Justus J. Randolph
Utah State University

A Quantitative Synthesis of Response Card Research on Student Participation, Academic Achievement, Classroom Disruptive Behavior, and Student Preference

Response cards are erasable boards on which students can write and display their answers to a teacher's question during whole-group instruction. They allow multiple students to respond at the same time. For the benefit of practitioners and researchers interested in making sense of the response card research, some of which is over 30 years old, the purpose of this work was to quantitatively synthesize and document the body of response card research. To carry out the documentation, a search was conducted to create a comprehensive list of English-language response card studies. Of these, individual-level studies were included in the synthesis if they a) used write-on response cards as the independent variable, b) used voluntary single-student oral responding (i.e., hand-raising) as a control condition, and c) reported effects on at least one of the dependent variables – participation, academic achievement, classroom behavior, or student preference. Mean percent change was calculated by subtracting the average score in the single-student oral responding condition from the average score in the response card condition across participants. Educationally significant differences were found in the response card condition on each dependent variable. Students with low levels of baseline performance typically benefited most from using response cards.

If as John Dewey (1916) held, students learn by doing, then it stands to reason that instructional strategies that actively involve the most students will lead to the most learning. However, it is ironic that hand-raising / single-student oral responding (SSOR) which limits the number of active responses to one per learning trial, is the norm in most classrooms during whole-group instruction. An alternative to

SSOR is to use response cards (RC) which are "cards, signs, or items that are used by students to indicate their response to a question or problem presented by the teacher" (Heward et al., 1996, p. 5).

Although the research on response cards is over a quarter of a century old and includes at least 23 published studies, theses, or dissertations, to date, there has been no quantitative synthesis of the response card literature. Therefore, for the benefit of educational researchers and practitioners alike, the purposes of this article are a) to document a comprehensive list of studies which have been conducted on response cards, b) to quantitatively synthesize the magnitude of effects across the studies, c) to examine the interactions between the effectiveness of response cards and student characteristics, and most importantly d) to frame the effects in terms of educational significance so that educational practitioners are aware of what can be expected from using response cards in the classroom.

Method

Data Collection

Data collection for research on response cards began with an electronic search of Academic Search Elite, ERIC, Professional Development Collection, PsycINFO, MasterFILE Premier, Primary Search, Middle Search Plus, Psychology and Behavioral Sciences Collection, TOPICsearch, and TOC premier, via EBSCO HOST using the keywords "response" and "cards." This search yielded 62 records. Their abstracts were reviewed to determine which research studies (including dissertations, theses, and unpublished manuscripts) would clearly not meet the criteria for inclusion. Of the remaining studies, the works cited and literature reviews were searched for other relevant response card studies until a point of saturation was reached. Finally, the author sent a list of the studies to a professor involved with much of the response card research at the Ohio State University to determine if any relevant studies were overlooked. This process yielded 23 theses, dissertations, or published studies that are relevant to the response card literature (Armendariz & Umbreit, 1999; Al-Attrash, 1998; Berg, 1994; Cavanaugh, 1992; Cavanaugh, Heward, & Donelson, 1996; Gardner, 1989; Gardner, Heward, & Grossi, 1994; Hoagland, 1983; Inwood,

1995; Kellum, Carr, & Dozier, 2001; King, 1996; Lambert, 2001; Lenox, 1982; Maheady, Michielli-Pendl, Mallette, & Harper, 2002; Meagher, 1969; Narayan, 1988; Narayan, Heward, Gardner, Courson, & Omness, 1990; Randolph, 2001; Reynolds, 2003; Rindfuss, 1997; Shields, 1996; Swanson, 1998; Wheatley, 1986).

Criteria for Inclusion

Studies were included in the quantitative synthesis if they met each of the following criteria:

1. The study used a single-subject design (e.g., a reversal, multiple baseline, or alternating treatments design).
2. Student-level data were reported.
3. The study provided enough information to calculate mean percent gain.
4. The use of write-on response cards was the sole independent variable.
5. Voluntary single-student oral responding, (i.e., hand-raising) was used during the control condition.
6. The study reported results on at least one of the following dependent variables: participation, achievement on daily quizzes, test achievement, behavioral disruptions, or student preference.
7. The report was written in English.

Of the 23 response card studies, 12 met the criteria for inclusion. They are summarized in Table 1.

Table 1

Response Card Studies Included in this Synthesis

Author	Subject description	Methodology	Reported Results
Armendariz & Umbreit (1999)	22 urban elementary school students	ABA design, compared SSOR with nonvoluntary RC on disruptive behavior	Disruptive behavior decreased. Level of disruption remained stable during RC condition.
Al-Attrash (1998)	29 students in a large suburban high school	ABAB design, compared RC, RC with guided notes, and SSOR	Quiz, test, and essay scores increased. Number and accuracy of responses increased. About half of the students liked using RC 'a little' or 'a lot.'
Cavanaugh (1992); Cavanaugh, Heward, & Donelson (1996)	23 students in a large suburban high school - 8 with special education needs	Alternating treatments design, compared SSOR and RC in different review formats	Increases on daily quizzes and tests for both special and general education students were found in most formats. Most students preferred RC to SSOR.
Gardner (1989); Gardner, Heward, & Grossi (1994)	22 elementary students in an inner-city classroom. 5 target students were closely observed	ABAB design, compared RC and SSOR conditions	Response rate, quiz, and test scores increased with RC. No significant increase in accuracy was found. Most students preferred using response cards.

Note: RC = response cards, SSOR = single student oral responding, NHT = numbered heads together, RC/S= RC and self-monitoring, RC/SG= RC/S and goal setting.

Table 1 continued

Response Card Studies Included in this Synthesis

Author	Subject description	Methodology	Reported Results
King (1996)	12 students in a suburban high school - 5 students received special education services	Alternating treatments design, compared SSOR and RC conditions	The majority of students had at least minimal benefits on quiz scores. Participation increased and accuracy decreased in the RC condition.
Lambert (2001)	9 elementary students with high levels of disruptive behavior in an urban school	ABAB design, compared SSOR to RC conditions	Increased number of responses and accuracy and decreased disruptive behavior was found during RC condition. Students preferred RC.
Maheady, Michielli-Pendl, Mallette, & Harper (2002)	21 students in an urban middle school	Alternating treatments design was used to compare RC, SSOR, and numbered heads together (NHT) conditions	Students performed best in RC and NHT conditions on quizzes and tests. Students preferred RC and NHT over SSOR.
Narayan (1988) Narayan, Heward, Gardner, Courson, & Omness (1990)	20 students in an urban elementary school	Experiment 1: ABAB design was used to compare write-on RC condition to SSOR condition. Experiment 2: Alternating treatments design was used to compare preprinted RC condition to SSOR condition	Increases in response rate, response accuracy, and daily quiz scores in RC condition. Most preferred RCs. Increases in response rate and accuracy, and review quizzes in RC condition.

Table 1 continued

Response Card Studies Included in this Synthesis

Author	Subject description	Methodology	Reported Results
Reynolds (2003)	32 public high school students	ABAB design, compared RC and SSOR conditions	Daily quiz scores increased in the RC condition and most students liked using response cards.
Rindfuss (1997)	85 eighth graders in a public middle school.	ABAB design was used to compare RC and SSOR conditions	Increases in quiz and exam scores were found in RC condition. Students preferred RC.
Swanson (1998)	6 middle school students; 3 with learning disabilities	Experiment 1: ABAB design, compared SSOR and RC	During RC condition there was an increase in test and quiz scores.
		Experiment 2: Multiple baseline design, compared RC, RC + self-monitoring (RC/S), And RC/S and goal setting(RC/SG)	RC/GS was the most effective of the three strategies. Most students preferred the RC condition.
Wheatley (1986)	9 middle school students with learning disabilities	Multiple baseline and alternating treatments design, compared SSOR and RC conditions and evaluated RC instruction effectiveness	Increases in responses, accuracy, and quiz scores were found in RC condition. Posttests showed effectiveness of RC condition.

Independent Variable

The independent variable of the studies included in this synthesis was the use of write-on response cards during group instruction. Write-on response cards were defined as boards on which students could write, display, and erase their answers multiple times during a classroom session. During a response card session, typically a teacher presented some information to students, asked the class a question, invited students to write their answers on the boards, cued the students to display their answers, and then gave feedback.

Control Condition

The control condition of the studies included in this synthesis was the use of voluntary SSOR during group instruction. SSOR was defined as a student raising his or her hand in response to a teacher query. The procedure in the control condition was similar to the procedure in the response card condition except that a teacher invited the students to raise their hand, called on one student, and then gave feedback to that student.

Dependent Variables

Participation

Participation in this study was defined as (the rate of response attempts per student per minute in a condition/ the teacher presentation rate per minute in a condition) or as (the number of response attempts per student/ the number of response opportunities). Studies that did not control for teacher presentation rate by either reporting it or by reporting response opportunities were not included in the synthesis on the participation variable. A response attempt occurred in the control condition when a student raised his or her hand in response to the teacher's question regardless of whether the student was called on to answer or if that answer was correct. In the RC condition, a response attempt occurred when a student wrote and displayed a response to a teacher's question regardless of the accuracy of response. A response opportunity occurred whenever a teacher invited students to respond to a question.

Achievement on Daily Quizzes

The studies included that measured short-term achievement in this synthesis used a teacher or research-made daily quiz on the information presented in the day's lesson. Achievement on daily quizzes was defined as (the number of correct responses on the quiz / the number of correct and incorrect responses).

Test Achievement

Long-term achievement was measured by teacher or researcher-made tests that occurred at weekly or longer intervals. Achievement on tests was defined as (the number of correct responses on a test / the number of correct and incorrect responses on the test).

Behavioral Disruptions

The behavioral definition of a disruption for the studies included in the synthesis varied from study to study; however, two common features were found across studies. The first was inappropriate interaction with others. Examples of inappropriate interaction with others included hitting/touching others, making noises, speaking out of turn, or throwing objects. The second was attending to stimuli other than instruction. Examples of attending to stimuli other than instruction were leaving an assigned seat, engaging in conversations during instruction, or playing with objects found in the desk.

Student Preference

Response card studies that reported the number of students in the class who preferred the response card conditions to the hand-raising conditions are reported in this study. Student preference was defined as (number of students who preferred response cards / number of students who preferred response cards and number of students who preferred hand-raising).

Participant Characteristics

Baseline performance and student classification in special education or general education, among other variables, were examined as covariates. Baseline level of performance was calculated as the average score (i.e., total number of correct answers / total number of correct and incorrect answers) in the baseline phases for each dependent variable.

Additional study characteristics were coded in the analysis as descriptors in the literature but not examined as covariates due to low or missing participants in one or more cells. The descriptive study and participant characteristics examined were publication type, author's affiliation, study design, grade level of school, and academic subject.

Data Analysis

Mean percent gain was the common metric used in this analysis. Mean percent gain was calculated by taking the difference between each participant's average score in each condition and then averaging over all participants. A standardized mean difference effect size, Cohen's *d*, was calculated by taking the [(average score in response

Table 2

Characteristics of Studies that Met the Criteria for Inclusion

	Number of Studies	Studies (%)	Number of Participants	Participants (%)
Publication type				
Journal Publication	2	16.7	42	14.5
Dissertation/Thesis	10	83.3	247	85.5
Author's Affiliation				
The Ohio State University	8	66.7	209	72.3
Other Affiliation	4	33.3	80	27.7
Design				
ABAB	7	58.3	203	70.2
ABA	4	33.3	65	22.5
Alternating Treatment	1	8.3	21	7.3
Grade Levels				
K-3	1	8.3	21	7.3
4-6	3	25.0	51	17.6
7-9	4	33.3	121	41.9
10-12	4	33.3	96	33.2
Academic Subject				
Mathematics	3	25.0	39	13.5
Social Studies	4	33.3	67	23.2
Science	4	33.3	98	33.9
History	1	8.3	85	29.4
Overall	12		289	

card condition across participants – average score in control condition across participants) / pooled standard deviation across participants].

Results

Descriptive Study Characteristics

Overall, a total of 10 dissertations/theses and 2 publications met the criteria for inclusion. In total, 289 students were included in this analysis. Three additional publications met the criteria for inclusion (Gardner et al., 1994; Cavanaugh et al, 1996; Narayan et al., 1990); however, they were not included in the synthesis because they were based on data sets from dissertations/theses that were already being used in the synthesis. Table 2 describes the characteristics of the studies that met the criteria for inclusion.

Main Effects

Participation

Nineteen participants from three studies were included in the synthesis of the participation variable. Two studies (Narayan, 1988, experiment 1; Gardner, 1989) measured the rate of response attempts and the rate of teacher presentation. The average rate of response attempts in these two studies was 0.55 response attempts per minute in the SSOR condition and 0.80 response attempts per minute in the RC condition. The average teacher presentation rate across these two studies in the SSOR condition was 1.71 learning trials per minute and 1.09 learning trials in the RC condition. The other study included in the synthesis of the participation variable, (Rindfuss, 1997), recorded total number of response attempts and response opportunities.

Across these studies, the mean percent of participation rose from 37.1% (SD=22.7) in the SSOR condition (i.e., a student raised his or her hand 37.1% of the time) to 72.7% (SD = 30.0) in the RC condition (i.e., a student wrote and displayed something on the RC 72.7% of the time). The mean percent gain for participation in the RC condition was 35.6%. Cohen's *d* was 1.34. In other words, the mean of the participants while in the RC condition was 1.34 standard deviations higher than the mean of the same participants while in the SSOR condition. See Table 3.

Achievement on Daily Quizzes

Average achievement on daily quizzes for 259 students across ten studies (Al-Atrash, 1998; Cavanaugh, 1992; Gardner, 1989; King, 1996; Maheady et al., 2002; Narayan, 1988; Reynolds, 2003; Rindfuss, 1997; Swanson, 1998; Wheatley, 1986) rose from 63.4% (SD = 23.0) correct answers in the SSOR condition to 79.9% (SD=18.1) in the RC condition. The mean percent gain between conditions was 16.5 and Cohen's *d* was 0.80. See Table 3.

Table 3

Main Effects for Participation, Quiz Scores, Test Scores, and Intervals of Behavioral Disruptions

Dependent Variable	N (studies)	N (subjects)	RC Condition Mean (%) SD Median	SSOR Condition Mean (%) SD Median	Mean Gain (%)	Cohen's *d*	Effect-size Correlation (r_{ES})
Participation**	3	19	72.7 30.0 82.5	37.1 22.7 36.8	35.6	1.34	0.56
Quiz Scores**	10	259	79.9 18.1 85.0	63.4 23.0 66.0	16.5	0.80	0.37
Test Scores**	5	165	73.0 26.8 82.8	65.7 30.6 71.0	7.4	0.26	0.13
Intervals of ** Behavioral Disruptions	2	30	9.4 7.2 9.2	51.7 20.4 54.3	- 42.3	-2.77	-0.81

Note: SSOR = single-student oral responding, RC = response cards
** $p < 0.0001$ using a paired samples t-test (two-tailed)

In terms of educational significance, in the traditional U.S. grading system, students while in the RC condition received, on average, a grade and half higher on quiz scores than in the SSOR condition. From another viewpoint of educational significance, 62.2% of students while in the RC condition would have received an average grade of B (i.e., 80% or better) as opposed to only 29.7% of students getting a grade of B or better while in the SSOR condition.

Achievement on Tests

While in the RC condition, 165 students over five studies (Al-Atrash, 1998; Cavanaugh, 1992; Gardner, 1989; Rindfuss, 1997; Swanson, 1998) raised their test scores on average by 7.4%. This equates to a ¾ of a grade increase. In the SSOR condition the mean percent score was 65.7 (SD=30.6). In the RC condition, the mean percent score was 73.0 (SD=26.8). As illustrated in Table 3, Cohen's *d* was 0.26. In the RC condition, 52.1% of the students would have received an average grade of B or better whereas in the SSOR condition 45.5% of the students would have received a grade of B or better. See Table 4.

Table 4

Projected Cumulative Percentage of Letter Grades in Each Condition for Quizzes and Tests

Grade	RC Quiz	SSOR Quiz	RC Test	SSOR Test
A (90-100%)	37.1 %	13.1 %	41.8 %	34.5 %
B (80 –89%)	62.2 %	29.7 %	52.1 %	45.5 %
C (70-79%)	78.0 %	45.9 %	64.2 %	54.5 %
D (60-69%)	86.1 %	60.9 %	73.9 %	61.2 %
F (F < 60)	100.0 %	100.0 %	100.0 %	100.0 %

Table 5

Results of Classification as a Mediator of Mean Percent Gain

Dependent Variable	Special Education Mean percent gain SD of percent gain N (participants)	General Education Mean percent gain SD of percent gain N (participants)	Cohen's *d*
Quiz scores*	26.0 20.9 32	13.3 10.5 195	0.77
Test scores*	12.7 7.2 18	6.7 12.7 147	0.58

* $P < 0.05$ using an independent samples t-test with equal variances not assumed (two-tailed)

Behavioral Disruptions

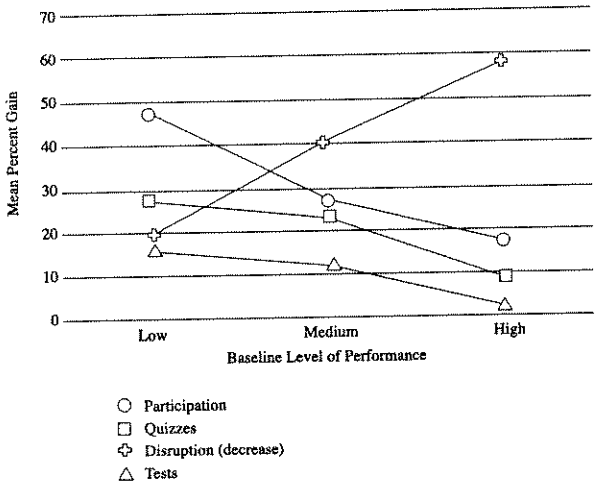
Thirty students from two studies (Amendariz & Umbreit,1999; Lambert, 2001) decreased their intervals of disruptive behavior from 51.7% (SD = 20.4) while in the SSOR condition to 9.4% (SD = 7.2) in the RC condition. The mean difference in intervals of disruptive behavior was 42.3% between conditions. The corresponding value of Cohen's *d* was –2.77. That is, the mean percent of intervals of disruptive behavior in the RC condition was 2.77 standard deviations less than the mean percent of intervals of disruptive behavior in the SSOR condition.

Student Preference

Eight studies relevant to the research on response cards were included in the synthesis on student preference (Cavanaugh, 1992; Gardner, 1989; King, 1996; Lambert, 2001; Narayan,1988; Randolph, 2001; Rindfuss, 1997; Swanson, 1998). These studies asked their participants, dichotomously, if they preferred using response cards or hand-raising / SSOR. Of 225 students who responded, 185 (82.2%) reported that they preferred using response cards.

Interactions

An analysis of interactions revealed that baseline level of performance was an important mediator of the effectiveness of response cards. See Figure 1 for a means plot of mean percent gain and baseline level of performance.



High baseline performance on a dependent measure was defined as having a mean score/interval/proportion of 66.67% or higher on the respective dependent measure during the SSOR condition. Likewise, students with between 33.34% and 66.66% on a dependent measure in the SSOR condition were considered medium baseline performers on that same measure. Low baseline performers had 33.33% or lower during the baseline condition. As Figure 1 illustrates, there is a strong

interaction between baseline level of performance and mean percent gain. For participation, quiz scores, and test scores, students who were high performers in the baseline (SSOR) condition on average experienced smaller gains from using response cards than medium or low baseline performers. Low baseline performers had the largest mean percent gain from using response cards. For behavioral disruptions, the trend goes in the opposite direction because the desired effect is a decrease, not increase in the target behavior. Students with the highest baseline percentage of intervals of behavioral disruptions had a greater decrease in the percentage of intervals than did students with medium or low intervals of behavioral disruptions.

A mediating variable related to baseline performance is a student's classification in special education or general education as displayed in Table 5.

As expected from the baseline performance interaction, students receiving special education services had higher mean percent gain between conditions than did general education students. Students receiving special education services had a mean percent gain 0.77 standard deviations higher on quizzes and 0.58 standard deviations higher on tests than general education students.

Discussion

This synthesis illustrated that using RC in the classroom has significant educational benefits over SSOR on many educational variables. In terms of participation, the frequency of active student attempts to respond increased significantly (i.e., 35.6%) during the response card condition. However, given the small number of participants (19) and study replications (2) included in the synthesis of the participation variable, the generalizability of these results is still somewhat questionable. Although not included in the synthesis because student level data were not reported, a study by Randolph (2001) found only a 10.6% increase in participation with 25 Polish English-as-a Foreign-Language students. Even if the actual percent increase in participation were only 10%, that much gain would still be educationally significant.

Heward (1994) attributes more learning and increased on-task behavior to the use of high active-student-response teaching strategies like RC. This synthesis supports both of those assertions. Quiz scores in the RC condition were over a grade and a half higher than in the SSOR condition. Likewise, the percent of students getting a grade of B (i.e., 80% or better) on quizzes doubled in the RC condition. The results for tests scores were not as high as for quiz scores, but impressive nonetheless. Results for decreases in disruptive behavior, although based on only a small number of studies, were dramatic. Another finding from this synthesis is that most students preferred using RC over SSOR.

Although, on average, there are benefits for students at all performance levels, an analysis of interactions showed that students with the lowest levels of performance in the baseline condition benefited the most from the use of RC. Similarly, students who received special education services experienced higher mean percent gains than general education students. Therefore, it is especially important for special education practitioners to consider using RC strategies in their pedagogical repertoire.

In conclusion, the few resources that are needed to create and implement response cards in the classroom appear to be worth the educational benefits found in student participation, academic achievement, decreases in disruptive behavior, and student satisfaction with RC. For educational practitioners interested in implementing response cards in their schools or classrooms, articles by Heward (1994), Heward et al. (1996), Tam and Scott (1996), or a website by Cartledge (2003) are excellent resources.

Works Cited

Al-Attrash, M.I. (1998). Evaluating the Combined Effects of Response Cards and Guided Notes on Students' Retention of Course Content: A Systematic Replication in a Secondary Social Studies Classroom. Dissertation, The Ohio State University, Columbus.

Armendariz, F. & Umbreit, J. (1999). Using active responding to reduce disruptive behavior in a general education classroom. *Journal of Positive Behavioral Interventions, 1, 3,* 152-158.

Berg, M. F. (1994). An Analysis of the Effects of Using Preprinted Response Cards and

Manipulative Response Cards During Small-Group Instruction with Preschool Children with Disabilities on the Acquisition, Generalization, and Maintenance of Selected Relational Concepts. Master's Thesis, The Ohio State University, Columbus.

Cartledge, G. (2003). *Response Cards.* Retrieved October 21, 2004, from The Ohio State University, Culturally Responsive Instruction for Urban Learners Web

Site: http://education.osu.edu/gcartledge/urbaninitiative/responsecards.htm

Cavanaugh, R.A. (1992). Comparative Effects of Verbal and Response Card Reviews During Lesson Closure on the Academic Performance of High School

Students in a Ninth-Grade Earth Science Course. Dissertation, The Ohio State University, Columbus.

Cavanaugh, R.A., Heward, W.L., & Donelson, F. (1996). Effects of response cards during lesson closure on the academic performance of secondary students in an earth science course. *Journal of Applied Behavior Analysis, 29,* 403-406.

Dewey, J. (1916). *Democracy and Education.* New York: MacMilllan.

Gardner, III, R. (1989). Differential Effects of Hand Raising and Response Cards on Rate and Accuracy of Active Student Response and Academic Achievement By At Risk and Non At Risk Students During Large Group 5th Grade
Instruction. Dissertation, The Ohio State University, Columbus.
Gardner III, R., Heward, W. L., & Grossi, T. A. (1994). Effects of response cards on student participation and academic achievement: A systematic replication with inner-city students during whole-class science instruction. *Journal of Applied*
Behavior Analysis, 27, 63-71.
Heward, W.L. (1994). Three "low tech" strategies for increasing the frequency of active student response during group instruction. In Gardner, III, R., Sainato,
D.M., Cooper, J.O. & Heron, T.E. (Eds.), *Behavior Analysis in Education: Focus on Measurably Superior Instruction.* (pp. 283-320). Monterey, CA: Brooks/Cole.
Heward, W.L. (1997). Four validated instructional strategies. *Behavioral and Social Issues, 7, 1,* 43-51.
Heward, W.L., Gardner, III, R., Cavanaugh, R.A., Courson, F.H., Grossi, T.A., & Barbetta, P.M. (1996). Everyone participates in this class: Using response cards to increase active student response. *Teaching Exceptional Children, 28, 2,* 4-11.
Hoagland, C.A. (1983). Teaching Learning Disabilities Students Traffic Signs and Laws. Master's thesis, The Ohio State University, Columbus.
Inwood, K.K. (1995). Effects of Response Cards on Participation and On-Task behavior by Preschool Children with Special Needs During Small-group Instruction. Master's thesis, The Ohio State University, Columbus.
Kellum, K.K., Carr, J.E., & Dozier, C.L. (2001). Response-card instruction and student learning in a college classroom. *Teaching of Psychology, 28, 2,* 101-104.
Lambert, M.C. (2001). The Effects of Increasing Active Student Responding with Response Cards during Mathematics Instruction on the Disruptive Behavior of Fourth-Grade Urban Learners. Dissertation, The Ohio State University, Columbus.
Lenox, S.L.R. (1982). The Effects of a Modified Visual Response System Instructional
Program on Teaching Job Application Skills to Mildly Retarded Secondary School Students in a Conventional Classroom. Master's thesis, The Ohio State University, Colunbus.
King, R.A. (1996). Comparative Effects of Using Response Cards or Single-Student Oral
Responses During Review of Global History Concepts and Facts on Secondary Students' Test Scores. Master's thesis, The Ohio State University, Columbus.
Maheady, L., Michielli-Pendl, J., Mallette, B., & Harper, G.F. (2002). A collaborative research project to improve the performance of a diverse sixth grade science class. *Teacher Education and Special Education, 25, 1,* 55-70.

Meagher, J.A. (1969). Multiple Meaning of Words – Intermediate: A Comparison of Three Teaching Techniques. Paper presented to the International Reading Association Conference, Kansas City, MO. April 30 – May 3, 1969.
Narayan, J.S. (1988). Comparison of Hand Raising and Response Card Methods of Group Instruction on Fourth-Grade Students' Opportunity to Respond and Academic Achievement. Master's thesis, The Ohio State University, Columbus.
Narayan, J.S., Heward, W.L., Gardner, III, R., Courson, F.H., & Omness, C.K. (1990). Using response cards to increase student participation in an elementary school classroom. *Journal of Applied Behavior Analysis, 23,* 483-490.
Randolph, J.J. (2001). Effects of Response Cards on Student Participation and Achievement: A Systematic Replication with Polish Students in the English as a Foreign Language Classroom. Master's thesis, Framingham State College, Framingham, MA.
Reynolds, C.M. (2003). Opportunities to Respond through the Use of Response Cards. Master's thesis, Buffalo State College, Buffalo.
Rindfuss, J.B. (1997). Using Guided Notes and Response Cards to Improve Quiz and Exam Scores in an Eigth Grade American History Class. Master's thesis, The Ohio State University, Columbus.
Shields, L.M., (1996). The Differential Effects of Single Student Oral Responding and Write-On Response Cards on the On-Task/Disruptive Classroom Behaviors of Elementary Students At-Risk for Academic Failure during Whole Class Science Instruction. Dissertation, The Ohio State University, Columbus.
Swanson, P.N. (1998). An Analysis of the Effects of Response Cards, Self-Monitoring, and Goal-Setting on the Social Studies Achievement of Students with Learning Disabilities. Dissertation, Vanderbilt University, Nashville.
Tam, B.K.Y., & Scott, M.L. (1996). Three group instructional strategies for students with limited English proficiency in vocational education. The Journal for Vocational Special Needs Education, 19, 1, 31-36.
Wheatley, R.K. (1986). Effects of Hand Raising and Response Card Conditions on Nine Intermediate Developmentally Handicapped Students During and After Money Instruction. Master's thesis, The Ohio State University, Col