The Relative Effectiveness of Group Contingencies on Academic Performance, Engagement, and Disruptive Behaviors

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I am submitting herewith a dissertation written by Caroline Marie Jaquett entitled "The Relative Effectiveness of Group Contingencies on Academic Performance, Engagement, and Disruptive Behaviors." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in School Psychology.

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The Relative Effectiveness of Group Contingencies on Academic Performance, Engagement, and Disruptive Behaviors

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Abstract

Group contingencies are often used in the classroom to decrease disruptive behavior and improve both academic performance and on-task behavior. However, research is mixed regarding the most appropriate target for intervention: academic performance, on-task behavior, or disruptive behavior. The current study was designed to extend research on group contingency target behaviors by evaluating and comparing two interdependent group contingencies: an academic performance contingency and an on-task behavior contingency. Dependent variables included percent correct, percent on-task, and disruptive behavior. The participants were seven, eighth-grade students with Emotional Behavior Disorder. Data were collected in the social studies classroom. An adapted alternating treatments design was used with on-task behavior and academic performance contingencies serving as the treatments. Acceptability data were collected to determine if students and the teacher preferred one contingency over another.

Data were collected during independent seatwork, and participants were told whether it was an on-task contingency day or an academic performance contingency day. If the class average percent correct or percent on-task met a randomly selected criterion, all class members earned access to a randomly selected group reward. Visual analysis and effect size data showed that the on-task contingency produced large increases in class average percent correct and percent on-task. The academic performance contingency had small effects on class average percent correct and percent on-task. Neither contingency affected disruptive behavior.

Survey and interview data reveal that the classroom teacher and the students found both interventions acceptable. Neither contingency was preferred over the other. Theoretical and
applied implications of the findings, study limitations, and directions for future research are discussed.
# Table of Contents

**CHAPTER I: LITERATURE REVIEW** ........................................................................................................1  
Independent Contingencies ..........................................................................................................................3  
Dependent Contingencies ............................................................................................................................6  
Interdependent Contingencies ......................................................................................................................7  
Comparing the Contingencies ......................................................................................................................9  
  Unknown/randomly selected components .......................................................................................10  
Contingency Targets and the Target Selection Problem ...........................................................................12  
Disruptive Behavior Targets .......................................................................................................................13  
  Indirect effects ....................................................................................................................................15  
  Disadvantages of targeting disruptive behavior ...............................................................................16  
On-Task (Engaged) Behavior Targets ........................................................................................................17  
  Indirect effects ....................................................................................................................................19  
  Disadvantages of targeting on-task behavior ....................................................................................21  
Academic Performance ...............................................................................................................................21  
  Indirect effects ....................................................................................................................................23  
Application of Contingencies with  
Students with Emotional Behavioral Disorders ......................................................................................27  
Purpose of the Current Study ......................................................................................................................29  
Research Questions .....................................................................................................................................31  

**CHAPTER II: METHOD** ..........................................................................................................................33  
Participants and Setting ..............................................................................................................................33  
Materials and Measures ............................................................................................................................33  
Dependent Variables ....................................................................................................................................35  
  Percent correct .......................................................................................................................................35  
  Percent on-task ......................................................................................................................................36  
  Disruptive behavior ...............................................................................................................................36  
Design and Procedures ...............................................................................................................................37  
  Baseline: No intervention .......................................................................................................................38
List of Tables

Table 1. Mean and standard deviation data for each dependent variable by condition and phase........................................................................................................................91

Table 2. Mean differences, pooled standard deviations, effect sizes, PND, and PEM across baseline and alternating treatment phases for percent correct data.........................92

Table 3. Mean differences, pooled standard deviations, effect sizes, PND, and PEM across baseline and alternating treatment phases for percent on-task data....................93

Table 4. Mean differences, pooled standard deviations, effect sizes, PND, and PEM across baseline and alternating treatment phases for disruptive behavior data .............94

Table 5. Mean and standard deviation of academic performance for each student by condition and phase...................................................................................................................95

Table 6. Mean differences, pooled standard deviations, effect sizes, PND, and PEM across baseline and alternating treatment phases for within-student academic performance data............................................................................................................96

Table 7. Student acceptability survey and the number and percent of students who responded from strongly disagree to strongly agree ..............................................................97
List of Figures

Figure 1. Class average academic performance on independent social studies assignments across baseline and alternating treatment phases .................................................................98

Figure 2. Average percent of students on-task across all intervals during baseline and alternating treatment phases ...........................................................................................................99

Figure 3. Percent of intervals disruptive across baseline and alternating treatment phases .................................................................................................................................100

Figure 4. Aaron’s academic performance across baseline and alternating treatments phases .................................................................................................................................101

Figure 5. Bill’s academic performance across baseline and alternating treatments phases .................................................................................................................................101

Figure 6. Carey’s academic performance across baseline and alternating treatments phases .................................................................................................................................102

Figure 7. Dennis’s academic performance across baseline and alternating treatments phases .................................................................................................................................102

Figure 8. Edward’s academic performance across baseline and alternating treatments phases .................................................................................................................................103

Figure 9. Fred’s academic performance across baseline and alternating treatments phases .................................................................................................................................103
Figure 10. George’s academic performance across baseline and alternating treatments phases

104
Chapter I

Literature Review

In the classroom, students have the opportunity to engage in a variety of behaviors, including desired behaviors (e.g., on-task, engaged) as well as a wide range of alternative undesired behaviors (e.g., out-of-seat, staring out window, inappropriate talking; Cates & Skinner, 2000). Contingencies are often used in the classroom to increase the likelihood that students will choose to engage in desired behaviors over undesired ones. Contingencies, as described by Skinner, Skinner, and Burton (2009), are “if-then environment-behavior” relationships; if, under certain environmental conditions a behavior occurs, then the environment is more likely to supply a consequent stimulus. For example, if on a 20-item spelling test (environmental antecedent), Tom spells 18 out of 20 words correctly (target behavior and criterion), then Tom will receive a lollipop from his teacher (environmental consequence).

Contingencies have three parts: antecedents, behaviors, and consequences (Kazdin, 2001). Antecedents are the stimuli or context that occur prior to the behavior and set the stage for the behavior to occur. For example, a knock on the door serves as an antecedent for opening the door. The behavior, in this example, is opening the door. The consequence of this behavior will influence whether an individual is likely to perform a similar behavior given similar antecedent conditions (e.g., answer the door the next time there is a knock). Consequences, which follow the behavior, can function as rewards, punishments, or neutral stimuli (Kazdin & Rotella, 2013; Skinner et al., 2009). In the previous example, if the behavior of opening the door results in a greeting from a friend (a reward), then it would be more likely that the individual will answer the door the next time he hears a knock. However, if answering the door results in a neighbor yelling
at him (a punishment), then the individual would be less likely to answer the door the next time someone knocks.

Contingency consequences are typically described using the terms reinforcement and punishment (Kazdin, 2001). Reinforcement refers to a consequence that increases the probability of the previous behavior occurring when presented with similar antecedent stimuli. This leads to a strengthening or maintaining of the previous behavior. In the prior example, the friend at the door served as a reinforcement, and strengthened the previous door opening behavior. Punishment, on the other hand, refers to a consequence that decreases the probability of the previous behavior occurring when presented with similar antecedent stimuli (e.g., the angry neighbor at the door). This leads to a weakening of the previous behavior (Kazdin, 2001).

In addition to describing the contingency consequences as reinforcement or punishment, contingencies may be classified as either individual or group-oriented (Kelshaw-Levering, Sterling-Turner, Henry, & Skinner, 2000). Individual contingencies are employed when each student receives his/her own behavioral intervention. This means that all aspects of the intervention, including the behavioral target, the contingency, and the reward, are individualized for each student. For example, if Tom and Beth are in a classroom, Tom’s intervention might involve receiving a sticker if he achieves over 70% correct on the spelling test, while Beth’s intervention might be that she receives a Jolly Rancher if she is on-task over 60% of the time throughout the school day. In these interventions, the target behaviors, criteria, and rewards, have been individually selected based on the student’s individual needs and goals. Although individual behavior interventions have been found to be effective in increasing desired behavior and decreasing undesired behavior (e.g., Flood & Wilder, 2003), they are difficult to implement
in the general education classroom, where a teacher often has to attend to 20 or more students at a time (Heering & Wilder, 2006). Thus, in the general education classroom, group-oriented contingencies may be a more effective strategy than individual contingencies in promoting on-task behavior and academic performance (Turco & Elliott, 1990).

A contingency is defined as group-oriented (i.e., a group contingency) when one or more components of a behavioral intervention (e.g., behavioral target, criteria, and/or consequence) are shared by more than one student (Litow & Pumroy, 1975). Group-oriented contingencies are easier to employ in a large classroom setting because they involve less management by the classroom teacher. Instead of having to keep up with separate behaviors, goals, and rewards for each student, some of these components are kept constant between students. Group-oriented contingencies are typically further categorized into one of three types: independent, dependent, or interdependent (Litow & Pumroy, 1975).

**Independent Contingencies**

Independent group-oriented contingencies refer to contingencies where the target behavior, criteria, and consequences are kept constant across students. However, each student’s chance to access the reward is based on his/her individual behavior (Litow & Pumrow, 1975; Skinner, Williams, & Neddenriep, 2004). For example, with classroom grades, each student’s access to the reward is dependent on individual behavior, not the behavior of one’s peers. Thus, if Tom and Beth are both told that they can earn a Jolly Rancher if they receive an 80% or above on their spelling test, and Tom earns a 70% while Beth earns an 82%, Beth will receive access to the Jolly Rancher (reward), while Tom will not. Tom’s behavior has no effect on Beth’s chances of receiving the reward and vice versa. Most often, grading systems in classrooms are
independent group-oriented contingencies. Each student takes the same exam (behavior), has the same reward criteria (different percentages earn access to different letter grades) and the same reward (letter grade). Independent group contingencies have been found to be effective in improving behaviors such as academic performance on writing tasks and homework completion (Kelley & Stokes, 1984; Winn, 2006). Independent group-contingencies are effective because everyone can be targeted in the intervention, but they offer the added practicality for the teacher, who does not have to manage multiple contingencies with different target behaviors, criteria, and rewards for each student, as a result of similar program components (Little, Akin-Little, & O’Neill, 2015; Skinner et al., 2009).

Also, there are numerous disadvantages associated with independent group contingencies (for review, see Skinner, Cashwell, & Dunn, 1996). Because access to the reward is based on an individual’s behavior in the classroom, this type of contingency results in some students gaining access to rewards, but not others. And, because rewards are dependent on individual behavior, this type of contingency does not encourage cooperation (Swanson, 1985). There are no incentives for children to work together, because a child does not gain anything by helping a classmate earn access to the reward. Furthermore, this type of contingency might actually cause children to sabotage their peers. For example, if children who achieve 80% or higher behavior scores get a piece of candy, then a student who has already missed out on meeting that criteria for the day may try to sabotage his/her peers, to ensure that they do not receive the candy reward either.

Another limitation with independent contingencies is that feedback is delivered based on who earned rewards. Because everyone has the same target behavior and criteria, when rewards
are delivered, it is apparent to everyone in the class which students met the reward criteria and
which students did not. Accordingly, non-earners may be made to feel inadequate or unworthy.
These resulting feelings of negativity are undesirable and are not the types of feelings that result
in student motivation. In addition, because students are all being held to the same criterion in this
type of contingency, inevitably some students will meet the criterion easier than others. For
example, if 80% correct on a weekly math test will earn access to extra recess time, then student
A, who excels in mathematics, might easily meet this criterion week after week. However, if
student B, who finds mathematics extremely difficult, does not meet the criterion week after
week despite studying hard, he/she may give up trying. That is, if the message the student learns
is that regardless of how hard he tries, he will not be able to earn the reward, then the logical
conclusion is to stop trying. This phenomenon is known as ratio strain; when the ratio between
behavior attempts (in this case, studying and working hard in math class), and reinforcement
(extra recess time) is too large, the behavior may slow or stop altogether (Cooper, Heron, &
Heward, 2007). Independent contingency schedules are especially susceptible to ratio strain,
because due to idiosyncratic differences among students, it is difficult to set one criteria that is
high enough to encourage already strong students to improve in their performance, but not so
high that weaker performers encounter ratio strain.

Finally, although less tedious than individual contingencies, the teacher still needs to
individually measure the behavior of every student in an independent group-oriented
contingency, which can be time consuming, especially depending on the behavior. For some
types of problem behaviors (e.g., high incidence, high rate), this intervention might not be
manageable. For example, imagine trying to individually score each student’s rate of calling out
behavior in a classroom in which most students are calling out. It would be nearly impossible for a classroom teacher to manage this sort of data collection and administer rewards with accuracy.

**Dependent Contingencies**

A dependent group contingency refers to a system in which the performance of a selected group member or members determines the consequence (access to the reward) for the entire group of students. In this system, all group members share the same reward, but only the performance of the selected group member or members determines whole-group access to the reward (Popkin & Skinner, 2003). The performance of the unselected group members is irrelevant when it comes to determining reward access. Thus, for most students, access to the reward is not based on his/her individual behavior, but is instead based on the behavior of other selected student(s) (Skinner, Williams, & Neddenriep, 2004).

Dependent contingencies may be especially effective in the case of behaviors that are difficult or too time intensive to measure for all students (e.g., homework performance, disruptive behavior) or in cases in which the target behavior is individualized for one student’s behavior. For example, if Beth earns 80% or more on her daily spelling tests, the class receives a pizza party on Friday. An added benefit of dependent contingencies is positive reinforcement through social praise (Popkin & Skinner, 2003; Skinner et al., 2004). If, as in the previous example, Beth earns a pizza party for her entire class, it is likely that she will receive social praise from her classmates for meeting the behavior criterion and earning the reward for the class.

However, there are limitations associated with dependent group-contingency systems. Some educators view dependent contingencies as unfair, because the reward for many is based...
on the performance of a few. For example, Romeo (1998) pointed out that the reward system might serve to punish those students who are meeting the behavioral criteria when selected students do not meet the criteria. In the above example with Beth, if the rest of the class is earning an 80% or higher average on the spelling test, but Beth does not, then the rest of the class is effectively punished despite their positive academic behavior. Although social praise is likely in the case that the target student meets the criterion, hostility and criticism are likely outcomes in cases in which the criterion is not met (Popkin & Skinner, 2003; Romeo, 1998; Scott et al., in press). Target students may also feel singled out and threatened, instead of empowered by the contingency system (Little et al., 2015). A final disadvantage is that although dependent contingency systems employ group rewards, they are most often designed to target the behavior of an individual or small group. Thus, it is difficult to simultaneously target the behavior of all class members with this type of contingency.

**Interdependent Contingencies**

In an interdependent contingency system, all group members are rewarded if the group meets a certain criteria or level of group performance (e.g., average score, all exceed minimum or maximum; Litow & Pumroy, 1975). In the prior spelling test example, the class would be rewarded if the class average on the test is at least 80%. Similar to the independent contingencies, each student’s performance contributes to whether he or she will receive the reward. As an added benefit, because an individual’s performance counts toward the collective goal, student cooperation is encouraged. Like with the dependent contingency, some of the work is taken off the teacher when using the interdependent contingency. In the spelling example, although the teacher will still need to grade every worksheet to determine whether the class gets
the reward, he/she will not need to keep tally of whether each student gets the reward, just whether the class as a whole met the goal. Reward distribution is also easier when all or none of the students receive access to the reward.

Interdependent contingencies also alleviate one of the main concerns of the dependent group contingency, student targeting. Because each student has a role in whether the group earns the reward, single students are less likely to be the target of criticism if the goal is not attained. In fact, in this system students are not given any feedback about the behavior of their peers. Finally, a larger variety of rewards can be used when all or no students receive access to rewards. Specifically, this contingency allows for the use of activity reinforcers, which are often powerful reinforcers, but are difficult to provide to some students and not others. For example, it would be difficult to give extra recess time to only certain students, with the practical concern of finding a monitor for those who failed to earn. However, with interdependent contingencies either every student or no students will earn access to the reinforcer (Skinner, 2004).

Interdependent group-oriented rewards are often critiqued for being unfair (Skinner et al., 2009). Similar to the dependent contingency, students who perform well still might not earn access to the reward if the rest of the class performs poorly. This may create a perception among the high performing students that they are being unfairly punished due to the behavior of their peers (Little et al., 2015). Furthermore, it may cause the high performing students to become hostile toward the low performing students. To remedy this concern, Skinner et al. (2009) recommend not providing any public feedback on any students’ performance, unless the group earned the reward. To alleviate the concern among high-performing students that they are being unfairly punished, Skinner (2004) suggests that current individual and independent rewards
typically used in classrooms be kept in place, so that students can be reminded that there are still rewards for their individual performance (e.g., grades), and that there is no losing with this contingency, only the chance to earn access to additional rewards or bonus rewards.

A final concern with interdependent contingencies is that the reward delivered to all students is a common one. Because students differ in their preference for certain rewards, the reinforcing quality of the reward will vary as well. If all students are working for access to Jolly Ranchers, students will differ in their motivation to work towards this goal based on the strength of the reward for the individual. For example, if Jolly Ranchers are a high-quality reinforcer for Beth, she will probably work very hard towards the goal. But at the same time, Tom might not like Jolly Ranchers as much, and thus this reward potential will not serve as motivation for him to work with similar effort to Beth. Furthermore, if a reward serves as a punisher for some students, those students might attempt to sabotage the group’s performance in order to avoid access to the reward altogether (McKissick, Hawkins, Lentz, Hailley, & McGuire, 2010).

**Comparing the Contingencies**

Each type of group-oriented contingency, independent, dependent, and interdependent, has its strengths and weaknesses. When researchers have compared the three, the results often show little to no differences in effectiveness. Gresham and Gresham (1982) compared the three different types of contingencies in reducing disruptive behavior, and concluded that interdependent and dependent contingencies were slightly more effective than independent contingencies in decreasing disruptive behavior, probably due to the element of group cooperation in these contingencies. Alternatively, Theodore, Bray, and Kehle (2004), found that although all three contingencies were effective, the dependent and independent contingencies
were slightly more effective than interdependent contingencies in reducing disruptive behavior in three adolescents with EBD. A recent meta-analysis, comparing the effects of group contingencies from 1980-2010 on different target behaviors, found no differences (Little et al., 2015).

Regardless of the type of group contingency employed, Little et al. (2015) found a large effect size for each variable. There was a discrepancy in the types of contingencies employed in the studies used. Specifically, 70% of the studies Little et al. (2015) reviewed employed an interdependent contingency. This shows that there may be a preference for this contingency among practitioners and researchers (Little et al., 2015). Due to the lack of differences found between types of contingencies, group contingency choices can be confidently made based on the practitioner’s group and preference.

**Unknown/randomly selected components.** A recent development in group-oriented contingencies is the application of randomly selected components, including target behavior, criterion, and rewards. Skinner and Watson (1997) note that by randomizing contingency components, some of the potential limitations associated with group reinforcement are reduced. Randomizing target behaviors reduces the possibility of other undesired behaviors replacing the targeted behavior (McKissick et al., 2010). In addition, student uncertainty about which behavior will be targeted increases the chance of altering all the potential target behaviors (Skinner & Watson, 1997). For example, if the teacher implements a group-oriented reward in which extra recess will be earned at the end of the week contingent on the class earning an “A” average on their weekly spelling or math test, then students will likely alter their performance in both spelling and math in anticipation of the reward.
Randomly selected or unknown criteria could also be an effective randomized component. If students do not know the level of behavior that they need to attain, all students will be motivated to try their best. For example, if students are instructed that they need to attain an 80% average on their spelling test, the best spellers in the class might not work to their full potential while the worst spellers might be disheartened, believing that they can never achieve 80% (Hawkins, Musti-Rao, Hughes, Berry, & McGuire, 2009). However, if the students are unaware of the criteria, (e.g., the teacher selects 50%, 70%, 80% or 90% from a hat) then students will not know how well they need to perform to earn the reward (Skinner et al., 2004). If this is the case, students will just know that higher performance will likely increase the probability of earning a reward. Random schedules with randomly selected criteria are also likely to help students maintain the behavior over time (Kelshaw-Levering et al., 2000). Finally, random schedules could also assist with generalization. In life, higher performance often coincides with a higher probability of reward. By first applying this logic in the classroom setting, students will be more likely to carry this knowledge with them and generalize it to other behaviors.

Finally, randomly-selected rewards can alleviate some concerns with reward satiation (McKissick et al., 2010). If a teacher continues to provide the same reward for a behavior, then over time, no matter how exciting the reward was initially, students may begin to satiate and the reward will lose its motivational quality. If each reward is randomly selected, students will not be able to satiate to it. In addition to solving the satiation problem, randomly-selected mystery rewards are likely to maintain anticipation of access to the reward longer than known rewards (Murphy, Theodore, Aloiso, Alric-Edwards, & Hughes, 2007). Randomly-selected rewards also
alleviate the concern of rewards having different reinforcing qualities to different students. Because students will not know which reward they are working towards, there will be less of a chance of students not working up to their potential or sabotaging the group due to the reward having a low reinforcing or even punishing quality (Skinner et al., 1996). Rhode, Jenson, and Reavis (1993), termed unknown rewards “mystery motivators” and noted that they are particularly useful when implementing group-oriented rewards. If, for each student, there is the potential of a large reward, each student may improve target behavior in anticipation of earning this reward (Kelshaw- Levering et al., 2000). Hawkins et al. (2009) suggest having at least one high quality reward received for each member in the class. With this pool of reinforcers, students are likely to put forth greater effort, knowing that the reward chosen might be an extremely powerful reinforcer for them.

**Contingency Targets and the Target Selection Problem**

Three classes of behavior are often targeted with group contingencies: disruptive behaviors, on-task behaviors, and academic behaviors (see Stage & Quiroz, 1997 for review). Ideally, teachers would prefer that their students show low levels of disruptive behavior, are engaged in the classroom, and perform well academically. However, typically only one of these classes of behavior is targeted during an intervention. Unfortunately, in addition to only intervening on one type of target, researchers often do not look at the effects of the intervention on other classes of target behavior. In a seminal paper on this topic, Lentz (1988), referred to this issue as the “target selection problem” and called for more research on this topic. If researchers do not measure the effects of their contingency on other classes of target behavior, then indirect effects cannot be measured. This is an important gap in the research; if one class of behaviors has
positive indirect effects on others (e.g., a contingency focusing on on-task behavior also leads to an increase in academic performance), then this class would be an obvious choice for a contingency target.

**Disruptive Behavior Targets**

Early group contingency researchers targeted disruptive classroom behaviors (e.g., (Barrish, Saunders, & Wolf, 1969; Gresham & Gresham, 1982; McKissick et al., 2010). Disruptive behaviors typically include inappropriate vocalizations, out of seat, and physically aggressive behaviors. Researchers investigating group contingencies often find large reductions in these disruptive behaviors when they are directly targeted (see Little, Akin-Little, & O’Neill, 2010 for meta-analysis). In fact, group contingency interventions meet What Works Clearinghouse criteria for an evidence-based strategy to decrease disruptive behavior (Maggin, Johnson, Chafouleas, Ruberto, & Berggren, 2012).

A classic study on the effectiveness of group contingencies on decreasing disruptive behavior was employed with a self-contained classroom of students with intellectual disability (Gresham & Gresham, 1982). This study compared independent, dependent, and interdependent group contingencies on the frequency of disruptive behavior of the students. The group contingency involved a reward for the student (independent), team (interdependent), or team dependent on the behavior of the team captain (dependent), with the lowest number of disruptive behaviors. Gresham and Gresham found that although all the contingencies reduced disruptive behavior, the interdependent and dependent contingencies were more effective than the independent contingency. As is common in many group contingency studies, academic performance and on-task behavior were not directly measured.
Kelshaw-Levering et al., (2000) employed an interdependent group contingency procedure on the disruptive behavior of 12 students in a second-grade classroom. A multiphase time series was employed, with either the reward or all intervention components randomized. Results indicated that disruptive behavior significantly decreased from a mean of 37% of intervals in baseline to a mean of 14% of intervals during the first intervention phase. A withdrawal of intervention procedures led to a spike in disruptive behavior ($M = 42\%$). Implementation of the completely randomized phase led to a similar reduction in disruptive behavior ($M = 10\%$). Results indicated that both interventions were effective, and randomizing all components within an intervention might be slightly more effective than simply randomizing rewards. However, similar to the Gresham & Gresham (1982) study, during this study neither on-task behavior nor academic performance data were measured and thus indirect effects cannot be assessed.

Theodore et al. (2004) examined the effectiveness of independent, dependent, and interdependent group contingencies in the reduction of disruptive behavior in adolescent males with EBD. In order to receive a randomly chosen reinforcement, the students needed to either individually (independent) or as a group (interdependent) incur fewer than five checks on the list of disruptive behaviors. In the dependent condition, a student was randomly selected to have his/her behavior evaluated. All three group contingencies reduced disruptive behavior in the participants. The dependent contingency was slightly more effective for two of the three intervention participants, while the independent contingency was slightly more efficacious for the remaining student. Thus, the authors concluded that all three types of group contingencies
were effective in reducing disruptive behavior in adolescents with EBD. As in the other studies, neither on-task behavior nor academic performance data were collected.

**Indirect effects.** There is some evidence that targeting disruptive behavior can lead to increased academic performance. Medland and Stachnik (1972) reported that the Good Behavior Game, a game in which reinforcement is contingent upon low levels of disruptive behavior, showed indirect increase in academic productivity. Van Houten, Nau, MacKenzie-Keating, Sameoto, and Colavecchia (1982) employed verbal reprimands contingent on disruptive behavior and also examined the effect of the intervention on academic behavior. For a majority of the students, academic performance increased as a result. However, for two students, levels of disruption and academic performance were both high at the beginning of the study. Thus, the correlation between disruptive behavior and academic performance might not be as clear as originally thought.

There is also some evidence that decreased levels of disruptive behavior can lead to increased levels of on-task behavior. Christ and Christ (2006) examined the effects of an interdependent group contingency on disruptive behavior and academically engaged (on-task) behavior in high school students. The contingency was based on students’ lack of disruptive behavior during 2-minute intervals. If the class earned 17 intervals without disruptions, they earned free time as a reward. Researchers also measured academically engaged behavior, defined as physical movements or physical orientation directed toward an instructional activity (e.g., writing, reading aloud, eyes oriented to speaker), using momentary time sampling. The results showed that disruptive behavior and teacher reprimands significantly decreased and academic engaged behavior significantly increased as a result of the intervention.
Corroborating this result, McKissick et al., (2010) used a multiple baseline across settings design to examine the effects of randomizing multiple components within an interdependent group contingency on problem behavior and student engagement. Three problem behaviors in particular need of intervention were identified by the teacher: out of seat, talking out, and disrespect, and these problem behaviors served as the target for intervention. Each day, students were informed that they could earn a reward if the class displayed appropriate behavior. The target behavior (chosen from the three problem behaviors), criterion, and reward were randomly selected from three jars at the end of each class period. The reward included pre-selected, but unknown positive consequences selected by the teacher, such as selection from a box of tangibles (e.g., candy, pencils) or earning two minutes of free talk time at the end of class. Students earned the reward 83% of times the contingency was in place. Across the three settings, a significant change in behavior was observed after the intervention was employed.

Although the intervention only specifically targeted problem behaviors, researchers also measured engaged (on-task) behavior. Student engaged behavior, defined as students being in their seat, and oriented toward the teacher, papers, books, or other work-related materials, was measured during the final 20-minutes of each class session (excluding 5 sessions when the researcher needed to leave early). Engaged behaviors increased from means of 37%-55% during baseline, to 80%-85% during intervention. These studies provide preliminary evidence that targeting disruptive behavior can lead to an increase in on-task behavior as well.

**Disadvantages of targeting disruptive behavior.** There are ethical concerns associated with establishing contingencies that only focus on decreasing undesired behaviors (Winett & Winkler, 1972). Specifically, it is unethical to simply focus classroom interventions on keeping
students “quiet, docile, and still” at the expense of focusing on improving deficit academic skills (Reddy & Richardson, 2006; Winett & Winkler, 1972). This critique is especially relevant given the lack of clear evidence that disruptive behavior targets are correlated with improvements in academic performance.

Secondly, disruptive behaviors are typically public behaviors that are observed by the other students in the classroom; indeed, this is what makes the behavior disruptive. If a class’ reward is contingent upon a reduction in disruptive behavior, then it will be apparent to the rest of the class whose behavior causes the class to fail to earn a group reward. This may cause peers to aggress against students who engage in these public behaviors (Skinner et al., 2009).

A final criticism of a focus on disruptive behavior is based on the difficulty of choosing disruptive behavior(s) to target. Although targeted behaviors may decrease as a result of the intervention, students might simply replace the inappropriate targeted behavior with another equally problematic behavior (McKissick et al., 2010). That is, a decrease in disruptive behavior does not necessarily lead to an increase in on-task behavior (Radley, Dart, & O’Handley, 2016). Students instead could choose passive behaviors, such as day-dreaming, or other active, but non-disruptive behaviors, such as coloring or reading an unrelated book. Thus, a sole focus on disruptive behavior could create children who are “quiet, docile, and still,” but who are not completing their academic work (Winett & Winkler, 1972).

On-Task (Engaged) Behavior Targets

Due to the criticisms directed toward focusing on disruptive behavior, as well as a desire to focus on improving positive behaviors rather than minimizing negative ones, some researchers targeted on-task or engaged behavior. A recent review by Maggin et. al., (2012) notes that there
is a scarcity of research with regard to this target, and instead most group contingencies target nonacademic behaviors (e.g., disruptive behaviors). Because engagement in school is crucial to school achievement, on-task behavior appears to be an appropriate target (Finn & Zimmer, 2012).

Crouch, Gresham, and Wright (1985) used an interdependent group contingency to target on-task behavior in a third-grade classroom. If 80% of the students were on-task at a set number of pre-determined intervals throughout the day, the students were rewarded with 10 minutes of free time and a snack. Throughout the intervention, on-task behavior increased by over 20%. Although disruptive behavior also decreased during the intervention phase, a separate contingency was put in place to decrease disruptive behavior, and thus the effects of this contingency cannot be said to have indirect effects on disruptive behavior. In addition, due to the multiple contingencies operating in the classroom during this study, the effects of any one contingency are unclear. Academic performance was not targeted or measured in this study.

Heering and Wilder (2006) employed a dependent group contingency with unknown components targeting on-task behavior during math instruction in two, third and fourth grade general education classrooms. They found that allowing students to gain access to preferred items/activities contingent on their being on-task at unknown times during the math lesson resulted in an increase in on-task behavior from mean levels of 35% and 50% to over 80% for all classrooms.

The dependent variable, on-task behavior, was defined as students being in their seats and making eye contact with the teacher, papers, books, or other work-related materials. In this intervention, a row of students was randomly selected by the teacher’s aide. Four time intervals
were randomly chosen at the beginning of each class period to measure on-task behavior. If, at the end of the class period, the randomly selected rows were on-task during 75% or more of the observed intervals, the students were given access to preferred items/activities. In addition, momentary time sampling at 15-second intervals was used to record whether students in a specified row were on-task. The results showed that on-task levels improved from a mean of 36% during baseline to a mean of 83% during intervention. Overall, the results showed that dependent group contingencies, using randomly selected contingency targets and rewards, can be used to significantly increase on-task levels of third and fourth grade students (Heering & Wilder, 2006). Unfortunately, researchers failed to collect academic performance data or disruptive behavior data. Thus, this study does not allow one to draw any conclusions about the indirect effects of on-task behavior targets on either disruptive behavior or academic performance.

**Indirect effects.** Radley et al. (2016) targeted both on-task behavior and disruptive behavior in an intervention focusing on classroom volume (The Quiet Classroom Game). Specifically, attaining a class reward was dependent on classroom noise level (measured in decibels) being below a goal level for five out of seven intervals. The experimenters used classroom volume as a target due to its correlation with both on-task and disruptive behavior. The results showed that on-task behavior increased from baseline levels of 40% to 72% during intervention. In addition, disruptive behavior showed immediate decreases as a result of the intervention. This study provides some evidence that there may be a negative correlation between on-task behavior and disruptive behavior, and that an intervention focusing on just one could lead to a indirect increase or decrease in the other, respectively. A study conducted by
Ferritor, Buckholdt, Hamblin, & Smith (1972) supported this correlation. Researchers investigated the efficacy of an independent group contingency in which obtaining tokens was contingent upon on-task behavior, academic performance, or a combination of the two. Disruptive behavior was also measured. They found that phases which reinforced on-task behavior reliably increased on-task behavior and decreased disruptive behavior. Importantly, they found that disruptive behaviors decreased significantly more under the reinforcement of on-task behavior as opposed to the reinforcement of academic responding.

Although targeting on-task behavior might be linked to a decrease in disruptive behavior, this target does not necessarily lead to increases in academic performance. Many studies with on-task contingencies use self-monitoring procedures (e.g., McLaughlin, 1984; Snider, 1987). In these studies, although self-monitoring behavior was found to increase on-task behavior, the effects on academic performance were mixed. Specifically, out of the six studies on self-monitoring of on-task behavior reviewed by Snider (1987) that also measured academic performance, four demonstrated improved but inconsistent results, one demonstrated slight improvement, and the final indicated no improvement at all. Thus, an increase in on-task behavior does not necessarily lead to increased academic performance.

However, there is some evidence that increasing on-task behavior can lead to indirect increases in academic performance. Rapport, Murphy, and Bailey (1982) used an independent response-cost group contingency for on-task behavior. As a result, both on-task behavior and academic performance increased to near maximum levels. In addition, multiple reviews have concluded that targeting academic (on-task) responding is more likely to directly affect academic

**Disadvantages of targeting on-task behavior.** Lentz (1988) argued that on-task behavior is too broad of a construct to measure efficaciously. Specifically, he referred to on-task behavior as a Level I target, on a level system going from least specific (I) to most specific (IV) common classroom intervention targets. According to Lentz, a Level I target is too inclusive to tease out the effects of the intervention on specific behaviors that are encompassed in the on-task construct (e.g., completing work, eyes on teacher). Given that an intervention might have differential effects on the encompassed behaviors, collapsing all of these behaviors into a single construct inhibits the investigation of the intervention’s effects on the various behaviors targeted, thus weakening the efficacy of this construct as a whole. Additionally, on-task behavior is typically measured using time sampling procedures. Lentz argues that this measurement system is sloppy, and may misrepresent “real time” behaviors, that would be better assessed using more refined methods (e.g., rate or percentage correct counts).

**Academic Performance**

Partially as a result of the criticisms against targeting disruptive or on-task behavior targets, there has been a surge in research recently with group contingencies targeting academic behaviors instead. These behaviors, which include homework completion and accuracy (Lynch, Theodore, Bray, & Kehle, 2009; Reinhardt, Theodore, Bray, & Kehle, 2009), reading quiz performance (Sharp & Skinner, 2004), and mathematics, spelling, and English performance (Popkin & Skinner, 2003) among others, offer another potential advantage: improving academic
performance. This outcome is likely tied to a primary goal of education-equipping students with knowledge and skills they can use to further society.

Popkin and Skinner (2003) examined the effects of interdependent group contingencies on the academic performance of students with EBD. They randomly selected all components of the contingency: target behavior, criterion, and reward. The three target behaviors were academic performance on independent seatwork assignments in spelling, mathematics, and English. The target behaviors were added sequentially, so that in the beginning there were only spelling goals, but by the end of the intervention, randomly selected target behaviors could be spelling, mathematics, or English performance (in order to encourage students to do their best in every subject). The class’ academic performance increased from a mean of 62% during baseline to 96% during intervention for spelling, 66% to 86% for mathematics, and 85% to 93% for English. In addition, an immediate increase in performance occurred for both spelling and mathematics as a result of implementing the intervention phase (performance in English was more variable during baseline than during the intervention phase, and no immediate increase was noted for this subject). The results of this intervention show that contingencies targeting academic performance can have powerful results on academic performance. However, neither disruptive behavior nor on-task behavior was directly measured during this study.

Reinhardt et al. (2009) used similar procedures as Popkin and Skinner’s (2003) study and extended the research to target homework accuracy of fourth-grade general education students. Similar to Popkin and Skinner (2003), Reinhardt et al. (2009) randomized all aspects of the intervention and added target behaviors (homework subjects: reading comprehension, mathematics, and spelling) in subsequent intervention phases. Results showed that contingencies
targeting homework accuracy were effective in improving accuracy rates. However, because this study focused on homework accuracy, in-class rates of on-task behavior or disruptive behavior were not measured.

Scott et al., (in press) used two different group contingencies to improve math independent seat-work in a first-grade classroom: a small-group dependent contingency and a large group independent contingency. The dependent variable was the percentage of correctly completed daily math worksheets. A randomly selected reward was given to all class members if the class average or small-group average (depending on the phase) met a randomly selected criterion. A modified adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) was used to see if math performance differed under the small-group or whole-group contingencies. Results showed that math performance significantly improved during both interventions. Both the whole group interdependent and small group dependent contingencies were equally effective in increasing student math performance. As in the other academic performance target studies reviewed, neither disruptive behavior nor on-task performance were directly measured in this study.

**Indirect effects.** Some research indicates that targeting academic behavior is likely related to reductions in disruptive behavior. Ayllon and Roberts (1974) examined the use of an independent contingency using tokens as rewards for performance on reading worksheet assignments during language arts class for five, fifth-grade boys with extremely disruptive behavior. Students received two points (tokens) if they achieved an 80% on writing assignments and five points if they achieved 100% for writing assignments. These points could then be exchanged for back-up reinforceers such as extra recess or being the teacher’s assistant. When the
independent group-contingency was applied, performance in language arts increased significantly. For disruptive behavior, the trend was not clear due to large variability in disruptive behavior scores during baseline phases, with an average of 40% of intervals scored as disruptive. However, during the intervention, disruptive behavior reliably decreased to near zero levels (5%).

Marholin and Steinman (1977) employed an individual contingency targeting academic performance and on-task behavior. For this study, academic performance was defined by the rate and accuracy with which the students completed individual math assignments. Students were reinforced with points which then could be used to purchase free time in the classroom. Students were reinforced on variable interval schedules, based on their baseline performance. In the first phase, on-task behavior was reinforced, and in the second phase, academic performance was reinforced. They measured these behaviors both when the teacher was present and absent in the classroom. Disruptive behavior, though not a part of the contingency, was also measured throughout the study. The results showed that on-task behavior increased during the teacher’s presence when targeting both academic performance and on-task behavior. Interestingly, instances of disruptive behavior varied according to whether the teacher was present in the room. In phases in which the teacher was present, disruptive behavior decreased during both on-task and academic performance target phases. It appeared reinforcing on-task behavior was marginally superior to academic performance reinforcement. However during the teacher’s absence, disruptive behavior increased in the on-task behavior condition. Students were less disruptive when academic performance was reinforced, but disruptive behavior still remained at relatively high rates. Thus, the authors concluded that in the presence of a teacher, both
reinforcement of on-task behavior and reinforcement of academic performance decrease classroom disruptive behavior. However, these results do not extend to when the teacher leaves the room.

Ferritor et al. (1972) found different results using an independent contingency targeting on-task behavior and academic performance in a third-grade general education classroom with high rates of disruptive behavior. Students were rewarded with tokens for either on-task behavior or academic performance on daily math problems. During the on-task behavior phase, students earned tokens for attending every 1-2 minutes. During the academic performance phase, the students could earn one token for every seven problems completed correctly. During the combined phase, students could earn tokens for both attending behavior and academic performance. During this final phase, back-up reinforcers were made more expensive to adjust to students having the chance to earn twice as many tokens. Results showed that on-task behavior increased and disruptive behavior decreased during the on-task target phase. However, academic performance (i.e., accuracy) or responding (i.e., number of problems answered) was not affected during this phase. When the target behavior shifted to academic performance, academic performance (accuracy) reliably increased, the number of problems answered remained the same, and on-task behavior actually dropped, while disruptive behavior increased. Only when both on-task behavior and academic performance were reinforced did the authors reliably increase both academic performance and on-task behavior while decreasing disruptive behavior. Thus, Ferritor et al. (1972) concluded that disruptive behavior did not decrease simply as a result of the academic performance contingency.
Other researchers have found that disruptive behavior is not reduced until directly targeted. Dougherty and Dougherty (1977) evaluated the effectiveness of an intervention targeting homework completion and rates of disruptive (talking out) behavior. An independent group contingency was employed where students were graded on their homework completion and rates of disruptive behavior on a daily report card. At the end of the day, the teacher shared feedback with the students on their daily performance, and gave praise or corrective feedback as necessary. Results showed that although homework completion increased significantly following the implementation of the daily report card, disruptive behavior did not decrease until it was directly targeted.

An additional concern with the indirect effects of academic behavior targets on disruptive behavior is that although some of the studies reviewed above have reported reduced disruptive behavior, reduction of disruptive behavior to widely acceptable levels has not been consistently demonstrated (Lentz, 1988). This brings up the question of statistical significance versus practical significance. Researchers have found statistically significant drops in disruptive behavior, but not to educationally valid levels of change (levels that are acceptable to teachers). Thus, even if there are some indirect reductions in disruptive behavior as a result of academic behavior targets, if the reductions are not to acceptable levels, then the relationship is not ecologically valid.

Many researchers assert that academic performance is functionally related to time spent on task (for a review, see Lentz, 1988). Therefore, a contingency targeting academic performance should, in theory, indirectly cause increases in on-task behavior. Marholin and Steinman (1978) found that in phases targeting academic performance, on-task behavior also
increased. More recently, researchers used an independent token economy with four middle school students in a seventh-grade reading classroom to increase both oral reading fluency and on-task behavior. However, because behaviors that fell under on-task behavior and academic performance behavior were not clearly teased out (i.e., tokens were earned concurrently for on-task and academic performance behaviors) it cannot be determined whether the academic target, on-task target, or both targets contributed to the increase in both of these behaviors (Dolezal, Weber, Evavold, Wylie, & McLaughlin, 2007).

Although academic performance targets are sometimes seen to indirectly affect on-task behavior, the impact is generally not as great as when on-task behavior is directly targeted (Lentz, 1988; Ruggles & LeBlanc, 1985). Thus, although there does appear to be some evidence for a direct correlational relationship between academic performance and on-task behavior, this relationship is not consistent.

**Application of Contingencies with Students with Emotional Behavioral Disorders**

Schools use the term Emotional Behavioral Disorders (EBD) to identify children whose emotional and behavioral exceptionalities make it difficult for them to succeed in the general education system. EBD are a group of disorders which have in common pervasive emotional and behavioral dysfunction. Federally, under IDEA, EBD is defined as “emotional disturbance”:

- A condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree that adversely affects a child’s educational performance:
  - (A) An inability to learn that cannot be explained by intellectual, sensory, or health factors.
  - (B) An inability to build or maintain satisfactory interpersonal relationships with peers
and teachers.

(C) Inappropriate types of behavior or feelings under normal circumstances.

(D) A general pervasive mood of unhappiness or depression.

(E) A tendency to develop physical symptoms or fears associated with personal or school problems.

The term includes schizophrenia. The term does not apply to children who are socially maladjusted, unless it is determined that they have an emotional disturbance. (IDEA Regulations, 2004).

Although the federal definition uses the term *emotional disturbance*, this paper will use the term emotional behavioral disorder (EBD; Christle & Yell, 2013). Recent research estimates on the prevalence of EBD in the schools vary from 6% (U.S. Department of Education, Office of Special Education Programs, 2015), to over 20% (Brauner & Stephens, 2006; Kauffman & Landrum, 2012; National Institute of Mental Health, 2001). Unfortunately, students with EBD have high rates of school failure, with at least 35% dropping out of high school each year from 2002-2013 (U.S. Department of Education, Office of Special Education Programs, 2015). These school failure rates are the highest among all student disability categories. Students with EBD also suffer from under-identification and a lack of treatment (Reddy, Newman, De Thomas, & Chun, 2009; The President’s New Freedom Commission on Mental Health, 2003). Thus, research on children and adolescents with EBD is important for the field.

Students with EBD are often an idiosyncratic group presenting with distinct problematic behaviors and academic skill deficits. This provides challenges for teachers regarding both academic instruction and behavior management. Given that it would be difficult to manage
individual contingency programs for each student, a better option might be to employ interdependent group contingency programs (Skinner et al., 1996). Interdependent group contingencies have been successfully used with students with EBD to improve academic performance (e.g., Popkin & Skinner, 2003) and reduce disruptive behavior (e.g., Theodore, Bray, Kehle, & DioGuardi, 2004). In addition, a recent meta-analysis of prevention and intervention studies for students with emotional behavioral disorders found positive effect sizes between 1.2 and 2 for group contingency intervention programs focusing on behavior at school (Reddy et al., 2009).

Although group contingency programs are particularly effective with EBD students, the research base is lacking with regard to the best target behaviors for intervention. In a recent meta-analysis, the authors concluded that the majority of the intervention studies, particularly with this population, focus on reducing disruptive behavior (60% of intervention programs reviewed), rather than focusing on strengthening positive behaviors such as engagement in the classroom or academic performance (Reddy et al., 2009). This limitation demonstrates the need for research regarding effective practices with EBD students. In addition, because interdependent group contingencies have been found to be especially effective with this group, students with EBD seem to be an especially appropriate group to study regarding this research question.

**Purpose of the Current Study**

Given that EBD teachers and school psychologists often have a long list of inappropriate or academic behaviors to choose from when developing a group contingency system, it is necessary to investigate the utility of each target. EBD teachers are often faced with the challenge of enhancing academic performance while simultaneously decreasing inappropriate
behaviors (Landrum, Tankersley, & Kauffman, 2003; Popkin & Skinner, 2003). Although some
studies found evidence that targeting on-task behavior is likely related to reductions in disruptive
behavior (e.g., Ayllon & Roberts, 1974; Ferritor et al., 1972), others have found that disruptive
behavior is not reduced until directly targeted (Dougherty & Dougherty, 1977; Marholin &
Steinman, 1977). Furthermore, disruptive behavior is often not directly measured in studies
targeting academics (e.g., Popkin & Skinner, 2003). There is also research indicating that
targeting disruptive behavior has positive effects on academic achievement (Medland &
Stachnik, 1972; Van Houten et al., 1982). However, this research is dated, and the majority of
recent studies that focus on disruptive behaviors do not collect academic performance data (e.g.,
Heering & Wilder, 2006; McKissick et al., 2010). In addition, few studies have examined the
effects of academic behavior contingencies on both disruptive and on-task behavior, and vice
versa (see Lentz, 1988 for review).

Researchers have studied the effect of group contingencies on academic performance, on-
task behavior, and disruptive behavior separately; however, researchers have not yet investigated
the effects of a single contingency on all three of these behaviors. Through comparing effects of
one contingency on all three of these behaviors, the direct and indirect effects of the contingency
can be evaluated, potentially producing evidence for the superiority of one contingency target
(e.g., academic performance or on-task behavior) over another. Additionally, prior group
contingency research has focused on academic performance in math and English classes, rather
than in content area classes, such as science and social studies. Research is needed regarding the
use of contingencies to promote academic performance in content areas (e.g., history, science).
Finally, although some researchers have focused on students with EBD, more research is needed
regarding evidence-based practices to encourage academic performance and engagement within this population.

The current study was designed to evaluate and compare the effect of two group contingencies, one targeting academic performance, the other targeting on-task behavior, on the accurate academic performance, disruptive behavior, and on-task behavior of eighth-grade students in an alternative school social studies classroom. Disruptive behavior was not chosen as a contingency due to the disadvantages with choosing this target (McKissick et al., 2010; Radley et al., 2016; Reddy & Richardson, 2006; Skinner et al., 2009; Winnett & Winkler, 1972). Students with EBD were chosen for the population due to their high rates of disruptive behavior as well as the large body of relevant research (see Theodore, Bray, Kehle, & DioGuardi, 2004 for review) to draw from. In addition, interdependent group contingencies were chosen because they can promote cooperative behavior amongst students and are easier for the teacher to implement (i.e., the entire class either does or does not receive the reward; Kelshaw-Levering et al., 2000). Contingency criteria and rewards were randomly selected due to the benefits of randomizing components (i.e., avoid ratio strain, encourage all students to do their best academically, and enhance each student’s motivation to increase desirable behaviors (Skinner & Popkin, 2003; Skinner et al., 2009).

**Research Questions**

This study examined the direct and indirect effects of on-task behavior versus academic performance targets on the on-task behavior, disruptive behavior, and academic performance of seven eighth-grade EBD students in an alternative school social studies classroom and sought to answer three main questions:
1. What is the effect of an accurate academic performance contingency on on-task behavior, academic performance, and disruptive behavior?

2. What is the effect of an on-task behavior contingency on on-task behavior, academic performance, and disruptive behavior?

3. Which contingency causes the greatest improvement on on-task behavior, academic performance, and disruptive behavior?
Participants and Setting

Participants included 7 eighth-grade students at a self-contained middle school in the Southeastern United States. Participants were all students in a single social studies class. The entire class consisted of 11 students. Students were often absent from class, so that on any given day the number of students in the classroom typically averaged 6-9 students. The racial make-up of the class was approximately 50% African American and 50% Caucasian. Students are typically placed in this middle school for half-year or full-year placements due to displaying extreme behaviors that cannot be appropriately served at their local schools. All participants completed the study each school day over a period of eight weeks of the spring semester. Toward the end of the study, (i.e., Day 19 and Day 21) two participants dropped out due to switching schools or switching classes within the school. Two students were also added to the class throughout data collection. Data were not collected from these additional students. Procedures were conducted within the social studies classroom.

Materials and Measures

The primary researcher was a School Psychology doctoral student completing her dissertation. One other doctoral student assisted with data collection. Before data collection, the primary researcher trained the other experimenter on the specific procedures that were used within this study. The teacher and teaching assistant also received training on study procedures.

Materials for the current study included daily independent social studies assignments and two envelopes with slips of paper listing the randomized criteria and reward options (e.g., candy). The unknown criteria and reward were recorded on slips of paper and stored in
envelopes, labeled “Criteria” and “Rewards”. Specific criteria were selected following baseline data analysis and included 13 options ranging from 40% to 90%. The same criteria and reward options were used regardless of treatment. When a criterion was selected each day, the index card with the chosen criterion was moved to another envelope (labeled as “Academic Reward Day” or “On-Task Behavior Reward Day”), which was then put on a table within view of everyone in the class.

Choosing the rewards for the current study was a collaborative effort between the primary researcher, the classroom teacher, and the students, and consisted of six possible rewards (e.g., a piece of candy, computer time). One of these rewards was randomly selected by the researcher and given to the participants at the beginning of the following class period contingent upon the group meeting or exceeding a randomly selected criterion. Although independent rewards were typically offered in the classroom without an intervention (e.g., sit in special chair, mints, class dollars, grades), these rewards were delivered to some, but not all students. Bonus rewards were only made available to all students in the classroom for each day of the group-oriented reward conditions and only in response to meeting the reward criterion.

The typical class period consisted of 30 minutes of teacher-led group instruction (e.g., lecture, recitations, demonstrations, videos), followed by 10-15 minutes of independent seatwork. During independent seatwork, each student was given a brief written assignment covering the material that was taught that day. The typical written assignment consisted of 10 questions, and might include fill in the blank, short answer, and/or multiple-choice question types. The worksheets were selected by the teacher from various educational resources and were not altered for the purposes of the study.
Treatment acceptability was evaluated in two ways: a paper-and-pencil survey administered to participants and a semi-structured interview with the classroom teacher. Following all data collection procedures, a paper-and-pencil survey was group administered to all class members. Students read the survey to themselves, but the primary researcher in the room was available to answer questions. Survey questions focused on whether students enjoyed participating in the intervention, whether they felt the intervention was effective in general, and whether the on-task behavior criteria or the academic performance criteria were, in their view, more effective. In addition, the classroom teacher answered a teacher version of the acceptability survey during this time. Finally, the classroom teacher also participated in a brief semi-structured interview, so that we could gain more open-ended responses to these questions (see Appendices G-I).

**Dependent Variables**

The dependent variables for this study included academic performance (i.e., percent correct), class average on-task behavior (i.e., percent on-task), and intervals scored with disruptive behavior (i.e., disruptive behavior).

**Percent correct.** Percent correct was operationalized as the percent of the independent seatwork worksheets correctly completed. The variable was measured by collecting and scoring each student’s independent seatwork at the end of each class. Questions on the worksheet were scored as either a 1 (correct) or 0 (incorrect) and then totaled to create an “items correct” over “total items” score. After each worksheet was individually graded, the class average was calculated.
Percent on-task. Percent on-task was operationalized as the participant’s head oriented toward the speaker or school-related materials. The variable was measured using momentary time sampling with 15-s intervals and 5-s of scoring time. When the interval was signaled, the observer circled the number of students on-task, which was then converted to a percentage of students on task. Since only seven students were participants in the study, observers could see each student clearly when collecting data. On-task behavior ceased being recorded for a student once he had turned in his independent seatwork for the day. At the end of class, an average percent of students on-task was calculated.

Disruptive behavior. Disruptive behavior, which was defined more explicitly following classroom observation of disruptive behaviors in this classroom, was defined as inappropriate vocalizations. This definition resulted from the observation that any disruptive behavior (e.g., out of seat, throwing objects) was usually accompanied by an inappropriate vocalization. In addition, this definition did not unnecessarily punish the students for leaving their seats to turn in work. Disruptive behavior was measured on a 15-s partial interval schedule with 5-s of scoring time. If any student engaged in any disruptive behavior, the interval was scored. At the end of class, percent of disruptive behavior across the intervals was calculated.

Data collection sessions occurred during independent seatwork sessions and continued until all students had finished the assignment for the day. At minimum, data collection sessions lasted for 7 minutes, and at maximum, for 26 minutes. As mentioned above, on-task behavior data stopped being recorded for a student once he turned in his independent seatwork assignment. However, that student could still be recorded as engaging in disruptive behavior.
**Design and Procedures**

An adapted alternating treatments design was used to evaluate the effects of the group-oriented rewards using unknown criteria on percentage of independent seat work correctly completed, disruptive behavior, and on-task behavior (Sindelar et al., 1985; Scott et al., in press; Skinner & Shapiro, 1989). The design consisted of a baseline followed by an alternating treatment phase. During baseline, no-intervention procedures were applied, which included typical classroom independent group-oriented contingencies (see below for a more complete discussion on these contingencies). During the alternating treatments phases, one of two interventions (academic performance or on-task behavior) were applied each day, with a no-intervention condition (i.e., baseline phase procedures) implemented one day per week (Scott et al., in press). Because students did not complete independent seatwork on Thursdays, data collection occurred for approximately four days each week.

For the first day, the treatment was randomly selected by the researcher. The first randomly-selected treatment was applied for two consecutive days, followed by the other treatment for two consecutive days. This strategy was used to enhance the probability of students learning each contingency and how to distinguish between the contingencies. After these first four days, the contingencies were randomly selected by the researcher each day, except for two rules: there could be no more than two consecutive days of a contingency in a week, and one day per week was pre-designated for the no-intervention condition.

For both treatments, all class members or no class members received access to rewards. Although behavior and academic performance were not recorded for the remaining class members who were not participants in the study, they still received the same feedback and
rewards as the participating classmates. Both contingencies were class-wide interdependent group rewards, but they were based on different target behaviors. In one contingency, the “academic performance” contingency, the class’s access to rewards was based on the class-wide average for the percentage of items completed correctly on the independent seatwork social studies assignment meeting or exceeding a randomly selected criterion. For the other contingency, the “on-task behavior” contingency, the class’s access to rewards was based on percent of intervals of on-task behavior meeting or exceeding a randomly selected criterion. Criteria levels for academic performance and on-task behavior were selected following the collection of baseline data and based on a small, medium, and large increase from baseline levels of behavior. The 13 criteria levels ranged from 40% to 90%. Academic performance served as the primary dependent variable used when considering when to apply the contingencies and when to end the study.

**Baseline: No intervention.** During the baseline phase, no additional contingencies were implemented within the classroom. The no-intervention independent group-oriented contingencies (typical classroom procedures) remained in place. When students entered the classroom, they were instructed to take their seats. Students were assigned to desks in the classroom. Students sat away from each other to discourage class disruptions. The teacher then would begin classroom instruction. At the end of the lecture (typically 30-35 minutes), the teacher distributed the independent seatwork worksheet, which students were told to work on for the remainder of class. The teacher walked around the room to assist students as needed.

Several independent group-oriented contingencies remained in place as a part of no intervention. Students were individually graded on their behavior in the class by the teaching
assistant. Points, which started at 100 each school day, were taken away when students were found to be in violation of one of three rules: respect for self and others, stay in assigned area, and follow directions. Students who dropped below 90 and 80 points lost privileges such as talking during lunch and going to the school store. Students who dropped below 60 points were put on “restriction,” and spent the school day in an area separated from their classmates. These losses of privileges served as independent punishers.

The classroom teacher also implemented some independent group-oriented rewards. The student with the most points at the end of the school day could sit in a special chair during the social studies lecture the next day in class. The teacher also regularly awarded class dollars for good behavior. Class dollars were a part of the school’s token economy system and could be used to buy small items at the school store once a week. As stated above, these no-intervention contingencies all remained in place for the duration of the study.

**Alternating treatment phase: General procedures.** The alternating treatments phase was in place for 20 consecutive school days (excluding days on which independent seatwork was not completed). For this phase, there were three conditions: the class-wide interdependent condition with on-task behavior targets (OT), the class-wide interdependent condition with academic performance targets (AP), and the no-intervention condition, i.e., baseline procedures (NI). The AP contingency was selected as the first intervention based on a coin toss by the primary researcher. This intervention was implemented for two consecutive school days. The OT contingency was then implemented for the next two consecutive school days to ensure that participants understood the distinction between the two group-oriented reward conditions (Sindelar et al., 1985). The contingency conditions were then randomly selected by a coin toss,
subject to the rule that there could be no more than two consecutive days of any contingency within one week. To control for threats to internal validity, no-intervention (i.e., baseline) conditions were implemented one day per week (Sindelar et al, 1985). To control for variability in student behavior and performance across different times of the week, the no-intervention condition was on a pre-designated day each week of the intervention.

**Procedures for alternating treatment phase.** On the first day of the alternating treatment phase, the primary researcher presented the procedures as an *Academic and Behavior Reward* game (adapted from Scott et al., in press and Popkin & Skinner, 2003). Students were informed that they would have the opportunity to earn rewards based on their performance in the classroom and on their independent social studies assignments. The definition of on-task behavior was read to the students (see Appendix L for script). Furthermore, students were told that either everyone in the classroom or no one would receive the reward based on either their accuracy on the daily worksheets or on-task behavior. Students were also informed that on select days, no intervention would occur and no reward would be randomly selected. When students arrived each day, the researcher announced that it was an academic-, behavior-, or no-reward day. Although a small number of students in the class were not participants in the study, they still received class rewards along with the rest of the class and believed that their behavior was being recorded.

**Procedures for on-task condition.** When students entered the classroom, the teacher announced whether the class had met the reward criteria from the previous day. If so, she drew a reward out of the “Reward” envelope, and the researcher supplied the reward to the class. If the class did not meet the randomly selected criterion for the previous day, then the teacher
announced that the class did not meet the criterion and would not receive a reward for that day. She then announced it was an “On-Task Behavior Reward Day.” The teacher reviewed on-task behavior rules with the students and selected a criterion from the envelope labeled “Criteria”, placed it in the envelope labeled “On-Task Behavior Reward”, and put it on a table in front of the class as a visual reminder of the condition. The criterion and reward remained unknown to students. The teacher then began her daily lesson. The primary researcher sat in the back of the classroom. When the class switched from teacher lecture to independent seatwork, the researcher collected on-task and disruptive behavior data in the manner defined above. Data continued to be collected until all students turned in their assignment, or until the end of the class session, whichever came first. In order for a data session to be counted, students needed to spend at least five minutes on the independent seatwork assignment. At the end of the class session, the researcher calculated the percent of intervals with on-task behavior. The researcher then compared the percent of on-task intervals to the criterion to determine whether or not the class had earned the reward for that day.

**Procedures for academic performance condition.** For this condition, when students entered the classroom the teacher announced whether students had met the reward criterion the day before, and, if so, selected a reward using the same procedures detailed in the on-task condition above. Similar to the on-task procedures, the researcher passed out the reward at that time. The teacher then announced it was “Academic Reward Day”. The teacher randomly selected a criterion from the criteria envelope, placed it in an envelope entitled “Academic Reward”, and put it on the front table as a visual reminder for the students. Classroom procedures were identical to those used for the on-task reward condition; the teacher lectured for
approximately 30-35 minutes, followed by completion of an independent seatwork worksheet. The researcher continued to collect on-task and disruptive behavioral data during the class sessions. At the end of the class session, the primary researcher graded the independent seatwork assignments for each student in the class and calculated a class average. The researcher then compared the class average to the criterion to determine whether or not the class had earned the reward for that day.

*Procedures for no-intervention condition.* On days in which the class did not have the opportunity to receive access to the group-oriented reward, no-intervention procedures remained in place. When students entered the classroom, the teacher announced that it was a “no intervention” day, but students were expected to remain on-task and to accurately complete their independent seatwork assignments. The primary researcher collected behavioral observation data on on-task and disruptive behavior during independent seatwork time, and graded each student’s independent social studies assignment at the end of the class period.

*Analysis procedures.* After each day, the class average of percent completed correctly on the daily independent worksheets, % intervals scored with disruptive behavior and mean % of students’ on-task behavior across all scored intervals were plotted on time-series graphs. Visual analysis of these graphs was used to make judgements regarding the variability, trend, and level in the data. The primary dependent variable, academic performance, was analyzed to determine when to discontinue the alternating treatments phase.

As a second level of analysis, three methods were used to calculate effect size: percent non-overlapping data points (PND; Parker & Hagan-Burke, 2007), percent of data points exceeding the median (PEM; Ma, 2006), and Hedges’ *g* (Hedges, 1981). Both PND and PEM
indicated the consistency of differences between conditions and Hedges $g$ indicated the magnitude of the differences.

**Procedural integrity and interscorer agreement.** To ensure that the intervention was implemented with integrity, the secondary researcher and classroom teacher reviewed a checklist of treatment components prior to intervention onset (Appendix K). Following completion of the intervention session, the secondary researcher and teacher completed the checklist for 25% of sessions for each phase and condition. Results showed 100% procedural integrity across all sessions. The primary researcher scored individual social studies assignments. In order to ensure accuracy of behavioral and academic performance data, a second observer trained to criteria independently collected direct observation data and scored assignments for 25% of the sessions for each phase and condition. The number of agreements was divided by the total number of data points and then multiplied by 100. Interscorer agreement for on-task behavior data ranged from 81%-90% and averaged 86%. Interscorer agreement for disruptive behavior data ranged from 85%-98% and averaged 93%. Interscorer agreement for academic performance was 100% across all sessions.

**Social Validity Measures.** A researcher-developed social validity questionnaire (Appendix J) was used to determine student acceptability for the contingencies. Only those students who obtained parental consent completed the questionnaire. Four students completed the questionnaire, as one student switched schools in the middle of the study and two students were absent on the day the questionnaires were distributed. The items were completed independently and anonymously. The questionnaire consisted of 16 Likert-type items. The scale ranged from 1 (“Strongly Disagree”) to 6 (“Strongly Agree”). This scale was adapted from some
items of an acceptability measure developed by Scott et al. (2016). Items focused on the extent to which students appreciated the contingencies and believed that the contingencies assisted with their completion of social studies assignments and improved their behavior.

To determine teacher treatment acceptability, the teacher completed an 8-item Likert-type scale (see Appendix H). The Likert-scale matched the student scale. Items focused on the extent to which the classroom teacher appreciated the contingencies, and believed the contingencies improved classroom behavior and academic performance. The scale was adapted from some items of acceptability measures developed by Fudge et al. (2008), and Scott et al. (2016). A semi-structured interview (Appendix I) was also conducted with the classroom teacher following the last session of data collection. This interview was conducted to gain more open-ended feedback about the acceptability of the intervention and the ease with which it was implemented.
Chapter III

Results

Visual Analysis of Class-wide Data

The class met or surpassed the contingency criteria and consequently earned a reward on 13 out of 16 sessions (81%). They met the criterion and earned a reward on 6 out of 8 sessions under the academic performance contingency (75%) and on 7 out of 8 sessions under the on-task contingency (87.5%). (Figures 1-3 (Appendix A) show alternating treatments graphs that display the class averages on the three dependent variables: independent social studies assignments (i.e., percent correctly completed), on-task behavior (i.e., percent of individuals on-task in each interval), and disruptive behavior (i.e., percent of intervals with disruptive behavior) across baseline and alternating treatments phases. These three variables will hereafter be referred to as percent correct, percent on-task, and disruptive behavior. The no-intervention baseline (NIB) and no-intervention alternating treatments (NIAT) phases were identical except for the phase in which they were applied. Decisions on when to begin and end alternating treatments phase were based on visual analysis of class average data for academic performance (e.g., variability, trends). Thus, investigation of individual performance using visual analysis of repeated measures graphs was only conducted after study conclusion.

Table 5 provides descriptive data across all conditions for each participant in the class. Additionally, participant averages were transformed to letter grades based on the following 10-point scale: 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, and 59% and below = F. This data is further discussed in the within-student analyses section. Individual data on disruptive behavior and on-task performance were not collected.
**Percent correct.** Figure 1 shows that during the third baseline session, percent correct was higher ($\bar{X} = 65.0$) than the other three days of baseline. The final three days showed little variability and no clear trend ($\bar{X} = 52.0$, $SD = 1.73$). The overall average academic performance for the baseline phase was $\bar{X} = 55.0$. After the AP contingency was implemented, percent correct immediately improved ($\bar{X} = 86.0$). However, this behavior was extremely variable ($SD = 14.79$), and at several points during the alternating treatments phase, percent correct resembled baseline levels (See Figure 1). Despite variability, the overall mean for the AP intervention ($\bar{X} = 65.0$) was higher than no intervention during both the baseline phase ($\bar{X} = 55.0$) and the alternating treatments phase ($\bar{X} = 45.0$).

Figure 1 shows that percent correct immediately increased following the OT contingency implementation, and remained higher throughout the alternating treatments phase. During the alternating treatments phase, the mean for the OT intervention ($\bar{X} = 80.0$) was higher than the mean for the AP intervention ($\bar{X} = 65.0$), as well as the means for no intervention under baseline ($\bar{X} = 55.0$) and alternating treatments ($\bar{X} = 45.0$) phases. Percent correct under the OT intervention, though still variable, showed more stability ($SD = 11.09$). Overall, these data support visual analysis of Figure 1. Although both interventions led to an increase in percent correct on individual social studies assignments, the OT contingency was superior to the AP contingency in consistency and average percent-correct data.

Visual analysis of the percent correct data shows that neither the OT or AP condition have a consistent trend. Instead, the data are variable for both conditions, with the OT condition showing more stability ($SD = 11.09$) than the AP condition ($SD = 14.79$). There is also no clear trend for the no-intervention data during the alternating treatments phase. There was one outlier
(Session 13) when percent correct was uncharacteristically low ($\bar{X} = 25.0$). Other than this outlier, the data for the NIAT condition are stable and much like baseline conditions. The similarity in baseline data between alternating treatments and baseline phases suggests that percent correct data is not affected by history, carryover, or contrast effects (Sindelar et al., 1985; Skinner & Shapiro, 1989).

**Percent on-task.** Figure 2 shows that percent on-task during the first baseline session was significantly higher ($\bar{X} = 74.0$), than the final three baseline sessions. These remaining sessions showed no clear trend ($\bar{X} = 33.6, SD = 5.24$). The overall average for percent on-task during baseline was 43.7. During the alternating treatments phase, under the AP contingency, percent on-task immediately increased, but then dropped below baseline levels, before leveling out above the baseline mean (see Figure 2). As shown in Table 1, despite considerable variability ($SD = 13.50$), average percent on-task for the AP contingency ($\bar{X} = 62.0$), was still higher than during no intervention, during either the baseline ($\bar{X} = 43.7$) or alternating treatments ($\bar{X} = 51.0$) phases.

With the implementation of the OT contingency, percent on-task showed an immediate increase, and consistently remained higher than baseline behavior throughout the alternating treatments phase (see Figure 2). Under the OT contingency, percent on-task was less variable ($SD = 8.58$), and, on average ($\bar{X} = 76.0$), higher than percent on-task during the AP contingency, and during no intervention, during both the baseline ($\bar{X} = 43.7$) and alternating treatments ($\bar{X} = 51.0$) phases. Although both interventions led to increases in percent on-task, these data and visual analysis suggests that the OT contingency led to a larger increase than the AP contingency.
The data are variable for both conditions, and visual analysis shows no clear trend for either condition. The OT condition data are more stable ($SD = 8.58$) than those of AP condition ($SD = 13.50$). There is also no clear trend for no-intervention percent on-task during the alternating treatments phase. A visual comparison of the no-intervention data during both baseline and alternating treatments phases shows stability and similarity in percent on-task across phases. This suggests that percent on-task data are not affected by history, carryover, or contrast effects (Sindelar et al., 1985; Skinner & Shapiro, 1989).

Disruptive behavior. Figure 3 shows that disruptive behavior during the first baseline session was much lower ($\bar{X} = 18.0$), than the remainder three baseline days, which showed smaller variability and no clear trend ($\bar{X} = 88.2$, $SD = 7.52$). The overall average for disruptive behavior during baseline conditions was 70.6%. During the alternating treatments phase, implementation of both the AP and OT interventions resulted in little change in disruptive behavior (AP $\bar{X} = 55.0$; OT $\bar{X} = 65.0$), especially when considering the substantial variability of the data (See Figure 3 and Table 3). These data suggest that neither intervention had much effect on disruptive behavior in the classroom.

As described above, the disruptive behavior data show similarly high variability for both the AP and OT contingencies (AP $SD = 28.2$; OT $SD = 26.7$). There is no clear trend for either condition. There is also no clear trend for the highly variable, no-intervention condition. Instead, the data appear highly unstable regardless of the condition, supporting the suggestion that neither intervention affected classroom disruptive behavior.
Statistical Analysis of Data Across Phases and Conditions

Percent correct: Means and letter grades. Under the no-intervention condition for both baseline and alternating treatments phases, percent correct on social studies assignments would result in a failing grade (45% and 55%, respectively; see Table 1). During the alternating treatments phase, the academic performance contingency increased percent correct to a grade of D (65%), while the on-task contingency increased percent correct to a grade of a B (80%). These data suggest that while both interventions had a meaningful increase in social studies performance (at least a letter grade), the on-task contingency caused a more educationally valid increase in social studies performance, because it promoted performance two letter grades higher than the academic performance contingency.

Effect sizes. Effect size data were calculated across phases and conditions using three methods: percent non-overlapping data points (PND; Parker & Hagan-Burke, 2007), percent of data points exceeding the median (PEM; Ma, 2006), and Hedges’ g (Hedges, 1981). PND (Parker & Hagan-Burke, 2007), a popular effect-size measure, evaluates the consistency of the differences in data between phases. However, this effect-size measure is insensitive to the size of the differences and is highly sensitive to variable data. When interpreting PND, we used the following scale of effectiveness: <50%, 50% - 70%, 70% - 90%, and over 90%, signifying less than small, small, medium, and large effects respectively. Due to concerns with PND and the high variability of our data, we also calculated PEM.

PEM (Ma, 2006) is also a measure of the consistency of the differences in data between phases. Compared to PND, PEM is less sensitive to variable data, and data affected by floor and ceiling effects. However, PEM is still insensitive to the magnitude of the differences. When
interpreting PEM, we used the following scale of effectiveness: <50%, 50 - 70%, 70% - 90%, and 90% and above, signifying less than small, small, medium, and large effects, respectively.

Hedges’ $g$ (Hedges, 1981) is a statistical measure that measures the magnitude of the differences between phases. Hedges’ $g$ is recommended when data show no clear trend and when there are small samples (i.e., under 20 data points). In our study, the data revealed no clear trends and each phase had, at maximum, eight data points, thus showing the worth of this effect-size measure. Hedges’ $g$ is calculated by comparing the difference in means across conditions divided by the pooled standard deviations of the corresponding conditions. In determining the practical significance of Hedges’ $g$, we used a conservative criterion, with $g > .41, 1.15, \text{and } 2.70$ signifying small, medium, and large effects, respectively (Ferguson, 2009).

Effect size data, using all three methods described above, are displayed in Table 2, which provides comparisons of the class-wide data between all study phases and conditions. When the AP contingency is compared with both no-intervention conditions (baseline and alternating treatments phases), there were four overlapping data points, with 50% of the data points non-overlapping. This suggests the AP contingency had a small effect on percent correct. When the OT contingency is compared to both no-intervention conditions, there are no overlapping data points. This means that each OT contingency session resulted in a higher class-average percent correct than under each no-intervention session, which suggests a large effect. These data suggest that the OT contingency had more of a consistently positive effect on percent correct than when no intervention was employed. PEM analysis shows similar results. Under the AP contingency, 75% of the data points are over the NIB median, and 87.5% are over the NIAT median, suggesting medium effects. Under the OT contingency, 100% of data points are over the
no-intervention median in both baseline and alternating treatments phases, suggesting a large effect. PND and PEM analysis, like earlier visual analysis, suggest that the on-task contingency caused a more consistent increase in class average percent correct than the academic performance contingency.

Hedges' \( g \) analyses’ comparing the AP and OT interventions to each no-intervention condition revealed different increases in social studies performance (see Table 3). Effect sizes comparing the AP condition to both no-intervention conditions were smaller than those comparing the OT condition to both no-intervention conditions; the latter revealed medium to large effect sizes (see Table 3). A comparison of NIB to NIAT revealed a small effect size (\( g = -1.05 \)) which shows that there was a slight decline in percent correct during the NIAT phase when compared to the baseline phase.

An effect size comparison of the two conditions shows that there was a small difference in effectiveness between the academic performance condition and the on-task condition, with the on-task condition being more effective (\( g = 1.15 \)). Thus, Hedges’ \( g \) calculations are consistent with all prior analyses, which all suggest that although both contingencies caused increases in percent correct, the on-task contingency produced differences that were larger (Hedges’ \( g \)), more meaningful (letter grades), and more consistent (PND and PEM) than those produced by the academic performance contingency.

**Percent on-task: Means.** Class average percent on-task under no intervention was low for both baseline (43.7%) and alternating treatments phases (50.5%). During the alternating treatments phase, the academic performance contingency increased percent on-task to 62% while the on-task contingency increased percent on-task to 76%. These data suggest that while both
interventions had an increase in percent on-task, the on-task contingency caused a larger increase in percent on-task than the academic performance contingency (see Table 1 for mean and standard deviation data).

**Effect sizes.** Effect size data for percent on-task, with comparisons across all phases and conditions of the study, are displayed in Table 4. When the AP contingency is compared with both no-intervention conditions (baseline and alternating treatments phases), there were seven overlapping data points, with 12.5% of the data points non-overlapping. This indicates the AP contingency had a less than small effect on percent on-task. All but one data point surpass the no-intervention median of 43.5%, with 87.5% of the data points surpassing the median, indicating a medium effect. When the OT contingency is compared to both no-intervention conditions, there are four overlapping data points, with 50% of data points non-overlapping, indicating a small effect. All data points surpass the no-intervention median. This means that percent on-task during the OT contingency consistently surpassed the no-intervention median, which indicates a large effect. Although the PEM data support the conclusion that both interventions had positive effects on percent on-task, overall these data suggest that the on-task contingency intervention had more of a consistently positive effect. PND and PEM analyses support visual analysis data, which suggests that the contingency targeting on-task behavior caused a more consistent increase in class average percent on-task than the contingency targeting academic performance.

Hedges’ $g$ analyses comparing both interventions to each no-intervention condition revealed increases in percent on-task (see Table 3). Effect sizes comparing the AP condition to both no-intervention conditions were smaller than those comparing the OT condition to both no-
intervention conditions, which were medium (see Table 3). A comparison of NIB to NIAT revealed a small effect size \( (g = .44) \), which lends evidence to the conclusion that threats to internal validity did not contaminate this study. Percent on-task slightly decreased from NIB to NIAT.

An effect size comparison of the two treatments shows that there was a moderate difference in effectiveness between the academic performance condition and the on-task condition, with the on-task condition proving more effective \( (g = 1.24) \). Thus, Hedges’ \( g \) calculations are consistent with previous analyses, which all suggest that although both contingencies caused increases in percent on-task, the on-task contingency produced differences that were larger (Hedges’ \( g \)) and more consistent (PND and PEM) than those produced by the academic performance contingency.

**Disruptive Behavior: Means.** Class average disruptive behavior during the no-intervention baseline condition was high (70.6%). During the alternating treatments phase, average disruptive behavior was lower across both treatments (55% and 65% for the AP and OT contingencies, respectively). However, it was also low during no-intervention conditions during the alternating treatments phase (57%). Given the lack of difference between disruptive behavior during typical classroom procedure and intervention phases, particularly during the NIAT phase, these data show that neither intervention appears to have influenced disruptive behavior (see Table 1 for mean and standard deviation data).

**Effect sizes.** Data displayed in Table 4 present the class-wide comparisons across all phases and conditions of the study. When the AP contingency is compared with both no-intervention conditions (baseline and alternating treatments phases), all data points were
overlapping, indicating a less than small effect. Because the expected direction of the data was decreasing, the percent of data points below the median was calculated in this case. Out of eight data points, five are below the no-intervention median of 74.5%, with 62.5% of the data points below the median, indicating a small effect. When the OT contingency is compared to both no-intervention conditions, all but one of the data points were overlapping, with 12.5% of data points non-overlapping, indicating a less than small effect. Half of data points fell below the no-intervention median, indicating a small effect. PND and PEM analyses support visual analysis of the data, which suggests that neither intervention influenced disruptive behavior.

Hedges’ $g$ analyses comparing the AP and OT interventions to each no-intervention condition revealed no decreases in disruptive behavior (see Table 4). Effect sizes comparing the AP and OT treatments to both NI conditions were small to less than small in all cases (see Table 4). Effect sizes comparing NIB to NIAT also revealed less than small effect sizes ($g = .30$). It appears that disruptive behavior was highly variable regardless of the phase or condition implemented. An effect size comparison of the two conditions shows that there was no difference in effectiveness between the academic performance condition and the on-task condition ($g = .36$). Thus, Hedges’ $g$ calculations are consistent with previous analyses, which all suggest that neither contingency caused a decrease in disruptive behavior.

**Within-student Analyses of Percent Correct Data**

**Visual analysis of individual student graphs.** Figures 4-10 show the repeated measures graphs for percent correct for each student under each phase and condition. An examination of individual student graphs reveals that, overall, the interventions were effective in increasing percent correct in five out of seven students. The remaining two students, Bill and Carey, had
high performance during all phases of the study, even hitting the ceiling of 100% on several occasions. For the remaining five students, analysis further reveals that percent correct for two of the students, Aaron and Dennis, was more consistently high during the on-task contingency, while performance for two of the students, Edward and George, showed similarly high performance regardless of the treatment. Fred’s performance, though extremely variable throughout all conditions of the study, appears to also show higher performance during the intervention phase of the study, regardless of treatment. None of the participants appear to have benefitted more from the academic performance contingency than the on-task contingency.

**Descriptive statistics.** Table 5 shows the percent correct mean and standard deviation data for each student across conditions. Both no-intervention phases (baseline and alternating treatments) were collapsed for the purposes of analyses. A comparison of the no-intervention data to the intervention conditions reveals that average percent-correct was higher for five out of the seven students during the AP condition (71.4%) and for six out of the seven students during the OT condition (85.7%).

During the AP condition, Bill and Dennis did not show improvement. Bill’s performance was high throughout baseline, averaging 98.67% during no-intervention phases. Although his performance dropped to 98.50%, on average, during the academic performance contingency, this difference is negligible. Bill’s performance during the on-task contingency condition also showed a negligible difference in performance (97.75%). Dennis’s performance during no intervention was low (averaging 36%). His performance remained similarly low during the academic performance condition (33%). Dennis’s performance increased significantly during the on-task contingency condition (79.33%).
In comparing academic performance and on-task contingency conditions, one student, Carey, showed a larger increase in percent correct during the academic performance condition, three of the students, Aaron, Dennis, Edward, showed larger increases in percent correct during the on-task condition, and two of the students, Fred, and George, showed similar increases in performance regardless of condition. One student, Bill, showed high performance regardless of study phase or condition. Overall, these data support the entire-class data and visual analysis and provide evidence that the on-task contingency appeared more effective than the academic performance contingency in improving percent correct.

**Effect size analysis: PEM.** Table 6 shows percent exceeding the median data for each student across conditions. Although percentage non-overlapping data is also presented, PEM was considered a better estimate of effect size due to several students reaching the ceiling of 100% percent-correct at some point during data collection in the no-intervention condition (Ma, 2006). PEM data reveal that for the academic performance condition, PEM was small (less than 70%) for six of the students, medium (70% - 90%) for none of the students, and large (90% -100%) for the remaining student. For the on-task condition, PEM data are small for two of the students, moderate for two students and large for the remaining three students. This data corroborates the visual analysis data, which suggests that individual student percent-correct benefitted more consistently from the on-task behavior contingency than from the academic performance contingency.

**Effect size analysis: Hedges’ g.** Effect sizes for each student across phases and conditions are presented in Table 6. No-intervention conditions were collapsed across the baseline and alternating treatments phases to increase sample size. Effect-size analyses support
earlier analyses showing the superiority of the on-task contingency. Effect-size analyses of the academic performance contingency, when compared to no-intervention conditions across phases reveal less than small to small effect sizes for six out of seven students ($g = .04 - .83$). Only one student, George, showed a moderate effect size of the academic performance contingency ($g = 1.45$). Effect size analyses of the on-task condition, when compared to the no-intervention condition across phases reveal less than small effect sizes for one student (Bill; $g = .19$), small effect sizes for two of the students (Carey and Fred; $g = .41$ and .88, respectively), and moderate effect sizes for the remaining four students ($g = 1.52 - 2.37$). Effect size analyses between the academic performance and on-task conditions reveal moderate differences in effectiveness for two of the students, Aaron and Dennis, in both cases supporting the on-task contingency. Less than small differences in effectiveness were found for the remaining five students. Overall, these data support the prior analyses showing that the on-task contingency is more consistently effective than the academic performance contingency.

**Letter grades.** Although effect size data are often used to indicate intervention strength, analyses of individual students’ grades can provide a practical analysis of intervention effects (Popkin & Skinner, 2003). Table 5 presents letter grades across each condition for each individual student as well as their corresponding percent correct score. NIB and AT were collapsed and examined together to increase sample size.

A comparison of the academic performance contingency to both NI phases shows that two of the seven (28.6%) students increased their letter grade under the AP intervention. The remaining five students had no change in their letter grade. Of the two students who increased their letter grade, one student increased by two letter grades and one increased by three letter
grades. Of the five students who showed no change in letter grades, two were “A” students throughout the entire study regardless of condition or phase. One student, Aaron, did not complete any work during the no-intervention condition in either phase of the study, and raised his average grade to 16.57% during the academic performance intervention. Fred, although he maintained a failing grade regardless of the intervention, improved his performance from an average of 20.71% during no-intervention conditions to 49.25% during the academic performance contingency. As described above, Dennis was the only student whose grade decreased slightly during the academic performance contingency, from an average of 36% in NI to 33% in the AP contingency.

During the on-task contingency, in comparison to both NI phases, four of the seven students increased their letter grade. For these four students, increases ranged from one to four letter grades (e.g., Edward increased his grade from an F (45%) to an A (92.25%). The three remaining students showed no change in letter grades. Out of these three students, two (Bill and Carey) had “A” averages during all NI procedures. The remaining student, Fred, though still failing, more than doubled in his performance, increasing his percent correct from 20.71% during baseline to 49.13% during the OT contingency phase.

A comparison of the two contingencies shows no difference in letter grades in four out of seven (57%) students. For the remaining students (Aaron, Dennis, and Edward), the OT intervention was associated with a higher letter grade than the AP intervention, with one student scoring one letter grade higher and two students scoring two letter grades higher.

Altogether, the individual student data show that the AP and OT interventions were effective for most of the students. The on-task contingency intervention was most effective for
more students than the academic performance contingency. This finding supports visual analysis, PEM, and effect-size data.

**Teacher Acceptability**

The lead teacher was given an acceptability form (see Appendix G) to complete immediately following the last day of the alternating treatments phase. The lead teacher agreed with items 1, 2, 6, and 8. This indicates that she thought that the intervention was good and that most teachers would find it appropriate to deal with behavior in the classroom. She also agreed that the intervention was fair to all students. She rated items 3, 4, 5, and 7 as “3”, slightly disagree. This indicates that she slightly disagreed with seeing improvements in percent correct, spent less time disciplining students, and that the game quickly improved the students’ academic success. She also slightly disagreed that she would use the game with future classes. Teacher answers to the acceptability form indicate moderate acceptability with the contingency conditions.

The teacher also participated in an individually-administered semi-structured interview (see Appendix H) to gain further feedback on her specific likes and dislikes about the intervention. During this interview, she expressed more appreciation for the intervention than her survey results initially indicated. She indicated that she thought the reward game was very successful in motivating students to complete their work. She indicated that she also thought the game helped somewhat with classroom behavior, but that this change was not consistent. She noted that as a positive side effect, students were more likely to attempt their work when playing the game. She stated that the class was excited to hear about the rewards each day, and would ask her about the rewards before the researcher arrived. She also noted that she liked having another
adult in the room (i.e., the researcher), even though the researcher could not help while collecting data. The teacher indicated that she did not observe any negative side effects because of the game.

Regarding things she did not like about the game, the teacher stated that it is hard for her to be invested in something that she does not create. That is, nothing itself was wrong with the game, but she did not feel as invested in it, because she did not create it herself. She also stated that the class was an immature group; consequently, she was concerned they did not always understand the rules of the game. The classroom teacher reported that she felt the game was fair to all the students in the class.

When asked if she would continue using the game in the future, the teacher reported that she would probably continue the game in the future, with a few tweaks. She added that she thought she could target specific behaviors based on the needs of each individual class, which could be especially beneficial. She also thought that the game could help her be clear with classroom expectations in the future. Overall, the teacher reported that she enjoyed having the researcher in the classroom and that she thought the class benefitted from the intervention as well. Her responses suggest teacher acceptability.

Student Acceptability

Student acceptability data were collected from four students. Social validity results were positive across students’ responses to the student acceptability study. Table 7 presents the results of the student-reported social validity data. Answering options 1 through 3 indicated levels of disagreement with the survey question while options 4 through 6 all indicated levels of agreement with the survey question. All students reported that they agreed that it was important
for them to do well on their social studies assignments. The majority (75%) also reported that
they agreed that it is important for other students to do well on social studies assignments. All
students reported that they agreed that the reward game helped them complete their work, helped
classmates complete their work, and helped them and their classmates stay on-task. All students
also agreed that the reward game helped themselves and the class reduce disruptive behavior. In
addition, all students reported liking the reward game. Most respondents (75%) reported that
they liked social studies more with the reward game. All respondents reported that they agreed
that they would like to use the game in other classes.

Students did not have a strong preference for either game (contingency), with one student
reporting a slight preference for the on-task game, one reporting a slight preference for the
academic game, and two students reporting no preference. All students agreed that the reward
game was fair. Students also reported that they enjoyed the mystery goals and rewards, with all
students agreeing with these statements. These responses suggest a strong level of student
acceptability for both interventions.
Chapter IV

Discussion

We evaluated and compared two group contingencies on academic performance, percent on-task, and disruptive behavior in an eighth-grade social studies classroom in an alternative school. While researchers have validated the efficacy of interdependent group contingencies on each of these behaviors individually (e.g., Dolezal et al., 2007; Heering & Wilder, 2006; Popkin & Skinner, 2003), previous researchers have only examined one or two of these behaviors concurrently. The current study extends this research by evaluating each of these behaviors (academic performance, on-task, and disruptive behavior) concurrently.

Evaluating and Comparing the Contingencies

Percent correct: Direct and indirect effects. Class average data provide some evidence for the effectiveness of both the AP and OT contingencies in increasing class-wide average percent correct. Average percent correct during both the AP (65%) and OT (80%) contingencies was higher than means under no-intervention conditions (55% and 45%, for NIB and NIAT, respectively). However, the data had high variability throughout the AP treatment. In addition, although the AP contingency led to a 10-20% increase, this only amounted to an average letter grade of “D”. Visual analysis and effect size data support class average data, which leads to the conclusion that the AP contingency, while effective in improving class average percent correct, produced small effects at best.

Although the data were still variable, the OT contingency produced a consistently higher class average percent-correct than that of no-intervention conditions. The lack of overlapping data between intervention and baseline conditions rules out threats to internal validity. Visual
analysis and effect size data all corroborate class average data, showing that the OT contingency produced, on average, large increases in academic performance on social studies assignments. This intervention also increased the average student grade to a “B” average; this was much higher than the AP intervention’s “D” average. Effect size estimates comparing the two contingencies add to the evidence that the on-task contingency produced larger increases in class average percent correct on independent seatwork than the academic performance contingency.

Thus, the data show that the academic performance contingency had a small effect on percent correct; the effect was not larger due to the relatively small magnitude of difference between baseline and treatment phases, the large variability of the data, and the preponderance of overlapping data. The lack of a larger direct effect on academic performance fails to support studies such as Skinner & Popkin (2003), Reinhardt et al. (2009) and Scott et al. (in press), who all found large direct effects of an academic performance group contingency on academic behaviors.

Regarding indirect effects, the data show that the on-task contingency had a large effect on percent correct. This is notable, because a previous review by Snider (1987) found that the majority of studies targeting on-task behavior have mixed results on academic performance. This result, which shows a medium or large effect using all effect size measures, contradicts that finding, and suggests that an on-task contingency can have a positive indirect influence on class academic performance.

**Percent on-task: Direct and indirect effects.** Class average data provide some indication of the effectiveness of both the AP and OT contingencies on percent on-task. Percent on-task averages for both the AP (62%) and OT (76%) contingency are higher than average.
percent on-task for no-intervention conditions (43.7% and 51%, for NIB and NIAT, respectively). However, as with the percent-correct data, the variability in the percent on-task data for the AP contingency suggests less consistent effectiveness. Effect size data, on average, corroborate class average evidence showing that the AP contingency produced small effects on percent on-task.

Evidence showing the effectiveness of the OT contingency on percent on-task is stronger. In addition to the class average data, the OT contingency shows smaller variability than the AP contingency. Depending on the effect size estimate chosen, the OT contingency produced medium (Hedges $g$) to large (PEM) increases in class average percent on-task. PND, although calculated, was not the best indicator of effect size for this dependent variable due to the outlier (an atypically high score) during Session 1 of baseline conditions. Visual analysis of the alternating treatments graph also lends evidence to the superiority of the on-task contingency. An effect size comparison between the two interventions produced similar results, showing medium to large increases in effectiveness for the on-task intervention when compared to the academic performance intervention.

The data show that the contingency focusing on on-task behavior has direct effects on class-wide percent on-task. Indeed, the overall findings point to a large effect of an on-task behavior contingency on percent on-task. This finding corroborates findings by researchers such as Crouch et al., (1985) and Heering and Wilder (2006), which showed that directly targeting on-task behavior causes increases in that behavior.

The contingency focusing on academic performance produced a small increase in on-task behavior, showing that the academic performance contingency had a small indirect effect on on-
task behavior. This effect provides evidence that academic performance is functionally related to
time spent on task, so there should be a positive correlation between the two (reviewed in Lentz,
1988). However, the effects here are small, and should not be exaggerated. Thus, this finding
lends more support to researchers who found small indirect effects of academic performance
targets on on-task behavior, but concluded that effects were not as great as when on-task
behavior was directly targeted (Lentz, 1988; Ruggles & LeBlanc, 1985).

**Disruptive behavior: Direct and indirect effects.** Class average data for disruptive
behavior show that neither the AP nor OT contingencies had much of an effect on disruptive
behavior. Average disruptive behavior under the AP contingency (55%) was lower than NIB
(70.6%), but not significantly lower than disruptive behavior during NIAT (57%). Additionally,
the large variability of the data, which can be seen most clearly through visual analysis,
corroborates the assertion of the ineffectiveness of the AP intervention. Effect size estimates add
to all previous evidence, showing less than small effects of the AP intervention.

Class average, visual analysis, and effect size data for the OT contingency show similar
results. Class average data show that although the OT intervention mean (65%) was lower than
the NIB mean (70.6%), it was higher than the NIAT mean of 57%. The alternating treatments
treatment graphs demonstrate the large variability of the data, which show almost all data points
overlapping between phases of the study. Most effect size estimates corroborate class average
and visual analysis data, showing that the OT intervention had less than small effects on
classroom disruptive behavior. Although PEM shows a medium effect of the OT intervention on
baseline behavior, a less than small effect is found when comparisons are made to the NIAT
phase. Additionally, visual analysis suggests PEM is not the best effect size measure in this instance.

While mean data show some evidence of spill-over effects, the disruptive behavior data were highly variable throughout all conditions and phases of this study. This suggests that any differences in disruptive behavior across conditions (e.g., means between NIB and NIAT) were not caused by the treatments, but merely a byproduct of highly variable disruptive behavior. This suggests that any differences in disruptive behavior across conditions (e.g., means between NIB and NIAT) were not caused by the treatments, but merely a byproduct of highly variable disruptive behavior. Thus, the results of class average data, visual analysis, and effect size data provide consistent evidence that neither the academic performance nor on-task contingency decreased disruptive behavior. Instead, it appears that disruptive behavior was highly variable regardless of the contingency.

Disruptive behavior was not directly targeted in this study. Instead, it was indirectly targeted using academic performance and on-task behavior contingencies. The results show that neither the AP nor OT contingencies indirectly affected disruptive behavior. This finding validates the findings of researchers who found that targeting academic performance (e.g., Dougherty & Dougherty, 1977; Ferritor et al., 1972;) does not lead to decreases in disruptive behavior. No prior research supported the use of an academic performance contingency in reducing disruptive behavior. However, the lack of effectiveness of the OT contingency fails to support researchers’ findings of a negative correlation between on-task behavior and disruptive behavior (Ferritor et al., 1972; Radley et al., 2016).

Overall, the data show that the OT contingency had large effects on percent correct and percent on-task, while the AP contingency had small effects on percent correct and percent on-task. Neither contingency influenced disruptive behavior.
**Individual Student Data.** The individual data show more variability than is seen in the class average graphs. This increase in variability is not uncommon when group data are split into individual data (Fudge et al., 2008). However, the data still support the conclusions from class-wide analyses. Within-student average data show that for the four out of seven students whose average percent correct changed substantially (at least a letter grade), three of those students (Aaron, Dennis, and Edward) benefitted more from the OT contingency. The remaining student’s grade, George, increased similarly under both interventions. Therefore, no students performed significantly better under the AP contingency.

Hedges $g$ and PEM were the best effect size estimates in individual student data due to ceiling effects present in the data. This discussion focuses on Hedge’s $g$ because it is the more conservative measure of effect size. Effect size estimates show medium effects of the OT contingency for the three students who worked better under the OT contingency. Effect size estimates are less than small or small for six out of seven students under the AP contingency. The final student, George, showed medium effects for both contingencies.

For students who benefitted significantly from the interventions (at least a letter grade), more students benefitted from the OT contingency than from the AP contingency. Thus, the present study supports other researchers who validated the use of on-task contingencies to improve academic performance (Rapport et al., 1982). This finding also validates researchers’ reviews who suggested that targeting on-task behavior is likely to affect academic performance (Hoge & Andrews, 1987; Ruggles & LeBlanc, 1985).

**Social Validity.** Social validity data suggest high acceptability by students for both interventions, with students not showing a preference for one intervention over the other.
Teacher social validity data showed moderately high acceptability for the interventions. She also did not indicate a preference for either intervention, but instead discussed how she would change the interventions in the future to better suit individual classes (e.g., targeting specific behaviors).

Applied and Theoretical Implications

Superiority of on-task target. The superiority of the on-task contingency, particularly in its indirect effect on academic performance, is surprising, and contravenes previous researchers who found positive effects from academic performance contingencies (e.g., Popkin & Skinner, 2003; Scott et al., in press). One reason for this difference could be due to variation in independent seatwork assignments. All students in the classroom received the same social studies assignment, but the students themselves had varying ability and achievement levels, according to teacher report. Thus, the assignments given to students were very easy for some students but extremely difficult for others. If the assignment was too difficult, the students who felt like they could not complete the assignment could have been less motivated by the academic performance contingency, regardless of the randomization of contingency criteria. Ratio strain, which we tried to eliminate by using an interdependent contingency and randomized criteria, may have negatively impacted the academic performance contingency (Cooper et al., 2007).

Although the interdependent nature of the contingency was meant to alleviate ratio strain concerns, the theory behind one or two bad scores being made up for by good scores holds less weight in such a small class. Instead, your individual score counts for 14% of the class’s percent-correct score at the very least. This presents more pressure to perform than in a typical classroom of 25 students. Furthermore, although the randomized criteria were intended to help all students feel as if they could contribute, if a student could not read the majority of words in the
assignment (as was the case for some participants), then any criterion would feel unachievable. The variation in assignments, combined with participants that are probably used to failure in the past, may be one reason why the AP contingency only caused small increases in academic performance.

Conversely, to earn the reward under the on-task contingency, students only needed to look like they were attempting their work (i.e., eyes toward work). Thus, even if the assignment was extremely difficult for some students, they could still engage in on-task behavior, and the criterion could still be met. This may explain why the on-task contingency was more effective in increasing percent on-task. This research adds to the research base by showing the positive effect of a contingency focusing on on-task behavior, given the relative scarcity of research with this target (Maggin et al., 2012).

The on-task contingency also was largely effective in increasing percent correct on independent seatwork assignments. Perhaps under the on-task contingency, because students were motivated to look like they were attempting their assignments, more students attempted their assignments. This could have been caused by a variation of the foot-in-the-door phenomenon (Freedman & Frasier, 1966). Once students began to pretend to attempt their assignment, a lower-effort behavior, they were more likely to actually attempt it (a higher-effort behavior). An assignment attempt, even if still a failing grade, resulted in higher credit than students putting their heads down and not trying to complete the assignment at all. Thus, the on-task contingency was effective in increasing percent correct, because students were motivated to attempt their work.
That an on-task contingency can indirectly increase academic performance more than a contingency directly targeting academic performance is novel and noteworthy. This finding provides preliminary evidence that an on-task contingency can be used in a classroom to promote both on-task behavior and academic performance. Although procedures used in the current study to collect on-task data would be difficult for classroom teachers to apply, a different form of collection for on-task data would make this contingency system feasible for teachers to implement. For example, teachers could set a timer, and every time the timer goes off, the teacher could do a quick scan of the room, and mark how many students were on task. The intervals would not need to be nearly as short as in the present study, but instead could be once every 5 or 15 minutes. Alternatively, this contingency could be run by the teacher marking on a 1 to 10 scale how on-task the class was during the entire class period. This more subjective method would not take much time out of the classroom teacher’s day, and would still serve to reward students for their on-task behavior.

**Null effects on disruptive behavior.** Another notable finding is that neither the academic performance nor on-task contingency had an indirect effect on disruptive behavior. This finding supports Dougherty and Dougherty’s (1977) finding that disruptive behavior must be directly targeted to be reduced, and Lentz’s (1988) assertion that decreases in disruptive behavior resulting from academic performance contingencies have not been to acceptable levels. However, the finding is not consistent with findings from Ayllon and Roberts (1974) and Ferritor et al. (1972), who found indirect effects on disruptive behavior using academic performance and on-task contingencies, respectively.
This class’s disruptive behavior was highly variable, regardless of study condition or phase. Although theoretically a student that is trying to perform academically may be less disruptive, the contingencies themselves could still be met while engaging in disruptive behavior. For example, a student who completed his academic work while singing could simultaneously achieve high percent correct and be on-task, while still engaging in disruptive behavior. The finding in Van Houten et al.’s (1982) study supports this point, as they found that some students in their study had high disruptive behavior co-occurring with high academic performance.

Practically speaking, it can be inferred from this finding that on-task behavior, while effective in improving percent on-task and percent correct behaviors, is not a catch-all contingency, or a substitution for other classroom management strategies. For educators who point to disruptive behavior as the biggest problem in their classroom, a contingency that specifically focuses on disruptive behavior is likely to have the largest effects in reducing disruptive behavior (e.g., Kelshaw-Levering et al., 2000; Theodore et al., 2004). A contingency focusing on both on-task and disruptive behavior might also be effective in decreasing disruptive behavior, while increasing academic performance and on-task behavior. Future researchers could consider this possibility.

**Contingencies in a social studies course.** We could not identify any previous published research investigating academically-oriented group contingencies in a social studies classroom. Previous research with group contingencies has focused on math performance (e.g., Popkin & Skinner, 2003; Scott et al., in press), spelling or English performance (e.g., Popkin & Skinner, 2003), or homework performance (e.g., Lynch et al., 2009; Theodore et al., 2009). A contingency focusing on percent correct presented challenges due to the differential nature of
assignments in a social studies classroom. Instead of discrete problems like in math or spelling worksheets, social studies worksheets often involve more extensive written assignments and vary in difficulty from day to day. Despite these obstacles, results show that the on-task contingency effectively increased academic performance on social studies assignments.

Thus, teachers in content courses can and should be encouraged to implement contingencies promoting academic performance. In addition, future researchers should continue to research the implementation of group contingencies in other academic areas, such as science, or enrichment classes to see if results differ across academic areas.

**Use of contingencies for students with EBD.** This study also extends the research base of group contingency interventions for students with EBD. The results of this study showed that an on-task behavior contingency improved the academic performance of six out of seven students, and four of these students improved by at least one letter grade. Given that students with EBD are more likely than students under any other disability category to leave school prior to graduating (U.S. Department of Education, Office of Special Education Programs, 2015), academic improvement in this population, especially by a letter grade, is no small victory. Additionally, this study adds to the research base in that the contingencies were based on academic performance and on-task behavior. Most research on contingencies with this population has focused on disruptive behavior targets (Reddy et al., 2009). Thus, results of this study show that despite the considerable behavior variation that often occurs in students with EBD, the on-task contingency increased both percent on-task and percent correct on independent seatwork.
Educators of students with EBD are often looking for ways to engage students in academic activities. Both teacher and student social validity data indicate that the students in this study preferred social studies when the contingencies were employed. Future group contingency researchers should continue to focus on this population regarding the effectiveness of group contingencies on academic behaviors, such as academic performance and on-task behavior. These contingencies offer a cost-effective and easy-to-administer solution to engage this population of students in the classroom.

**Limitations and Directions for Future Research**

Despite the practical and theoretical implications of these findings, the study has several limitations. The first limitation of this study was sample size. This study was only conducted in one classroom, with seven male students. In addition, this school was for students with EBD who could not be in their local education agencies (LEA) due to previous behavioral problems. Due to the small number and uniqueness of the sample, there are many threats to external validity that could not be controlled. Thus, these findings cannot be generalized to other settings, students, or to larger groups of students.

Future researchers should consider evaluating and comparing academic performance and on-task contingencies across different settings (e.g., general education classroom, special education classroom in an LEA), populations (e.g., age, disability categories, gender), and teachers. Future researchers might want to compare the contingencies in an elementary classroom, to see if the effects vary based on student age. In addition, this research was only conducted in a social studies classroom, and future researchers might want to see how effects vary for different subjects.
Another limitation of this study is that within each condition data were highly variable across sessions, which may have been influenced by the participants, class attendance and size, and assignments. As described above, this classroom was in a self-contained school for students with EBD. One reason students are placed in such a segregated setting is that they tend to display highly variable inappropriate and appropriate behavior (Christle & Yell, 2013).

Students were often absent from class due to visits with social workers, counselors, or the principal. Additionally, attrition from two participants occurred during the last few data collection sessions and two other students (although not study participants) were added to the classroom during the study. Absences and changes in classmates made for a shifting classroom dynamic. For example, over the course of the study the number of students in the class ranged from four to eleven. Classroom behavior likely also varied due to which students were in the class. There were a few students who appeared to be more disruptive than others. These students may have negatively influenced other students, particularly in small class sizes, thereby decreasing class-wide on-task behavior and increasing instances of disruptive behavior.

Thus, the participants, the number of students present, and who was present (i.e., disruptive vs. less disruptive students) may have enhanced variability across all dependent variables, making it difficult to evaluate treatment effects and relative treatment effects. Future researchers interested in this population would benefit from choosing a more controlled environment, such as a residential facility, where truancy and class changing are not as much of a concern, to see if the contingency effects would differ.

The assignments provided to the students differed widely from class session to class session, ranging from 15-item multiple choice and short-answer quizzes, to fill-in-the-blank
worksheets completed after watching a short video. This variability in assignments meant that it was easier to earn higher credit during some sessions than others. This variability affected both dependent measures (e.g., % correct higher on easier assignments regardless of condition) and independent variables (e.g., more likely to get effort when assignment was easier and required less effort, regardless of condition). Although the random selection of contingency days and the random selection of criteria should reduce some of this variability, future researchers should attempt to conduct their studies with more controlled assignments.

While the high variability is a limitation, it is also commonplace with studies conducted in natural environments. Despite all the sources of variability limiting the power of the study, the OT contingency still produced moderate to large effects (see effect size data) on percent correct and percent on-task. Thus, the OT contingency was effective enough to cause meaningful changes in behavior that were sufficient to overcome the variability associated with conducting students with EBD under natural conditions.

This study was only conducted over the period of six weeks, from the end of spring break until the end of the school year. Due to time constraints, no maintenance data were collected. Future researchers might want to collect maintenance data, withdrawing one or both contingencies for several consecutive sessions, to measure changes in behavior. In addition, because the on-task contingency was found to be more effective overall, future research would benefit from just employing this contingency in the classroom, to see if the effects in this study could generalize to non-randomized contingency conditions.

Lentz (1988), suggested that studying on-task behavior is imprecise due to the large number of behaviors included in this term, and that the time sampling procedures used to
measure this behavior are often inaccurate measurement systems. Future researchers could attempt to remedy these concerns by adding target behaviors that encompass on-task behavior sequentially (e.g., eyes on teacher, seat in seat). By adding the behaviors sequentially, contingency effects on these specific behaviors could be studied (see Popkin & Skinner, 2003, for an example of sequential addition with contingencies).

Data for the present study were collected only during independent seatwork. For this reason, contingency effects on on-task and disruptive behavior cannot be generalized to behavior during other classroom activities (e.g., teacher led large group instruction, small group collaborative learning activities). Future researchers could compare the effect of an on-task contingency during other classroom activities. On-task data and disruptive behavior data were only conducted using class-wide sampling procedures. Effects of the contingencies on these behaviors for individual students could not be examined. Future researchers should evaluate the effects of these or similar group contingencies by collecting individual data for on-task and disruptive behaviors.

Disruptive behavior in the classroom was only coded using time sampling procedures. If any student talked during the 15-second interval, it was marked as disruptive, which caused a large portion of intervals to be marked as such. A more precise measurement of disruptive behavior (e.g., using partial 5-s intervals) might have resulted in differences measured between contingencies and phases.

Summary

Previous researchers have validated the use of group contingencies to decrease disruptive behavior, (e.g., Gresham & Gresham, 1985; Little et al., 2010; Kelshaw-Levering et al., 2000;
Theodore et al., 2004), increase on-task behavior (e.g., Crouch et al., 1985; Heering & Wilder, 2006) and increase academic performance (e.g., Lynch et al., 2009, Reinhardt et al., 2009; Sharp & Skinner, 2004). However, researchers had not investigated the indirect effects of a contingency focusing on one of these behaviors on the other two behaviors. Given that educators would like to have a classroom where students are engaged in their work, academically productive, and not disruptive, it seemed appropriate that the direct and indirect effects of these contingencies be investigated.

The present study investigated the direct and indirect effects of two contingencies, an academic performance contingency and an on-task contingency, on the percent on-task, percent correct, and disruptive behavior of an eighth-grade social studies classroom for students with EBD. Across baseline procedures, academic performance was at an “F”, on-task behavior was low (43.7%), and disruptive behavior was high (70.6%). After implementing the on-task contingency, percent correct increased to a “B” average and percent on-task increased to 76%. The academic performance contingency also increased percent correct and percent on-task, but to a smaller degree (i.e., a “D” average and 62%, respectively). Disruptive behavior remained highly variable during both contingencies. Thus, the on-task behavior contingency had a large direct effect on percent on-task, a large indirect effect on percent correct, and appeared superior to the academic performance contingency in altering these behaviors. These findings add further evidence to the small amount of research showing the effectiveness of on-task contingencies in increasing academic performance (Rapport et al., 1982). These findings hold important implications for both researchers and educators alike.
Given that the rewards (small pieces of candy, food items or free time in class) require few resources, and that the on-task interdependent contingency can easily be implemented by a classroom teacher, this intervention appears to be a reasonable option for educators who wish to increase academic productivity and on-task behavior in the classroom. When one considers the cost of other remediation programs (e.g., after-school programs, extended school year, special education) and the cost to the American workforce if these students drop out of school, the effect of an on-task contingency seems even more impressive. Thus, future researchers who are interested in continuing to enhance academic outcomes for students with Emotional and Behavioral Disorders should continue to research the use of group contingencies with this population.


Crouch, P. L., Gresham, F. M., & Wright, W. R. (1985). Interdependent and independent group contingencies with immediate and delayed reinforcement for controlling classroom...


IDEA Regulations, 34 C.F.R § 300.8(c)(4) (2004).


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Appendices
Appendix A

Tables and Figures

Table 1

*Mean and standard deviation for each dependent variable by condition and phase*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Mean (SD) NIB</th>
<th>Mean (SD) NIAT</th>
<th>Mean (SD) AP</th>
<th>Mean (SD) OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Performance</td>
<td>55.00 (7.00)</td>
<td>45.00 (11.9)</td>
<td>65.00 (14.79)</td>
<td>80.00 (11.09)</td>
</tr>
<tr>
<td>On-task Behavior</td>
<td>43.70 (20.65)</td>
<td>51.00 (11.47)</td>
<td>62.00 (13.50)</td>
<td>76.00 (8.58)</td>
</tr>
<tr>
<td>Disruptive Behavior</td>
<td>70.60 (35.62)</td>
<td>57.00 (27.70)</td>
<td>55.00 (28.20)</td>
<td>65.00 (26.70)</td>
</tr>
</tbody>
</table>

*Note.* NIB = no-intervention procedures, baseline phase; NIAT = no-intervention procedures, alternating treatments phase; AP = Academic performance condition data; OT = On-task condition data.
Table 2

Mean differences, pooled standard deviations, effect sizes, PND, and PEM across baseline and alternating treatment phases for percent correct data

<table>
<thead>
<tr>
<th>Comparisons</th>
<th>Mean Difference</th>
<th>Pooled SD</th>
<th>Hedge's G [Size]</th>
<th>PND [Size]</th>
<th>PEM [Size]</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP - NIB</td>
<td>10.0</td>
<td>12.95</td>
<td>.77 [S]</td>
<td>50% [S]</td>
<td>75% [M]</td>
</tr>
<tr>
<td>OT - NIB</td>
<td>25.0</td>
<td>10.04</td>
<td>2.5 [M]</td>
<td>100% [L]</td>
<td>100% [L]</td>
</tr>
<tr>
<td>NIB - NIAT</td>
<td>10.0</td>
<td>9.76</td>
<td>1.02 [S]</td>
<td>0% [&gt;S]</td>
<td>25% [S]</td>
</tr>
<tr>
<td>AP - NIAT</td>
<td>20.0</td>
<td>13.99</td>
<td>1.43 [M]</td>
<td>37.5% [&gt;S]</td>
<td>87.5% [M]</td>
</tr>
<tr>
<td>OT - NIAT</td>
<td>35.0</td>
<td>11.34</td>
<td>3.09 [L]</td>
<td>100% [L]</td>
<td>100% [L]</td>
</tr>
<tr>
<td>OT - AP</td>
<td>15.0</td>
<td>13.07</td>
<td>1.15 [S]</td>
<td>25% [&gt;S]</td>
<td>100% [L]</td>
</tr>
</tbody>
</table>

Note. NIB = No-intervention procedures, baseline phase; AP = Academic performance condition data; OT = On-task condition data; NIAT = No-intervention procedures, alternating treatment phase; PND = Percentage nonoverlapping data; PEM = Percentage exceeding median.
Table 3

*Mean differences, pooled standard deviations, effect sizes, PND, and PEM across baseline and alternating treatment phases for percent on-task data*

<table>
<thead>
<tr>
<th>Comparisons</th>
<th>Mean Difference</th>
<th>Pooled SD</th>
<th>Hedge's G Size</th>
<th>PND Size</th>
<th>PEM Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP – NIB</td>
<td>18.3</td>
<td>15.98</td>
<td>1.15 [S]</td>
<td>12.5%</td>
<td>100%</td>
</tr>
<tr>
<td>OT – NIB</td>
<td>32.3</td>
<td>13.40</td>
<td>2.41 [M]</td>
<td>50%</td>
<td>100%</td>
</tr>
<tr>
<td>NIB - NIAT</td>
<td>-7.3</td>
<td>16.70</td>
<td>-.44 [S]</td>
<td>0%</td>
<td>75%</td>
</tr>
<tr>
<td>AP – NIAT</td>
<td>11.0</td>
<td>12.92</td>
<td>.85 [S]</td>
<td>37.5%</td>
<td>75%</td>
</tr>
<tr>
<td>OT - NIAT</td>
<td>25.0</td>
<td>9.54</td>
<td>2.62 [M]</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>OT – AP</td>
<td>14.0</td>
<td>11.31</td>
<td>1.24 [M]</td>
<td>12.5%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Note.* NIB = no-intervention procedures, baseline phase; AP = Academic Performance Condition data; OT = On-task condition data; NIAT = no-intervention procedures, alternating treatment phase; PND = percentage nonoverlapping data; PEM = Percentage exceeding median.
Table 4

Mean differences, pooled standard deviations, effect sizes, PND, and PEM across baseline and alternating treatment phases for disruptive behavior data

<table>
<thead>
<tr>
<th>Comparisons</th>
<th>Mean Difference</th>
<th>Pooled SD</th>
<th>Hedge's G [Size]</th>
<th>PND [Size]</th>
<th>PEM* [Size]</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIB – AP</td>
<td>15.6</td>
<td>30.62</td>
<td>.51 [S]</td>
<td>0% [S]</td>
<td>50% [S]</td>
</tr>
<tr>
<td>NIB - OT</td>
<td>5.6</td>
<td>29.66</td>
<td>.19 [&gt;S]</td>
<td>12.5% [&gt;S]</td>
<td>87.5% [M]</td>
</tr>
<tr>
<td>NIB - NIAT</td>
<td>13.6</td>
<td>31.91</td>
<td>.43 [&gt;S]</td>
<td>12.5% [&gt;S]</td>
<td>87.5% [M]</td>
</tr>
<tr>
<td>NIAT-AP</td>
<td>2.0</td>
<td>28.05</td>
<td>.07 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>50% [S]</td>
</tr>
<tr>
<td>NIAT-OT</td>
<td>-8.0</td>
<td>27.00</td>
<td>-.30 [&gt;S]</td>
<td>-12.5% [&gt;S]</td>
<td>-37.5% [&gt;S]</td>
</tr>
<tr>
<td>AP-OT</td>
<td>10.0</td>
<td>27.46</td>
<td>.36 [&gt;S]</td>
<td>12.5% [&gt;S]</td>
<td>37.5% [&gt;S]</td>
</tr>
</tbody>
</table>

Note. NIB = No-intervention procedures, baseline phase; AP = Academic performance condition data; OT = On-task condition data; NIAT = no-intervention procedures: alternating treatment phase; PND = Percentage nonoverlapping data; PEM = Percentage exceeding median. *Percentage below median calculated due to desired directionality of data.
Table 5

Mean and standard deviation of academic performance for each student by condition and phase

<table>
<thead>
<tr>
<th>Students</th>
<th>NI B &amp; AT Mean (SD) [Letter Grade]</th>
<th>Mean (SD) AP [Letter Grade]</th>
<th>Mean (SD) OT [Letter Grade]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaron</td>
<td>0.00 (0.00) [F]</td>
<td>16.57 (31.77) [F]</td>
<td>68.00 (35.21) [D]</td>
</tr>
<tr>
<td>Bill</td>
<td>98.67 (3.27) [A]</td>
<td>98.50 (3.67) [A]</td>
<td>97.75 (5.20) [A]</td>
</tr>
<tr>
<td>Carey</td>
<td>92.00 (16.00) [A]</td>
<td>98.71 (3.40) [A]</td>
<td>97.00 (5.13) [A]</td>
</tr>
<tr>
<td>Dennis</td>
<td>36.00 (24.17) [F]</td>
<td>33.00 (33.94) [F]</td>
<td>79.33 (27.08) [C]</td>
</tr>
<tr>
<td>Edward</td>
<td>45.00 (30.55) [F]</td>
<td>78.33 (46.46) [C]</td>
<td>92.25 (9.67) [A]</td>
</tr>
<tr>
<td>Fred</td>
<td>20.71 (20.25) [F]</td>
<td>49.25 (39.29) [F]</td>
<td>49.13 (36.65) [F]</td>
</tr>
<tr>
<td>George</td>
<td>65.00 (19.29) [D]</td>
<td>90.00 (7.44) [A]</td>
<td>89.57 (9.96) [Round to A]</td>
</tr>
</tbody>
</table>

*Note.* NI B & AT = No-intervention procedures, combined baseline and alternating treatments phases; AP= Academic performance condition data; OT = On-task behavior condition data.
<table>
<thead>
<tr>
<th>Student</th>
<th>Comparisons</th>
<th>Mean Difference</th>
<th>Pooled SD</th>
<th>Hedge's G [Size]</th>
<th>PND [Size]</th>
<th>PEM [Size]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OT - NI:B &amp; AT</td>
<td>68.00</td>
<td>28.75</td>
<td>2.37 [M]</td>
<td>100% [L]</td>
<td>100% [L]</td>
</tr>
<tr>
<td></td>
<td>AP- OT</td>
<td>51.43</td>
<td>36.31</td>
<td>1.42 [M]</td>
<td>50% [S]</td>
<td>83.3% [L]</td>
</tr>
<tr>
<td>Bill</td>
<td>AP - NI:B &amp; AT</td>
<td>-.17</td>
<td>3.48</td>
<td>.04 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>0% [&gt;S]</td>
</tr>
<tr>
<td></td>
<td>OT - NI:B &amp; AT</td>
<td>-.92</td>
<td>4.83</td>
<td>.19 [&gt;S]</td>
<td>12.5% [&gt;S]</td>
<td>12.5% [&gt;S]</td>
</tr>
<tr>
<td></td>
<td>AP- OT</td>
<td>-.75</td>
<td>4.98</td>
<td>-.15 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>12.5% [&gt;S]</td>
</tr>
<tr>
<td>Carey</td>
<td>AP - NI:B &amp; AT</td>
<td>6.71</td>
<td>11.67</td>
<td>.57 [S]</td>
<td>0% [&gt;S]</td>
<td>0% [&gt;S]</td>
</tr>
<tr>
<td></td>
<td>OT - NI:B &amp; AT</td>
<td>5.00</td>
<td>12.10</td>
<td>.41 [S]</td>
<td>0% [&gt;S]</td>
<td>0% [&gt;S]</td>
</tr>
<tr>
<td></td>
<td>AP- OT</td>
<td>-1.71</td>
<td>4.35</td>
<td>-.39 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>0% [&gt;S]</td>
</tr>
<tr>
<td>Dennis</td>
<td>AP - NI:B &amp; AT</td>
<td>-3.00</td>
<td>32.33</td>
<td>-.09 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>50% [&gt;S]</td>
</tr>
<tr>
<td></td>
<td>OT - NI:B &amp; AT</td>
<td>43.33</td>
<td>28.52</td>
<td>1.52 [M]</td>
<td>66.7% [S]</td>
<td>83.3% [L]</td>
</tr>
<tr>
<td></td>
<td>AP- OT</td>
<td>46.33</td>
<td>33.43</td>
<td>1.39 [M]</td>
<td>66.7% [S]</td>
<td>100% [L]</td>
</tr>
<tr>
<td>Edward</td>
<td>AP - NI:B &amp; AT</td>
<td>33.33</td>
<td>41.53</td>
<td>.80 [M]</td>
<td>33.0% [S]</td>
<td>66.7% [L]</td>
</tr>
<tr>
<td></td>
<td>OT - NI:B &amp; AT</td>
<td>47.25</td>
<td>27.33</td>
<td>1.73 [M]</td>
<td>0% [S]</td>
<td>100% [S]</td>
</tr>
<tr>
<td></td>
<td>AP- OT</td>
<td>13.92</td>
<td>37.01</td>
<td>.38 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>0% [&gt;S]</td>
</tr>
<tr>
<td>Fred</td>
<td>AP - NI:B &amp; AT</td>
<td>28.54</td>
<td>34.22</td>
<td>.83 [&gt;S]</td>
<td>50% [&gt;S]</td>
<td>62.5% [&gt;S]</td>
</tr>
<tr>
<td></td>
<td>OT - NI:B &amp; AT</td>
<td>28.42</td>
<td>32.36</td>
<td>.88 [&gt;S]</td>
<td>37.5% [M]</td>
<td>75% [S]</td>
</tr>
<tr>
<td></td>
<td>AP- OT</td>
<td>-.12</td>
<td>37.99</td>
<td>-.003 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>37.5% [M]</td>
</tr>
<tr>
<td>George</td>
<td>AP - NI:B &amp; AT</td>
<td>25.00</td>
<td>17.25</td>
<td>1.45 [M]</td>
<td>0% [&gt;S]</td>
<td>100% [S]</td>
</tr>
<tr>
<td></td>
<td>OT - NI:B &amp; AT</td>
<td>24.57</td>
<td>15.98</td>
<td>1.54 [M]</td>
<td>0% [&gt;S]</td>
<td>100% [M]</td>
</tr>
<tr>
<td></td>
<td>AP- OT</td>
<td>.43</td>
<td>10.09</td>
<td>.004 [&gt;S]</td>
<td>0% [&gt;S]</td>
<td>57.1% [S]</td>
</tr>
</tbody>
</table>

*Note.* NIB = No-intervention procedures, baseline phase; AP = Academic performance condition data; OT = On-task condition data; NIAT = No-intervention procedures: alternating treatment phase; PND = Percentage nonoverlapping data.
Table 7
Student acceptability survey and the number and percent of students who responded from strongly disagree to strongly agree

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It is important for me to do well on my social studies assignments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 (75%)</td>
<td>1 (25%)</td>
</tr>
<tr>
<td>2. It is important for other students in my class to do well on their social studies assignments</td>
<td>1 (25%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The Reward Game helped me complete my work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
<tr>
<td>6. The Reward Game helped my class complete their work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>2 (50%) 1 (25%)</td>
</tr>
<tr>
<td>7. The Reward Game helped me stay on-task in class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
<tr>
<td>8. The Reward Game helped the class stay on-task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 (50%)</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>9. The Reward Game helped me reduce disruptive behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 (50%)</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>10. The Reward Game helped the class overall reduce disruptive behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 (50%)</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>11. I liked the Reward Game</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
<tr>
<td>12. I like social studies more with the Reward Game</td>
<td>1 (25%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I would like to use the Reward Game for other subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
<tr>
<td>14. I liked the Academic game more than the On-Task Behavior game</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
<tr>
<td>15. I liked the On-Task Behavior game more than the Academic game</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
<tr>
<td>14. The Reward Game was fair for everyone in the class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 (50%)</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>15. I liked not knowing the mystery goals each day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
<tr>
<td>16. I liked not knowing the mystery rewards each day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (25%)</td>
<td>1 (25%) 2 (50%)</td>
</tr>
</tbody>
</table>
**Figure 1.** Class average academic performance on independent social studies assignments across baseline and alternating treatment phases.
Figure 2. Average percent of students on-task across all intervals during baseline and alternating treatment phases.
Figure 3. Percent of intervals with disruptive behavior across baseline and alternating treatment phases.
Figure 4. Aaron’s academic performance across baseline and alternating treatments phases.

Figure 5. Bill’s academic performance across baseline and alternating treatments phases.
Figure 6. Carey’s academic performance across baseline and alternating treatments phases.

Figure 7. Dennis’s academic performance across baseline and alternating treatments phases.
Figure 8. Edward’s academic performance across baseline and alternating treatments phases.

Figure 9. Fred’s academic performance across baseline and alternating treatments phases.
Figure 10. George’s academic performance across baseline and alternating treatments phases.
Appendix B

Teacher Consent Form

Dear Teacher,

My name is Caroline Jaquett, and I am a graduate student in the School Psychology Ph.D. program at the University of Tennessee. I would like to conduct research in your classroom during the 2017 school year under the supervision of my advisor, Dr. Christopher H. Skinner, a professor at the University of Tennessee. The purpose of my study is to enhance academic performance and engaged behavior during these assignments via group contingency models utilizing randomized, unknown criteria. I will be evaluating the effects of group contingencies on percentage of independent social studies seat work correctly completed or the percent of engaged behavior. The target behavior(s) will be academic performance on the independent social studies seat work assignments or engaged behavior during these assignments.

If you agree to participate, I will be collecting data on assignments that remain part of your typical classroom agenda and on typical classroom behavior. I would like for you to present the procedures to the class in an Academic and Behavior Reward Game in which students will be informed that they have the opportunity to earn rewards based upon their performance on independent seat work social studies assignments or on their levels of engaged behavior in the classroom. Students will be told that either everyone in the classroom or no one will receive the reward based on either the class performance on the assignment or classroom behavior performance. This academic or behavior contingency will easily be incorporated into your class structure. I will provide all materials needed for your classroom and I will meet with you to go over the system, practice the procedures, and answer any questions you have about the system before implementation in your classroom.

I will collect the data from the classroom each day for approximately 5 weeks. I will quietly enter the classroom each day and either score or record the percentages from the social studies assignments and collect behavior ratings. You are free to request that my involvement in the classroom be discontinued at any time with no penalty to you or the participating students. At the end of the study, I will give you a survey to complete regarding your thoughts about the intervention’s effectiveness and ease of administration. I would also like to interview you for no more than fifteen minutes to hear more about your thoughts regarding the intervention. You may choose to not answer any survey or interview questions that you do not wish to answer. Choosing to discontinue participation in the survey and/or interview will not cause any penalty to you or the participating students.

No risks for teachers or students are anticipated from this study other than those ordinarily encountered in the classroom. Your name will not be recorded on any of the materials in this study. Instead, your identity will be recorded as “Teacher of Classroom.” Students’ names will be entered onto a separate sheet and assigned a code number for survey responses and data collection purposes. Individual students’ names will NOT be revealed.
Participation in this study is voluntary, which means that you do not have to participate and can stop at any time without penalty. Although results of our research may be shared with others through professional publications or presentations, your name or the names of your students will never be revealed.

Enclosed is a copy of this letter for your records. If you agree to participate in this research, please complete the section below on one copy of this letter and return it to me. Your signature indicates that you have read and understand the information above, that you willingly agree to participate, and that you may withdraw at any time and discontinue participation without penalty. If you have any questions about this consent form or this study, please feel free to contact my faculty advisor, Christopher Skinner at (865) 974-8403 or myself (Caroline Jaquett) at (609) 602-7809 before you sign this form.

If you have any questions about your rights as a research participant, please contact the UT Office of Research Compliance Officer at (865) 974-7697.

Thank you for your time and consideration,
Caroline Jaquett, M.S.
University of Tennessee
Educational Psychology and Counseling
Knoxville, TN 37996
(609) 602-7809

CONSENT
I have read the above information. I have received a copy of this form. I agree to participate in this study.

Participant's Name (printed) ________________________________________________
Participant's Signature ______________________________________ Date _______

IRB NUMBER: UTK IRB-16-03312-XP
IRB APPROVAL DATE: 11/02/2016
IRB EXPIRATION DATE: 11/01/2017
Appendix C

Parent Consent Form

Dear Parent,

My name is Caroline Jaquett and I am a doctoral student in the School Psychology program at the University of Tennessee. I am currently working on research for my dissertation designed to enhance both engaged behavior and the academic performance of students. I am seeking your consent for your child to complete a survey related to this study and to include your child’s results in my study’s findings. I will be working with and be supervised by Dr. Christopher H. Skinner, a professor at the University of Tennessee.

I am looking to examine class averages on the daily completed worksheets already completed by students, classroom behaviors such as disruptive behavior (e.g., inappropriate talking), and on-task behavior (e.g., completing classwork). Based on the performance of classes on daily worksheets and classroom behavior, the students will have opportunities to earn small class-wide rewards (e.g. small amounts of candy). I plan to observe classroom behaviors for five to six weeks. All typical classroom routines will remain the same.

If you agree to allow your child to participate, 

- I will calculate your child’s disruptive and on-task behavior into the class average.
- I will also include your child’s daily worksheet performance in the class average.
- At the conclusion of the study, your child will complete a small survey and circle to what degree they enjoyed their participation in the study.

If you agree to allow your child to participate, your child may stop participating in the study at any time. This will have no effect on your child’s grade. Although results of our research may be shared with others through professional publications or presentations, your child’s name will never be revealed or linked to their results. Individuals will receive code names so that individual names will never be contained in our study records.

If you have any questions about this study or consent form, feel free to contact me, Caroline Jaquett, at (609) 602-7809. If you agree to allow your child to be included in this study, please sign this form in the space provided on the next page for parental or legal guardian signature.

If you have any questions about your child’s rights as a research participant, please contact the UT Office of Research Compliance Officer at (865) 974-7697.

Thank you for your and your child’s time and consideration,

Caroline Jaquett
University of Tennessee, Educational Psychology and Counseling
Knoxville, TN 37996
(609) 602-7809
cjaquett@vols.utk.edu
CONSENT

I have read the above information. I have received a copy of this form. I agree to allow my child to participate in this study.

Child’s Name: _____________________________________

Your Name (printed): _________________________________________

Signature: _________________________________________ Date: _______________
Parent or Legal Guardian

IRB NUMBER: UTK IRB-16-03312-XP
IRB APPROVAL DATE: 11/02/2016
IRB EXPIRATION DATE: 11/01/2017
Appendix D

Child Assent

My name is Caroline Jaquett and I am a graduate student in the Ph.D. School Psychology Program at the University of Tennessee. I am studying academic performance and classroom behavior and would appreciate your help in a research study. In class this year, you are going to participate in the Academic and Behavior Reward Game. As a part of the game, I am going to observe classroom behavior and calculate class averages on daily independent seatwork. If you agree to help with my study, I will include your behavior and independent seatwork in the class average. You will also complete a survey at the end of the study about your thoughts on the Academic and Behavior Reward Game.

If you choose to help, you can quit at any time by letting me or your teacher know you wish to stop participating and I will stop including your academic performance in the class averages. You will not be punished for choosing to quit the study. You can also discontinue participation in the survey at any time and not be punished for doing so.

If you agree to participate, please write your name on the line below. If you do not want to participate in the study, your teacher will give you something else to work on while we do this study.

Thank you for your help.
Sincerely,
Caroline Jaquett

CONSENT

I have read the above information. I have received a copy of this form. I agree to participate in this study.

Name: ___________________________ Date: ________________
Appendix E
Knox County Approval Letter

KNOX COUNTY SCHOOLS
ANDREW JOHNSON BUILDING

Buzz Thomas, Interim Superintendent

August 16, 2016

Caroline Jaquett
1112 Alexander St.
Knoxville, TN 37917

Caroline Jaquett:

You are granted permission to contact appropriate building-level administrators concerning your research study: Evaluating the Effectiveness of Randomized Contingencies on Academic Achievement and Behavior. Final approval of any research study taking place within the Knox County School system is contingent upon acceptance by the principal(s) at the site(s) where the study will be conducted. Include a copy of this permission form when seeking approval from the principal(s).

Any study involving direct contact with students requires that the investigator(s) complete a background check with the results residing in the Knox County Schools Human Resource department.

In all research studies names of individuals, groups, or schools may not appear in the text of the study unless specific permission has been granted through this office. The principal researcher is required to furnish this office with one copy of the completed research document.

Good luck with your study. Contact me at 865-594-1735 if you need further assistance or clarification of the research policies of Knox County Schools.

Yours truly,

[Signature]
John Beckett
Director
Research and Evaluation

Project Number: 161705

P.O. Box 2188 • 912 South Gay Street • Knoxville, Tennessee 37901-2188 • Telephone (865) 594-1800
Appendix F

Principal Approval Letter

Caroline Jaquett
University of Tennessee, Educational Psychology and Counseling
Knoxville TN 37996

Dear Ms. Jaquett,

I give my permission for you to conduct your study “Evaluating the Effectiveness of Randomized Contingencies on Academic Achievement and Behavior” at Ridgedale Alternative School under the direction of Dr. Christopher Skinner. The details provided from the researcher give me full confidence in approving this research. I am assured that student assent will be obtained and I am confident that every effort has been made to ensure the safety of the Ridgedale students participating in this study. I have also ensured that the names of the participants and the participating school district will be kept confidential. I hereby give my permission for this research to be conducted at Ridgedale Alternative School.

With Warm Regards,

Diana Gossett
Principal
Appendix G

UTK IRB Approval Letter

November 02, 2016
Caroline Marie Jaquet,
UTK - Educational Psychology & Counseling
Re: UTK IRB-16-03312-XP
Study Title: Evaluating the Effectiveness of Randomized Contingencies on Academic Performance and Behavior

Dear Caroline Marie Jaquet:

The UTK Institutional Review Board (IRB) reviewed your application for the above referenced project. It determined that your application is eligible for expedited review under 45 CFR 46.110(b)(1), categories (5) and (7). The IRB has reviewed these materials and determined that they do comply with proper consideration for the rights and welfare of human subjects and the regulatory requirements for the protection of human subjects.

Therefore, this letter constitutes full approval by the IRB of your application (version 1.2) as submitted, including Teacher Consent (v 1.1), Parent Consent (v 1.2), Child Assent (v 1.2), Academic Data Collection Sheet (v 1.0), Behavior Observation Data Recording Sheets (v 1.0), Teacher Acceptability Survey (1) (v 1.1), Teacher Acceptability Interview (v 1.0), Student Acceptability Interview (v 1.0). All of the listed forms have been dated and stamped IRB approved. Approval of this study will be valid from November 2, 2016 to November 1, 2017.

In the event that subjects are to be recruited using solicitation materials, such as brochures, posters, web-based advertisements, etc., these materials must receive prior approval of the IRB. Any revisions in the approved application must also be submitted to and approved by the IRB prior to implementation. In addition, you are responsible for reporting any unanticipated serious adverse events or other problems involving risks to subjects or others in the manner required by the local IRB policy.

Finally, re-approval of your project is required by the IRB in accord with the conditions specified above. You may not continue the research study beyond the time or other limits specified unless you obtain prior written approval of the IRB.

Sincerely,

Colleen P. Gilrane, Ph.D.
Chair

Institutional Review Board | Office of Research & Engagement
1534 White Avenue | Knoxville, TN 37996-1529
865-974-2697 | 865-974-7400 fax | irb@utk.edu

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Flagship Campus of the University of Tennessee System
Appendix H

Teacher Acceptability Survey

Directions: I would like to learn more about your experience with the Academic and Behavior Reward Game. Please select the number corresponding to the extent to which you agree with the following statements. Your responses to the following questions are completely voluntary. Thank you for your participation.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The <em>Academic and Behavior Reward Game</em> was a good intervention</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. Most teachers would find the <em>Academic and Behavior Reward Game</em> appropriate to deal with academic behavior in the classroom</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. I noticed the students’ academic performance improve when the <em>Academic and Behavior Reward Game</em> was used.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. I spent less time disciplining students when using the <em>Academic and Behavior Reward Game</em></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. The <em>Academic and Behavior Reward Game</em> quickly improved students’ academic performance</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. The <em>Academic and Behavior Reward Game</em> was fair for all students in the class.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. I will use the <em>Academic and Behavior Reward Game</em> with future classes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. I would recommend the <em>Academic and Behavior Reward Game</em> to other teachers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Appendix I
Teacher Acceptability Interview

I would like to learn more about your experience with the Academic and Behavior Reward Game. This will in no way affect the results of my dissertation but will serve to improve future implementation. Your responses to the following questions are completely voluntary.

1. In your opinion, was the Reward Game effective in improving social studies scores?
2. In your opinion, was the Reward Game effective in improving classroom behavior?
3. What types of positive side effects did you observe after implementation of the Academic and Behavior Reward Game?
4. Did you observe any negative side effects of student performance, classroom procedures, or student behaviors?
5. Is there anything you would change regarding the procedures?
6. Is there anything you did not like about the Academic and Behavior Reward Game?
7. Were there any students who did not show improvements with the Academic and Behavior Reward Game?
8. Did you feel that all conditions were fair across all students in the classroom?
9. Are you likely to continue using the Academic and Behavior Reward Game in the future? Why or why not?
Appendix J
Student Acceptability Survey

Directions: Circle the appropriate number indicating your experience with the *Academic and Behavior Reward Game* you participated in during this year. Your responses to the following questions are completely voluntary and will in no way affect your grades. You may choose to not answer any questions you do not want to answer. Thank you for your participation.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It is important for me to do well on my social studies assignments</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. It is important for other students in my class to do well on their social studies assignments</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. The <em>Reward Game</em> helped me complete my work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. The <em>Reward Game</em> helped my class complete their work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. The <em>Reward Game</em> helped me stay on-task in class</td>
<td>1</td>
<td>2</td>
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<td>4</td>
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<td>6</td>
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</tr>
<tr>
<td>8. The <em>Reward Game</em> helped the class stay on-task</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>9. The <em>Reward Game</em> helped me reduce disruptive behavior</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</tr>
<tr>
<td>10. The <em>Reward Game</em> helped the class overall reduce disruptive behavior</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>11. I liked the <em>Reward Game</em></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
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<td>12. I like social studies more with the <em>Reward Game</em></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>13. I would like to use the <em>Reward Game</em> for other subjects</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>14. I liked the <em>Academic game</em> more than the <em>On-Task Behavior game</em></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</tr>
<tr>
<td>15. I liked the <em>On-Task Behavior game</em> more than the <em>Academic game</em></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>14. The <em>Reward Game</em> was fair for everyone in the class</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td>6</td>
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</tbody>
</table>

**116**
<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td><strong>15. I liked not knowing the mystery goals each day</strong></td>
<td></td>
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<tr>
<td><strong>16. I liked not knowing the mystery rewards each day</strong></td>
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</tbody>
</table>
Appendix K

Procedural Integrity Checklist

_____ The teacher announced to the class which reward contingency was in effect for that day (academic performance, on-task behavior, or no reward).

_____ The teacher randomly selected an index card from the Criteria envelope and placed it into the manila envelope for the particular condition (% correct vs. % intervals on-task).

_____ The researcher correctly coded the disruptive behavior and on-task intervals.

_____ The researcher collected the appropriate social studies assignments (the entire class of students).

_____ The researcher correctly scored the social studies assignments.

_____ At the beginning of the next class, the teacher announced whether the criterion was met to determine if the class received access to a reward.

_____ The teacher randomly selected a reward from the rewards envelope when the criteria was met or exceeded.

_____ The teacher distributed the same reward to all students in the classroom the next day if the criterion was met or exceeded.
Appendix L

Procedures Script

As you know, I have been in the class for the past few weeks observing. Next week, we are going to begin playing a game called the Academic and Behavior Reward Game. I will continue observing your behavior in the classroom. As a class, you will have the opportunity to earn rewards based on your independent seatwork and on-task behavior in the classroom. I will announce each day whether the reward will be based on academic performance or on-task behavior. If it is an academic reward day, your reward will be based on the class average of your independent seatwork surpassing a certain score. You will not know what that score is, so it is just important to try your best. If it is an on-task behavior reward day, your reward will be based on how on-task the entire class is, on average. You will not know what that on-task score needs to be, so it is important to just try your best. On-task behavior means you are, essentially, doing what you are supposed to be doing. If the teacher is talking, your eyes are on her. If you are completing a test or worksheet, your eyes are on your paper. On-task behavior is not sleeping during class, putting your head down on your desk, or looking out into space, day dreaming. Are there any questions on what on-task behavior is?

If the class average surpasses the mystery score, I will select a reward out of this envelope for you all to receive in class the next day. You will each get to add two possible rewards to the envelope. Please make the reward options feasible and appropriate; otherwise I will not be able to include them as options. Some possible options could include small food items or a few minutes of computer/movie time in class.

There will also be some days on which we do not play this game. On those days, it is still important to be on-task and try your best on your independent seatwork. In addition, on days in which you do not complete written work, we will not play the game.

Are there any questions?

On-task Behavior Reward Day Refresher

Today it is an on-task behavior reward day. As a reminder, that means your reward will be based on the class average on-task behavior surpassing a mystery score that I will choose now [choose criterion and put it in criteria envelope]. On-task behavior means that you are looking at your teacher when she is talking, or at your worksheets if you are supposed to be completing some independent seatwork. On-task behavior is not sleeping, having your head down at your desk, or day dreaming. Are there any questions?
Academic Performance Reward Day Refresher

Today is an academic performance reward day. As a reminder, that means that your reward will be based on the class average for your independent seatwork surpassing a mystery score that I will choose now [choose criterion and put it in criteria envelope]. I will be scoring your independent seatwork worksheets at the end of class. Are there any questions?

No-intervention Day Refresher

We will not be playing the game today. However, it is still important to be on-task and try your best on your independent seatwork. Are there any questions?
Vita

Caroline Jaquett was born in Pomona, New Jersey and grew up in Seaville, New Jersey. She graduated with a B.A. in Psychology with Honors and Minors in Sociology and Linguistics from Wake Forest University in 2013. In 2013, Caroline entered the University of Tennessee’s School Psychology Ph.D. Program. She graduated with an M.S. in Applied Educational Psychology from the University of Tennessee in December of 2015. Caroline will receive her Ph.D. in School Psychology in August 2018 following completion of a year-long internship with Lenoir City Schools, as a part of the Tennessee Internship Consortium in Knoxville, TN.