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A Comparison of High-Tech and Low-Tech Response Modalities to Improve Student Performance and Classroom Behavior

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A Comparison of High-Tech and Low-Tech Response Modalities to Improve Student Performance and Classroom Behavior

by

Thomas J. Schulz

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science
Department of Child and Family Studies
With a concentration in Applied Behavior Analysis
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ABSTRACT

This study compared the effects of high-tech (e.g., clickers) and low-tech (e.g., response cards) active responding strategies during whole-group English language arts in two first-grade classrooms serving students with and without disabilities. The authors combined an ABAB reversal design with an alternating treatments design to compare the impact of using high-tech (clickers) and low-tech (response cards and hand raising) modalities on academic engagement, accuracy of responding, and disruptive behavior across four teacher-nominated students in two first-grade classrooms. During baseline, the teacher conducted her lesson as planned by having the students raise his/her hand to answer questions. In the intervention phase, students alternated between using preprinted response cards and clickers each session to answer the teacher’s questions. When using the pre-printed response cards or clickers, the students were instructed to hold up the index card with the correct answer or click the correct answer on his/her remote after the teacher read the question. The results of the study indicate that both active responding strategy (ARS) modalities were equally effective in increasing student academic engagement and decreasing disruptive behavior.
INTRODUCTION

Student participation in academic activities traditionally involves raising their hand and waiting to be called on by the teacher before answering the question, while others are required to listen without answering questions (Armendariz & Umbreit, 1999; Horn, Schuster, & Collins, 2006). Hand raising (HR) may be a preferred method for many teachers because it allows for more instructional time; however, there are several limitations (Horn, 2010). Hand raising allows only one student at a time to actively participate in the lesson, while the remaining students listen. Additionally, high-achieving students are more likely to raise their hand to respond, resulting in more opportunities to be engaged in the lesson. Meanwhile, students who are struggling, or for other reasons are less prone to engage, are left with fewer opportunities to participate (Gardner, Heward, & Grossi, 1994; Heward et al., 1996). This could be detrimental to children with disabilities, as these children are 2.5 times more likely to engage in off-task behavior, thus interfering with their ability to learn and attend to classroom content (Vile-Junod, DuPaul, Jitendra, Volpe, & Cleary, 2006). Another limitation of HR is that it may give the teacher a false impression that students understand the material, which may not be the case (Heward, 1994, p. 290). Additionally, Stowell and Nelson (2007) found that students tend to hesitate in raising their hand until a peer does so. This could result in less active responding overall.

Educational research has shown that students are likely to learn more when they are required to actively participate (Bondy & Tincani, 2018; Christle & Schuster, 2003; George,
Increasing the opportunity for students to actively participate in instructional activities promotes a positive environment in the classroom and as a result, contributes to reducing classroom problem behavior and increasing learning (Sutherland & Wehby, 2001). There are many active responding strategies (ARS) that can be used to increase academic engagement and decrease disruptive behavior. Two ARS modalities that can be used are response cards (RC; Randolph, 2007) and clickers (Kay & LeSage, 2009).

RCs are cards or boards that all students can use to simultaneously respond to questions posed by the teacher (Christle & Schuster, 2003; Heward, 1994, p. 299; Heward, 1997; Heward et al., 1996). When the teacher gives the signal to hold up their cards or boards, students raise their RC into the air for the teacher to see. RCs are available in various forms such as a preprinted deck, ‘pinch cards’, and write-on items (Heward et al., 1996; Heward, 1997). In the case of a preprinted deck, students are given a personal set of cards with various potential answers (i.e., Yes/True, No/False, multiple choice [A, B, C, D], concepts such as ‘before’ and ‘after’). Whenever the teacher poses a question, students answer by selecting one of the cards and showing it to the teacher. Pinch cards, on the other hand, consist of a single card with multiple answers. The teacher can either have the students ‘pinch’ the answer or attach a clothespin to the answer they believe is correct. Finally, write-on RCs requires that the students write down the answer on a personal board. These boards can take the form of a mini-white board, chalk board, or simply a manila folder inserted into a sheet protector (Heward et al., 1996) and answers are erased after each question is answered.

RCs have many benefits including immediate feedback for students (Cavanaugh et al., 1999; Christle & Schuster, 2003), which can help them identify lesson material for further
review and decrease disruptive behavior due to the incompatible nature of active lesson participation (Armendariz & Umbreit, 1999; Berrong et al., 2007; Heward, 1994; Lambert et al., 2006). The use of RCs also benefits teachers by giving them the opportunity to perform contingent teaching (Clarke, Haydon, Bauer, & Epperly, 2016; Gardner et al., 1994; Heward, 1994). Contingent teaching allows teachers to make immediate adjustments to the lecture based on students’ understanding of the material as determined by the answers they provide using their RC. Additional benefits of using RCs are that they are a low-cost intervention that can be used with students of all abilities (Horn, 2010; Wood, Mabry, Kretlow, Lo, & Galloway, 2009) including students with limited vocal skills (Cakiroglu, 2014). Additionally, research indicates that students often prefer RCs over HR (Armendariz & Umbreit, 1999; George, 2010; Lambert et al., 2006).

Although there are many benefits, the literature has also reported limitations of using RCs. Bondy and Tincani (2018) and Clarke, Haydon, Bauer, and Epperly (2016) indicated that the time required to train students and teachers, prepare materials, and implement the procedure was extensive for some forms of RCs (i.e., preprinted RCs). Students may also refuse to answer questions or engage in counterproductive behaviors (i.e., draw on the RC board) instead of participating in the lesson (George, 2010). Additional limitations of RCs were identified by Heward et al. (1996); for instance, preprinted RCs limit the available responses and are not appropriate for questions that have multiple answers. Furthermore, write-on RCs are more likely to produce incorrect answers, require more time, and can cause strain on the teacher’s eyes due to poor calligraphy or small font size of the response.

Another type of ARS used in classrooms is an electronic clicker. Clickers are handheld devices that permit students to answer multiple choice and true/false questions displayed at the
front of the room (Kay & LeSage, 2009). Student responses are instantly graphed and displayed for the class to see and can then be reviewed and discussed by the teacher. Many names have been used in the literature to describe clickers, including ‘audience response system’ (Stowell & Nelson, 2007), ‘personal response system’ (Shaffer & Collura, 2009), ‘classroom response system’ (Fallon & Forrest, 2011), ‘student response system’ (Blood, 2010), and ‘technology-based network system’ (Elicker & McConnell, 2011). Clickers have been used in elementary schools (Scott, Fahsl, Fark, & Peterson, 2014), middle schools (Xin & Johnson, 2015), high schools (Blood, 2010; Wang, Chung, & Yang, 2014), and universities (Elicker & McConnell, 2011; Fallon & Forrest, 2011; Shaffer & Collura, 2009; Stowell & Nelson, 2007; Zayac, Ratkos, Frieder, & Paulk, 2016). This modality has also been used by children with disabilities serviced in both general and special education classrooms (Wang et al., 2014) in addition to children with specific learning disabilities, attention deficit disorder, emotional and behavioral disorders (EBD), and other impairments serviced in special education classrooms (Xin & Johnson, 2015).

Similar to RCs, clickers have produced promising effects: increased participation in activities (Blood, 2010; Shaffer & Collura, 2009; Stowell & Nelson, 2007; Wang et al., 2014), correct responding (Kulesza, Clawson, & Ridgway, 2014), academic achievement (Scott et al., 2014; Shaffer & Collura, 2009; Wang et al., 2014; Xin & Johnson, 2015; Zayac et al., 2016), and on-task behavior (Xin & Johnson, 2015). Clickers also have many benefits, some of which are similar to RCs, including: immediate feedback to both teachers and students, opportunities for contingent teaching (Scott et al., 2014; Stowell & Nelson, 2007; Xin & Johnson, 2015), and teacher preference over traditional HR and RC (Fallon & Forrest, 2011; Elicker & McConnell, 2011; Scott et al., 2014; Shaffer & Collura, 2009; Stowell & Nelson, 2007; Wang et al., 2014; Xin & Johnson, 2015; Zayac et al., 2016). Another benefit of using clickers is that they provide
anonymity to individual students (Scott et al., 2014; Stowell & Nelson, 2007; Wang et al., 2014). This method of responding only allows the teacher to see individual student responses, which may encourage participation. However, some of the disadvantages of clickers include the fact that participation is hindered when students forget to bring their clickers to class or experience technical issues with the software (Dallaire, 2011). Although clickers are associated with an increase in participation, it may not result in a decrease in problem behavior because students can continue to engage in disruptive behavior during the time between questions (Blood, 2010).

Given the potential benefits of both clickers and RCs, some studies have compared the effects across these modalities. Stowell and Nelson (2007) investigated the impact of using clickers, RCs, and an alternative HR on student participation in a simulated introduction to psychology class in a Midwest university. In their study, the professor asked the students questions in each condition and the students answered using the appropriate response modality. In the alternative HR, the professor asked multiple-choice questions and the students raised their hand for the option they believed was correct. Following the conclusion of the lecture, the students were given a 10-question quiz based on the lecture. Overall, the authors found that the students were more likely to participate when using clickers than when using other response modalities, but this increase in participation did not result in improved quiz scores. Other studies found similar results in university settings (Elicker & McConnell, 2011; Fallon & Forrest, 2011; Zayac et al., 2015).

Despite the growing research in ARS, the researcher found no published studies that compared the effects of RCs and clickers to traditional HR on academic engagement, accuracy of responding, and disruptive behavior with elementary school students, which warranted the need for further research. Therefore, the purpose of this study was to compare the impact of using
high-tech (clickers) and low-tech (RCs and HR) modalities on student engagement in instructional activities and the accuracy of responding of elementary school students at risk for a referral to special education. Further, this study examined the effects of each ARS modality on student disruptive behavior.

**METHOD**

**Setting**

This study was conducted at an urban elementary school in two 1st-grade general education classrooms that served 19-22 students with and without disabilities. These classrooms were selected because teachers had previously expressed concerns to the school administration regarding the level of their students’ challenging behaviors and the need for additional support. The school serves students in grades Pre-Kindergarten to fifth and receives Title 1 funding. Both classroom teachers indicated that English language arts (ELA) was the academic time period in which most problem behavior occurred; thus, the ELA time period was targeted for intervention.

**Participants**

The participants in this study included four elementary school students and two teachers in two classrooms. Each classroom teacher had two participating students. Inclusion criteria for student participants included: (a) be between the ages of 5-12 years-old in a 1st- through 5th-grade general education classroom (b) be able to participate in whole group instructional activities, and (c) engage in disruptive behavior for at least 25% of the time during a specified
problematic academic instructional period. Exclusion criteria include students who are frequently absent and served by classroom teachers who already use, or have previously used, RCs or clickers. All students in the classrooms received the response cards and student response system (clicker) interventions; however, data were only collected on the four students who were nominated by the classroom teacher and met the inclusion criteria. To protect the identity of the participating students, pseudonyms were given to each participant.

Nick and Timmy were served in the same classroom. Nick was a 6-year-old White, non-Hispanic boy, who was receiving Tier 2 academic supports for reading and math at the time of the study. According to his teacher, Nick often got out of his seat and walked around the room or laid on the ground. In addition, at times he would crawl under his desk and scream and/or cry during instruction. Throughout his participation in the study, Nick received mental health counseling at school from the school district’s mental health counselor. His counseling sessions occurred one day a week for 30 min. During the two initial classroom observations conducted to determine participant eligibility, Nick engaged in disruptive behavior during for an average of 45% of intervals during the target instructional time. Timmy was a 6-year-old White, non-Hispanic boy, who had been receiving Tier 2 academic supports for reading and math at the time of the study. His teacher reported that Timmy rarely participated in class and, at times, he engaged in problem behavior that was disruptive to the class. During the initial observations, Timmy engaged in disruptive behavior for an average of 34% of intervals during the target instructional time.

Kelly and Brandon were served in the same classroom. Kelly was a 7-year-old, Asian American female student, who was receiving Tier 2 academic supports for reading and math at the time of the study. Her teacher reported that Kelly had difficulty remaining focused and
frequently disrupted the class by talking, screaming, crying and/or dropping to the floor if the
daily classroom routine was altered. During the initial classroom observations, Kelly engaged in
disruptive behavior for an average of 40% of intervals during the target instructional time.

Brandon was a 7-year-old, African American, non-Hispanic boy, who had also been receiving
Tier 2 academic supports for reading and math at the time of the study. His teacher reported
Brandon would engage in disruptive behavior for attention. Brandon’s teacher also reported that
he would occasionally bully another student in his class by making negative verbal statements
towards them. Bandon engaged in disruptive behavior for an average of 32% of the ELA
instructional time.

The teacher in the first classroom (Teacher 1) was a White, non-Hispanic woman who
had been teaching for 25 years. She received her bachelor’s degree in elementary education and
her master’s degree in curriculum and instruction. This classroom had a university student intern
majoring in education. The intern assisted the teacher with lesson development and
dissemination. The teacher in the second classroom (Teacher 2) was a White, non-Hispanic
woman who had been teaching for 11 years. She received her bachelor’s degree in English
literature.

To recruit participants, the researcher met with the district behavior specialist and the
principal of the school to discuss the purpose of the study and obtain permission to have flyers
distributed to teachers. The flyers briefly described the study, perceived benefits from similar
studies, and included the researcher’s contact information (Appendix A). The researcher gave
flyers to each teacher and met with each individually to explain the study and complete the
teacher interview form developed by the researcher (Appendix B). This form was designed to
confirm teacher eligibility. At the end of the meeting, the researcher obtained written consent
from the teacher to participate in the study. Once teacher consent was attained, the researcher sent home informed parental consent (permission) forms to all students in their classrooms. Once parental consent was obtained, the researcher obtained verbal assent from the students using an assent form. Then each teacher nominated two participants for data collection and the researcher observed the potential participants to determine their levels of disruptive behavior and confirm eligibility for the study.

**Materials**

Materials included a set of preprinted RCs, iClicker+ student remotes and Instructor Base, Microsoft® PowerPoint, a computer and projector. Other materials used in the study included a pen and stopwatch. Each student received a set of preprinted RCs with answer choices A, B, C. The answer choices were written on laminated 7.6 cm high X 12.7 cm wide colored-index cards. Each student had a total of three preprinted RCs that were handed out at the beginning of the lesson by the researcher or research assistant (RA). Participants also received an iClicker+ provided by the researcher. The researcher assigned the four participating students a number that corresponded with an iClicker+ (Zayac et al., 2015) to which only the teacher and study staff had access.

iClicker+ is an interactive classroom response system which allows students to respond to multiple choice and true and false questions. The iClicker Classic v7.21.0 software was downloaded onto a USB drive, which was plugged into the teacher’s computer along with the iClicker Instructor Base. The iClicker Instructor Base has a two-way radio frequency system that records each student’s answer during a polling session. Microsoft® PowerPoint v16.21 was used to create the questions used during the baseline and intervention phases, and a projector in the classroom was used to display the PowerPoint presentation onto the screen in the front of the
room. The researcher constructed data sheets for each dependent variable that was measured (Appendix D). Data were recorded using a pen and a stopwatch.

**Dependent Variables**

The primary dependent measures for this study were academic engagement and disruptive behavior. The secondary dependent measure was accuracy of responding. Each of these responses were operationally defined for each participant with help from their teacher. The researcher and RA collected data on the dependent measures 3-5 days a week. If the teacher was unable to complete at least 50% of the lesson, data from that observation was discarded.

Academic engagement was defined as the participant initiating a response to the teacher’s questions using the appropriate response method (i.e., hand raise, RC, clicker) within 15 s of a question or cue given by the teacher (e.g., “You can respond now using your response cards”). The researcher and RA recorded the occurrence (+) and nonoccurrence (-) of academic engagement during each opportunity. That is, following each question presented by the teacher, the researcher and RA recorded if the participant initiated a response to the question (i.e., raise hand). During baseline, academic engagement was recorded if the students independently raised their hand to answer the teacher’s question within 15 s after the teacher finished reading the question and answer choices. During the intervention phase, academic engagement was recorded if the students independently held up their RC or clicked their answer on the clicker within 15 s following the teacher’s cue. The percentage of participant-initiated responses were measured based on the number of questions (percentage of opportunities) given by the teacher (Munro & Stephenson, 2009). Both teachers indicated that they typically asked 10 multiple-choice and true-and-false questions during their lesson. The number and type of questions were held constant across all conditions and phases. The total number of responses (i.e., hand raise, RC, clicker) was
divided by the total number of questions asked and multiplied by 100 to calculate a percentage of academic engagement for each participant.

Disruptive behavior was individually defined for each participant. For Nick, disruptive behavior was defined as making any audible noise (e.g., talking out of turn, screaming) rolling on the floor, leaving the assigned area without asking (e.g., standing up, walking away from seat), verbal or non-verbal task refusal (e.g., “I’m tired” or putting head down), or manipulating items other than required materials with hands during a task. For Timmy, disruptive behavior was defined as making any audible noise (talking out of turn), leaving assigned area without asking, verbal or non-verbal task refusal (e.g., “I’m tired” or putting head down), or manipulating items with hands during a task. Disruptive behavior for Kelly was defined as making any audible noise (talking out of turn), leaving assigned area without permission, verbal or non-verbal task refusal (e.g., “I’m tired” or putting head down), dropping to the floor, manipulating items with hands during a task, or touching peer with head, hands, feet or object. For Brandon, disruptive behavior was defined as making any audible noise (e.g., talking out of turn, popping sounds), leaving assigned area without permission, verbal or non-verbal task refusal (e.g., “I’m tired” or putting head down), laying down, throwing objects into the air, dancing, or touching a peer with head, hands, feet or object.

Data on disruptive behavior were collected using a 10-s partial interval recording system. If a participant engaged in the target behavior during any portion of interval, an occurrence (+) was recorded. If the participant did not engage in the target behavior, a nonoccurrence (-) was recorded. The intervals with disruptive behavior were added together and divided by the total number of intervals, and then multiplied by 100 to calculate the percentage of intervals each student engaged in disruptive behavior.
Participating students were also assessed on the accuracy of each response (i.e., the percentage of correct responses) to teacher-posed questions. During baseline, an accurate response was recorded if the student provided a correct answer to the teacher’s question after raising a hand and being called on by the teacher. If the teacher randomly called on a participant when he or she did not have their hand raised, this was not scored as an occurrence of academic engagement, but instead scored as an occurrence of accurate responding if the question is answered correctly. During the RC condition, each answer was on a different colored-index card. When the students held up their RC, the researcher and RA circled if the question was answered correctly (+) or incorrectly (-) from the back of the classroom. During the clicker condition, the students’ correct responses were downloaded from the iClicker software and were scored accordingly for each question. The researcher and RA circled if the question was answered correctly (+) of incorrectly (-). The percentage of correct responses was measured based on the number of questions (percentage of opportunities) given by the teacher. The total number of correctly answered questions was divided by the total number of questions asked and multiplied by 100 to calculate a percentage of correct responses for each participant.

**Interobserver Agreement (IOA) & Teacher Implementation Fidelity**

To assess IOA, four trained RAs independently collected data on each of the three dependent variables and teacher implementation of the procedures. IOA was assessed by comparing the data collected by the researcher and RA for an average of 40% of the sessions across all participants during the baseline and intervention phases. IOA was calculated by comparing the data from the researcher to that of the RA on each interval/opportunity to determine if there was an agreement and the calculating the number of trials/opportunities with agreements. The IOA score for disruptive behavior was calculated by dividing the number of
intervals with agreements by the total number of intervals and multiplying by 100. The IOA score for academic engagement and accuracy of responding was calculated by dividing the number of opportunities with agreement, by the total number of opportunities per observations, multiplied by 100. During baseline, the average IOA across participants was 97.4% (range, 80-100%) for academic engagement, 96.9% for accuracy of responding (range, 50-100%), and 94.4% for disruptive behavior (range, 80.6-100%). During intervention, the average IOA for academic engagement was 100%, for accuracy of responding 98.5% (range, 87.5-100%), and for disruptive behavior 89.5% (range, 76.2-99.2%). Mean IOA across baseline and intervention was 97% (range, 84.3-100%) for Nick, 97.1% (range, 80.6-100%) for Timmy, 93.5% (range, 50-100%) for Kelly, and 97% (range, 76.2-100%) for Brandon.

The researcher and RAs collected data on teacher implementation fidelity for Teacher 1 during an average of 53.4% of sessions across all phases and for Teacher 2 on 59.2% of sessions across all phases. Fidelity was scored using task analyses for baseline and each response modality (Appendix E, F, & G). The task analyses included a list of the procedures (7 steps) and were scored using a yes/no format to calculate the percentage of procedures implemented with fidelity. A percentage was calculated by dividing the steps the teacher completed by the total number of steps in the task analysis. Implementation fidelity for Teacher 1 in the baseline conditions averaged 91.5% (range, 83-100%) and 100% for the RC and clicker conditions. Implementation fidelity for Teacher 2 in the baseline conditions averaged 95.8% (range, 83-100%) and 100% for the RC and clicker conditions. IOA for teacher implementation fidelity was assessed by having the researcher and a RA independent collect implementation fidelity and comparing these scores on a step-by-step basis. The IOA score calculated by dividing the number of steps agreed by the total number of steps then multiplied by 100. For the mean IOA
was 100% for the baseline condition and 100% for the RC and clicker conditions for Teacher 1 and Teacher 2.

**Experimental Design**

An ABAB reversal design embedded with an alternating treatment design was used to examine the outcome of implementing the intervention and compare the impact of RCs and clickers on academic engagement, disruptive behavior, and accuracy of responding compared to HR during instructional time. For each participant, three conditions, (a) baseline, (b) RC, and (c) clicker were evaluated across four phases: baseline (A1), RC and clicker comparison (B1), baseline (A2), and RC and clicker comparison (B2). Baseline data were taken during the target instructional period using the traditional HR method. During the comparison phases, the students alternated between using the RCs and clickers each session.

**Procedures**

Sessions took place during the ELA instructional period, 3-5 days per week. The teachers gave the researcher a book each day to create multiple-choice questions and/or true-and-false questions for the lessons for the following day. The questions averaged between 6-7 multiple-choice and 3-4 true-and-false. Before starting the lesson, the teachers informed students of which response modality they were using to answer questions. During each ELA lesson in both classrooms, the class read a novel short story and then the teacher assessed students’ comprehension of the short story using multiple-choice and/or true-and-false questions that were presented via Microsoft® PowerPoint. The short stories consisted of both fiction and non-fiction books at a 1st grade reading level. During this comprehension assessment, each question was presented to the class. This process was repeated until all questions were answered and this academic time period lasted 15-30 minutes per day. Teacher 1 read the story to the students
while they sat at their desks. After the story was finished, the teacher presented to the class 10 questions related to the story. Teacher 2 read the story to the students while they sat on the carpet in front of the projector screen. The students each had a copy of the book to follow along if available. Throughout the story, she would stop and ask the students questions pertaining to the book.

**Baseline.** During this condition, instruction was delivered as described above. When giving questions, the teachers read each question and possible answers to the students once in the first classroom and twice in the second classroom, waited 15 s for students to raise their hands, and then randomly called on a student to verbally answer the question. Specific praise was delivered from the teacher for correct responding (i.e., “Great job, Nick! A is the right answer”). If the answer provided by the student was incorrect, the teachers prompted students to look at the book to locate the correct answer. If no students raised their hand within 15 s of the question, the teachers usually randomly selected a student to answer the question. However, throughout the duration of this study every question presented by the teacher resulted in one or more student raising his/her hand to answer the question.

**Teacher training.** Prior to implementing intervention, each teacher received a 30-min training on the procedures for the RCs and clicker conditions. The researcher used Behavior Skills Training (BST; Miltenberger et al., 2004) to teach the procedures to the teacher. That is, the researcher provided instructions, modeled the responses, allowed the teacher to rehearse, and then provided feedback. Instructions for each condition consisted of task analyses that described how the teacher should present questions to the students during each condition. These tasks analyses were developed by the researcher. The researcher provided the teachers with a copy of the task analyses, reviewed them, and then modeled the procedures for each response modality.
The teacher and researcher then role-played the procedures. Following role-play, the researcher provided praise and corrective feedback. This process continued until the teachers performed all steps of the task analyses with 100% accuracy across three consecutive trials for each modality.

**Response cards.** In this condition, similar procedures were used from the baseline condition with the exception that the students used RCs to answer the questions. On the first day of the RC condition, the teachers began the lesson by informing students how to use the RCs and then had students practice using the RCs to answer sample questions before beginning the lesson. The sample questions were in addition to the required number of lesson questions that were asked. Training lasted approximately 10 min and concluded when all students responded within the 15-s interval after given the cue, “You can respond now using your response cards,” three consecutive times. Data were not taken on the dependent measures during the student training session. The RCs were handed out at the beginning of the instructional period and collected at the end by the researcher or RA. The teachers read the question from the slide along with the possible answer choices, gave the cue for the students to raise his or her RC into the air, and then waited 15 s for students to respond. After answering each question, Teacher 1 allowed the students to silently celebrate at their desk if they answered correctly, and Teacher 2 would ask if the students agreed with the correct answer using sign language for “yes” or “no” before moving onto the next question. Positive and corrective feedback were delivered to the whole class by the teacher.

**Clickers.** The teachers trained the students how to use the clickers on the first day of the clicker intervention. Clicker training followed a similar format as the RC training. The teachers began the lesson by informing the students about the clickers and modeling how to use the response modality. The training lasted 10 min and concluded when all students responded to the
sample questions within the 15-s interval after the cue, “Click your answer now,” was provided for three consecutive times. The clickers were handed out at the beginning of the instructional period and collected at the end by the researcher or RA. During this condition, the teachers read the question and answer choices to the students, gave the cue and began the 15-s polling period. After the polling period expired, the students’ anonymous responses were immediately graphed and projected onto the screen for the entire class to see. The teachers then reviewed each correct answer and clicked the correct answer on the graph for the students’ responses to be scored. Positive and corrective feedback were delivered following similar procedures outlined in the RC condition.

RESULTS

Results are shown in Figures 1 and 2. Figure 1 shows the data for academic engagement and disruptive behavior for all four participants. During baseline all participants engaged in moderate to high levels of disruptive behavior (mean 46.1%; range, 8-89%) and low to moderate levels of academic engagement (mean 39.5%; range, 0-90%). During the ARS phase, academic engagement increased (mean 87.9%; range, 40-100%) and disruptive behavior decreased (mean 20.6%; range, 4-62%) for all participants. During the second baseline phase, levels of disruptive behavior increased (mean 43.8%; range, 8-83%) and levels of academic engagement decreased (mean 41.5%; range, 10-70%) for all participants; however, Kelly’s disruptive behavior occurred at a variable rate during this phase. Upon reintroduction of ARS, academic engagement
increased (mean 84.6%; range, 60-100%) and disruptive behavior decreased (mean 12.3%; range, 4-38%) for all participants. Figure 2 shows data on the accuracy of responding for all participants across all phases. The accuracy of responding during baseline for all students averaged 69.2% (range, 0-100%) and during the ARS phase, it averaged 71.8% (range, 67-77%) with levels that were similar across RCs (mean 66.4%; range, 53-79%) and clicker (mean 70.2%; range, 66-78%).

During the initial baseline phase, Nick engaged in the lesson for an average of 48.0% (range, 30-90%) of the opportunities and engaged in disruptive behavior for an average of 82.6% (range, 74-89%) of the intervals during the academic period. Once the ARS were introduced, academic engagement increased to an average of 96.7% (range, 70-100%) of the opportunities and his disruptive behavior decreased, averaging 30.3% (range, 7-62%) across both intervention conditions. During the second baseline phase, Nick engaged in the lesson for an average of 34.0% (range, 10-50%) of the opportunities and engaged in disruptive behavior for an average of 58.2% (range, 28-83%) of the intervals during the academic period. Once the ARS were reintroduced, academic engagement increased to an average of 96.7% (range, 80-100%) of the opportunities and his disruptive behavior decreased, averaging 9.2% (range, 7-13%) across both intervention conditions. In addition, Nick’s levels of academic engagement and disruptive behavior were similar across the RC and clicker conditions. Across both ARS phases, academic engagement occurred in a mean of 98.3% (range, 90-100%) in the RC condition and 95.0% (range, 70-100%) for the clicker condition. Disruptive behavior occurred in a mean of 27.7% (range, 7-62%) in the RC condition and 32.8% (range, 10-57%) in the clicker condition. In addition, as depicted in Figure 2, accuracy of responding was variable but similar across RC and clicker.
Timmy engaged in the lesson during the initial baseline phase for an average of 24.0% (range, 0-50%) of the opportunities and engaged in disruptive behavior for an average of 36.6% (range, 11-67%) of the intervals during the academic period. Once the ARS were introduced, academic engagement increased to an average of 80.8% (range, 40-100%) of the opportunities and his disruptive behavior decreased, averaging 13.0% (range, 4-22%) across both intervention conditions. During the second baseline phase, Timmy engaged in the lesson for an average of 46.0% (range, 30-60%) of the opportunities and engaged in disruptive behavior for an average of 39.6% (range, 29-53%) of the intervals during the academic period. Once the ARS were re-introduced, academic engagement increased to an average of 90.0% (range, 70-100%) of the opportunities and his disruptive behavior decreased, averaging 8.2% (range, 4-15%) across both intervention conditions. In addition, Timmy’s levels of academic engagement were higher during the RC condition; however, levels of disruptive behavior were similar across the RC and clicker conditions. Across both ARS phases academic engagement occurred in a mean of 91.4% (range, 70-100%) in the RC condition and 66.7% (range, 40-90%) for the clicker condition. Disruptive behavior occurred in a mean of 12.4% (range, 10-19%) in the RC condition and 13.8% (range, 4-22%) in the clicker condition. In addition, as depicted in Figure 2, accuracy of responding was variable but similar across RC and clicker.

During the initial baseline phase, Kelly engaged in the lesson for an average of 24.6% (range, 0-70%) of the opportunities and engaged in disruptive behavior for an average of 23.8% (range, 14-29%) of the intervals during the academic period. Once the ARS were introduced, academic engagement increased to an average of 93.3% (range, 80-100%) of the opportunities and his disruptive behavior decreased, averaging 11.4% (range, 4-22%) across both intervention conditions. During the second baseline phase, Kelly engaged in the lesson for an average of
42.0% (range, 10-70%) of the opportunities and engaged in disruptive behavior for an average of 24.0% (range, 8-35%) of the intervals during the academic period. Once the ARS were re-introduced, academic engagement increased to an average of 75.0% (range, 60-100%) of the opportunities and her disruptive behavior decreased, averaging 9.8% (range, 5-19%) across both intervention conditions. In addition, Kelly’s levels of academic engagement and disruptive behavior were similar across the RC and clicker conditions. Across both ARS phases, academic engagement occurred in a mean of 91.4% (range, 80-100%) in the RC and 93.3% (range, 80-100%) in the clicker conditions. Disruptive behavior occurred in a mean of 8.0% (range, 4-13%) in the RC condition and 15.0% (range, 6-22%) in the clicker condition. In addition, as depicted in Figure 2, accuracy of responding was variable but similar across RC and clicker.

Brandon engaged in the lesson during the initial baseline phase for an average of 61.2% (range, 40-67%) of the opportunities and engaged in disruptive behavior for an average of 34.4% (range, 18-57%) of the intervals during the academic period. Once the ARS were introduced, academic engagement increased to an average of 81.3% (range, 40-100%) of the opportunities and his disruptive behavior decreased, averaging 25.3% (range, 9-54%) across both intervention conditions. During the second baseline phase, Brandon engaged in the lesson for an average of 44.0% (range, 30-60%) of the opportunities and engaged in disruptive behavior for an average of 53.4% (range, 48-61%) of the intervals during the academic period. Once the ARS were re-introduced, academic engagement increased to an average of 76.7% (range, 60-100%) of the opportunities and his disruptive behavior decreased, averaging 21.8% (range, 8-38%) across both intervention conditions. In addition, Brandon’s levels of academic engagement were higher during the clicker condition; however, levels of disruptive behavior were similar across the RC and clicker conditions. Across both ARS phases, academic engagement occurred in a mean of
72.1% (range, 40-90%) in the RC condition and 93.3% (range 80-100%) for the clicker condition. Disruptive behavior occurred in a mean of 24.4% (range, 9-37%) in the RC condition and 25.4% (range, 17-54%) in the clicker condition. In addition, as depicted in Figure 2, accuracy of responding was variable but similar across RC and clicker.

**DISCUSSION**

This study compared the impact of using high-tech (clickers) and low-tech (RCs and HR) modalities on student engagement in instructional activities, disruptive behavior, and accuracy of responding for four elementary school students at risk of referral to special education. Subsequent to baseline, an alternating treatments comparison was implemented in a reversal design across participants. The results of the study indicate that both ARS modalities were equally effective in increasing student academic engagement and decreasing disruptive behavior. For all students, disruptive behavior decreased, and academic engagement increased immediately when the intervention conditions were introduced. When comparing RCs and clickers, the RCs produced higher levels of academic engagement for one student and the clickers produced high levels of academic engagement for one student relative to the initial baseline phase. However, the changes in disruptive behavior were greater for two students during the clicker condition than during the RCs condition.

The results of this study are consistent with the results of Horn, Schuster, and Collins (2006) and Xin and Johnson (2015) who reported that both RCs and student response systems
(clickers) were effective in increasing academic engagement and decreasing inappropriate behavior. However, previous research has produced mixed results regarding the impact of using clickers on problem behavior. Whereas Xin and Johnson (2015) successfully used clickers to decrease problem behavior in students with EBD, specific learning disabilities, and attention deficit disorder. Blood (2010) found that clickers had no effect on problem behavior. Further research should be conducted to determine the effects of clickers on student problem behavior.

In the current study, the researcher was interested in comparing the use of RCs and clickers to increase academic performance. The findings indicate that despite an increase in academic engagement, improvement in this behavior does not necessarily result in increased academic performance (Blood, 2010; Bondy & Tincani, 2018; Elicker & McConnell, 2011; Lambert et al., 2006). However, previous research on the effects of RCs and clickers on academic performance or accuracy of responding has been limited (Bondy & Tincani, 2018; Kulesza et al., 2014; Lambert et al., 2006). One possible reason that both RCs and clickers had minimal impact on academic performance may have been due to the way the two classroom teachers asked questions of students, or the length of the stories read during class. The teachers asked questions of students during or at the end of the session, and some stories were longer than others.

There are limitations of the current study. Similar to Dallaire (2011), the students in the second classroom reported experiencing technological issues. The clickers would occasionally turn off during session before the auto-turn off would occur. The iClicker+ is programmed to automatically turn off after 10-min. Valuable time was lost when the teacher had to divert her attention from the lesson to address this issue. This may have been attributed to the students in
the second classroom continuously clicking the answer choice for the duration of the polling period, resulting in missed opportunities to answer the teacher’s questions.

A second limitation to this study was that answers were not always submitted independently. Specifically, Kelly was observed to look at her peer’s RC or clicker before answering the question. The teacher would often prompt Kelly to keep her eyes up front after she was caught cheating, but then would frequently cheat when answering the next question. The teacher attempted to mitigate this by stating rules at the beginning of the lesson (i.e., “When we answer questions, we want to make sure we keep our eyes up front”), and through environmental changes like moving Kelly to the carpet square in front of the teacher and then to the carpet square in the front row by the projector screen. Cheating was also present in the first classroom during the clicker conditions. When the teacher gave the cue for the class to click their answer, a small number of students, including Nick, would occasionally shout out the answer they selected (e.g., “I picked A”). With this in mind, ARS modalities may not report a valid measurement of accuracy, as student’s responses were not always independent. This contradicts the argument of Stowell & Nelson (2007) and Fallon & Forrest (2011) who reported that these ARS modalities created an avenue for anonymous student responding.

Despite these limitations, the current study extends the literature on ARS by comparing the impact of RCs and clickers to traditional HR in a novel setting and with a novel population. Previous studies have only compared the impacts of these ARS modalities in university classrooms (Elicker & McConnell, 2011; Fallon & Forrest, 2011; Stowell & Nelson, 2007; Zayac et al., 2015). Further research is needed to evaluate these same teaching modalities in other settings, such as middle schools and high schools, as well as with novel populations, such
as students with emotional or behavioral disorders, autism spectrum disorder, and attention-deficit/hyperactivity disorder.

Given that the teachers and students (or teachers or students only) in the current study found that using clickers was more acceptable than using response cards, further research is needed to identify variables that influence teacher or student preference for different ARSs. Given that these ARS modalities were novel to the students and only used during one academic period for 15-30 min each day, preference may change when the modalities are used for longer durations and during other academic periods throughout the day. Future research should evaluate the effects of these ARS modalities across the school day with different grade levels to determine whether it is the novelty of the ARS modalities that changes student behavior.
Figure 1. Shows the percentage of occurrences for academic engagement (AE) and percentage of intervals with disruptive behavior (DB) during the instructional period for all four participants across experimental phases. Breaks in data points indicate student absences.
Figure 2. Shows the percentage of accurate responding for all four participants across experimental phases.
REFERENCES


APPENDICES
Appendix A: Recruitment Flyer

A Comparison of High-Tech and Low-Tech Response Modalities to Improve Student Performance and Classroom Behavior

PARTICIPANTS NEEDED FOR A CLASSROOM MANAGEMENT INTERVENTION RESEARCH STUDY!

Purpose:
The purpose of this study is to compare the impact of using low-tech (response cards and hand raising) and high-tech (clickers) modalities on student engagement in instructional activities and the accuracy of responding of elementary students with disabilities. Further, the study will examine changes in student disruptive behavior and compare the results for the three response modalities.

Teacher Eligibility Criteria:
- Willing to use pre-printed response cards and clickers during math, science, or social studies
- Currently ask questions to students during academic instruction
- Consent to receive training to use response cards and clickers
- Nominate at least two students based on student inclusion criteria
- Have access to a computer and projector in the classroom

Student Eligibility Criteria:
- Be able to participate in whole group instructional activities
- Engages in disruptive behavior for at least 25% of the time during a problematic academic instructional period

If you have any questions or are interested in participating and have students that may benefit from this intervention, please contact:

TJ Schulz, B.S., RBT
Master’s Student in Applied Behavior Analysis at the University of South Florida
Cell: (561) 339-6223
Email: tschulz1@mail.usf
Appendix B: Teacher Interview Questions

1. Do you have at least two students engaging in disruptive or inappropriate behavior in your classroom?

2. Do these students distract others from learning?

3. What does disruptive or inappropriate behavior look like for each of these two students?

4. Are the student’s parents aware of their disruptive or inappropriate behavior?

5. How often do these students participate in class?

6. Is the student’s disruptive or inappropriate behavior affecting their academic success?

7. During which instructional period do these students engage in disruptive or inappropriate behavior most?

8. How do you disseminate the lesson during this instructional period?

9. If capable, are you willing to disseminate your lesson during this instructional period using PowerPoint with the help of the researcher to create these PowerPoints?

10. Do you believe an intervention is needed to increase participation, academic achievement, and decrease disruptive or inappropriate behavior for these four students?

11. Do you have any background knowledge or previous experience of using active responding strategies? If so, please describe.

12. Do you currently use any active responding strategy in your class (i.e. response cards, clickers, choral responding, or guided notes)?

13. Are you willing to use active responding strategies, such as response cards and clickers, in your class?
Appendix C: Academic Engagement & Accuracy of Responding Data Sheet

Participant Identifier: _____  Observer: __________ Date: _______  Condition: ________

**Instructions:** For each question, put a “+” in the box labeled “Bx” if the student responded using the correct modality and an “-“ in the box if they did not respond with the correct modality or at all. Circle “+” if answered correctly or “-“ if answered incorrectly.

<table>
<thead>
<tr>
<th>Question</th>
<th>Bx</th>
<th>Accuracy</th>
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(Total # of occurrences / total # of questions) x 100 = % _____ / _____ = _____%

(Total # of accurate responses / total # of questions) x 100 = % _____ / _____ = _____%

Participant Identifier: _____  Observer: __________ Date: _______  Condition: ________

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<th>Question</th>
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(Total # of accurate responses / total # of questions) x 100 = % _____ / _____ = _____%

Participant Identifier: _____  Observer: __________ Date: _______  Condition: ________

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(Total # of occurrences / total # of questions) x 100 = % _____ / _____ = _____%

(Total # of accurate responses / total # of questions) x 100 = % _____ / _____ = _____%
**Partial Interval Recording Sheet - Disruptive Behavior**

Participant Identifier: ____________  Participant Identifier: ____________

Observer: ____________  Date: ______

**Code:** + (occurrence)  - (nonoccurrence)  **Condition:** ____________

**Instructions:** For each interval, record a “+” if disruptive behavior occurred and a “-” if disruptive behavior did not occur in the interval.

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<th>Min</th>
<th>10 s</th>
<th>20 s</th>
<th>30 s</th>
<th>40 s</th>
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Total number of Intervals: ______  ______

Total number of intervals with Disruptive Bx ______

Percentage of intervals with Disruptive Bx ______%  ______%
## Appendix D: Baseline Teacher Implementation Fidelity Task Analysis

<table>
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<tr>
<th>Step</th>
<th>Description</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
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<td>1.</td>
<td>Teacher reminds students at the beginning of the lesson to raise their hands to answer questions</td>
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<td>Y/N</td>
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<td>2.</td>
<td>Teacher asks a question</td>
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<td>Y/N</td>
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<td>Y/N</td>
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<td>3.</td>
<td>Teacher waits predetermined time</td>
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<td>Y/N</td>
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<td>4.</td>
<td>Teacher calls on student with his/her hand raised</td>
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<td>Y/N</td>
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<tr>
<td>5.</td>
<td>Provide feedback based on current practices</td>
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<td>Y/N</td>
<td>Y/N</td>
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<tr>
<td>6.</td>
<td>If no students raise their hand, follow current practices</td>
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<td>Teacher asks all predetermined questions</td>
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**Total Yes:** / / / / / / / / / / / / / Percentage: --
Appendix E: Response Card Teacher Implementation Fidelity Task Analysis

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<tbody>
<tr>
<td>1. Teacher reminds students at the beginning of the lesson to use their RC to answer questions</td>
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<td>2. Teacher asks a question</td>
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<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>3. Teacher waits predetermined time</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>4. Teacher gives cue “Cards up?”</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>5. Provide feedback based on current practices</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>6. Teacher gives the cue “Cards down!”</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>7. Teacher asks all predetermined questions</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td><strong>Total Yes:</strong></td>
<td>/7</td>
<td>/7</td>
<td>/7</td>
<td>/7</td>
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<td></td>
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<td></td>
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<td></td>
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</table>
## Appendix F: Clicker Teacher Implementation Fidelity Task Analysis

<table>
<thead>
<tr>
<th>Step</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Teacher reminds students at the beginning of the lesson to use their clickers to answer questions</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>2. Teacher asks a question</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>3. Teacher gives cue “Go ahead and click your answer!”</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>4. Teacher waits predetermined time</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>5. Teacher displays graph of student’s answers</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>6. Provide feedback based on current practices</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td>7. Teacher asks all predetermined questions</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
</tbody>
</table>

**Total Yes:** /7 /7 /7 /7 /7 /7 /7 /7 /7

**Percentage:**
Appendix G: IRB Approval Letter

10/23/2018

Thomas Schulz, Jr.
ABA-Applied Behavior Analysis
6345 25th Street South
Apt 125
St. Petersburg, FL 33712

RE: Expedited Approval for Initial Review
IRB#: Pro00035862
Title: A Comparison of High-Tech and Low-Tech Response Modalities to Improve Student Performance and Classroom Behavior

Study Approval Period: 10/23/2018 to 10/23/2019

Dear Mr. Schulz:

On 10/23/2018, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Study Protocol_V#1_10.01.18

Consent/Assent Document(s)*:
Parental Permission_V#1_09.30.18.pdf
Teacher Consent_V#1_09.20.18.pdf
Student Verbal Assent_V#1_09.19.18**

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. **verbal assent forms are unstamped

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR.46.110. The research
proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Research Involving Children as Subjects: 45 CFR 46.404

This research involving children as participants was approved under 45 CFR 46.404: Research not involving greater than minimal risk to children is presented.

Requirements for Assent and/or Permission by Parents or Guardians: 45 CFR 46.408

Permission of one parent is sufficient.

Assent is required of children ages 7-12 years old.

Assent is not appropriate due to the age, maturity and/or psychological state of the children under the age of 7.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Melissa Sloan, PhD, Vice Chairperson
USF Institutional Review Board
Appendix H: Parental/Adult Consent Form

Study ID:Pro000435862 Date Approved: 10/23/2018

Parental Permission for Children to Participate in Research Involving Minimal Risk

Information for parents to consider before allowing your child to take part in this research study
Pro #00035862

The following information is being presented to help you and your child decide whether or not he/she wishes to be a part of a research study. Your child’s class will be participating in a research study that involves minimal risk and includes procedures that teachers frequently use in the classroom.

Please read this information carefully. If you have any questions or if you do not understand the information, we encourage you to ask the researcher.

We are asking you to allow your child to take part in a research study called:

A Comparison of High-Tech and Low-Tech Response Modalities to Improve Student Performance and Classroom Behavior

The person who is in charge of this research study is Thomas Schulz. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. He is being guided in this research by Kwang-Sun Cho Blair, Ph.D., BCBA-D and Catia Cividini-Motta, Ph.D., BCBA-D.

The research will be conducted in two Manatee County school classrooms, during a normal academic instructional activity.

Purpose of Study:

The purpose of this study is to find out which method of responding to teacher’s questions will result in increased participation in the lesson, as well as the accuracy of your child’s answer, and decrease disruptive behaviors in the classroom. We will be comparing the traditional method of responding, hand raising, to response cards and clickers. Response cards are individual index cards with a preprinted response (e.g., A, B, C, D) that are held up by the student to answer the teacher’s question. Clickers are handheld electronic devices that allow the student to answer teacher’s questions anonymously from their desk by selecting either A, B, C, or D on the device. Each student in your child’s class will be using response cards and clickers, but we will only be taking data on two students in your child’s class.

Previous research suggests that when students participate more in class, they learn more and engage in less disruptive behaviors. By conducting this research, we will hope to learn which method of responding is more effective at increasing participation and the accuracy of the response as well as decreasing disruptive behavior in the classroom.
Why is your child being asked to take part?

Your child is being asked to take part because your child is a 1st-5th grade student and your child’s teacher has agreed to participate in this research study to improve classroom behavior of multiple students. To accomplish this, we want to use different methods of responding, called active responding strategies, to see which method works best for your child as well as other students in the class. Active responding strategies encourage participation in class by allowing every student the opportunity to participate in a fun new way!

Study Procedures:

A maximum of four students in two classrooms who have difficulty engaging in activities during class will be nominated by their teacher to have data collected on how often they participate, answer questions correctly when they do participate, and how often they engage in disruptive behaviors during an academic instructional activity. If your child is selected as one of those students, you will be notified. Your student’s participation in this study will be completely anonymous from the rest of the class. If one or both of the nominated students do not return consent forms, the teacher will be asked to nominate one or two other students. If no other students in the class are able to be nominated, the class will no longer receive the intervention and another classroom will be selected.

Students who return a signed consent form and are not selected will be asked to use a set of response cards and a clicker with the rest of the class to participate during the academic instructional activity. They will also be asked to complete an anonymous acceptability survey at the conclusion of the study, but no data will be collected on their behavior. Data will only be collected on the students who have returned a signed parent consent form and who have verbally agreed to participate in the study.

If your child is selected as one of the four students, she/he will be asked to:

- Allow 1-2 University of South Florida student research study staff to observe her/him during targeted academic instructional activity. Observers will be as unobtrusive as possible and will not interfere with classroom activities. The observers will observe your child and record how often your child engages in the lesson, answers questions correctly, and how often your child engages in disruptive behavior.

All students who return a signed consent form, including the four selected students, will be asked to:

- Take part in a 10-min training on how to use the response cards and clickers. This training will take place during class. During the training, your child’s teacher will show the students how to use the response cards and clickers and then he/she will have the students practice answering sample questions using the new responding strategies.

- After the training, the students will alternate between using the response cards and clickers during the same academic instructional activity each day to see which is most effective at increasing participation, the accuracy of your child’s response, and which strategy decreases disruptive behavior most. Again, data will only be taken on the four students selected to participate.

- Throughout the lesson, the teacher will ask the students multiple choice questions about what they are being taught to serve as a learning check. Each student will use the appropriate responding strategy to answer the teacher’s questions during the lesson that day.

- At the end of the study we will ask each student in the class to fill out a survey about which active responding strategy he/she liked using the most and what he/she liked best about using response cards and clickers. No identifying information will be collected on this form and your
child can choose not to participate in completing this form. If your child chooses not to participate, he/she may return the blank form and will not be penalized in any way for doing so.

- Your child will be observed for 30-60 minutes, 2-5 times per week for 2-3 months.

Total Number of Participants

About 72 students will take part in this study in Manatee County Schools along with 3 teachers.

Alternatives / Voluntary Participation / Withdrawal

If you decide not to let your child take part in this study, that is okay. Instead of being in this research study your child can choose not to participate and will continue to answer the teacher’s questions by raising his/her hand and will not fill out an acceptability survey at the conclusion of the study. You should only let your child take part in this study if both of you want to. You or child should not feel that there is any pressure to take part in the study to please the study investigator or the research staff.

If you decide not to let your child take part:

- Your child will not be in trouble and will still participate in all of your class’ usual activities.
  - **Note: by participating in this study, your child’s grades or academic standing will not be affected in any way.

Alternatives to participating in the study include: your child receiving regular universal school-wide and class-wide interventions.

You can decide after signing this informed consent form that you no longer want your child to take part in this study. We will keep you informed of any new developments which might affect your willingness to allow your child to continue to participate in the study. However, you can decide you want your child to stop taking part in the study for any reason at any time. If you decide you want your child to stop taking part in the study, tell the study staff as soon as you can.

If your child’s teacher chooses to discontinue the using the active responding strategies intervention, your child’s involvement in the study will be discontinued. There may be other reasons we may need to withdraw your child from the study. We will let you know the reason for withdrawing your child’s participation in this study.

Benefits

The potential benefits to your child include:

- Students will be likely to benefit from lowered disruption in their classroom, which allows for more time to be spent on instructional activities.
- Students may benefit from participating more in class, thus learning more and answering the teacher’s questions correctly.
- Students may also benefit from the anonymity of using active responding strategies by allowing students to answer questions without their peers knowing their answer.

Risks or Discomfort

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. Your child may become frustrated with alternating between using response cards and clickers. This concern will be reduced by having the teacher remind the students...
which active responding strategy they will be using that day. There is also a potential risk for a breach of confidentiality. The study staff will take every precaution to ensure this does not happen by storing all identifiable information such as consent forms in a locked box stored in the Faculty Advisor’s office at the University of South Florida.

Compensation
Your child will receive no payment or other compensation for taking part in this study.

Costs
It will not cost you anything to let your child take part in the study.

Privacy and Confidentiality
We will do our best to keep your child’s records private and confidential. We cannot guarantee absolute confidentiality. Your child’s personal information may be disclosed if required by law. Certain people may need to see your child’s study records. These individuals include:

- The research team, including the Principal Investigator, study coordinator, research assistants, and all other research staff.
- Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.
- Any agency of the federal, state, or local government that regulates this research, including the Office for Human Research Protection (OHRP).
- The USF Institutional Review Board (IRB) and related staff who have oversight responsibilities for this study, including staff in USF Research Integrity and Compliance.

We may publish what we learn from this study. If we do, we will not include your child’s name. We will not publish anything that would let people know who your child is.

You can get the answers to your questions, concerns, or complaints.

If you have any questions, concerns or complaints about this study, call Thomas Schulz at (561) 339-6223 or contact by email at tschulzl@mail.usf.edu.

If you have questions about your child’s rights, or have complaints, concerns or issues you want to discuss with someone outside the research, call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.
Consent for My Child to Participate in this Research Study

I freely give my consent to let my child take part in this study. I understand that by signing this form I am agreeing to let my child take part in research. I have received a copy of this form to take with me.

Printed Name of Child Taking Part in Study

___________________________________________

Signature of Parent/Guardian of the Child Taking Part in Study  Date

Printed Name of Parent/Guardian of the Child Taking Part in Study

___________________________________________

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their child’s participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

___________________________________________  Date

Signature of Person Obtaining Informed Consent

Printed Name of Person Obtaining Informed Consent
Appendix I: Teacher Consent Form

Informed Consent to Participate in Research Involving Minimal Risk

Pro #00035862

You are being asked to take part in a research study. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or study staff to discuss this consent form with you, please ask him to explain any words or information you do not clearly understand. The nature of the study, risks, inconveniences, discomforts, and other important information about the study are listed below.

We are asking you to take part in a research study called:

A Comparison of High-Tech and Low-Tech Response Modalities to Improve Student Performance and Classroom Behavior

The person who is in charge of this research study is Thomas Schulz. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. He is being guided in this research by Kwang-Sun Cho Blair, PhD., BCBA-D and Catia Cividini-Motta, Ph.D., BCBA-D.

The research will be conducted in two Manatee County school classrooms during a normal academic instructional activity you identify to be problematic.

Purpose of the Study

The purpose of this study is to find out which method of responding to teacher posed questions will result in increased participation in the lesson, the accuracy of your student’s answers, and decrease disruptive behaviors in the classroom. We will be comparing the traditional method of responding, hand raising, to response cards and clickers. Response cards are individual index cards with a preprinted response (e.g., A, B, C, D) that are held up by the student to answer the teacher’s question. Clickers are handheld electronic devices that allow the student to answer teacher’s questions anonymously from their desk by selecting either A, B, C, or D on the device. Each student in your class will be using response cards and clickers, but we will only be taking data on two students in your class. If one or both of the nominated students do not return consent forms, the teacher will be asked to nominate one or two other students. If no other students in the class are able to be nominated, the class will no longer receive the intervention and another classroom will be selected.
Previous research suggests that when students participate more in class, they learn more and engage in less disruptive behaviors. By conducting this research, we will hope to learn which method of responding is more effective at increasing participation and the accuracy of the response, as well as decreasing disruptive behavior in the classroom.

Why are you being asked to take part?

We are asking you to take part in this research study because you are a 1st-5th grade teacher and have indicated that you would like to implement an effective intervention to decrease disruptive behavior and increase academic engagement or accuracy of responding with students in your classroom.

Study Procedures:

A maximum of four students across two classrooms who have difficulty engaging in activities during class will be selected by their teacher to have data collected on how often they participate, answer questions correctly when they do participate, and how often they engage in disruptive behaviors during an academic instructional activity.

If you take part in this study, you will be asked to:

- Answer a few questions by the researcher to confirm your eligibility to participate.
- Nominate two students in your class who are able to (a) participate in whole group instructional activities and (b) engage in disruptive behavior at least 25% of the time during a problematic academic instructional period.
- Send home parental permission forms to each student in the classroom.
  - If there are students in your class who do not wish to participate, they will continue to answer your questions by raising their hand and will not complete an acceptability survey at the end of the study.
- Allow the researcher to observe your students during the academic instructional period you have identified as being problematic.
  - During this time, you will conduct your class as you normally would to determine if the students you have nominated meet the inclusion criteria to participate in this study.
- Each week, we will meet at a time convenient for you to create multiple choice questions, and if applicable PowerPoint slides, for the lessons that week.
  - You will ask the same number of multiple-choice questions each lesson. We will determine a set number of questions that you are most comfortable with.
- Before implementing the active responding strategies, we want to know how often the nominated students participate in class, as well as how often they engage in disruptive behaviors during the problematic academic instructional activity. When the nominated students do participate in class, we would also like to know how often they answer questions correctly.
- Once this is determined, we will train you how to use both response cards and clickers. This training will take approximately 30 minutes. The PI will go over a list of steps for each active responding strategy with the you and then model the appropriate procedures for each response strategy following the outlined steps. The PI and you will then role-play the procedures, and the PI will give provide corrective feedback if needed. You will be required to score 100% across three consecutive trials in order to conclude the training session.
- You will then conduct a 10-minute training for the students on the first day of using each response strategy. The students will be required to answer practice using the appropriate response strategy by answering easy sample questions. These active responding strategies will be alternated during the same academic instructional activity each day to see which is more
effective at increasing participation, the accuracy of student responses, and which strategy decreases disruptive behavior most.

- Throughout the lesson, you will ask your students multiple-choice questions about what they are being taught to serve as a learning check. The students will use the appropriate responding strategy to answer your questions during the lesson that day.
- Data will be collected a minimum of two days per week. During this time, one or two observers will observe your classroom during the problematic academic instructional period to take data on the nominated student’s participation, accuracy of responding, and disruptive behavior. Some days, we will also take data on how well you follow the implementation steps from the training to make sure the procedures are being implemented correctly. We will try our best not to interrupt your class because we know your students are busy learning!
- At the end of the study we will ask you to fill out two surveys (one for response cards and one for clickers) about the acceptability of the interventions and the ease of implementation of each.
- We will also distribute a survey to your students to fill out about which active responding strategy they liked using the most and what they liked best about using response cards and clickers.
- You and your students will be observed for 30-60 minutes, 2-5 times per week for 2-3 months.

**Total Number of Participants**

About 72 students will take part in this study in Manatee County Schools along with 3 teachers.

**Alternatives / Voluntary Participation / Withdrawal**

You do not have to participate in this research study.

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study. Your decision to participate or not to participate will not affect your job status, employment record, employee evaluations, or advancement opportunities.

**Benefits**

The potential benefits of participating in this research study include:

- Decrease in student problem behavior in the classroom.
- Increase in student appropriate classroom behavior, and academic engagement.
- Increase in student behavior that can result in increased instructional time.
- Increase in instructional time of other students’ due to decrease in disruptive behavior.

**Risks or Discomfort**

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There is also a potential risk for a breach of confidentiality. The study staff will take every precaution to ensure this does not happen by storing all identifiable information such as consent forms in a locked box stored in the Faculty Advisor’s office at the University of South Florida. There are no known additional risks to those who take part in this study.
Compensation
You will receive no payment or other compensation for taking part in this study.

Costs
It will not cost you anything to take part in the study.

Privacy and Confidentiality
We will do our best to keep your records private and confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Certain people may need to see your study records. These individuals include:

- The research team, including the Principal Investigator, study coordinator, research assistants, and all other research staff.
- Certain government and university people who need to know more about the study, and individuals who provide oversight to ensure that we are doing the study in the right way.
- Any agency of the federal, state, or local government that regulates this research, including the Office for Human Research Protection (OHRP).
- The USF Institutional Review Board (IRB) and related staff who have oversight responsibilities for this study, including staff in USF Research Integrity and Compliance.

We may publish what we learn from this study. If we do, we will not include your name. We will not publish anything that would let people know who you are.

You can get the answers to your questions, concerns, or complaints
If you have any questions, concerns or complaints about this study, or experience an unanticipated problem, call Thomas Schulz at (561) 339-6223 or email at tschulz1@mail.usf.edu.

If you have questions about your rights as a participant in this study, or have complaints, concerns or issues you want to discuss with someone outside the research, call the USF IRB at (813) 974-5638 or contact by email at RSCCH-IRB@usf.edu.
Consent to Take Part in this Research Study
I freely give my consent to take part in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

________________________________________  __________
Signature of Person Taking Part in Study                  Date

Printed Name of Person Taking Part in Study

Statement of Person Obtaining Informed Consent
I have carefully explained to the person taking part in the study what he or she can expect from their participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

________________________________________  __________
Signature of Person obtaining Informed Consent                  Date

Printed Name of Person Obtaining Informed Consent
Appendix J: Student Verbal Assent Form

Assent of Children to Participate in Research
Pro #00035862

Title of study:
A Comparison of High-Tech and Low-Tech Response Modalities to Improve Student Performance and Classroom Behavior.

Why am I being asked to take part in this research?
You are being asked to take part in a research study about using different ways to answer your teacher’s questions during class. You are being asked to take part in this research study because your teacher and I want to help you participate more in class in a fun new way! If you take part in this study, you will be one of about 72 people at this site.

Who is doing this study?
The person in charge of this study is Thomas Schulz. He is being guided in this research by Dr. Kwang-Sun Cho Blair, PhD, BCBA-D and Dr. Catia Cividini-Motta, Ph.D., BCBA-D. However, other research staff may be involved and can act on behalf of the person in charge.

What is the purpose of this study?
By doing this study, we hope to learn which method of responding will help you participate most in class, answer the most questions correctly, and help you stay focused while your teacher is teaching you something new.

For this study, we will be using response cards and clickers to answer your teacher’s questions during class. Response cards are index cards that have individual answers written on each card, such as A, B, C, and D. For example, when your teacher asks you a question, you will hold up the card with the answer choice you think is right for him/her to see. Clickers are little handheld remotes that let you answer your teacher’s question by pushing the button with the answer choice you think is right. Your answers will then be saved to your teacher’s computer for him/her to see later.

Where is the study going to take place and how long will it last?
The study will be taken place in your classroom in Manatee County. You will be asked to participate in 2-3 visits each week which will take about 30-60 minutes. The total amount of time you will be asked to volunteer for this study is a maximum of 5 hours per week over the next 2-3 months.

What will you be asked to do?
- Allow me to observe you guys during your class time where you simply do what you do every day.
During this time, you will be asked to respond to the teacher’s questions how you normally would, by raising your hand!

- We will then give each person in the class a set of response cards and a clicker and your teacher will show you how to use them.
- After that you will then answer the teacher’s questions during the lesson using the response method being used that day.
- After some time, we will have you guys answer the teacher’s questions again by raising your hands.
- Then we will have you guys go back to answering the questions by using the response cards or clickers.
- Throughout this study, I will be observing you guys to see if response cards or clickers help you guys most. Some days I will be by myself, other days I may have a friend with me to help me out. We will try our best not to interrupt your class because we know you guys are busy learning!
- At the end of the study we will ask you guys to fill out a survey about which responding method you liked using the most and what you liked best about using response cards and clickers.
- You will be asked to participate for 30-60 minutes, 2-5 days per week over the next 2-3 months.

**What things might happen if you participate?**
To the best of our knowledge, your participation in this study will not harm you.

**Is there benefit to me for participating?**
We cannot promise that you will receive benefit from taking part in this research study. However, some students have experienced learning more when Response Cards or Clickers are used.

**What other choices do I have if I do not participate?**
You do not have to participate in this research study.

Alternatives to participating include:
- Continuing to raise your hand to answer your teacher’s questions during the lesson.

**Do I have to take part in this study?**
You should talk with your parents or guardian and others about taking part in this research study. If you do not want to take part in the study, that is your decision. You should take part in this study because you want to volunteer.

**Will I receive any compensation for taking part in this study?**
You will not receive any compensation for taking part in this study.

**Who will see the information about me?**
Your information will be added to the information from other people taking part in the study, so no one will know who you are.

**Can I change my mind and quit?**
If you decide to take part in the study, you still have the right to change your mind later. No one will think badly of you if you decide to stop participating. Also, the people who are running this study may need for you to stop. If this happens, they will tell you when to stop and why.
What if I have questions?
You can ask questions about this study at any time. You can talk with your parents, guardian or other adults about this study. You can talk with the person who is asking you to volunteer by calling Thomas Schulz at (561) 339-6223. If you think of other questions later, you can ask them. If you have questions about your rights as a research participant, you can also call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Assent to Participate

I understand what the person conducting this study is asking me to do. I have thought about this and agree to take part in this study. I have been given a copy of this form.

Name of person agreeing to take part in the study

Date

Printed name of person providing information (consent) to subject

Date

Signature of person providing information (consent) to subject