruction academic achievement should improve (Carnahan et al., 2009). Previous studies have found improved participation resulted in improved daily quiz scores (Marmolejo et al., 2004), improved biweekly tests (Gardner et al., 1994), and improved chapter test grades (George, 2010). The purpose of this research was to compare the effect using RC at the high school level would have on academic outcomes for students without disabilities and students with disabilities who also exhibit challenging behaviors. Data collected in this research supports the implementation of RC as a classwide teaching strategy for high school students with disabilities and challenging behaviors and students without disabilities to increase student engagement. Results showed that RC are an effective strategy to increase student engagement and academic achievement for both.

During this study, RC increased student engagement by increasing time on-task and percentage of attempted responses for all six target students. Student time on-task increased for all students with Drew (Class A; Gen) and Eric (Class B; AU) showing a 30% increase of time on-task. The other four target students showed about a 5% increase each for time on-task across phases. Attempted responses during session reviews increased for all six target students as well. The increase ranged from 37% (Kathy) to 53%(Kyle), with half the students attempting to respond about 45% more often when using RC than when using HR. The increase in student engagement when RC were used may have led to the increase in academic achievement.

The next-day quiz score results are inconclusive. Two of the three students with disabilities and challenging behaviors had a 10% higher mean for next-day quizzes when using RC during the alternating treatment phase; and two of the three students without disabilities had higher mean scores when using RC during the alternating treatment phase. However, the biweekly probes showed all six target students had increased long-term retention of material reviewed using RC compared to material reviewed using the more traditional approach of HR.

In addition to comparing the academic achievement of students without disabilities and students with disabilities and challenging behaviors, academic achievement was compared to the class means on next-day quizzes and biweekly probes. Like the scores of individual target students, overall class achievement fluctuated throughout the study. In both classes during the alternating treatment phase, the class mean was slightly higher on next-day quizzes and biweekly probes for material reviewed using RC as compared to material reviewed using HR. Based on the literature

supporting RC as an effective strategy across grade levels, this study also examined the validity of using RC at the high school level.

The results of the student surveys indicate that students with and without disabilities enjoyed using RC. The students who ranged in grade level from ninth through twelfth grades reported RC helped them learn more by keeping them on-task, paying more attention to the lesson, allowing them to learn more, and improving their grades. Many students reported RC would be helpful in other courses and they enjoyed using RC as a learning strategy. Both teachers reported RC could be a valuable teaching strategy in general education classes for students with and without disabilities to increase student engagement, to review course material, and to assess student knowledge.

A benefit of this study was the teachers implemented RC easily and with consistency. The results of this study indicate RC may be efficiently implemented with fidelity by classroom teachers. Even within the structure of this study, Robert and Lillian varied their approach to implementing RC. Robert replaced the laminated cards with white boards and was satisfied if only a few students responded, acknowledging each answer by providing feedback and praise to the individuals which seemed to encourage the students who were more resistant to answer. Lillian who was more animated in her teaching wanted all the students to respond so she began writing the answers on a RC and showing it when she cued the students, “Show your answers.” As teachers become accustomed to using RC as a teaching strategy they will be able to individualize the strategy to match the unique needs of their students.

Limitations and Future Directions

There are several limitations of this study which may hinder the generalization of the findings. First, the number of participants in the study was small with three students with disabilities and three typical peers. Also, of the three students with disabilities in the study, each had a different disability (i.e., E/BD, LD, AU) which limits generalization. Furthermore, each student with a disability had varying (a) histories and topographies of challenging and disruptive classroom behaviors, (b) goals and objectives on current BIPs, and (c) contact with the behavior specialist team. Replication of this study with more high school participants with and without disabilities is warranted to provide more generalizable evidence on whether RC are more effective than HR during academic general education inclusion classes.

Second, there were two technical issues which may have influenced the conclusions. One was the method used to measure time on-task. It was noted numerous times during observations that a target student sometimes responded after being recorded as not on-task (i.e., eyes not directed on the teacher or review statement) possibly indicating students at the high school level may be on-task when not focusing on the teacher. Future researchers may consider measuring topographies of time off-task (i.e., sleeping, talking to peer, texting). Also, the lack of teacher feedback and value given to next-day quizzes may have limited student effort. Students repeatedly requested graded quizzes be returned to see how they were doing; however, quizzes were not returned in a timely manner or on a regular basis. Likewise, the teachers did not define the value of the quiz grades, and one teacher indicated the quiz scores did not affect the student's

course grade. Repetition of this study with immediate feedback and appropriate value provided to students following quizzes may produce different results.

Third, there were different classroom management and instructional strategies used during academic instruction by the teacher participants which may have influenced the data. In Class A during instruction, the students were required to be seated, quiet, and nondisruptive (i.e., students were allowed to read, sleep, eat, put on make-up, do other assignments, use the computers, and come and go from class), while in Class B the students were required to be on time, to begin work immediately, to have only work-related items on their desks, and to participate during instruction. These classroom management differences may account for some of the differences in target students' class participation, next-day quiz scores, and probe data.

In addition, although treatment fidelity was consistent in both classes instruction differed. No measurement was used to determine the effectiveness of instruction. It is plausible that results were influenced by how effectively the teachers presented the material. A third consideration related to classroom management and effective instruction includes consideration of the novelty of RC and the possible effect using RC daily may have had on data. Several students reported using RC was helpful, but using them every day was too intensive. Future researchers may want to (1) better control or match classroom management strategies to assist in generalization of the effectiveness of RC, (2) use RC less often to examine if results different based on frequency of RC use; and (3) include a measure to look at the effectiveness of classroom instruction.

Fourth, various temporal issues may have influenced student outcomes. For example, instructional time was limited due to incorporating daily quizzes and reviews

during 50-minute class sessions. These study activities restricted the amount of new information taught each session. Also, teaching new information requires building on previously learned information, therefore course material overlapped from one day to the next with discussions and practice spanning over several days. This overlap of instruction may account for the inconsistencies or lack of improvement in next-day quiz scores. In addition, teachers were required to spend time on previously learned material to prepare students for the end-of-year state testing mandatory for graduation. And the conclusion of the school year prevented maintenance observation sessions to investigate the effect of RC over time. Future researchers may investigate (a) using RC during the lesson rather than adding an end-of-class review to limit the reduction of instructional time, (b) implementing RC earlier in the school year when students are learning more new material and reviewing less, (c) implementing each condition over consecutive days until the new concept has been taught, giving a quiz before introducing the next new concept, and (d) extending the length of the study to determine if on-going RC would continue to increase student participation and retention of material learned over time.

Implications for Classroom Practice

The need for efficient and effective instructional strategies to increase student achievement is reported by general and special education teachers (Idol, 2006; Mastropieri & Scruggs, 2001). Because the majority of students with disabilities receive instruction in general education classrooms (NCES, 2010), it is essential to continue to examine teaching strategies that will improve academic outcomes for students with and without disabilities in general education classrooms (Carnahan et al., 2009; Druian & Butler, 1987). The findings from this study indicate RC are easily and efficiently

executed in large groups. One teacher managed material distribution (e.g., RC, markers, and erasers) while concluding the instructional portion of the lesson without interruption of teaching, while the other teacher allowed students to keep the materials in the bookrack under each desk for easy access (Christle & Schuster, 2004). The RC offered a hands-on strategy compatible with direct instruction (Cavanaugh et al., 1996; Kellum et al., 2001) allowing the teachers to continue using a lecture, followed by a brief review to assess student understanding. In addition, both teachers stated preparing the reviews and next-day quizzes helped them remain focused on the day's learning objectives and encouraged them to maintain a brisk pace to cover the planned instruction. Although not part of the study, the teachers were observed using the RC review as an opportunity to provide extra instruction to students with incorrect responses and as a tool to measure student participation.

RC showed potential for increasing student engagement and achievement across grade levels (Randolph, 2007). During this study the increased levels of student responding and increased achievement by individual target students indicates using RC in high school classes could raise individual grade point averages by one letter grade (i.e., 10%) and may increase student test scores by increasing the amount of material retained over time. As previously reported (Gardner et al., 19994; George, 2010) students preferred RC over HR. In this study 76% of the students reported using RC increased their learning and 88% reported using RC improved their quiz grades. The students in this study reported that RC increased their attention to the lesson and allowed them to be more involved. One student reported appreciation that the whole class was able to be involved. The increased student participation and achievement using RC along with the

teachers' stated benefits in Math Models and Integrated Physics and Chemistry indicates using RC may be useful in other high school courses required for graduation. Although future research is warranted to minimize the limitations of the current study and to extend the RC strategy, the findings of this study support previous research in using RC as an evidence-based teaching strategy.

In conclusion, results of this study support the use of RC to increase student participation and student achievement in academic high school classes for students without disabilities and students with disabilities who exhibit challenging behaviors. The implementation of biweekly probes analyzed learning over time indicating RC may increase student retention over time. In addition, this study extended previous research by comparing target students with and without disabilities to the class mean. The results indicate using RC as an intervention for students with disabilities may also benefit students without disabilities in general education classrooms.

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APPENDIXES

APPENDIX A

Data Collection & Seating Chart **PHASE_____ Condition: HR / RC IOA: Yes / No**

Class : 3:10 - 4:00	# students taking quiz/probe ____	# students during review ____
Session # _____ **Date: _____**	# statements on quiz/probe ____	# of review statements ____
Observer:		

	1	2		1	2		1	2		1	2		1	2		1	2
Quiz			Quiz			Quiz			Quiz			Quiz			Quiz		
Lesson			Lesson			Lesson			Lesson			Lesson			Lesson		
Review			Review			Review			Review			Review			Review		
	1	2		1	2		1	2		1	2		1	2		1	2
Quiz			Quiz			Quiz			Quiz			Quiz			Quiz		
Lesson			Lesson			Lesson			Lesson			Lesson			Lesson		
Review			Review			Review			Review			Review			Review		
	1	2		1	2		1	2		1	2		1	2		1	2
Quiz			Quiz			Quiz			Quiz			Quiz			Quiz		
Lesson			Lesson			Lesson			Lesson			Lesson			Lesson		
Review			Review			Review			Review			Review			Review		
	1	2		1	2					1	2		1	2		1	2
Quiz			Quiz						Quiz			Quiz			Quiz		
Lesson			Lesson						Lesson			Lesson			Lesson		
Review			Review						Review			Review			Review		

FRONT OF CLASSROOM

Teacher Fidelity:

PROVIDED:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
With a Blank															
OTR															
Feedback															
WITHOUT blank															

On-task Intervals: Mark on-task behavior for target students while the teacher is reading each review statement (10" interval)..

Interval → Student ↓	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1															
2															

Attempted Responses: Mark each attempted response made by target student (i.e. raised hand, verbal or/written response.

Question → Student ↓	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1															
2															

Class Mean for Next-day Quizzes and Bi-weekly Probes: Class A

student	1	2	3	4	5	PROBE	1	2	3	4	5	6	7	8	9	10	PROBE	1	2
	HR 3/30	HR 3/31	HR 4/1	HR 4/4	HR 4/5	**PROBE 4/6**	RC 4/12	HR 4/13	RC 4/14	HR 4/15	HR 4/18	HR 4/20	RC 4/21	RC 4/22	HR 4/25	**RC 4/26**	**PROBE 5/2**	RC 5/4	RC 5/5
2																			
3																			
4																			
7																			
8																			
9																			
10																			
11																			
12																			
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22																			
23																			
25																			
M =	77.0	67.0	65.5	64.7	53.1	53.9	65.3	74.2	60.5	64.5	55.0	69.4	63.3	83.8	74.3	70	44.7	52	41.8
count	20	21	20	19	17	21	19	19	19	20	20	18	18	12	20	18	17	18	17

APPENDIX C

Next-day Quiz Sample

Student Number_____ IPC Period _____ Date_____

IPC Review Quiz – Light pt 2

1. The range of wavelengths that our human eye can see is called _____ _____.
2. The visible light spectrum has a range of wavelengths from _____ to _____.
3. The visible light spectrum can be broken in to an array of colors (each wavelength causes a different color). These colors can be easily remembered by a mnemonic:_____.
4. If all of the colors of visible light are blended at once, it is called _____ _____.
5. There are three colors of light that can be blended to make white light instead of the whole spectrum of visible wavelengths. These colors are called _____colors.
6. The primary colors of light are_____, _____ and _____.
7. There are molecules that absorb different wavelengths of light and reflect others. These molecules are called dyes or_____.
8. If all of the colors of pigments are mixed together (absorbing all wavelengths of light), the resulting color is_____.
9. There are three pigments that can be mixed to absorb the whole spectrum of visible wavelengths (instead of using all the pigments). These three are called the _____pigment colors.
10. The primary pigment colors are_____, _____, and _____.

ROY G. BIV	red	blue	magenta	cyan
green	white light	pigments	black	yellow
primary	secondary	700 nm	400 nm	visible light

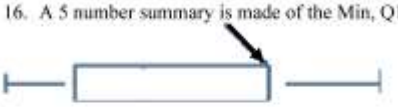
APPENDIX D

Number _____

Bi-weekly Quiz
5/2/11

median	theoretical	Y = f + 22	90°	similar	straight	quadruples	2	all/total
mode	doubles	empirical	1 3 2	domain	4, 3, 2, 1 = 10	180°	74	standard deviation
bottom	independent	Steeper	0.35	parallel	false	$1.70	x	decreasing
steeper	cross	Divide	$1.07	congruent	empirical	0.54	35%	1/6 x 1/6 = 1/36
positive	quadratic	mean	180°	true	5, 4, 3, 2, 1= 15	160°	mode	zero

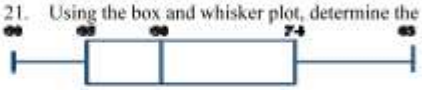
1. The percent 35% can be written in decimal form as _____
2. When someone experiments by rolling dice to determine the probability of rolling snake eyes, it is called_____ probability.
3. A function is defined as f(x) = x3+2x2+3. The x is the _____ variable.
4. If you add complementary angles together, they will add up to _____.
5. The term that describes the spread of the x values is the _____.
6. The parent function of f(x)=x2=3x-4 is the _____ function.
7. The Y variable is always the _____ variable
8. Two rectangles that have the same length sides and same size angles are _____.
9. The ratio of the sides of a 30-60-90 triangle are _____.
10. Supplementary angles add up to _____.
11. If you are buying a candy bar for $1.00, and the tax rate is 7.1%, what is the total to buy the candy bar?_____
12. Two triangles that are proportional are known as _____ figures.
13. Lines with the same slope are _____.
14. 54% can be written in decimal form as _____.
15. The supplementary angle to 20 is _____.
16. A 5 number summary is made of the Min, Q1, _____, Q3 and Max values of a dataset.



17. Given the following five numbers (3, 4, 3, 1, 3) the most common number (3) is the _____.
18. The most common or popular number in a set of data is the _____.
19. All the possible outcomes go in this part of a probability equation: _____
20. This function f(x) = 2x + 12 is _____.

Number _____

21. Using the box and whisker plot, determine the Q3 value:_____



22. 5 students need to sit in 4 desks, how many possible ways can they be arranged:_____

23. This equation y=3x+2 has a _____slope.

24. .35 can be represented as a percentage:_____.

25. The dimensions of a box quadruples with a factor of _____.

26. In a system of equations, a solution is found on a graph where the lines _____ .

27. You are 22 years old. Your friend is 20 years old. What equation could represent your age 'Y' and your friend's age f: _____

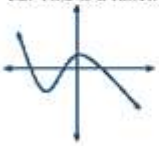
28. Running trials or experiments to determine probability is known as _____ probability.

29. When the slope of an equation increases, the line becomes _____.

30. To cancel out a multiplication operation, you should _____.

31. The average value of a set of data is known as _____.

32. This is a function, T or F:_____



33. A linear function is characterized by a _____ line.

34. The bottom number in a probability represents _____ possible outcomes.

35. A measure of the spread of data (or how far away from the mean) is _____.

36. When a function is defined as f(x) = x4-2x2+4. What is the independent variable? _____

37. In a direct variation (a specific linear equation), the y intercept is always _____.

38. If Pcop has $4 less than his neighbor (let's call that "x"), his wallet could be described by this equation: _____.

39. A scale factor of 2 _____ the area of a shape.

40. The probability of rolling a (5,5) with two dice is _____. (hint: write it out)

APPENDIX E

Student Treatment Acceptability Rating Form – Revised (TARF-R)
(Reimers & Wacker, 1988)

Effects of Response Cards on Academic Outcomes for High School Students

Your participation in this study has been appreciated. THANK YOU!

Student Information Class_____ Grade Level: _____ Age: _____ Male / Female

1. **From your perspective how did participation in the study *Effects of Response Cards* affect your daily work habits and overall achievement?**
   a. List any positives you gained in participating in the study:

_____

_____

b. List any negatives you found in participating in this study:

_____

_____

Directions: Please complete the items listed below as they pertain to the study Effects of Response Cards. Place one check mark on the line under the question that best indicates how you feel using response cards affected your achievement.

2. **How clear was your understanding of the *Effects of Response Cards* study?**

_____	_____	_____	_____	_____	_____	_____
Not at all clear			Neutral			Very clear

3. **How helpful did you find the response cards compared to raising your hand in your overall learning?**

_____	_____	_____	_____	_____	_____	_____
Not at all helpful			Neutral			Very helpful

4. **How helpful did you find response cards in your participation during daily reviews sessions?**

_____	_____	_____	_____	_____	_____	_____
Not at all helpful			Neutral			Very helpful

5. **How did using response cards effect your participation during daily reviews?**

_____	_____	_____	_____	_____	_____	_____
Less time on-task			No change			More time on-task

6. **How helpful did you find daily reviews to be in improving your learning?**

_____	_____	_____	_____	_____	_____	_____
Not at all helpful			somewhat helpful			Very helpful

7. How helpful did you find daily quizzes to be in improving your learning?

Not at all helpful — somewhat helpful — Very helpful

8. How effective did you find response cards in improving your next-day quiz grades?

Grades went down — No change — Grades went up

9. How helpful do you think using response cards would be in other classes you take?

Not at all helpful — somewhat helpful — Very helpful

10. How do you think using response cards changed how much you learned?

No change at all — some change — A lot of change

11. Do you think response cards are helpful for your learning in this class?

Not at all helpful — somewhat helpful — Very helpful

12. How helpful do you think response cards would be in your other classes?

Not at all Helpful — Some help — Very helpful

13. How much do you like using response cards to answer questions?

Not at all — A little — Like it very much

14. How much do you like raising your hand to answer questions?

Not at all — A little — Like it very much

15. How much do you think other students would like using response cards to answer question in classes?

Not at all — A little — Like it very much

16. How much do you think the other students in your class liked using response cards?

Not at all — A little — Like it very much

Comments: _____

APPENDIX F

Teacher Treatment Acceptability Rating Form – Revised (TARF-R)
(Reimers & Wacker, 1988)

Effects of Response Cards on Academic Outcomes for High School Students With and Without Disabilities/BIP
Teacher _____ Course: _____ Grade Level: _____ Spring 2011

1. From your perspective how did participation in the study *Effects of Response Cards Study* affect your daily schedule and overall work routine for this course.

a. List any positives you found when taking part in the Effects of Response Cards Study:

_____

_____

b. List any negatives you from taking part in the Effects of Response Cards Study:

_____

_____

Directions: Please complete the items listed below as they pertain to the study *Effects of Response Cards Study.* Place only one check mark on the line under the question that best indicates how you feel the use of Response Cards and the effect the strategy had.

2. How clear was your understanding of the *Effects of Response Card (RC)* study?

_____ _____ _____ _____ _____ _____ _____
Not at all Clear — Neutral — Very clear

3. How acceptable did you find using Response Cards in meeting the needs of the students you teach?

_____ _____ _____ _____ _____ _____ _____
Not at all acceptable — Somewhat acceptable — Very acceptable

4. How willing are you to share information about using Response Cards with other teachers at your school?

_____ _____ _____ _____ _____ _____ _____
Not at all willing — Neutral — Very willing

5. How helpful did you find the class procedures during the RC study on planning lessons?

_____ _____ _____ _____ _____ _____ _____
Not at all helpful — Neutral — Very helpful

6. How effective do you perceive RC to be for increasing overall class participation during instruction?

_____ _____ _____ _____ _____ _____ _____
Not effective — No change — Very effective

7. How effective do you perceive RC to be for increasing participation for students with disabilities/BIP?

_____ _____ _____ _____ _____ _____ _____
Not effective — No change — Very effective

8. How effective do you perceive RC for increasing participation for students without disabilities?

_____ _____ _____ _____ _____ _____ _____
Not effective — No change — Very effective

9. To what extent do you think RC affected overall student achievement?

No change at all — Some change — A lot of change

10. How helpful do you think your students perceived RC to be for reviewing academic content?

Not at all helpful — somewhat helpful — Very helpful

11. How did RC change next-day quiz scores for students with disabilities/BIP?

Grades went down — No change — Grades went up

12. How did RC changed next-day quiz scores for students without disabilities?

Grades went down — No change — Grades went up

13. Do you think RC were effective in increasing student performance as measured on bi-weekly probes?

Not at all effective — No change — Very effective

14. How effective do you think RC might be in other classes you teach?

Not at all effective — No change — Very effective

15. How valuable do you believe RC are as an instructional tool for teaching this class?

Not at all valuable — Somewhat valuable — Very valuable

16. How likely are you to continue to use RC now that the study is over?

Not at all likely — somewhat — Very likely

17. How valuable do you think RC would be for students during instruction rather than during review?

Not at all valuable — Somewhat valuable — Very valuable

18. In what way(s) do you believe RC might be implemented more efficiently?

19. How might you change the RC procedures (i.e., next-day quizzes, daily reviews, and/or actual use of RC) to be more effective with the students in your classes?

APPENDIX G

Fidelity Checklist RC Study Phase: _____ Condition: HR / RC IOA: Yes / No

Class: **9:47-10:42** # students taking quiz _____ # students during review _____
Session # _____ # items on quiz _____ # of review statements _____
Date _____
Observer:

1	Teacher began quiz within 2 minutes of the class bell.	yes	no
2	Teacher used timer & allowed 10 minutes to complete quiz. **OR** Teacher used timer & allowed 30 minutes to complete bi-weekly probe.	yes	no
3	Quiz included 10 fill–in-the-blank items. **OR** Bi-weekly probe included 40 fill–in-the-blank items.	yes	no
4	Quiz included a 15 term word bank. **OR** Bi-weekly probe included a 45 term word bank.	yes	no
5	Observer was provided a copy of the quiz with correct answers. **OR** Observer was provided a copy of the bi-weekly probe with correct answers.	yes	no
6	Teacher collected quizzes/probes and began instruction.	yes	no
7	10-minute daily review occurred after instruction at the end of class.	yes	no
8	Teacher presented review statements to the class on the overhead.	yes	no
9	Observer was provided a copy of the review statements with the correct answers.	yes	no
10	Review statements were presented in a fill-in-the-blank format.	yes	no
	15 review statements presented twice each: For each review statement read, place a 'v' in the appropriate box to indicate 'yes' this occurred when: 1. Item first presented with a blank. 2. Student(s) given an OTR. 3. Teacher provided either corrective feedback or praise. 4. Item then presented with the blank completed. **Retrieve score from other data collection sheet.**	____	60
	Total yes: Total no:	Fidelity ____ / 70	
	70/70 = 100%; 69=99%; 68 =97%; 67 =96%; 66= 94%; 65= 93%; 64= 91%; 63= 90%; 62 = 86%; 61= 87%; 60=86%; 59=84%; 58=83%; 57=81%; 56=80%; 55=79%; 54=77%; 53= 76%; 52=74%; 51=73%; 50=71%; 49=70%; 48=69%; 47=67%; 46=66%; 45=64%; 44=63%; 43=61%; 42=60%; 41=59%; 40=57%; 39=56%; 38=54%; 37=53%; 36=51%; 35=50%; 34=49%; 33=47%; 32=46%; 31=44%; 30=43%; 29=41%; 28=40%; 27=39%; 26=37%; 25=36%; 24=34%; 23=33%; 22=31%; 21=30%; 20=29%; 19=27%; 18=26%; 17=24%; 16=23%; 15=21%; 14=20%; 13=19%; 12=17%; 11=16%; 10=14%;9=13%; 8=11%; 7=10%; 6=9%; 5=7%; 4=6%; 3=4%; 2=3%; 1=1%	____%	

Notes: