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I, Laura Shipp Clarke,

hereby submit this original work as part of the requirements for the degree of:

Doctor of Education

in Special Education

It is entitled:

Use of Picture Response Cards in the General Education Classroom to

Increase Participation of Students with Mild Mental Disabilities

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This work and its defense approved by:

Committee Chair: Anne Bauer, EdD

Anne Bauer, EdD
Use of Picture Response Cards in the General Education Classroom
to Increase Participation of Students with Mild Mental Disabilities

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Author Note
A dissertation presented to the Graduate School of the University of Cincinnati in partial fulfillment of the requirements for the Degree of Doctor of Education 2010
Abstract of Dissertation Presented to the Graduate School of the University of Cincinnati in Partial Fulfillment of the Requirements for the Degree of Doctor of Education

Chair: Anne Bauer
Major: Special Education

The passage of IDEA and No Child Left Behind have highlighted the importance of all students having access to the general curriculum, and to learning in the least restrictive environment. Prior to IDEA and No Child Left Behind, students with intellectual disabilities were often excluded from instruction in the general education classroom, and were provided separate instruction. Research-based strategies are needed to support education of students with intellectual disabilities in the general education classroom. This study used an ABAB design to investigate the effects of using response cards to increase student participation, accuracy and test performance in the general education classroom.

Results of this study suggest that response cards are an effective instructional strategy to increase in on-task behavior, accurate responding, and test scores for students with intellectual disabilities. Results from this study extend earlier research in which authors found that response cards increase the participation of students with intellectual disabilities in the resource setting.

*Keywords: response cards, accurate responding, on-task behavior, instructional strategy, intellectual disabilities*
Dedication page

Thanks to the committee
Anne Bauer, Ed.D., chair
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Todd Haydon, Ph.D.
David Barnett, Ph.D.

Thanks to my family
My husband, Dan
My three children, Catherine, Daniel and Elizabeth
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Andrew Shipp, Lelia Shipp and Alex Wendell,
And all of my in-laws, nieces and nephews
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Use of Picture Response Cards to Increase Student Engagement

Recent legislation (No Child Left Behind) increased the focus on the participation of students with intellectual disabilities in the general education classroom (Arthur-Kelly, Bochner, Center & Mok, 2007). These students struggle in the general education classroom because they do not possess the skills sets to respond to traditional teaching methods. Traditional methods are predominantly observed as teacher presentation with students passively watching and listening, and a few high achieving students responding verbally to teacher questions (Council for Exceptional Children, 2005; Haydon, Conroy, Scott, Sindelar, & Orlando, 2010;). To help students with significant learning needs learn in all academic settings, researchers have recommended looking at classroom practice to assess interventions in which students experience the most participation and success (Arthur-Kelly, et al., 2007).

Since the passage of IDEA, general and special educators and parents have struggled to support students in the least restrictive environment, and to help students engage in content materials in a way that students can understand and demonstrate understanding of age- and grade-appropriate content. Researchers have investigated many strategies with students with intellectual disabilities in the resource room, but few studies have looked at ways for students with limited skill sets to learn and demonstrate learning in the general education setting.

Response Cards Increase Student Participation

One potentially effective strategy for including students with intellectual disabilities in general education classrooms is the use of response cards. Narayan, Heward, and Gardner (1990) introduced response cards as a way to increase students’ active engagement. Response cards are an antecedent intervention that allows increased opportunities for students to actively respond to each teacher question. Examples of response cards include dry erase or white boards for students
to write their responses, pre-printed cards and signs or actual items that students hold up simultaneously to display their answers to questions or problems given by the teacher.

The purpose of this dissertation is to present results of research regarding the use of picture response cards to increase student participation in the general education classroom. This paper will seek to demonstrate a functional relationship between picture response cards and academic engagement and accuracy in responding to teacher questions. Picture response cards will be compared to the more traditional response option of hand raising to respond to teacher questions.

**Response Cards Increase Active Engagement and Learning**

Providing students with multiple opportunities to respond is crucial for students to build knowledge (Haydon, et al., 2010; Stichter, Lewis, Whittaker, Richter, Johnson, & Trussell, 2009). Multiple opportunities to respond allow students to demonstrate higher rates of learning (Haydon, et al., 2010). Teachers in traditional learning environments often ask questions that allow one student to respond and receive feedback on his or her response. In traditional learning environments, higher achieving students most frequently respond to teacher questions, and students with learning disabilities are less likely to engage in learning (Christle & Schuster, 2003). Teachers may use choral responding to increase response opportunities and allow every student to answer the question. While choral responding allows everyone to respond, it is limited because it is difficult to ascertain who specifically made an incorrect response (Haydon, et al., 2010). In addition, students engage in passive repetition rather than actively engaging in higher order thinking and being a part of the learning process.

Response cards are another option teachers use to assess responses and give immediate individual feedback to students for correct and incorrect answers (Narayan, et al., 1990).
Response cards are an evidenced-based practice in classroom management that maximizes academic engagement for students across the academic spectrum (Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008). Response cards have been used in general education and resource settings with students ranging from those identified as gifted and talented to students with intellectual disabilities. Response cards provide additional opportunities to respond and to increase student attentiveness (Narayan, et al.; Randolph, 2007) They also decrease disruptive behavior (Stichter, et al., 2009).


Response cards are consistent with the Universal Design for Learning principles and provide for alternative means of presentation, expression and engagement (Rose & Meyer, 2002). Universal Design for Learning promotes the modification of content materials to meet individual student needs for maximum student participation. These modifications can include using different response formats during instruction. One response modification can be the use of a response card instead of verbally requiring a student to answer a question. Response cards increase students’ ability to demonstrate learning, and they provide teachers with ongoing formative and summative evidence of student engagement and understanding (Berrong, et al,
Running head: USE OF PICTURE RESPONSE CARDS

Response cards allow for a wide variety of presentations, and can be a low cost strategy that is used with a wide variety of curriculum (Christle & Schuster, 2003). Berrong, et al. (2007) demonstrated that response cards are an appropriate assessment accommodation.

Statement of the Problem

Response cards have been used with great success in the general education setting and in resource rooms, but there is no research on the use of response cards with students with intellectual disabilities in the general education classroom (Berrong, et al., 2007; Davis & O’Neill, 2004; Horn, Schuster, & Collins, 2006; Musti-Rao, Kroeger, & Schumacher-Dyke, 2008; Shabani & Carr, 2004). The research that does exist focuses on students with intellectual disabilities using response cards in the resource room (Berrong, et al. 2007; Horn, et al, 2006). These studies focused on activities such as participating in a calendar math group or answering questions about time. No studies focused on students mastering core content subjects such as science and social studies, nor did they focus on learning with typically developing peers.

Significance of the Study

Fifteen studies and one meta-analysis on response cards were reviewed, and data was data was primarily analyzed based on the environments in which the response cards were used. The two environments were general education classrooms and resource rooms. Studies were conducted in preschool, elementary, middle and high school classrooms as well as university classrooms. Data was also analyzed based on the populations of students who used response cards.

Randolph (2007) completed a meta-analysis of the use of response cards and determined the strategy increases participation, on-task behavior and test achievement. The results of the literature review indicated that two studies were conducting with students with intellectual
learning disabilities in the resource setting, but no studies were conducted using response cards with students with intellectual disabilities in the general education setting using core content curriculum.

This study extends the literature by examining the engagement and on-task behaviors of students with intellectual disabilities in the general education setting. Second, it compares the test scores of these students to their test scores when only hand-raising was used to solicit student responses.

**Purpose of the Study**

The purpose of this study was to investigate the following research questions: What are the effects of response cards on the:

1. active student responding and percent of correct responses for students with intellectual disabilities in third and fifth grade general education classrooms?
2. on-task behavior of students with intellectual disabilities in third and fifth grade general education classrooms?
3. percent of correct responses on end-of-unit quizzes for students with intellectual disabilities in third and fifth grade general education classrooms?

**Literature Review**

Narayan, et al. (1990) introduced response cards as a way to increase students’ active engagement in learning. Response cards are an antecedent intervention that allows increased opportunities for students to actively respond to each teacher question by physically engaging in the discussion as they hold up or display their answer to each question asked. Examples of response cards include dry erase or white boards for students to write their responses, pre-printed cards and signs or actual items that students hold up simultaneously to display their answers to
Questions or problems given by the teacher. Historically, every student in the classroom uses the same form of response cards to answer teacher questions, and every student is given the opportunity to respond to each question asked.

**Promoting active engagement, positive behavior, and higher test scores.** Response cards promote students’ active engagement, positive behavior and higher test scores. Response cards allowed students with intellectual learning disabilities to actively participate in instruction (Berrong, et al., 2007), and led to an increase in on-task behavior for students with mild learning disabilities in general education classrooms (Armendariz & Umbreit, 1999; Davis & O’Neill, 2004; Maheady, Michielli-Pendl, Mallette, & Harper; 2002). Students with intellectual disabilities who used response cards in the resource room increased their on-task behavior and spent less time engaged in inappropriate behaviors such as touching others (Berrong, et al., 2007). Response cards also led to an increase in on-task behavior because the intervention provided students with an alternative behavior to off-task behaviors the students had exhibited prior to the response card intervention (Armendariz & Umbreit, 1999).

Overall, response cards increased on-task behaviors in a variety of settings. In a study done with less experienced teachers and materials that varied in difficulty, response cards still caused a decrease in disruptive behaviors (Lambert, Cartledge, Heward, & Lo., 2006). Armendariz and Umbreit (1999) demonstrated that response cards provided an alternate behavior key to eliminating negative behaviors. In another study, Gardner, Heward and Grossi (1994) concluded that some students in the hand raising condition appeared frustrated and stopped raising their hands or attempting to answer teacher questions, while others put their heads down or complained about not getting to respond. These same behaviors were not observed during the response card condition, causing the researchers to surmise that the presence of the response card
intervention decreased students’ negative and acting out behaviors (Gardner, Heward, & Grossi, 1994).

Some researchers found variable success using the response card intervention (Berrong, et al., 2007; Davis & O’Neill, 2004). For example, Berrong, et al. reported that five out of seven students displayed greater rates of on-task behavior during the response card intervention than during the hand raising condition, and Davis and O’Neill found that three out of four students displayed greater rates of on-task behavior during the response card phase. Shabani and Carr (2004) noted no significant difference in quiz scores between the response card intervention and traditional teaching, but did report an increase in student participation using response cards.

In addition to promoting active engagement and positive behaviors, response cards may also increase academic learning as evidenced through test and quiz scores (Christle & Schuster, 2003; Davis & O’Neill, 2004; Gardner, Heward & Grossi, 1994; Kellum, Carr & Dozier, 1996; Malanga & Sweeney, 2007; Marmolejo, Wilder, & Bradley, 2004; Narayan, et al., 1990). Kellum, Carr and Dozier (1996) used quiz scores as the primary dependent measure of success of the response card intervention, and demonstrated an increase in quiz scores using response cards.

Response cards are considered a “best practice” in teaching because they provide for continuous teacher feedback (Cavanaugh, Heward & Donelson, 1996) They can provide teachers with ongoing formative and summative evidence of student engagement and understanding, and are a low cost strategy that can be used with a wide variety of curriculum (Christle & Schuster, 2003; Randolph, 2007). Berrong, et al. (2007) demonstrated that response cards are an appropriate assessment accommodation. Teachers reported that response cards were a beneficial teaching strategy because they allowed the teacher to modify instruction immediately (Gardner, et al., 1994). Musti-Rao, Kroeger, and Schumacher-Dyke (2008) demonstrated that the course
instructor noted large increases in student participation using the response card strategy, and stated that he altered instruction based on the immediate feedback he received using the response card strategy.

**Promoting benefits for all learners.** Response cards have been used in a wide variety of classrooms, from preschool to university classes (Armendariz & Umbreit, 1999; Cavanaugh, Heward, & Donelson, 1996; Clayton & Woodward, 2007; Davis & O’Neill, 2004; Gardner, Heward, & Grossi, 1994; Godfrey, et al., 2003; Kellum, Carr & Dozier, 2001; Lambert, et al., 2006; Malanga & Sweeney, 2007; Marmolejo Wilder, & Bradley, 2004; Musti-Rao, Kroeger, & Schumacher-Dyke, 2008; Narayan, et al., 1990 Shabani & Carr, 2003). While response cards have been used in a wide variety of settings, few studies have looked at how response cards can benefit students with intellectual disabilities.

Special education teachers used response cards with middle school students with intellectual disabilities in a self-contained classroom (Horn, Schuster, & Collins, 2006). They reported higher levels of active responding and on-task behaviors using laminated flip boards of clocks. A few studies looked at students with learning disabilities in a resource room or disruptive behaviors in the general education classroom, but no studies used response cards with students with more significant disabilities in the general education setting (Christle & Schuster, 2003; Narayan, et al., 1990).

In their study, Berrong et al. (2007) used a response card intervention and found it led to an increase in the participation of eight students with intellectual disabilities in a resource classroom during a calendar math activity. This study included an additional variable of a 10-second wait time to allow students to answer questions about seasons, months, date and temperature. Students used pre-printed 3 x 3 inch cards that included only words. They placed
the cards in baskets, and students chose a card from the basket and placed it on a Velcro strip to answer the question. In this study, students also received “chips” for complying with teacher requests, which they could turn in for rewards at the end of the session. This study demonstrated increase active responding and some decreased inappropriate behavior, but did not analyze the accuracy of responses. In addition, they did not consider environment circumstances, such as some students’ need for high rates of praise to comply with requests. See Table 1 for a complete list of studies reviewed, the types of response cards used in the study, study outcomes and recommendations for future research.


The effectiveness of response cards as an intervention is promising to improving student responses during classroom instruction (Armendariz & Umbreit, 1999; Gardner, Heward & Grossi, 1994; Godfrey, et al., 2003; Narayan, et al., 1990). Randolph (2007) reported in his meta-analysis that response cards led to higher rates of student responses and increased learning, as well as decreasing levels of off-task behavior. Randolph also reported that response cards lead to
better results than hand raising. The use of white boards improved overall student participation and accuracy for students identified with mild learning disabilities, but not all students are able to respond in writing or to respond within a specific time limit. Given this, some researchers working with students with intellectual disabilities have recommended considering additional factors when planning interventions. These factors include providing modifications for differing communication needs (Arthur-Kelly, et al., 2007). Additional cognitive processing time, or wait time, has also increased student accuracy (Rowe, 1987).

Response cards can increase the participation of students who need alternate response modes (Godfrey, et al. 2003; Horn, Schuster, & Collins, 2006). Godfrey, et al. noted that response cards provide students who are non-verbal with an alternate way to respond. Response cards allow for a wide variety of response options, from writing responses to using an eye gaze to respond. Other factors that should be considered include altering the amount of times response cards should be used during instruction (Clayton & Woodward, 2007), reviewing the level of difficulty of academic content (Lambert, et al., 2006), and taking into account that students who have documented troubles with reading and writing might find the white board response card strategy to be aversive (Davis & O’Neill, 2004).

Randolph’s (2007) meta-analysis of eighteen response card studies suggested that response cards led to higher rates of student responses and increased learning, as well as decreasing levels of off-task behavior. While response cards lead to better results than hand raising, Randolph’s conclusions were less definite regarding the use of write-on cards versus preprinted cards. He did, however, find that both forms of response cards had positive effect on test achievement, quiz achievement, and reduction in off-task behavior. In addition, Randolph suggests that response cards increase the level of participation for minimal cost.
Response cards can increase students’ on-task behaviors, accuracy and participation in class. Based on Berrong et al.’s (2007) findings, students with intellectual disabilities can participate in instruction and respond to teacher questions, but Berrong et al.’s findings were limited to the resource setting during calendar time. Berrong et al. recommended research be conducted in different academic venues to examine the effects of response cards on the accuracy and participation of students with intellectual disabilities in the general education setting. Berrong et al. noted that their research did not analyze the effects of response cards on on-task and inappropriate behavior or academic achievement.

Method

Using an ABAB design, this study examined the following questions:

1. What are the effects of response cards on the active student responding and percent of accurate responses for students with intellectual disabilities in third and fifth grade general education classrooms?

2. What are the effects of response cards on the on-task behavior of students with intellectual disabilities in third and fifth grade general education classrooms?

3. What are the effects of response cards on the percent of correct responses on end-of-unit quizzes for students with intellectual disabilities in general education classrooms?

Participants

The participants were seven students (4 males, 3 females) between the ages of 9 and 12 who were in the third and fifth grades. Students qualified for special education services and were identified as meeting state standards for the category Mild Intellectual Disabilities. All student participants were also identified as meeting state standards for a Speech Language Disability. All
seven students received testing accommodations that included a reader, scribe, paraphrasing, prompting and cueing, use of manipulatives and a calculator across all academic settings. Each student received their primary language arts and math instruction in the resource setting using intervention curriculum, with 120-180 minutes of pull-out instruction with a special education teacher each day. Other student selection criteria included the inclusion in general education during core content classes (science and social studies), and the ability to use response cards and their inclusion in the general education classroom during core content instruction without special education staffing support. Teacher selection criteria included the willingness of the general education teacher to participate in the study and modify her teaching practices to include the use of intervention strategies in her instructional practices.

**Student participants.** Participants in this study include seven Caucasian students. English was the first language for all seven students. Students were selected partly based on their grade’s participation in the annual state assessment test, as students in those grades had more background data available, and curriculum in those grades had been recently modified and reviewed for content difficulty. The grades included in state testing in the school where the primary researcher had permission to test were grades three through five. In a review of student data, the closest matches to the selection criteria of MAP percentile rank were students in the third and fifth grades. Of the students who agreed to participate in the study, five students were in the third grade and two were in the fifth grade. None of the students participated in the state’s free and reduced lunch program. All students receive speech therapy two times a week for a total of 60 minutes, with goals that focused on vocabulary and comprehension of core content concepts. To accomplish these goals, the speech therapist used picture supports and therapist-generated PowerPoint presentations that connected core concepts with picture symbols and real
photographs when possible. In addition, the speech therapist’s reports indicate that each student needs picture cues to demonstrate comprehension.

All five students participated in Northwest Evaluation Association’s (NWEA) Measures of Annual Progress (MAP) for Primary Grades. The district administered this norm-referenced test to all students three times a year. Students received no accommodations during the language arts part of the test, and received a reader only during the math portion of the test. Results demonstrated that all seven students were in the first percentile in reading comprehension and language usage.

Prior to the beginning of this study, students demonstrated the ability to master content when it was paired with picture supports in the resource classroom and general education classroom. They demonstrated mastery of content using classroom intervention text books and teacher-generated questions that required the student to point to the correct picture to answer the question. Intervention text that was used with students was Voyager Expanded Learning Curriculum level Passport C (second grade curriculum).

Students all participated in a daily 30-minute reading intervention program in the resource setting (not the setting for this study) in which they read a story and then answered questions based on a series of picture choices. All students struggled to find answers in paragraphs that if those questions were not paired with picture supports. With picture choices, the students were able to answer questions with 80-100% accuracy. When teachers removed picture supports and students were required to answer questions with only text, they answered with 0-40% accuracy.

Table 1

Student Participant Data
<table>
<thead>
<tr>
<th>Student (pseudonyms)</th>
<th>Grade, sex, age</th>
<th>State Disability category</th>
<th>Secondary Diagnosis</th>
<th>Reading wpm</th>
<th>Reading comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destiny (twin A)</td>
<td>3rd, female 9.7</td>
<td>Mild Mental Disability</td>
<td>ADHD, attention type</td>
<td>25 wpm</td>
<td>1.0</td>
</tr>
<tr>
<td>Ramona (twin B)</td>
<td>3rd, female 9.7</td>
<td>Mild Mental Disability</td>
<td>ADHD, attention type</td>
<td>18 wpm</td>
<td>1.0</td>
</tr>
<tr>
<td>Camden</td>
<td>3rd, male 8.11</td>
<td>Mild Mental Disability</td>
<td></td>
<td>11 wpm</td>
<td>1.0</td>
</tr>
<tr>
<td>Brady</td>
<td>3rd, male 8.9</td>
<td>Mild Mental Disability</td>
<td>Congenital hydrocephalus and two shunts</td>
<td>29 wpm</td>
<td>2.0</td>
</tr>
<tr>
<td>Danny</td>
<td>3rd, male 9.4</td>
<td>Mild Mental Disability</td>
<td>ADHD, attention type</td>
<td>43 wpm</td>
<td>2.5</td>
</tr>
<tr>
<td>Denise</td>
<td>5th, female 11.5</td>
<td>Mild Mental Disability</td>
<td>Fetal Valproate Syndrome, bilateral hearing aids</td>
<td>82 wpm</td>
<td>3.5</td>
</tr>
<tr>
<td>Eddie</td>
<td>5th, male 11.8</td>
<td>Mild Mental Disability</td>
<td>Reactive Attachment Disorder, needed behavioral supports (point system chart for each class period) to stay on task</td>
<td>24 wpm</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Note: Reading level for comprehension based on Read Naturally materials (80% accuracy rate).

**Individual learning characteristics.** Three of the five third grade students repeated one year of primary. Destiny and Ramona (note: all student and teacher names used in this study are pseudonyms) repeated kindergarten and Danny repeated first grade. Teachers noted in their reasoning for retaining the students both delays in academic performance and socially-
appropriate classroom behaviors. The classroom teacher reported that all five students in the third grade had issues with attention. Destiny, Ramona and Danny took medication for their attention issues. Destiny and Ramona took Concerta 36 mg each morning and Danny took Daytrana (a 20 mg patch put on each morning).

In interviews conducted with the general education teachers prior to the researchers taking baseline data, the teachers reported that they are the students’ parents had reported challenges with the students being able to start or sustain an age-appropriate conversation with peers or adults. Destiny and Ramona used socially inappropriate language (talking in “baby talk”) and would talk only about puppies and trucks. Ramona had punched a student early in the year because she reported that he made fun of the way she talked. Danny, Brady, and Eddie talked solely about cars and trucks, and did not generalize their conversation to topics of interest to their peers. Camden spoke to adults when prompted by another known adult, and rarely engaged in conversations with peers.

Camden’s educational history included spending his first four years of schooling in a resource room for students with profound disabilities. He attended specials each day in the general education classroom with a paraeducator, and spent the rest of his day in the resource room. He did not complete work (writing, carrying his books, picking up a paper or pencil) without a prompt from an adult. Last year, he began a transition to a resource room for students with intellectual learning disabilities, which included being in two intervention groups without paraeducator support. This was his first year completely unassisted by paraeducator support throughout his day.

The fifth grade students also experienced challenges in the socialization. Denise carried on a conversation about her interests (the latest Disney movie or something she had done over...
Running head: USE OF PICTURE RESPONSE CARDS

the weekend), but would repeat information so many times that students avoided her. Eddie engaged in conversation that a peer or adult initiated, but often would stop the conversation to tell the other person they were wrong, or that they had made him mad with something they had said. Due to their limited conversational skills, the general education teachers reported that they avoided calling on these students in class.

Eddie was adopted as a five year old (he and a sibling were removed from their birth home and placed with his adoptive family). His adoptive mother had homeschooled five biological children to graduation, and was attempting to home school Eddie and his brother. She reported that she was enrolling him in school because she was not able to handle his erratic behavior which included attempting to hit her and the other children, limited work production and significant delays in reading, writing and math. Initial testing last year indicated he was behind in all academic domains, and most of the year was spent attempting to moderate Eddie’s behaviors and work habits so he could learn and complete work. He had more than 10 office referrals for incomplete work and dangerous behaviors such as flipping over desks and destroying teacher property. He had two office referrals this academic year, both for refusal to work. He had a behavior plan that included earning points for on-task behaviors and completing work in each part of his day. He earned rewards for getting a certain level of points, and was earning rewards 3 out of 5 days each week. This plan remained in place throughout the course of the study.

Teachers. Two teachers and one student teacher participated in the study, a classroom teacher and student teacher in the third grade and a classroom teacher in the fifth grade. Both classroom teachers had their Master’s degrees, and the student teacher was completing her Bachelor’s degree. Mrs. Motz, the third grade teacher, had ten years of teaching experience, nine
of those in the third grade. She worked with students identified with Specific Learning Disabilities for eight years. This was her first year working with students identified with intellectual disabilities, and her class this year was comprised of 23 students total, five of whom had intellectual disabilities. Mrs. Smant, the third grade student teacher, had no prior experience teaching or working with students with exceptional learning needs. She had been in the classroom three weeks prior to the beginning of this study, and had spent six weeks in a first grade classroom in the same school. Her teaching experience in that classroom included working with students with specific learning disabilities, but her contact with these students was minimal, as students spent most time in the resource setting participating in interventions.

Mrs. Peact, the fifth grade teacher, had 14 years of teaching experience, and taught fourth or fifth grade all 14 years. She collaborated frequently with students with intense intellectual disabilities, but never with students with Mild Intellectual Disabilities. This year, her classroom had 28 students, two of whom had intellectual disabilities. She helped modify the fifth grade curriculum to meet state academic standards.

Both teachers had collaborated with special education teachers and provided accommodations and modifications to curriculum with students with disabilities. Both teachers expressed reservations as to what they should expect from students with mild mental disabilities, and both looked at their inclusion as mostly a social skills experience. All three teachers stated that they were unsure of how much content students with mild mental disabilities could be expected to understand or master.

Setting

The researcher conducted the study in a third and a fifth grade general education classroom during core content instruction at a large rural elementary school in the mid-western
United States with a population of 700. Students at this school came primarily from large subdivisions and a few larger farms. In this school, there were four third grade classrooms and four fifth grade classrooms, with one classroom in each grade designated as the classroom for students meeting the state category for Mild Mental Disabilities. The principal established collaborative partnerships with the general and special education teachers, and placed students in collaborative classrooms based on their special education supporting teacher. For this study, teacher agreed to use response cards for all students in their classrooms during the intervention phases, so all students were given response cards with which to respond to teacher questions during that phase.

Content for the study matched the subjects in which the students would be tested in statewide accountability assessments, and this content was taught in the general education classroom. In third grade, the students were included in the general education classroom for science and social studies instruction, and in fifth grade, and the students were included for social studies instruction.

**Materials**

District staff developers created the content curriculum for both grades in collaboration with classroom teachers from the district. The staff developers used Kentucky core content as the foundation for the content curriculum. Grade level teachers and staff developers designed the materials over the summer, and then revised them throughout the year during grade level common planning meetings.

Materials were created based on state recommendations for levels of difficulty (based on Bloom’s taxonomy), and on stated core content standards. Questions matched the first three levels of Bloom’s taxonomy, and question words were chosen from the knowledge,
comprehension, and application sections of Bloom’s. Prior to each lesson in baseline and intervention phases, the researcher and classroom teacher reviewed the daily lesson and chose ten questions for students to answer based on the daily content. The teacher asked all questions at the end of the daily lesson, and questions focused on the content taught throughout that unit of instruction. Questions were asked to all students, and all students had the needed materials to respond, depending on the condition and materials needed. For example, in the intervention condition, each student in the general education classroom had their own set of content response cards, and every student used those cards to respond to the teacher questions.

Most response card sets were created by the primary researcher. The classroom teacher and staff developer provided the primary researcher with key vocabulary for the unit, and the researcher used a combination of clip art from www.google.com, Microsoft Office clip art and www.pppst.com. She would provide a draft set to the classroom teacher, who would give suggestions for edits. In the third grade, the classroom teacher had some of the response card unit pictures already created (it was made for other activities, but was the right size and type to be used as response cards). In the third grade, the teacher had a parent volunteer who copied, cut and placed the response cards in individual baggies for each student. In the fifth grade, the classroom teacher and primary researcher shared responsibility for copying, cutting out and placing the response cards in individual baggies for each student. The classroom teachers passed out the baggies at the beginning of each unit, and students were responsible for keeping the cards together in their baggy (most students placed them in their pencil box or folder). The teacher had a few extra sets she could distribute for students who lost their original set. None of the students in the study lost or misplaced their sets of response cards.

Measures
The researcher measured four dependent variables for each student: (a) active student responding, (b) accuracy of those responses, (c) on-task behavior in class and (d) number of correct responses on end-of-unit tests.

**Active student responding.** The literature defined active student responding as the frequency with which a student attempted to respond to teacher questions (Lambert, et al. 2006; Randolph, 2007). The researcher counted a response opportunity each time a student raised his or her hand or showed his or her response cards in each session. During baseline, each time the student raised his or her hand in response to a teacher question, the researcher recorded an active student response. In the response card condition, each time the student raised his or her response card to in response to a teacher question, the researcher recorded an active student response.

**Accuracy of student response.** The literature defined an accurate response as the students’ correct responding to the teacher question (Lambert, et al. 2006; Randolph, 2007). During baseline, each time a student attempted to answer by raising their hand, they received credit for a response attempt. If the teacher called on the student and they gave the correct response, they were given credit for an accurate response. During the intervention phase, the answer was counted incorrect if a student looked at other students’ cards to get his or her response, or if he or she changed his answer after looking at other students’ cards.

**On-task behavior in class.** The literature defines on-task behavior as using materials for the purpose they were intended and following teacher directions or showing attention to the lesson (sitting up straight, eyes on the teacher, hands in lap, etc) (Berrong et al., 2007; Godfrey, et al., 2003). During baseline, on-task behavior included the student keeping their eyes on the teacher, sitting up straight, and raising a hand to respond to teacher questions. During
intervention, on-task behavior included keeping their eyes on their response cards or the teacher, choosing a card and raising response cards to respond to teacher questions.

Off-task or inappropriate behavior included using classroom materials for a purpose other than what it is intended, ie. coloring pictures, hitting a peer with their response cards, etc., answering in the non-requested format (ie. raising their hand when they should have held up a card), or engaging in a task other than the one assigned by the teacher (ie. staring out the window, playing with shirt, getting out of seat). The researcher used the classroom clock and observed students in a set pattern every 30 seconds, took data in each session, and counted each incident as a separate event, so if a student colored pictures, then hit a peer, it was counted as two incidents of inappropriate behavior in that session.

**Number of correct responses on tests.** The classroom teacher gave end-of-unit tests as both pre- and post-tests. The same test was given prior to the beginning of the unit and at the end of the unit to ascertain if students were able to answer more questions correct at the end of the unit, and also to see how much content knowledge students had prior to the beginning of teaching, so they could revise lessons based on students’ current depth of knowledge. The teacher counted the number of correct responses on multiple choice items, and scored open response items based on test rubrics, then gave a percentage of combined correct responses as the total grade for that test. Test questions were created by the district curriculum experts based on the unit of instruction and Kentucky Core Content 4.1 (Kentucky Department of Education, 2008), and students received their individualized accommodations on the assessment, (i.e. a reader, scribe, paraphrased directions, etc.).

**Dependent variable.** The dependent variable was each student’s variable rate of responses to questions. The modes of questioning included asking questions and having students
raise a hand or a pre-made card with pictures based on the vocabulary of the unit. In baseline, the dependent variable was the number of times the students raised their hand in response to teacher questions. The teacher asked students question as a group, and she called on individual students to respond. The teacher explained the procedure to the students on the first day of instruction in this way: “Throughout each lesson, I am going to ask you some questions, and you are going to answer by raising your hand after I’ve asked the question. I will call on one student to answer, and then give you feedback on your answer.”

In the intervention condition, the dependent variable was the number of times the student raised his or her response card(s) to respond to teacher questions. The teacher implemented the response card strategy by using the following steps. First, she passed out the response cards to all the students and asked them to place the cards neatly on their desk so they could see all the pictures. Next, she explained that the purpose of the cards was for students to use them to respond to questions instead of answering with words. She explained it to the students in this way: “I am going to ask you some questions, and you are going to answer using one or more of the vocabulary cards in front of you. When I ask the question, I want you to choose a card and hide your answer. When I give the word, I want you to hold up your answering card or cards so that I can see your answer.”

During each phase, to control the opportunities to respond, the teacher used error correction provided feedback to student answers. After he asked a question, she provided the correct response with either, “yes the answer is…” or “no, the answer is…” rather than allowing other students additional opportunities to respond. Using this feedback maintained a consistent number of opportunities to respond across all conditions.
Treatment fidelity. The researcher completed adherence checks using researcher direct observation (see Appendix 1) to maintain fidelity of treatment. Adherence checks included checking to make sure all materials were available to students. The researcher also measured other variables based on the following teacher behaviors: (a) having response cards distributed, (b) presenting each question, (c) waiting for the appropriate delay for students to respond, and (d) presenting appropriate feedback. The researcher trained a data collector to take this reliability data, and two data collectors took concurrent data on 1/3 of all sessions. This data collector was a special education teacher who was working on her Master’s in Education from another university. She completed part of the CITI ethics program for her other university, and also completed the University of Cincinnati’s requirements for the CITI ethics training program. In addition, she had experience collecting data. Data collection included the primary researcher taking data during instruction, and the other data collector watching videotaped classroom sessions and recording data based on the video.

Fidelity measures included accuracy of recorded student responses, number of questions asked, and adherence to the questions. It included student use of the appropriate intervention strategy during each phase of the study. The teacher provided the correct response if incorrect answers were given. The teachers completed an adapted version of the Teacher Post-Intervention Acceptability and Importance of Effects Survey (Lane & Beebe-Frankenberger, 2004). This survey included questions about the fidelity of the treatment and the teacher’s perceptions of value of the intervention.

Controls for threats to internal validity. The researcher put several procedures in place to control for threats to internal validity, including a review of academic content by other third grade teachers to check materials for a consistent level of academic difficulty. Staff developers
created a curriculum with a similar level of difficulty across the units used in the study. Staff developers chose topics the state deemed appropriate for students at that age to master, and the daily lessons were developed so they would have a similar amount of content that was considered to be comparable in difficulty for the students. By altering the conditions and leveling the content difficulty, it diminished the chance that students did better in one phase or the other due to easy or difficulty content, or that data is just demonstrating regression to the mean. By repeating each phase twice, it gave a more accurate picture as to how students and teachers performed in each phase.

Conditions were alternated in the following order: (a) baseline (traditional hand raising), (b) picture response cards (a) baseline, (b) picture response cards.

*Inter-observer Agreement*

Two data collectors independently recorded the accuracy and engagement of students during one-third of all sessions to obtain inter-observer agreement. The researcher calculated inter-observer agreement for all dependent variables using an occurrence/nonoccurrence formula (Kennedy, 2005). Inter-observer agreement was taken during 32.4% of sessions across all phases for third and fifth grades is this what you mean. Specifically, inter-observer agreement was taken during 31.3% of baseline sessions and 36.7% of intervention sessions in the third grade and 20% of baseline and 41.7% of intervention sessions in fifth grade. Inter-observer agreement during fifth grade baseline and intervention conditions was 100% for both active student responding and accurate student responses. Inter-observer agreement during third grade baseline conditions was 100% for both active and accurate student responses. Inter-observer agreement during third grade intervention condition was 100% for active student responses and 94.1% for accurate student responses (range = 80.0-100.0%)
Observers recorded data on a data sheet created by the primary researcher, and the primary researcher conducted trials using the data sheets to ensure agreement between the observers prior to the start of the study. The researcher collected data on the four student dependent variables across all conditions: (a) active responding, (b) accuracy of those responses, and (c) appropriate behavior. The researcher calculated accurate responses and appropriate behavior using the occurrence/non-occurrence formula. An agreement was scored when two observers recorded the same number of behavioral events during each interval of observation (Kennedy, 2005). Inter-observer agreement was 100% in fifth grade for recorded behavioral events, and 90% for behavioral events in third grade (range of 75-100%). Prior to starting data collection, the primary and secondary observer completed two observations and reviewed data to ensure both data collectors understood the operational definitions of the dependent variables and what those variables looked like in the classroom. Due to the number of student observations, on-task behavior was recorded as distinct events, with anecdotal notes taken by both the primary researcher and inter-observer agreement as to the amount of time spent off-task.

The researcher collected reliability data for the teacher behaviors in each lesson (see Appendix 1). The classroom teacher behaviors included: (a) having materials distributed (response cards), (b) presenting each question, (c) waiting for students to respond, and (d) presenting appropriate feedback. Interobserver agreement was 100% on all teacher behaviors in both third and fifth grade. In every lesson, the teacher performed all expected behaviors, including having materials distributed, presenting each question in the proper format, waiting for students to respond using the appropriate condition, and presenting appropriate feedback (ie. saying “that is correct” for right answers and providing the correct answer when students answered incorrectly).
**Social validity.** The teachers completed an adapted version of the Teacher Post-Intervention Acceptability and Importance of Effects Survey (Lane & Beebe-Frankenberger, 2004) (see Appendix 2). In addition to the survey, informal data was taken throughout the study by the primary researcher based on comments from both student participants and teachers as to which condition(s) they preferred and why (Horner, Carr, McGee, Odom, & Wolery, 2005). Questions focused on whether or not the intervention had value and was easily replicable in general education classrooms (Horner, et al., 2005). To demonstrate external validity across the participants and conditions, this research used clearly defined operational descriptions of the participants, study context, factors influencing participants’ behavior prior to the intervention, study procedures, and independent and dependent variables to see that external validity (Horner, et al., 2005).

**Data collection**

The researcher collected data during specific classroom sessions, which lasted 30 minutes and consisted of instructional content created by the district curriculum experts based on state curriculum standards. The grade level teaching team and district staff developers revised the curriculum to meet state standards for mastery of grade level content. The teacher’s instruction included 10 questions for students to answer according to the study condition (baseline or intervention). The teacher delivered instruction as she circulated around the room, with students sitting at desks arranged in groups facing the front of the room. The researcher took data using a data collection tool developed by the researcher to record the dependent variables in each session (see Appendix 1).

**Recording methods.** A video camera was used to record the 30 minute session to facilitate inter observer agreement. The researcher used a video camera in the classroom prior to
the start of the study to avoid any effects it might have on student performance. During data collection, the researcher circulated around the room to observe student and teacher behaviors.

**Training.** Both classroom teachers and the student teacher were trained in the intervention strategy (the use of picture response cards) prior to the beginning of the study. The researcher trained the data collector in the intervention strategy prior to the beginning of the study, and reviewed pre-recorded data with the primary investigator to ensure fidelity.

**Experimental Design and Conditions**

The effectiveness of response cards to increase the rates of active engagement, accurate responses and appropriate behavior was investigated using an ABAB design (Kennedy, 2005). Data was collected on all seven students on the dependent variables: (a) active responding, (b) accuracy of responses, (c) number of correct responses on post-tests compared to pre-tests and (d) on-task behavior.

During baseline condition, the teacher asked questions and students raised a hand to respond. In the picture response card condition, students held up pre-printed cards with pictures to answer teacher questions. For the third grade class, pre-printed cards had pictures and no text. In the fifth grade, pre-printed cards had the key vocabulary word or term in addition to the picture. Data was taken on both the number of times the student had an active student response, and whether or not the response was correct (for example, student A raised her hand but was not called on – see Appendix 1). Data was taken on the student’s off-task behavior during the session.

In addition to the dependent variables measured to track student progress, several variables were measured to chart teacher responses to the intervention. These variables included the following teacher behaviors: (a) having materials distributed (response cards), (b) presenting
each question, (c) waiting for the appropriate delay for students to respond, and (d) presenting appropriate feedback.

**Pre-experimental condition.** Teachers and students had used response cards prior to the beginning of the study. Both classroom teachers attended a professional development training on the use of response cards the prior academic year, and students used response cards during math instruction. In addition, the students in this study had used response cards during reading interventions in the resource room. All students were familiar with the concept of raising their hands to answer questions. In interviews with the teachers and students, both students in fifth grade had raised their hands to attempt to answer questions prior to the beginning of the study. Three out of the five third grade students, Danny, Camden and Destiny, said that they had never raised their hand to answer teacher questions prior to the beginning of the study. They were unable to express a reason as to why they didn’t raise their hands. The core content materials used in instruction were materials the students in the study had not been exposed to in an academic setting in the past, as they had been pulled out of core content instruction in younger grades to participate in reading interventions.

**Baseline.** The teacher provided guided instruction of district core content curriculum (third grade science and social studies and fifth grade social studies) in baseline condition. The teacher asked questions throughout her instruction, looked immediately for hands raised and called on a student who had his or her hand raised. The teacher explained the procedure in this way: “Throughout today’s lesson, I am going to ask you some questions, and you are going to answer by raising your hand after I’ve asked the question. I will call on one student to answer, and then give you feedback on your answer.” Data were collected on the number of times the
participating students attempted to answer a question, as well as their accuracy in answering if they are called on. Data were taken during the entire classroom instruction session.

**Intervention.** During intervention, the teacher gave each student ten and 20 vocabulary cards with a core content vocabulary picture associated with the key vocabulary word. The teacher provided instruction using district-created core content materials. The picture response cards were each approximately three-inch squares with a picture in the center of each card. These cards were created by the general education or primary researcher using Microsoft Office or Google clipart or clipart from www.pppst.com, or were part of the curriculum used by the district (for example, the community helpers response cards were part of a matching game already designed for the unit of instruction – these cards were used for response cards, and at the end of the unit as a test review, the students used them to categorize the types of community helpers).

Pictures on the response cards were either drawings or copies of paintings or historical archives. For example, in one third grade unit on community helpers, the students had 20 pictures of community helpers (police men, teachers, garbage workers, mail carriers, etc). In a fifth grade unit on the causes of the Revolutionary War, students were given 20 cards with pictures representing the Stamp Act, Patriots, Boston Massacre, taxation, Loyalists, etc. These cards included images of the actual stamp used for the Stamp Act, and paintings reproduced in local newspapers of the Boston Massacre, or historical paintings of Loyalists.

The teacher instructed students at the beginning of the session, “I am going to ask you some questions, and you are going to answer using one or more of the picture cards in front of you. When I ask the question, I want you to choose a card and hide your answer. When I give the word, I want you to hold up your answering card or cards and show me your answers.” The
researcher collected data on the number of questions the participating students attempted to answer, as well as their accuracy in answering.

**Withdrawal of intervention.** During the withdrawal condition, the teacher implemented her usual method of teaching. She provided instruction of district core content curriculum (third grade science and social studies and fifth grade social studies). In this condition, the teacher asked questions, looked immediately for hands raised and called on a student who has his or her hand up. The researcher collected data the entire classroom session on the number of times the participating students attempted to answer a question, as well as their accuracy in answering.

**Return to intervention.** The teacher gave each student 10 and 20 vocabulary cards with a core content vocabulary picture associated with the key vocabulary word. The teacher provided instruction of a unit of district-created core content instruction. The teacher instructed students at the beginning of the session, “I am going to ask you some questions, and you are going to answer using one or more of the picture cards in front of you. When I ask the question, I want you to choose a card and hide your answer. When I give the word, I want you to hold up your answering card or cards and show me your answers.” Data was collected on the number of questions the participating students attempted to answer, as well as their accuracy in answering.

**Data Analysis**

The researcher used a systematic visual comparison of data points within and across conditions and participants in the study (Horner, et al., 2005). Baseline and intervention data were analyzed using visual analysis that looked at trend, stability and variability. Data were displayed based on each participant’s individual results in baseline and in the response card intervention (Kennedy, 2005).
Data analysis included each of the dependent variables: (a) active responding, (b) accuracy of those responses, (c) inappropriate behavior and (d) number of correct responses on end-of-unit tests. Visual analysis included interpretation of the level, trend and variability of performance across baseline and intervention conditions (Horner, et al., 2005).

Results

The purpose of this study was to examine the effects of response cards on the active student responding and on-task behavior of seven students with intellectual disabilities in third and fifth grade general education classrooms. This study also examined the effects of response cards on the percent of correct responses on end of unit quizzes for these same students.

The researcher collected observation data using an ABAB design to determine the effects of the use of response cards on students’ active participation and accuracy in the general education classrooms. The primary researcher recorded data on data sheets she created, and displayed the data in Excel graphs for visual analysis (see Figures 1-2). The researcher collected treatment adherence data to corroborate the implementation of the study’s procedures, including the number of questions asked, the distribution of materials, and the correct use of the response protocol. The researcher also collected social validity data through surveys and follow up interviews to assess the teachers’ perceptions on the social significance, acceptability and importance of the response card intervention.

Intervention Results

A summary of student responses and on-task behavior during treatment is presented for each participant in grades three and five (tables 2-3). Data include a summary of mean percent and range of active student response attempts and accurate student response attempts. Graphic displays were used to organize and analyze data by providing detailed information for
comparison of the response and accuracy rate of students in the two conditions. Comparison was made within and across participant data displays. Visual analysis was used to evaluate changes in trend, level and variability, and results for the seven participants are summarized (figures 1-2) (Kennedy, 2005). Trend lines were determined by using a split-middle trend estimation line for lines with seven or more data points (Kennedy, 2005). Trend lines were used in analysis of the first baseline and first intervention condition for third grade. Visual analysis was used for lines with six or less data points (Kennedy, 2005). Visual analysis was used for analysis of the second withdrawal and return to intervention conditions in third grade and all condition in fifth grade.

Visual analysis and split middle trend estimation line analysis allowed for inspection of the overall response rate of students in both grades as well as a comparison of each student’s behavior during treatment. The degree of data paths (very slight, slight, moderate, large and very large) of difference, trend, and variability were analyzed and determined.

Results for the seven participants are summarized (see Tables 1-5). The results from the study indicate that the use of response cards produced the highest levels of active student responses as well as the highest rates of on-task behavior. Results on the effects of response cards on end-of-unit tests was less clear, but still showed a slight increase in percent correct on tests during the response card phase.

**Active student response attempts**

Active student responses were measured using a frequency count (Kennedy, 2005). The literature on response cards defined active student responding as the frequency with which a student attempted to respond to teacher questions (Randolph, 2007, Lambert, et al. 2006). In baseline, each time the student raised his or her hand in response to a teacher question, the researcher recorded an active student response. In the response card condition, each time the
student raised his or her response card to in response to a teacher question; the researcher recorded an active student response. Results for active student responses among the six participants are presented (Figure 1).

Analysis of the results demonstrated that all students attempted to respond more during both intervention phases (see Figure 1 and Table 2). All seven students attempted to answer 100% of the questions asked during the response card phase. In baseline condition, most students made no attempts to respond. Most students in third grade did not make any attempts to respond during baseline condition. Two students in third grade attempted to respond to one question. Brady made the most response attempts in third grade during baseline. He attempted to respond to two questions in the baseline conditions. The students in the fifth grade both attempted to respond to questions in the baseline condition, but neither student attempted to answer more than 50% of the questions asked in baseline condition.

**Third grade.** All students attempted to respond to 100% of questions in the intervention phases. At one end of the response spectrum, Camden and Danny did not attempt to respond to any questions. In baseline, Destiny and Ramona did not attempt to respond in the initial baseline phase, but did attempt one response in the withdrawal phase, and Brady attempted to respond to in both baseline conditions. There was a large amount of variability in the data points during the baseline conditions, with some students attempting zero responses and some students attempting multiple responses. (save the trend analysis for the end of the paragraph along with a discussion of non overlapping data points)

**Participant 1: Destiny.** Destiny attempted to respond zero times during baseline. During intervention, she had 100% response attempts. She attempted to respond one time during the withdrawal phase, and had 100% response attempts during the reintroduction of the intervention.
The mean rate of active student responses for Destiny during hand raising was 0% in the first phase, and 2.5% in the second hand raising phase (range 0-1). The mean rate of active student responding during response cards was 100% in both intervention phases (range 10-10).

The magnitude of difference between baseline and the intervention was large. During baseline, the data was stable, with no variability. During intervention, the data showed no variability. During withdrawal, the data showed a downward trend, and during the reintroduction of the intervention, the data showed no variability, with a 100% response rate.

**Participant 2: Ramona.** Ramona attempted to respond zero times during baseline. Ramona’s mean response rate was 100% during intervention (range 10-10). Ramona attempted to respond 2.5% of the time during the withdrawal phase (range 0-1), and responded 100% of the time during the reintroduction of the intervention.

The magnitude of difference between baseline and the intervention for Ramona was large. During baseline, the data was stable, with no variability. During intervention, the data showed no variability. In the withdrawal phase, the data showed a downward trend, and in the reintroduction of the intervention, the data showed no variability, with a 100% response rate.

**Participants 3 and 4: Camden and Danny.** Camden and Danny did not attempt to respond to any questions during baseline, and then responded to 100% of the questions asked during intervention. Neither Camden nor Danny attempted to respond to any questions in the withdrawal phase, and again responded 100% of the time in the reintroduction of the intervention.
The magnitude of difference between baseline and the intervention phase for Camden and Danny was very large. During the baseline conditions, the data was stable, with no variability. In the intervention conditions, the data showed no variability, with a 100% response rate.

**Participant 5: Brady.** Brady had the highest rate of attempted response rates in the third grade during baseline. He attempted to respond five percent of the time during the initial baseline phase (range 0-2), and then responded to 100% of the questions asked during intervention. Brady attempted to respond 2.5% of the time in the withdrawal phase (range 0-1), and again responded 100% of the time in the reintroduction of the intervention.

The magnitude of difference between the baseline and intervention phases for Brady was large. During intervention, there was a slight upward trend, with two overlapping data points in the third and fourth sessions. The last three data points were stable at zero. During intervention, the data was stable at 100%. During the withdrawal phase, the data had three data points at zero, including the last data point, and in the reintroduction of the intervention, the data showed no variability, with a 100% response rate.

**Fifth grade.** Denise and Eddie both attempted to respond to questions in baseline, with Denise attempting to respond to more questions in baseline than Eddie. Denise and Eddie both attempted to respond to every question in the intervention phases.

**Participant 6: Denise.** Denise had the highest rate of attempted responses in both grades. Her mean response rate was 47% (range 4-5) during baseline, with the highest amount of attempts being five answer attempts out of the ten questions answered in one session. She attempted to answer 100% of the time in the intervention phase. Denise’s mean rate of active responses was 20% (range 1-3) in the withdrawal phase. Denise attempted to answer 100% of the time in the reintroduction of the intervention phase.
The magnitude of difference between the baseline and intervention phases for Denise was large. During baseline, the data showed an upward trend, with the last two data points at 50%. In intervention, the data a slight upward trend ending at 30%. In the reintroduction of the intervention, the data showed no variability, with a 100% response rate.

**Participant 7: Eddie.** Eddie’s mean rate of active responses was 17% during baseline (range 0-4). He attempted to answer the most questions (four attempts) in the first session of baseline, then his response rate dropped to zero and rose to one attempt in the last session in baseline. His mean rate of active responses in intervention was 100% across all sessions of intervention. He did not attempt to respond in withdrawal phase, with a mean response rate of zero. Eddie responded to 100% of questions in the reintroduction of the intervention phase.

Figure 1. Percent of active engagement and accuracy
Percent of Active Engagement and Accuracy

Ramona

Camden
Table 2

Mean percent and range of active student response attempts

<table>
<thead>
<tr>
<th>Student</th>
<th>Hand raising</th>
<th>Response cards</th>
<th>Hand raising</th>
<th>Response cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destiny</td>
<td>0 (0-0)</td>
<td>100 (10-10)</td>
<td>2.5% (0-1)</td>
<td>100 (10-10)</td>
</tr>
<tr>
<td>Ramona</td>
<td>0 (0-0)</td>
<td>100 (10-10)</td>
<td>2.5% (0-1)</td>
<td>100 (10-10)</td>
</tr>
</tbody>
</table>

Note: HR=hand raising (baseline and withdrawal phases). RC= response cards (intervention and return to intervention phases). Diamonds= number of response attempts; triangles=accurate responses.
Camden    0 (0-0)      100 (10-10)    0 (0-0)      100 (10-10)
Brady     5.0 (0-2)    100 (10-10)    2.5% (0-1)   100 (10-10)
Danny     0 (0-0)      100 (10-10)    0 (0-0)      100 (10-10)
Denise    47 (4-5)     100 (10-10)    20 (1-3)     100 (10-10)
Eddie     17 (0-4)     100 (10-10)    0 (0-0)      100 (10-10)

Accuracy in responses

The literature defined an accurate response as the students’ correct responding to the teacher question (Randolph, 2007, Lambert, et al. 2006). Accurate student responses were measured using an occurrence/non-occurrence count. During baseline, each time a student attempted to answer by raising their hand, they received credit for an accurate student response attempt. If the teacher called on the student and they gave the correct response, they were given credit for an accurate response. During intervention, the answer was counted incorrect if a student looked at other students’ cards to get his or her response, or if he or she changed his answer after looking at other students’ cards.

Percent of accurate student responses. Students in both third and fifth grade demonstrated a higher degree of accurate responses during intervention over baseline. The students in third and fifth grade had a variable rate of accurate responses, with accurate student responses ranging from zero to seven percent during baseline to 56.7%–96.7% during intervention (see Table 3 and Figure 1). The greatest range of accuracy was in the third grade. All seven students had higher percentages of accuracy in the reintroduction of intervention than the first intervention.

Third grade. Students in the third grade demonstrated a higher degree of accuracy during intervention than during baseline. Several students had an accuracy rate of zero during baseline phase, including Destiny, Ramona, Camden and Danny. Brady answered one question accurately in the baseline phase, or 3.3%. Students demonstrated a slightly higher response rate
in the withdrawal phase, with Brady, Camden and Danny answering zero questions correctly, and Destiny and Ramona answering one question correctly, or 2.5%. In comparison, student accuracy in the reintroduction of the intervention phase ranged from 56.7%-96.7%.

**Participant 1: Destiny.** Destiny had an accuracy rate of zero during baseline condition. Her mean accuracy rate was the lowest of both grades during the intervention phase. Her accuracy was 56.7% during intervention, with results ranging from three to seven correct responses out of a total of 10 possible responses. She was accurate 2.5% of the time in the withdrawal phase. Destiny was accurate 86% of the time in the reintroduction of the intervention, with results ranging from eight to nine correct responses.

For Destiny, the magnitude of difference between baseline and intervention was large. During baseline, the data was stable, with no variability. During intervention, the data were stable. In the withdrawal phase, the last two data points were at zero levels, and in the reintroduction of the intervention, the mean rate was 86% (range =80-90%) with the final three data points staying at 90%.

**Participant 2: Ramona.** Ramona had an accuracy of zero during baseline. Her accuracy rate was 67.8% during intervention, with results ranging from four to eight correct responses out of a total of 10 possible responses. She was accurate 2.5% of the time in the withdrawal phase. Ramona was accurate 86% of the time in the reintroduction of the intervention, with results ranging from eight to nine correct responses.

For Ramona, the magnitude of difference between hand raising and response cards was large. During baseline, the data was stable, with no variability. During intervention, there was a moderate upward trend. During the withdrawal phase, the last two data points were at zero, and
in the reintroduction of the intervention, the data ranged from 80-90%, with the final three data points staying at 90%.

**Participant 3: Camden.** Camden had an accuracy of zero during baseline. His accuracy rate was 75% during intervention, with results ranging from five to nine correct responses out of a total of 10 possible responses. He was accurate zero times in the withdrawal phase. Camden was accurate 96.7% of the time in the reintroduction of the intervention phase, with results ranging from nine to 10 correct responses.

For Camden, the magnitude of difference between baseline and intervention was large. During baseline, the data was stable, with no variability. During intervention, the data were stable. In the withdrawal phase, the data points were at zero, and in the reintroduction of the intervention, the data ranged from 90-100%, with the final two data points staying at 100%.

**Participant 4: Brady.** Brady had an accuracy of 3.3% during baseline. His accuracy rate was 71.1% during intervention, with results ranging from four to nine correct responses out of a total of 10 possible responses. He was accurate 0% of the time in the withdrawal phase. Brady was accurate 96% of the time in the reintroduction of the intervention, with results ranging from nine to 10 correct responses.

For Brady, the magnitude of difference between baseline and intervention was large. During baseline, the data demonstrated a moderate upward trend, with the last three data points remaining stable at zero. During intervention, there was a moderate upward trend, with the last two data points remaining at 80%. In the withdrawal phase, the data was stable at zero, and in the reintroduction of the intervention, the data ranged from 90-100%, with the final three data points staying at 100%.
Participant 5: Danny. Danny had an accuracy of 0% in baseline. His accuracy rate was 77.8% during intervention, with results ranging from five to nine correct responses out of a total of 10 possible responses. He was accurate 0% of the time in the withdrawal phase. Brady was accurate 96.7% of the time in the reintroduction of the intervention, with results ranging from nine to 10 correct responses.

For Danny, the magnitude of difference between baseline and intervention was large. During the first hand raising condition, the data was stable, with no variability. During intervention, there was a moderate upward trend, with the last two data points remaining at 70%. In the withdrawal condition, the last two data points were at zero, and in the reintroduction of the intervention, the data ranged from 90-100%, with the final two data points staying at 100%.

Fifth grade. Denise and Eddie both were able to accurately answer one question during baseline. Their accuracy rate during intervention was higher than their accuracy rate in baseline.

Participant 6: Denise. In the fifth grade, Denise had an accuracy of 7% in baseline, with a range of zero to one. Her accuracy rate was 86.6% during intervention, with results ranging from eight to nine correct responses. She was accurate 0% of the time in the withdrawal phase. Denise was accurate 85% of the time in the reintroduction of the intervention, with a result of eight to nine correct responses in each session.

For Denise, the magnitude of difference between baseline and intervention was large. During baseline, the data varied from 0-10%. During intervention, the data were stable at 90% In the withdrawal phase, the data were at zero, and in the reintroduction of the intervention, the data ranged from 80-90%.

Participant 7: Eddie. Eddie had an accuracy of 3% during baseline, with between zero to one responses per session. His accuracy rate was 86.6% during intervention, with eight correct
responses in each session. He was accurate 0% of the time in the withdrawal phase. Eddie was accurate 80% of the time in the reintroduction of the intervention, with a result of eight correct responses per session.

For Eddie, the magnitude of difference between baseline and the intervention was large. During baseline, the last two data points were at zero. During intervention, the data alternated between 80% and 90%. In the withdrawal condition, the last two data points were at zero, and in the reintroduction of the intervention, the data was stable at 80%.

Table 3

Mean percent and range of accurate student responses

<table>
<thead>
<tr>
<th>Student</th>
<th>Hand raising</th>
<th>Response cards</th>
<th>Hand raising</th>
<th>Response cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destiny</td>
<td>0 (0-0)</td>
<td>56.7 (3-7)</td>
<td>2.5 (0-1)</td>
<td>86 (8-9)</td>
</tr>
<tr>
<td>Ramona</td>
<td>0 (0-0)</td>
<td>67.8 (4-8)</td>
<td>2.5 (0-1)</td>
<td>86 (8-9)</td>
</tr>
<tr>
<td>Camden</td>
<td>0 (0-0)</td>
<td>75 (5-9)</td>
<td>0 (0-0)</td>
<td>96.7 (9-10)</td>
</tr>
<tr>
<td>Brady</td>
<td>3.3 (0-1)</td>
<td>71.1 (4-9)</td>
<td>0 (0-0)</td>
<td>96 (9-10)</td>
</tr>
<tr>
<td>Danny</td>
<td>0 (0-0)</td>
<td>77.8 (5-9)</td>
<td>0 (0-0)</td>
<td>96.7 (9-10)</td>
</tr>
<tr>
<td>Denise</td>
<td>7 (0-1)</td>
<td>90 (9-9)</td>
<td>0 (0-0)</td>
<td>85 (8-9)</td>
</tr>
<tr>
<td>Eddie</td>
<td>3 (0-1)</td>
<td>86.6 (8-9)</td>
<td>0 (0-0)</td>
<td>80 (8-8)</td>
</tr>
</tbody>
</table>

On-task and off-task behaviors

The primary and secondary observers recorded off-task behavior as discrete events, with the primary researcher recording timed episodes using a stop watch to record episode lengths. The observers used student order to record behaviors, observing students in a specific order (students sat in the same seats each day, so the observers could visually observe students up and down the row, in the following order for third grade: Destiny, Camden, Bready, Danny, Ramona, and in the following order for fifth grade: Denise, Eddie). Observation length of each student was in 30 second intervals, using the classroom clock.
To measure off-task behavior, a definition of on-task behavior had to be established. The literature defines on-task behavior as using materials for the purpose they were intended and following teacher directions for showing attention to the lesson (sitting up straight, eyes on the teacher, hands in lap, etc) (Berrong et al., 2007; Godfrey, et al., 2003). During baseline, on-task behavior included the student keeping their eyes on the teacher, sitting up straight, and raising a hand to respond to teacher questions. During intervention, on-task behavior included keeping their eyes on their response cards or the teacher, choosing a card and raising response cards to respond to teacher questions. Inappropriate behavior included using classroom materials for a purpose other than what it is appropriate for the instructional activity, ie. coloring pictures, hitting a peer with their response cards, etc., answering in the non-requested format (ie. raising their hand when they should have held up a card), or engaging in a task other than the one assigned by the teacher (ie. staring out the window, playing with shirt, getting out of seat).

The researcher used the classroom clock and observed students in a set pattern every 30 seconds, took data in each session, and counted each incident as a separate event, so if a student colored pictures, then hit a peer, it was counted as two incidents of inappropriate behavior in that session. The total amount of time the student was off-task was then subtracted from the amount of time the student was on-task, and a total time of on-task behavior was recorded for each student for each session (see Table 4 and Figure 2).

Third grade. Students in the third grade all displayed high levels of on-task behavior in all four conditions. The highest rates of on-task behavior were seen during intervention, where behavior remained stable for all students at 100% on task.

Participant 1: Destiny. Destiny demonstrated a slight difference in on-task behaviors in the two conditions. Her on-task behavior began at 92%. Her mean rate of on-task behavior in the
baseline was 99% (range 80-100). The magnitude of difference during this condition showed a
stable trend, with the two sets of overlapping data points. The first and fourth data points were at
100% and the third and seventh data points were at 93%. The data ended on a downward trend.
The mean rate of on-task behavior increased to 100% (range 100-100) in the intervention. In the
withdrawal phase, Destiny’s on-task behavior was 98% (range 93-100). In this condition, the last
three data points overlapped at 100%, with the first data point beginning at 93%. Her mean rate
of on-task behavior was 100% (100-100) in the reintroduction of the intervention.

Participant 2: Ramona. Ramona’s on-task behavior began at 94% during baseline and
increased to 100% in the response card conditions. Her mean rate of on-task behavior in baseline
was 94% (range 86-100). There was a slight upward trend, with two overlapping data points at
87% and three data points overlapping at 100%. The mean rate of on-task behavior increased to
100% (range 100-100) during intervention. In the withdrawal phase, Ramona’s on-task behavior
was 88% (range 82-100). Her mean rate of on-task behavior was 100% (100-100) in the
reintroduction of the intervention.

Participant 3: Camden. Camden had several absences throughout the study which
affected the ability to establish trend lines, so visual analysis was used to analyze his data. The
split middle technique could not be used because he did not have enough consecutive data points
to use this form of analysis. His on-task behavior began at 83% in baseline and increased to
100% during intervention. His mean rate of on-task behavior in baseline was 83% (range 70-92).
His on-task behavior was lowest in the first two overlapping data points, and the data points also
overlapped on the third and sixth data points. There was a slight downward trend in the first hand
raising condition. The mean rate of on-task behavior increased to 100% (range 100-100) during
baseline. In the withdrawal phase, Brady’s on-task behavior was 98% (range 95-100). His mean rate of on-task behavior was 100% (100-100) in the reintroduction of the intervention.

**Participant 4: Brady.** Brady’s on-task behavior began at 99% in baseline and increased to 100% during intervention. The magnitude of difference in the level of on-task behavior during this condition showed a slight upward trend, with the last six data points being stable at 100%. His mean rate of on-task behavior in baseline was 99% (range 96-100). The mean rate of on-task behavior increased to 100% (range 100-100) during intervention. In the withdrawal phase, Brady’s on-task behavior was 98% (range 93-100). In this condition, three data points (the first, second and fourth) overlapped at 100%, with the third data point decreasing to 93%. His mean rate of on-task behavior was 100% (100-100) in the reintroduction of the intervention.

**Participant 5: Danny.** Danny’s on-task behavior began at 93% during baseline and increased to 100% during intervention. The magnitude of difference in the level of on-task behavior during baseline showed a slight upward trend, with the lowest data point occurring in the last baseline session, at 70%. Two of the last three data points in this condition overlapped. His mean rate of on-task behavior during baseline was 93% (range 70-100). The mean rate of on-task behavior increased to 100% (range 100-100) during intervention. In the withdrawal from intervention, Danny’s on-task behavior was 98% (range 93-100). In this condition, three data points (the first, third and fourth) overlapped at 100%, with the second data point decreasing to 93%. His mean rate of on-task behavior was 100% (100-100) in the reintroduction of the intervention.

**Fifth grade.** Students in the fifth grade had very different on-task behaviors during the baseline and the withdrawal phase, with both the lowest and highest percentage on on-task behavior occurring in these conditions. Both students were 100% on-task during intervention.
Participant 6: Denise. Denise had the highest percentage of on-task behavior of any student. Her mean rate of on-task behavior in baseline was 100% (range 100-100). Her mean rate of on-task behavior during intervention was also 100% (range 100-100). Her mean rate of responding during the withdrawal phase was 96% (range 92-100), and her mean rate of responding during the reintroduction of the intervention was 100% (range 100-100).

Participant 7: Eddie. Eddie had the lowest percentage of on-task behavior of any student. The mean rate of on-task behavior during baseline was 72% (range of 62-83). His mean rate of on-task behavior during intervention was 100%, and his mean rate of on-task behavior in the withdrawal phase was 74.5% (range of 66-83). His mean rate of on-task behavior in the reintroduction of the intervention was 100%. There were no overlapping data points in baseline condition.

Figure 2. Percent of on-task behavior
Note: diamonds=percent of time on task. HR=hand raising (baseline and withdrawal phases). RC= response cards (intervention and return to intervention phases).

Table 4

Mean percent and range of on-task behavior

<table>
<thead>
<tr>
<th>Student</th>
<th>Hand raising</th>
<th>Response cards</th>
<th>Hand raising</th>
<th>Response cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destiny</td>
<td>92 (80-100)</td>
<td>100 (100-100)</td>
<td>98 (93-100)</td>
<td>100 (100-100)</td>
</tr>
<tr>
<td>Ramona</td>
<td>94 (86-100)</td>
<td>100 (100-100)</td>
<td>88 (82-100)</td>
<td>100 (100-100)</td>
</tr>
<tr>
<td>Camden</td>
<td>83 (70-92)</td>
<td>100 (100-100)</td>
<td>98 (95-100)</td>
<td>100 (100-100)</td>
</tr>
<tr>
<td>Brady</td>
<td>99 (96-100)</td>
<td>100 (100-100)</td>
<td>98 (93-100)</td>
<td>100 (100-100)</td>
</tr>
</tbody>
</table>
Test scores

The classroom teacher gave end-of-unit tests as both pre- and post-tests. The teacher counted the number of correct responses on multiple choice items, and scored open response items based on test rubrics, then assigned a percentage score to the entire test (Table 5). Test questions were created by the district curriculum experts based on the unit of instruction and Kentucky Core Content 4.1 (Kentucky Department of Education, 2008), and students received their individualized accommodations on the assessment, ie. a reader, scribe, paraphrased directions, etc.

Pre- and post-test scores were collected during the first AB conditions. They were not collected during the second phase of the study in each grade due to time restraints and difficulty in breaking the questions into appropriate comparison units (more information overlapped during the second phase of the study due to the length of those units being longer than the first units).

Third grade. Overall, students did better on the test in the intervention phase than in baseline. Four of the five students in the third grade scored higher on the multiple choice section of the test given in the intervention phase, and four of the five scored the same on their open response questions.

Participant 1: Destiny. Destiny increased her multiple choice score from 50% in baseline to 60% during intervention. She maintained her score of 50% for open response questions in both conditions.
**Participant 2: Ramona.** Ramona increased her multiple choice score from 50% during baseline to 60% during intervention. She maintained her score of 50% for open response questions in both conditions.

**Participant 3: Camden.** Camden increased his multiple choice score from 40% during baseline to 60% during intervention. He maintained his score of 75% for open response questions in both conditions.

**Participant 4: Brady.** Brady increased his multiple choice score from 20% correct during baseline to 60% correct during intervention. His open response score remained the same at 50% in both the hand raising and response card condition.

**Participant 5: Danny.** Danny decreased his multiple choice score from 50% correct during baseline to 40% correct during intervention. His open response score went from 75% during hand raising to 25% during hand raising.

**Fifth grade.** Both fifth grade students increased their multiple choice and open response scores from baseline to intervention. Most significantly, they raised open response scores of 0 in baseline to scores of 50% and 75% in the intervention phase.

**Participant 6: Denise.** Denise increased her multiple choice score from 40% correct during baseline to 60% correct during intervention. Her open response score went from 0% during baseline to 50% during intervention.

**Participant 7: Eddie.** Eddie increased his multiple choice score from 20% correct during baseline to 50% correct during intervention. His open response score went from 0% during baseline to 75% during intervention.

Table 5
Pre- and post-test scores for multiple choice (MC) and open response (OR) answers

<table>
<thead>
<tr>
<th>Test</th>
<th>Destiny</th>
<th>Ramona</th>
<th>Camden</th>
<th>Brady</th>
<th>Danny</th>
<th>Denise</th>
<th>Eddie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre MC</td>
<td>50</td>
<td>50</td>
<td>40</td>
<td>20</td>
<td>50</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Pre OR</td>
<td>50</td>
<td>50</td>
<td>75</td>
<td>50</td>
<td>75</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Post MC</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>40</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Post OR</td>
<td>50</td>
<td>50</td>
<td>75</td>
<td>50</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
</tbody>
</table>

Note: MC= multiple choice, OR= open response question

**Treatment Adherence**

Treatment adherence data were collected for both conditions for all three teachers in the study (see Appendix 1). The three teachers in the study were Mrs. Motz, third grade teacher, Mrs. Motz, third grade student teacher, and Mrs. Peact, fifth grade teacher. Treatment adherence data were taken for each session of hand raising and response cards. The integrity for number of questions asked was 100%. All three teachers asked the 10 scripted questions in each session. In the intervention phases, the teacher distributed response cards in 100% of sessions. All three teachers presented appropriate feedback in that they supplied the correct answer if students answered incorrectly in the hand raising condition, and gave the correct answer to students in the response card condition.

**Social Validity**

To assess social validity, teachers filled out a survey and also provided informal comments to the primary researcher throughout the study on their thoughts about the use of the response card intervention. Mrs. Motz and Mrs. Peact both filled out the Teacher Post-Intervention Acceptability and Importance of Effects Survey (see Appendix 2). This survey used two types of questions for teachers to respond. The first ten questions used a Likert-type rating scale to determine the social validity of the intervention. The last two questions were open-ended with room for the teacher to write in a response. Likert values ranged from one, indicating the
intervention was not valuable, to five, indicating the intervention was very valuable. Results are
group.

reported in Table 6. Overall, teachers reported that the intervention fit into their schedule, was
valuable, indicating the intervention was very valuable.

appropriate to use and met the needs of the students in their class, and that it was easy to use.

They also reported that the intervention helped increase student attention.

The teachers also commented that the response cards made the intervention socially
acceptable, because all students in the classroom were using the intervention, and so students
with intellectual disabilities were not singled out or made to feel different as they used this
intervention. Since everyone participated in this intervention, it benefited everyone in the class,
and not just a targeted few.

Table 6.

Teacher responses

<table>
<thead>
<tr>
<th>Survey question</th>
<th>Mrs. Motz responses</th>
<th>Mrs. Peact responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>The intervention fit into my regular schedule.</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>The intervention taught important skills.</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>The intervention was appropriate given the needs of the students.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>The intervention was easy to implement and maintain.</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>The intervention increased student attention.</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The students enjoyed the intervention activities.</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>The intervention improved student performance during the group.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>I will use the intervention again.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>I would recommend the intervention to others.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>What did you like about the intervention?</td>
<td>Increased not only correct student responses but also student attempts</td>
<td>Students participated more in discussions and had better understanding of key vocabulary</td>
</tr>
<tr>
<td>What would you change about the intervention?</td>
<td>Not give as many choices on several of the activities</td>
<td>Limit the number of choices; give a few picture choices for some answers</td>
</tr>
</tbody>
</table>
Discussion

This discussion will interpret the results of the current study, which investigated the use of picture response cards in the general education classroom to increase the participation of students with intellectual disabilities. Based on individual participant’s data, conclusions can be drawn about the active student responding, on-task behavior and correct student responses across the seven participants. This discussion focuses on how these findings contribute to practice, and concludes with limitations and implications for practice and future research.

All seven participants demonstrated higher percentages of active student responses accurate responses. All seven participants also demonstrated higher rates of on-task behavior during intervention. Most students demonstrated higher multiple choice grades, and also showed maintenance of open response scores during intervention. All students in each class participated in the intervention, which increased the social acceptability of the students with intellectual disabilities, as it did not single them out as needing additional help.

Overview of the Findings

This study identifies several key findings. First, it appears that response cards are a more effective response tool teaching than hand raising in regards to increasing student participation and accuracy and on-task behavior. This finding is similar to prior research (Berrong, et al., 2007; Christle & Schuster, 1996; Gardner, Heward & Grossi, 1994; Narayan, Heward & Gardner, 1990). This study extends the research in that it looks at students with intellectual disabilities in general education classrooms who are participating in core content materials. Second, student test scores in the intervention phase were higher for six of the seven students than they were in the baseline phase.
All students were noted to have relatively high levels of on-task behavior in both the intervention and baseline phases. During baseline, observation notes indicated that the students in both grades had trouble maintaining the pace of instruction. For example, during several days of instruction, the teachers followed the protocol to teach and ask questions throughout instruction, so the students were engaged in multiple academic tasks at the same time, such as looking at pictures or text in their textbook or copying guided notes or filling in teacher-created handouts.

In his meta-analysis, Randolph (2007) noted that some negative parts of using response cards are that they are time consuming, messy and could be perceived as childish. In this study, these concerns were not noted by teacher or students. To help eliminate the concern of the cards not being age appropriate, all students in the general education classroom used the same response cards (they were not only used by students with intellectual disabilities, or a different kind of cards was not given to the students with intellectual disabilities). Students were used to switching between materials (books, journals, dry erase boards, etc) often, so the classrooms had established procedures in place for getting out materials, which helped eliminate this potential negative impact.

**Active student responses.** Several conclusions from this study are very clear. First, students demonstrated higher rates of active student responses using response cards than when asked to raise their hands to answer teacher questions. This extends earlier research on the effectiveness of response cards to increase the active engagement of students with intellectual disabilities (Berrong, et al., 2007), which focused on students responding to questions in the resource setting. While the Berrong, et al. (2007) and Horn, Schuster and Collins (2006) studies found that response cards increased on-task behavior in the resource setting, and other studies
(Christle & Schuster, 2003; Davis and O’Neill, 2004; Gardner, Heward, & Grossi, 1994; Lambert, et al, 2006; Narayan, Heward & Gardner, 1990) demonstrated an increase of active student responses for students who were typically developing or exhibited disruptive behaviors, in urban general education classes, this current study found that it increased the active student responses of students with intellectual disabilities in the general education environment, which is the preferred learning setting to comply with federal mandates to provide access to the curriculum in the least restrictive environment.

While typically developing students in the general education class were able to complete multiple tasks with relative degrees of success, the students in this study with the exception of Denise were not able to successfully find information in the textbook or write information down and answer teacher questions. When they were noted to attempt to answer a teacher question during baseline, it was usually because they had given up on the assigned task (they quit writing notes, or didn’t attempt to look in their book).

Another way this study extends the current research is by eliminating additional factors used in other studies. Davis and O’Neill (2004) questioned in their results if their use of tokens for each student response was needed to encourage student participation. In this study, no tokens or other incentives were offered, and student on-task behavior and response rates were still markedly higher during the intervention phase than during baseline.

**Accurate student responding.** A notable finding from this study is that all seven students had considerably higher percentages of accurate responses using response cards. While student accuracy during hand raising was anywhere from 0-7%, with the majority of the students having zero correct responses, during the response card condition, the mean student accuracy was 82.3% (range 56.7-96.7). This current study extends the research of Berrong, et. Al (2007)
and Christle & Schuster (2003), who looked at active student responding, but did not measure student accuracy. Horn, Schuster, and Collins (2006) found that response cards increased the accuracy of two out of three middle school students with intellectual disabilities in a rural self-contained classroom, while the current study found that response cards increased the accuracy of all seven elementary students with intellectual disabilities in the general education classroom.

**On-task behavior.** This study demonstrates that on-task behavior was highest during the intervention phase. During baseline, on-task behavior ranged from 72-100%, while during intervention, all seven students demonstrated 100% on-task behavior. These findings extend the current literature (Berrong, et al., 2007; Horn, Schuster, & Collins, 2006), who found that response cards increased on-task behavior in the resource room. The current study demonstrates that on-task behavior can be increased through the use of response cards in the general education classroom. Horn, Schuster, and Collins (2006) suggested that their results could have been due to the novel procedure of using response cards, but this study demonstrates that on-task behavior can be maintained even though the intervention isn’t novel, as these students had all used response cards in other resource and general education settings, and the results for on-task behavior were still very conclusive that the use of response cards led to an increase in on-task behavior.

**Percent of correct responses.** This study extends current literature which found that the use of response cards led to an increase in quiz scores (Cavanaugh, Heward, & Donnelson, 1996; Clayton & Woodward, 2007; Gardner, Heward, & Grossi, 1994; Kellum, Carr, & Dozier, 2001; Malanga & Sweeney, 2007; Marmolejo, Wilder, & Bradley, 2004).

The current study found six out of seven students had an increase in overall quiz scores, with six out of seven students having higher multiple choice percentages. Two students had
higher multiple choice percentages, and four students’ multiple choice percentages remained the same. Danny was the exception, with a multiple choice score that decreased from 50% in baseline to 40% in intervention, and an open response percentage that fell from 75% to 25%.

One possible explanation, according to the teacher, is that he had reported to her that week that he sometimes took off his Daytrana patch, which might have affected his focus and concentration on that day.

**Teacher input.** Social validity data indicated that both teachers thought the intervention was valuable, fit into their schedule, was appropriate for their students, was something they could implement and maintain. They also stated that they felt it helped increase student attention, improved student performance and is something they would recommend to others.

In pre-intervention interviews, both teachers expressed their reservations about how much students were learning in their classes. They felt the primary focus of this group of students being in their classroom during content instruction was to gain some social skills and learn to participate in a larger group, not to understand or master content. Both teachers stated that they thought the content was over this group of students’ heads and they wouldn’t be able to made adequate progress in the content without significant modifications and pull-out.

During the intervention phase, both teachers made comments to the primary researcher about how surprised they were with the number of questions the students attempted to answer and got correct. Both teachers made modifications to their instruction, adding “wrap-up times where they reviewed questions students had missed and restated correct information.

In post-intervention interviews, Mrs. Motz said she was incredibly surprised to find out how much the students in the study actually knew. She did not think the students with intellectual disabilities were keeping up with her class, and did not think they were getting
anything out of the content. She commented on the fact that most of them never raised their hand to answer questions, or were able to give an answer without her prompting every step of their response. With the response cards, she said she was able to see how much they really knew. She reported that she found that it also helped keep some of the other students in her room on task who had problems with attention.

Mrs. Peact stated that the use of response cards helped focus her entire class, and gave everyone a clearer focus on and understanding of key vocabulary. She noted that it seemed to decrease the distraction of the students in the study, and a few other students in her room who had challenges with focus and attention. She stated that she liked pairing pictures with the key vocabulary to help everyone get a mental picture of what each word meant, and that it aligned with other instructional strategies currently being implemented in the school by her administration, so it eliminated her having to create another piece of information meant to enhance student learning.

Mrs. Peact stated that the use of response cards gave her an instant look at everyone’s understanding, and let her know what concepts she needed to re-teach. She said that she felt the daily review of key vocabulary helped students focus on the key concepts. In addition, she began using response cards in other units of instruction.

**Conclusion**

The results of this study both replicate and extend previous research on the use of response cards for students with intellectual disabilities. First, they extend the research of Berrong, et al., (2007) which demonstrated that students with intellectual disabilities could use response cards in the resource setting to increase their attention and on-task behavior using response cards. This research extended the current body of literature on the use of response
cards. It took students out of the resource room and moved them into the general education setting, which is more in line with current federal and state mandates to educate all students in the least restrictive environment. This study found that students who use response cards could be more on-task and actively and accurately engaged with the learning process than they are during traditional hand raising opportunities.

The following research questions were addressed:

1. What are the effects of response cards on the active engagement and percent of accurate responses for students with intellectual disabilities in third and fifth grade general education classrooms?
2. What are the effects of response cards on the on-task behavior of students with intellectual disabilities in third and fifth grade general education classrooms?
3. What are the effects of response cards on the percent of correct responses on end-of-unit quizzes for students with intellectual disabilities in general education classrooms?

Based on analysis of individual student’s results in the two study conditions, conclusions can be drawn regarding all seven participants.

Implications for practice

The current study has practical implications for teachers and students because it provides evidence that students with intellectual disabilities can learn and demonstrate that learning in the general education classroom with minimal supports and no additional staffing.

These findings lend support for the use of response cards during general education instruction. Prior to implementation of response cards, teachers should consider the amount of cards that are optimal to use, and also the additional preparation time needed to create the cards.
Mrs. Motz had a parent volunteer who copied, cut and placed all the cards in baggies, which she said was a substantial help. Mrs. Peact collaborated with a special education teacher who created her cards for her room. Some students needed reminders to make sure they had all of their cards, to keep their cards in order and to make sure they put their cards back in their baggies for the next day’s lesson.

The short- and long-term benefits of using response cards may outweigh the initial time and effort required to create and implement a response card intervention. Some of the initial considerations include an effective classroom management system and teaching the procedures for the use of response cards so everyone has an opportunity to find their own answer and individually respond. For teachers who want to use this system as formative or summative data collection, a data collection tool (such as a student checklist) must be created and maintained. Students should also have a way to reflect on their learning and share that learning with others.

**Limitations**

Even thought there were positive effects with the use of response cards, there are several limitations to this study include using a large amount of response cards, which were hard for some of the students to organize and visually scan each card when answering a question. Teacher preference was to make sets of response cards that could be used over several days, instead of making specific cards for each day of instruction. These cards were cut and placed into individual plastic bags, which students kept in their desks. It took some time each day for students to find their cards and organize them on their desks.

Another limitation was the system used to assess on-task behavior. Momentary time sampling would have provided more detailed information, but was not used so the researcher could use a more narrative approach to tracking off-task and on-task behavior.
Another limitation to the study was the time taken to cover units of instruction, which affected when phases could begin and end. Since end-of-unit quiz scores were used as a measure, and since multiple students were involved in the study, conditions were not begun and ended based on stable baselines, but rather, data on the first two conditions was taken until time for the quiz, which did not always result in the best time to stop taking data.

A fourth limitation involves the small percentage of difference in quiz scores between the two conditions. Because no additional interventions were being measured, no additional teaching was done to pre-teach or re-teach concepts that were poorly understood, other than the general education teacher’s decision to review concepts at the end of the response card trial in a given day of instruction.

**Implications for Future Research**

The findings for this study demonstrate a functional relation between the use of response cards and increased active student responses and accurate student responses. As a next logical step, researchers should compare if prior teaching of core concepts could increase the accuracy of student responses on daily response opportunities and end-of-unit quiz scores (Christle & Schuster, 2003; Davis & O’Neill, 2004). Researchers should also look at Bloom’s Taxonomy to see if questions for response cards could be created to include higher levels of questioning, or to see if lesson extensions could be created using higher levels of Bloom’s Taxonomy, and to see if using higher levels of Bloom’s Taxonomy increases test scores, focusing on open response and on-demand writing opportunities.

Future researchers could also consider if an additional intervention, such as student flashbacks or daily open response opportunities, might increase student end-of-unit quiz scores (Cavanaugh, Heward, & Donnelson, 1996; Clayton & Woodward, 2007; Gardner, Heward, &
Grossi, 1994; Kellum, Carr, & Dozier, 2001; Malanga & Sweeney, 2007; Marmolejo, Wilder, & Bradley, 2004). Another area for future research is to assess if a collaborative partnership with speech and language pathologists (SLPs) leads to higher test scores, specifically if having SLPs pre-teach vocabulary and collaborate to create picture response cards that are used in both resource and general education settings leads to higher test scores and increased participation in class.

**Summary**

Prior research has demonstrated that response cards increase student responses in the general education setting for students in urban settings, students with mild learning disabilities, and students who are typically developing. Prior research has also demonstrated that response cards increase responses for students with intellectual disabilities when used in the resource setting. However, no study looked at using response cards in the general education setting for students with intellectual disabilities.

The current study demonstrates a functional relation between the use of response cards for students with intellectual disabilities in the general education setting and active, accurate student responding, on-task behavior and higher end-of-unit quiz scores. This study extends the literature in that results showed a positive impact for all seven students on active student responses, as well as accurate student responses. For six of the seven students, the study also demonstrated a relation between the use of response cards and higher quiz scores. Future research should focus on other supports that might increase students’ accurate responses and end-of-unit quiz scores.
References


### Response Cards Data Sheet

**Observation Date**__________  **Subject**__________________________

**Observer** ____________________  researcher or IOA  **Teacher** ________________

**Condition** (circle one)  handraising  picture response card

**Student 1**

<table>
<thead>
<tr>
<th>?</th>
<th>Answer attempt</th>
<th>Called on?</th>
<th>Correct/Incorrect</th>
<th>Behavior app/not (time in sec./code)</th>
<th>teacher response</th>
</tr>
</thead>
<tbody>
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<td>1</td>
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</table>

**Student 2**

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<thead>
<tr>
<th>?</th>
<th>Answer attempt</th>
<th>Called on?</th>
<th>Correct/Incorrect</th>
<th>Behavior app/not (time in sec./code)</th>
<th>teacher response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tbody>
</table>

**Treatment Adherence:** – use +/-

- materials handed out__  script followed ___  # of questions asked ____
- used appropriate condition for each question ____________________________________________

**Behavior code:**
- T=touching others  
- S=staring into space  
- D=Drawing pictures  
- P=Playing in desk or with supplies
Teacher Post-Intervention Acceptability and Importance of Effects Survey

Teacher: _____________________________

For each item, please circle the number that most closely represents your opinion about the intervention.

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Disagree</th>
<th>Neutral (50/50)</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fit into my regular schedule</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Taught important skills</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Was appropriate given the needs of the students</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Was easy to implement and maintain</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Was within my skill level to implement</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Increased student attention</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>The students enjoyed the activities</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Improved student performance during the group</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I will use the intervention again</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I would recommend the intervention to others</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

What did you like about the intervention?

What would you change about the intervention?

Table 1

Studies Using Response Cards to Increase Student Engagement.

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Methodology</th>
<th>Response card type</th>
<th>Result</th>
<th>Recommendations/future research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musti-Rao, Kroeger, Schumacher-Dyke (2008)</td>
<td>19 university undergraduates in special ed Instructional Strategies class</td>
<td>ABCBC withdrawal (B-guided notes, C-guided notes and RC)</td>
<td>Dry erase boards</td>
<td>Higher level of responding with RC; students preferred guided notes over RC</td>
<td>Increased active engagement is important; need to watch the number of response opportunities so as not to interfere with learning</td>
</tr>
<tr>
<td>Berrong, Schuster, Morse, &amp; Collins (2007)</td>
<td>8 elementary student with moderate to severe disabilities in resource</td>
<td>ABAB 3x3 cards to place on</td>
<td>Use of response boards increased active response for 6 and on-task behavior for all – rates of inappropriate behavior was variable</td>
<td>Try in general education environment</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Setting</td>
<td>Treatment</td>
<td>Assessment</td>
<td>Findings</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------------</td>
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<td>------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
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<tr>
<td>Malanga &amp; Sweeney</td>
<td>University undergrad</td>
<td>Alternating</td>
<td>Pre-printed</td>
<td>Higher quiz scores with both response cards and daily assessment (daily assessment scores higher than RC)</td>
<td>Results might not be applicable to students with special needs (added difficulty of writing on daily assessment), can’t tell how often RC or daily quizzes need to be taken to improve weekly quiz scores (1 day or every day?)</td>
</tr>
<tr>
<td>(2007)</td>
<td>ABA class</td>
<td>treatment to</td>
<td>text on 8 ½ by 11 with one answer printed on each side (DRA/DRO)</td>
<td></td>
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</tr>
<tr>
<td>Clayton &amp; Woodward</td>
<td>120 university students in intro psychology</td>
<td>ABA reversal used to compare file cards with one end cropped off to indicate</td>
<td>RC increased participation as well as quiz scores,</td>
<td>Students said they liked the RC intervention</td>
<td></td>
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<tr>
<td>(2007)</td>
<td></td>
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<tr>
<td>Horn, Schuster, &amp; Collins (2006)</td>
<td>3 middle school students in rural self-contained classroom with moderate to severe disabilities looking at: active responding, on-task behavior, inappropriate behavior and acquisition of target behavior</td>
<td>ABAB</td>
<td>Laminated flip board with digital clock on one section; : followed by # 0-9; and just # 0-9</td>
<td>Higher levels of active responding and on-task behavior and decreased levels of inappropriate behavior in RC condition, 2 of 3 students also had higher accuracy in RC condition</td>
<td>Limited number of participants, novel procedures could have attributed to increase in active responding</td>
</tr>
<tr>
<td>Lambert, 9 urban</td>
<td>ABAB (HR)</td>
<td>White board</td>
<td>Reductions in disruptive behavior decreased in RC,</td>
<td>Disruptive behavior decreased in RC,</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>Description</td>
<td></td>
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<tr>
<td>Cartledge, Heward &amp; Yo</td>
<td>Students in 4th grade math lesson (students chosen for disruptive behavior in class)</td>
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<tr>
<td></td>
<td>behavior and increases in academic responding and students responded more frequently during RC than HR</td>
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<tr>
<td></td>
<td>Materials varied in difficulty, and may have affected accuracy of responses</td>
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<tr>
<td>Davis &amp; O’Neill 2004</td>
<td>6 middle school students with learning disabilities who received ESL instruction</td>
<td>ABAB looking at number of responses, accuracy, and off-task behavior</td>
<td>RC showed higher levels of academic responses and correct responses, with mixed results of off-task behavior</td>
<td>Added dimensions including giving tokens for responding, and differing numbers of tokens given in both conditions, difficulty with writing</td>
<td>Possibly affecting students stating they preferred HR condition</td>
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<tr>
<td>White board</td>
<td>White board</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Methodology</td>
<td>Condition</td>
<td>Outcome</td>
<td>Comparison</td>
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<tr>
<td>Marmolejo, Wilder, &amp; Bradley (2004)</td>
<td>University, upper division psychology, ABAB looking at quiz scores on 2-color response card (T/F with ABCD on bottom of each card)</td>
<td>RC increased student learning as measured by quiz scores, 79% of students said use of RC improved their attention to lecture</td>
<td>Only 10% dif between conditions in test scores, but that was the dif. in a full letter grade (from a D to a C)</td>
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</tr>
<tr>
<td>Shabani &amp; Carr (2004)</td>
<td>University psychology in 2 research methods with Nonequivalent control group design (3x5 card with Yes/true/A on one side and No/false/B on other side)</td>
<td>No significant dif between RC and traditional teaching in quiz scores</td>
<td>Students reported enjoying use of response cards, increased participation</td>
<td></td>
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</tr>
<tr>
<td>Christle &amp; Schuster (2003)</td>
<td>5 students in 4th grade urban elementary school, ABA looking at participation</td>
<td>White board RC condition showed increase in active participation, academic performance</td>
<td>Students scored higher on weekly quiz scores in RC condition, on-task behavior greater in RC condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Godfrey, Grisham-Brown, Schuster &amp; Hemmeter (2003)</td>
<td>4 preschool students identified as having trouble attending during large group activities in a rural public preschool during calendar time</td>
<td>Alternating treatment of three conditions (HR, CH, RC) looking at on-task behavior and inappropriate behavior</td>
<td>Response board and 2-4 choices placed in front of student (4 seasons – had each season on a card in front of students)</td>
<td>Higher levels of responding in RC than other 2 conditions and less inappropriate behavior in RC condition</td>
<td>Didn’t address accuracy of response, novelty could have affected increased use, provides non-verbal way to respond (allows for use of eye gaze as response), allows for movement</td>
</tr>
</tbody>
</table>
### Table: Use of Picture Response Cards in Education

<table>
<thead>
<tr>
<th>Study Source</th>
<th>Type of Study</th>
<th>Method</th>
<th>Card Description</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kellum, Carr, and Dozier (2001)</td>
<td>40 Community college psychology</td>
<td>Alternating treatment w/ and w/o response cards</td>
<td>3x5 card (red/green on each side with A/true on one, B/false on other)</td>
<td>Higher % of students got A on end-of-class quizzes than w/o RC, higher student participation with RC. Students also reported liking use of RC – red/green color. Blindness could be future issue (idea: logo on one side, mascot on other) because only 2 choices, students had 50% chance of being right.</td>
</tr>
<tr>
<td>Cavanaugh, Heward, &amp; Donelson (1996)</td>
<td>9th grade suburban students in earth science class</td>
<td>Alternating Blank cards to write on</td>
<td>Weekly test scores higher for questions that had been reviewed using RC, next-day test scores higher with RC. Teacher indicated that RC answers let him know students hadn’t mastered material he thought they understood.</td>
<td></td>
</tr>
<tr>
<td>Gardner, Heward &amp; Grossi (1994)</td>
<td>5th grade inner city whole-class science instruction</td>
<td>ABAB White board</td>
<td>RC showed an increase in frequency of AR, improved test scores and students stated preference. Direct/ongoing assessment of each student’s performance allowed teacher to modify instruction as it was given.</td>
<td></td>
</tr>
</tbody>
</table>

Behaviors observed during HR not
Running head: USE OF PICTURE RESPONSE CARDS

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Design</th>
<th>Ethnicity</th>
<th>Active Responding</th>
<th>Response Cards</th>
<th>Teacher Assessment</th>
<th>Accuracy of Responses</th>
<th>Student Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narayan, Heward &amp; Gardner (1990)</td>
<td>20 students in urban 4th grade general ed social studies class</td>
<td>ABAB White boards</td>
<td>AR higher with RC than HR (HR averaged 40 active learning trials, RC average 480 response opportunities), most students did better on daily quizzes in RC, and 19 of 20 said they preferred RC to HR</td>
<td>RC did not affect accuracy of student responses.</td>
<td>RC increased teacher wait time from 3s to 5s</td>
<td>Daily quiz scores improved</td>
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</tbody>
</table>

Note. Not all studies examined by Randolph (2007) were reviewed for this study, as some of those studies were unpublished or not available to this researcher for review. HR=hand raising, RC=response cards, AR=active responding, CH=choral responding