THE EFFECTS OF THE THREE JARS INTERVENTION ON THE HOMEWORK COMPLETION AND ACCURACY OF MIDDLE SCHOOL MATHEMATICS STUDENTS

By

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A Master's Project

Submitted in Partial Fulfillment

Of the Requirements of the Degree of

Master of Science in Education

Department of Curriculum & Instruction

At the State University of New York at Fredonia

Fredonia, New York

May 2013

Project Certification Page

State University of New York at Fredonia
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CERTIFICATION OF PROJECT WORK
We, the undersigned, certify that this project entitled, ***The Effects of the Three Jars Intervention on the Homework Completion and Accuracy of Middle School Mathematics Students by Kaitlin Landy, Candidate for the Degree of Master of Science in Education, Department of Curriculum & Instruction***, is acceptable in form and content and demonstrates a satisfactory knowledge of the field covered by this project.

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Abstract

Homework is a teaching strategy that is used to reinforce concepts and skills taught in class and to promote student mastery through practice. It has strong positive effects on academic achievement across grade levels, content areas, and student abilities. To maximize academic learning in mathematics, completion and accuracy of math homework should be addressed. The present study examines the efficacy of the three jars game, a combination of group contingencies with randomized components and mystery motivators, on the homework completion and accuracy of an inclusive 7th grade math class. The three jars game produced immediate and substantive improvements in both pupils' completion and accuracy rates. Teachers and students rated the intervention very positively and suggested that it should be used more frequently in school. Limitations are delineated and future directions for research and practice in this area are provided.

Introduction

In the past 30 years, public education in the United Sates has undergone gradual but profound changes. Since the publication of *A Nation at Risk* in 1983 and *A Nation Prepared* in 1986 as well as the passage of the No Child Left Behind Act (NCLB) of 2001, parents, legislatures, and school boards have focused their efforts on adopting high academic standards, improving accountability, and achieving excellence (Aron & Zweig, 2003). During this time of change, homework has continued to be used as a common and well-established instructional strategy.

Research has shown, for example, that homework performance is positively correlated to academic achievement for students of varying levels of ability (Cancio, West, & Young, 2004; Cooper, Robinson, & Patall, 2006; DeJohn, Westerhof, & Creemers, 2000; Dettners, Trautwein, & Ludtke, 2009;Madaus, Kehle, Madaus, & Bray, 2003; Olympia, Sheridan, Jenson, & Andrews, 1994; Paschal, Weinstein, & Walberg, 1984; Trautwein, 2007; Trautwein & Ludtle, 2006). Many educators consider homework to be an essential component of the learning process because it promotes both academic and nonacademic benefits. The academic benefits of homework include facilitating the retention and understanding of class material, as well as developing and maintaining scholastic skills through practice (Gajria & Salend, 1995), and providing students the opportunity to demonstrate mastery and proficiency (Epstein & Van Voorhis, 2001). Nonacademic benefits include learning how to work independently (Bryan, & Sullivan-Burstein, 1997), developing good study habits (Gajria & Salend, 1995) and time-management skills (Cooper, 2001), home-school collaboration, and increased parental involvement (Keith, 1984). Homework also helps students to understand that learning can take

place anywhere, not just in the classroom. Thus, educators utilize homework with the intent of enhancing academic performance.

Although empirical evidence supports homework as an effective educational practice, it continues to be a source of concern for both parents and educators. This is because students may lack self-regulatory behaviors and/or academic skills that are required to complete homework assignments. Additionally, students continue to be uninterested and unmotivated, despite the negative consequences associated with homework incompletion (Rathvon, 1999). Although interest and motivation are important factors, homework will not serve any purpose if students do not complete their assignments or they complete the assignments inaccurately (Olympia et al., 1994). Therefore, educators need evidence-based practices (EBPs) that improve their students' homework completion and accuracy rates (and hopefully, their overall academic performance) (Sharp & Skinner, 2004; Theodore, DioGuardi, Hughes, Aloiso, Carlo, & Eccles, 2009). Researchers have successfully identified many different strategies that have positive effects on homework completion and accuracy; however, many of these are not efficient and easy for teachers to implement (Olympia et al., 1994).

The present study looks at the three jars game, an intervention package consisting of two primary components: (a) dependent and interdependent group contingencies with randomized components and (b) mystery motivators (Rhode, Jenson, & Reavis, 1993). When combined these components have the potential to help students to turn in their homework more consistently and to complete it more accurately. The illustrative literature review will examine the use of interdependent and dependent group contingencies with particular attention focused on studies that randomized contingency components, as well as the emerging literature on mystery motivators. The primary research question that will be addressed are (a) What effects, if any, will

the three jars game have on 7th grade students' homework completion and accuracy rates? and (b) How do classroom teachers and students feel about the three jars game?

Group Contingencies. Group contingencies serve as a viable alternative to individual contingency programs. According to Litow and Pumroy (1975), group contingencies may be classified as independent, interdependent, and dependent. Independent group contingencies are established when the criteria, behaviors, and rewards are the same for the entire class, but reinforcement is contingent upon each student's individual performance (Popkin & Skinner, 2003). Interdependent group contingencies require the class (as a whole) to meet a criterion for the entire class to earn a reward (Litow & Pumroy, 1975). Finally, dependent contingencies are in effect when the behavior of the entire class is rewarded based on the performance of a small group or an individual (Skinner, Cashwell, & Dunn, 1996). To date, few studies have investigated the comparative effects of independent, interdependent, and dependent group contingencies. Four of these studies are discussed here.

In one of the first comparative studies on group contingencies, Gresham and Gresham (1982) employed a modified reversal design to investigate the differential treatment effects of group contingencies in the reduction of disruptive behavior among 12 special education students in elementary school. They found that the interdependent contingency was slightly more effective than either the independent or dependent group contingencies in improving pupil behavior. The researchers cautioned, however, that all three group contingencies appeared to be more effective than existing instructional practices.

A second comparative study was completed by Shapiro and Goldberg (1986). These researchers examined the effects of the three different group contingencies on the spelling test performance of a group of 6th grade students. Using an alternating treatments design, Shapiro and

Goldberg found no clear superiority among the three contingencies. They concluded, in turn, that all three group contingencies were more effective than teacher-led instruction in improving pupils' weekly spelling test performance.

Theodore, Bray, and Kehle (2004) also conducted a study to compare the effects of three different group contingencies (independent, dependent, and interdependent) on students' disruptive behavior. All three students were classified as seriously emotionally disturbed and engaged in high rates of oppositional and defiant behavior, noncompliance, and verbal and physical aggression. Under independent group contingencies, students earned rewards based on their own behavior. If they received 5 or fewer checkmarks for disruptive behavior, then they could select a reward from the "rewards" jar. During dependent group contingencies, students were told that the teacher would select one piece of paper from a second jar labeled "names"; that student's performance was compared against the criteria (i.e., 5 or fewer marks). If the target student met criteria, then the entire group was rewarded. Finally, under interdependent contingencies, pupils were told that all students must have five or few marks to earn a reward. Researchers found that all three group contingencies reduced pupils' disruptive behaviors immediately and dramatically over existing management practices. Students and the teacher also provided positive evaluations of the intervention and the researchers stressed the importance of unknown reward in motivating student performance.

Finally, Lynch, Theodore, Bray, and Kehle (2009) completed a comparative study on the effects of independent, dependent, and interdependent contingencies on the math homework completion and accuracy of six students with special needs in a self-contained classroom. Using an alternating treatments design, the researchers found like others that all three types of group contingencies produced noticeable improvements in students' work completion and accuracy.

With regard to homework accuracy, the interdependent group contingencies produced slightly better results that the other two options. The classroom teacher rated the group contingency interventions as effective, appropriate, and acceptable and said she would recommend the intervention to others. Once again, students rated all three group contingencies in a favorable manner.

Although there were no noteworthy differences among group contingency types (Gresham & Gresham 1982; Shapiro & Goldberg 1986; Theodore et al., 2004), the interdependent contingency had several significant advantages. They included the facilitation of positive peer interactions as the class works toward meeting a common goal (Kelshaw-Levering, Sterling-Turner, Henry, & Skinner, 2000), time effectiveness for teachers as they are only managing one contingency program for the entire class (Skinner, Skinner, & Burton, 2009), and the avoidance of potential social punishment and peer rejection because the entire class either does or does not earn a reward; as opposed to some students earning a reward while others do not (Skinner et al., 1996). In contrast, there are also some disadvantages to the use of interdependent group contingencies. For example, students who are compliant and follow classroom rules may become frustrated over not earning rewards simply because the entire class did not reach the specified criterion. This may result in resentment, retribution to the culpable individual(s), and perhaps a decline in their performance as well (Skinner et al., 1996). Second, if selected rewards are not appealing to pupils, then they may not produce the desired change (Kelshaw-Levering et al., 2000). It is quite challenging to identify common consequences that are equally appealing to all students in a classroom. Consequently, students engage in undesirable behavior, or they may even sabotage the contingency program by repeatedly misbehaving (Skinner et al., 2009). Third, if students perceive that their opportunity to earn rewards ruined, they may stop following

classroom rules (Popkin & Skinner, 2003). Finally, improving pupil behavior in one area may result in students exerting less effort in other academic areas. For example, if pupils are earning rewards for completing math homework, they may begin to pay less attention to their reading or spelling work (Hulac & Benson, 2010; Kelshaw-Levering et al., 2000; Popkin & Skinner, 2003; Skinner et al., 2009).

Randomization. Two ways that researchers have found to minimize or eliminate the negative side-effects of interdependent and dependent group contingencies is to randomize contingency components (e.g., target behaviors, criteria, students, and rewards) and keep them unknown or a mystery to students (e.g., Kelshaw-Levering et al., 2000; Lynch et al., 2009; Reinhardt, Theodore, Bray, & Kehle, 2009; Theodore, Bray, Kehle, & Jenson, 2001). Randomization is a relatively new twist on the use of group contingencies. The first experimental analysis of interdependent group contingencies with randomized components was conducted by Kelshaw-Levering and colleagues (2000). They compared the effects of interdependent group contingencies with two variations on the disruptive behavior of 12 second grade students. In one variation, the teacher randomized rewards using an opaque jar that contained the names of a variety of potential incentives (e.g., free time, extra recess, and special snacks). Students were told that they must receive 36 or fewer checkmarks in order to select a reward from the jar. The teacher then marked disruptive behaviors using a simple monitoring checklist. At the end of class, the teacher counted the marks and if the total was 36 or less, then the teacher selected a student to pull a paper slip out of the reward jar. The reward was then given to the entire class. If the criteria were not met, then students were told that they couldn't pick a reward today but that they should try harder next time.

In the second variation, all contingency components (i.e., target behaviors, criteria, target students, and rewards) were randomized through the use of four opaque jars. The first jar was labeled “behaviors” and contained paper slips with the names of target behaviors (e.g., talk outs, out of seat, and off task) and reward criteria or the word “all” indicating that all behaviors were monitored. The second jar was labeled “whole class or individuals”. This jar determined whose behavior(s) were evaluated against the criteria. If the whole class was selected, then all disruptive behaviors were counted. However, if an “individual” paper slip was selected, then the teacher picked from the third jar. Jar #3, labeled “names”, contained paper slips with all children’s names written on them. If “individual” was selected from the second jar and “Maria” chosen from the third, then her performance was checked against the target behavior and criteria. If the class or individual met the criteria, then a randomly selected student was chosen to pick from the rewards jar (Jar #4). On days when criteria were not met, students were simply told that they could not choose from the rewards jar today and they were encouraged to try harder the next time. Both interdependent group contingencies produced immediate and noticeable improvements in pupil behavior, with the four jars generating more consistently low disruptive behavior rates.

Theodore, Bray, Kehle, and Jenson (2001) partially replicated the Kelshaw-Levering, et al., study with five adolescents with serious emotional disorders. The students attended the same self-contained, special education classroom and were engaging in high rates of disruptive behaviors (e.g., yelling obscenities, non-compliance, and inappropriate touching). To ease teacher implementation, researchers adapted the four jars intervention by using only two jars to randomize two contingency components (i.e., criteria and rewards). Jar # 1 was labeled “criteria” and contained nine paper slips. One slip each said “whole class”, “highest performing student”,

"lowest performing student", and "class average", while the remaining five slips contained individual names of five target students. At the end of each session, the teacher picked a paper slip from the first jar to determine *whose* behavior was evaluated (whole class and/or individual learners). If whole class was selected, then all students had to have five or fewer checkmarks for the entire group to earn a reward. If criteria were met, then the teacher selected a paper slip from Jar #2 to determine the shared reward. Theodore et al., (2001) reported that the two jars intervention produced immediate and drastic decreases in all target students' disruptive behaviors. The researchers concluded that, "Not knowing what would be reinforced (randomized criteria) and with what (randomized reinforcers), appeared to be motivating for both the teacher and students" (p. 276).

A third jar-related study was conducted by Popkin and Skinner (2003). Using a modified multiple baseline design across behaviors, the researchers examined the effects of an interdependent group contingency with randomized components (i.e., target behaviors, criteria and rewards) on the academic performance of an intact, middle school class that served five students with serious emotional disturbance (SED). Described as the *Academic Reward Game*, students were told that they could earn rewards based on their performance on in-class assignments, and that either everyone or no one would earn rewards. The intervention used two decorated shoeboxes (instead of jars) containing index cards listing target behaviors and criteria, as well as rewards. With teacher consultation, a series of criteria were generated for earning rewards first in spelling. The word "spelling" was written on 30 index cards and then varied criterion levels were written on each card: (a) one card with 25%, (b) three cards with 50%, (c) three cards with 70%, (d) four cards each with 80% and 85%, and (e) five cards with 90%, 95%, and 100% respectively. The 30 cards were placed into a shoebox labeled "goals". In subsequent

weeks, 30 math and 30 English cards with the same criteria were placed in the goals shoebox. In consultation with the teacher and students a list of possible rewards was also generated. The names of acceptable consequences were written on separate index cards and placed in a shoebox labeled “rewards”. The teacher also allowed students to contribute possible rewards through an in class suggestion box.

The class was told initially that rewards could be earned for improved performance in spelling. Later on, they were told that rewards were now dependent on their performance in spelling and math. Finally, 30 English cards were added to the goals box and students were informed that rewards were dependent on their performance in spelling, math, and English. Students worked daily on independent seatwork in all three academic areas. Instructional materials were based on each student’s IEP and, therefore, were unrelated to one another. At the end of each intervention session, the teacher picked a card from the goals shoebox. If the card said, “spelling – 85%”, then the teacher checked the class average in spelling and if it was 85% or higher, then the entire class earned a reward. Researchers found that the *Academic Reward Game* produced immediate, stable, and educationally important improvements in all five students’ academic performance. Students with high baseline grades (e.g., A or B) maintained those levels while students with low and failing grades (e.g., D or F) improved their performance across all three subject areas to much higher levels. The study was noteworthy in that it targeted academic performance.

It appears that randomization serves as a valuable and influential method of changing performance. With respect to randomized criteria, because students do not know which criteria will be chosen, they must change *all* behaviors in order to have a chance to win the game. Similarly, because students are unaware of which rewards will be earned, the likelihood of

purposeful sabotage is greatly diminished. Finally, anger and disgruntlement are less likely if students fail to meet criteria because rewards were not specifically identified (Skinner et al., 1996).

In 2009, Lynch and her colleagues completed a study focused on students with disabilities in a self-contained 5th grade classroom. The intent was to address whether group contingencies would increase students' homework completion and accuracy and if there were differential treatment effects by group contingency type. Results indicated that all three group contingencies were successful in improving homework completion and accuracy rates. However, the interdependent condition was somewhat superior to the other two contingencies for homework accuracy. It was also noted that the participating teacher strongly agreed/liked the intervention and felt that it was beneficial to homework performance.

That same year, Theodore and her colleagues conducted a reversal design using a jar intervention package that included randomized interdependent group contingencies and randomized rewards in the form of mystery motivators. The intervention was implemented with the intent of improving the spelling performance (i.e., completion and accuracy) of 21 elementary students. Similar to a previous investigation, this study only randomized rewards and criteria. Results demonstrated that the randomized interdependent group contingency, coupled with the mystery motivators, had an overall positive impact on students' spelling completion and accuracy in an inclusive setting. Additionally, consumer satisfaction data indicated that the participating classroom teachers were "somewhat satisfied with the intervention".

Finally, Reinhardt and his colleagues (2009) used a multiple-baseline experimental design across academic behaviors to examine the effects of another jar-related intervention. This intervention used a randomized interdependent group contingency program similar to Theodore

et al (2001; 2004). However, this program was intended to improve homework accuracy rates of six 4th grade students. The academic domains identified for improvement here were daily independent homework assignments in reading comprehension, mathematics, and spelling. Results demonstrated that with respect to homework accuracy, the interdependent group contingency coupled with randomly selected components improved rates among all three subjects, although to varying degrees. Follow-up data indicated that all students were able to maintain or improve upon intervention gains in mathematics. Additionally, the participants rated the intervention as "generally acceptable".

This illustrative review suggests that homework performance has important academic and nonacademic benefits that positively correlate with scholastic achievement. These studies showed how group contingencies and the randomization of components can be used to improve both homework completion and accuracy. Researchers, teachers, and students found the jar-related interventions to be both effective and socially acceptable, although only one study examined group contingency effects on pupil performance on math homework. Effective, efficient, and socially acceptable classroom-based interventions are sorely needed in an era of evidence-based practices. However, more empirical work may be need in the area of mathematics before firm conclusions can be generated. The purpose of the present investigation, therefore, was to examine the effects that the three jars game with mystery motivators has on the math homework completion and accuracy of a group of 7th grade students enrolled in a middle school inclusion classroom. In addition, the study examined teacher and pupils' feeling about the use of the three jars game in school.

Method

Participants and Setting

The study took place in a public school district located in rural and suburban areas of Western New York. The areas surrounding the district comprise a population of approximately 60,000 people. This is not a culturally diverse community. Approximately 97% percent of the population is Caucasian. The community has a median household income of about $42,227 and about 12.5% of households make less than $15,000 per year. The unemployment rate is nearly six percent, which is slightly lower than national percentages. The target district serves 1,400 students and operates one senior high school, one middle school, and one elementary school. The district minority rate is less than five percent, and 19% of students are eligible for free meals. Although this district and community lack diversity, they still provide students with ample opportunities to grow and learn. Unfortunately, district-wide achievement results on the New York State Grade 6 Mathematics Assessment have slipped noticeably over the past few years. The percentage of students scoring at a level four (i.e., highest possible) has decreased from 43% in the AY 2008-09 to 19% during the AY 2010-11. Currently, the district's achievement rates are slightly lower than other public schools in New York State.

The study took place in the middle school which houses approximately 348 students. Ninety-three percent of middle school students are Caucasian and 16% are eligible for free lunch. This statistic is slightly lower that the district's percentage. In this school, there are a total of 89 core classes. The average class size for mathematics was 19 pupils. Special education students are included extensively in the general education classrooms in accordance with their individualized education plans (IEPs).

There are five 7th grade inclusive math classes in the middle school. One class was selected for participation based on its poor homework performance. The participating class had 20 students (10M, 10F) ranging in age from 12 to 13 years old. Twelve students (60%) were classified and had IEPs. No specific learning challenges were shared with the investigator. However, it was revealed that most students frequently failed to complete homework and achieved low accuracy rates on the homework that they did complete.

The primary investigator was a Caucasian female with three years of part time teaching experience. She was responsible primarily for the development of study-related materials, student and teacher training, and data collection and analysis. The study was conducted during regularly-scheduled, 40-minute math periods. Two teachers, one general and one special education, were responsible for daily math instruction. The general education mathematics teacher was a Caucasian female with 19 years of teaching experience while her special education colleague was also a Caucasian female who had taught for 34 years. Both teachers participated to varying degrees in study implementation.

For instructional purposes, student desks were arranged into five rows all facing the front of the classroom. The general education teacher was responsible for lesson development and implementation, while the consultant teacher provided individualized assistance to special needs students as needed. Homework was assigned daily and usually consisted of 10 to 20 math problems. Math topics covered included (a) mean, median, mode; (b) quartiles and interquartile range; (c) box and whisker plots; and (d) Common Core practice problems. At the beginning of each class, the general education teacher walked around the room to record homework completion and accuracy scores of each student. During this time, students worked individually on fluency-building problems.

Dependent Variables

There were three dependent variables in the present study: (a) homework completion, (b) homework accuracy, and (c) consumer satisfaction ratings. A homework assignment was considered complete only if the following criteria were met: (a) the student submitted the assignment upon arrival to class and (b) all problems on the assignment were attempted as evidenced by appropriate numerals in the answers. In addition, the students were required to show all relevant work and computations on the homework sheet itself or hand in an additional sheet with the assignment showing their computations. The investigator used the following calculations to determine homework completion:

$$\underset{(individual\ student)}{\%\ of\ homework\ completion} = \left(\frac{number\ of\ completed\ homework\ problems}{number\ of\ homework\ problems}\right) \times 100$$

$$\underset{(class\ average)}{\%\ of\ homework\ completion} = \frac{sum\ of\ individual\ student\ percentages}{number\ of\ students}$$

Homework accuracy was defined as the percentage of problems solved correctly on daily homework assignments. The general education teacher checked each homework item and deemed it correct or incorrect. No partial credit was rewarded. The investigator used the following calculations to determine homework accuracy:

$$\underset{(individual\ student)}{\%\ of\ homework\ completed\ accurately} = \left(\frac{\#\ of\ accurately\ completed\ homework\ problems}{\#\ of\ homework\ problems\ completed}\right) \times 100$$

$$\underset{(whole\ class)}{average\ \%\ of\ homework\ completed\ accurately} = \left(\frac{sum\ of\ individual\ student\ percentages}{\#\ of\ students\ that\ completed\ assignment}\right)$$

The third dependent variable was student responses to a 21-item, 5-point Likert-type consumer satisfaction survey (see Appendix A). Students were asked to rate the intervention in terms of the: (a) importance of intervention *goals* (e.g., doing well in math and completing homework accurately), acceptability of instructional *procedures* (e.g., using the jars to set criteria, determine whose performance was evaluated, and earn mystery rewards), and (c)

satisfaction with intervention *outcomes* (e.g., improved grades in math, helped learn content better, and helped complete more work). The students also indicated the extent to which the intervention: (a) was fair, (b) should be done in other classes, and (c) could be harmful to other students.

Similarly, a teacher survey was administered at the end of the study to assess teacher perceptions. This survey consisted of 28-items that were rated using a 5-point Likert-type scale. Survey items were based on the work of other researchers who used group contingencies and rewards (Chafouleas, Briesch, Riley-Tillman, & McCoach, 2009; Witt & Martens, 1983) (see Appendix B). Teachers rated the three jars intervention in terms of: (a) acceptability, (b) understanding, and (c) feasibility. For both student and teacher surveys, items were scored on a 5-point scale with "1" indicative of negative perceptions and scores approaching "5" as reflective of positive perceptions. Students and teachers completed surveys *independently* and *anonymously*. Student responses were aggregated and presented in tabular fashion by item while teacher responses were described qualitatively.

Independent Variables

The intervention package included three primary components that served as independent variables: (a) randomized target behaviors and criteria, (b) interdependent and dependent group contingencies, and (c) unknown rewards in the form of "mystery motivators".

Randomized Target Behaviors and Criteria. After examining class performance during baseline sessions, two behaviors were targeted (homework completion and accuracy). Criteria were then set. Criterion levels varied from 80% to 100%. The target behaviors and varying criterion levels were written on paper slips (as seen in the table below) and placed into Jar #1 labeled "Criteria".

Homework Completion – 80%	Homework Accuracy – 80%
Homework Completion – 85%	Homework Accuracy – 85%
Homework Completion – 90%	Homework Accuracy – 90%
Homework Completion – 95%	Homework Accuracy – 95%
Homework Completion – 100%	Homework Accuracy – 100%

Each day, the teacher randomly drew one paper slip from Jar #1. This determined which target behavior and criterion needed to be met that day in order for the entire class to earn a reward. The target behavior and criterion were not shared with the class at that time.

Group Contingencies. Group contingencies were established by telling the entire class that their access to the "mystery" rewards was dependent on either the collective performance of the whole group (i.e., interdependent) or an individual student (i.e., dependent) performance. After the target behavior and criterion were selected, the teacher drew a paper slip from Jar #2, labeled "Who?" Jar #2 contained 26 paper slips labeled as follows:

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
Row 1	Row 2	Row 3	Row 4	Row 5
		Whole Class		

Each letter (A-T) represented an individual student. The second selected paper slip determined whose performance, on the target behavior and criterion, would be evaluated that day. An

interdependent group contingency was established if the "Whole Class" slip of paper was selected. If the whole class's average completion or accuracy score met or exceeded the daily criterion, then the whole group was rewarded. Dependent group contingencies were created if a "Row…" or letter slip of paper was selected. If the row's average completion or accuracy score met or exceeded the daily criterion, then the whole class was rewarded. Similarly, the whole group earned a reward if an individual student's completion or accuracy score met or exceeded the daily criterion. Target student selection was done privately and was not revealed to the class. If the criterion was not met, students were simply informed that a reward was not earned and they were encouraged to work harder in order to attain a reward the following day.

Unknown Randomized Rewards. If the whole class, small groups, or individuals met the daily criterion, then they were allowed to select one paper slip from Jar #3 labeled "Rewards". The jar held approximately 20 slips of paper that contained the names of material, activity, or novel rewards (e.g., gum, stickers, pencils, 5-minutes of free time, etc.). Potential rewards were selected based on teacher and student suggestions given prior to formal data collection. Five of the 20 rewards were "mystery motivators" (Rhode et al., 1993). Five envelopes, containing slips of paper with high preference rewards written on them, were hung prominently in the classroom. When a "mystery motivator" slip was chosen from Jar #3, the students voted on which envelope to open to determine that day's reward. Mystery Motivators included: (a) a movie and popcorn after school, (b) an ice cream party, (c) a donut party, (d) a pizza party after school, and (e) a cake/pie party.

Treatment Integrity

To ensure that the intervention was implemented correctly, a 10-item fidelity of implementation checklist was developed (see Appendix C). The 10 primary steps required to

implement the intervention as intended were included on the checklist. Spaces to indicate the presence or absence of each procedural step were included as well. During intervention sessions, the consultant teacher made observations and recorded the presence or absence of each procedural component during 25% of randomly selected intervention sessions. It was determined that the intervention was implemented with 100% accuracy for all intervention sessions.

Experimental Design and Procedures

An A-B-A-B withdrawal of treatment design was used to assess the effects of the intervention on students' homework completion and accuracy rates. This particular design is capable of establishing a functional relationship between the intervention and its outcomes by showing that student performances change, *when and only w*hen, the intervention is presented and/or withdrawn (Kennedy, 2005).

Baseline. In the present study, student homework performance was first examined under typical or normal teaching conditions. During these initial baseline sessions, math homework was assessed at the beginning of class by the general education teacher. Percentage scores for both completion and accuracy were recorded for all students and later forwarded to the investigator. During baseline sessions, there were no explicit consequences (neither positive nor negative) for homework performance (good or bad). Scores were typically entered into the teacher's grade-book and pupils were given general feedback on their homework.

Intervention. Prior to the intervention phase, the investigator instructed the general education teacher how to implement the intervention. After initial baseline sessions were completed, students participated in a brief (i.e. 20 minute) training session led by the general education teacher. The teacher announced that the class would be playing the "Three Jars Game" for the next few weeks. She described how the "game" was played and drew sample slips from

each jar to model how homework would be evaluated. A typical intervention session worked as follows: First, the general education teacher graded her students' homework while they worked on "fluency" math problems. Next, she emphasized to the class that everyone must work as a team in order to earn mystery rewards. The teacher then selected one paper slip from Jar #1 (to determine the target behavior and criterion) and another paper slip from Jar #2 (to determine whose performance would be evaluated). After demonstrating how to solve the "fluency" problems and instructing on new material, the general education teacher announced whether the criterion was reached. Lastly, if the criterion was achieved, a slip of paper was chosen form Jar #3. It was then determined when the reward would be delivered (i.e., the most immediate and reasonable time).

Withdrawal. After the intervention data stabilized, the intervention was removed for five days (return to baseline conditions). Students were informed that they would not receive rewards for their math homework performance during that time. All visual indicators of the intervention were removed.

Intervention II (Reimplementation). Following the second baseline period, the intervention was reintroduced. For this phase, the students were informed that they could again earn rewards for their homework performance. Immediately after the final intervention session, teachers and students completed the consumer satisfaction surveys anonymously and independently.

Results

Homework Completion. Data relevant to the class' homework completion rates can be seen in Figure 1. As depicted, the class completed daily homework inconsistently with an overall mean completion rate of 59% (range = 0 to 100%). This suggested that just over half of all

students were completing math homework on a typical day under normal instructional conditions. When three jars were implemented, the class' completion rate increased immediately and substantially to 95% with a range of 75% to 100%. This represented a 36% increase in the number of students completing math homework assignments. There was an initial accelerating trend in daily completion rates that leveled off above 90% after the fourth day of intervention. It is significant to note as well that there were no overlapping data points between the two adjacent experimental phases. When the three jars game was removed, there was an immediate and noticeable decrease in the class' completion rates. The class now completed on average about 65% of math assignments with a range of 11% to 100%. Again, there were no overlapping data points between adjacent experimental phases. Finally, when three jars were put back into effect, the class' average completion rate rose to 99%; only one student failed to complete every item on every homework assignment during intervention sessions. Once more, there were no overlapping data points.

Because class means can cloud intervention effects on individual pupils, Table 1 was created. During initial baseline sessions, individual pupil performance was quite variable. Six students, for example, completed all baseline assignments and five earned 100% correct on each assignment. In contrast, there was one pupil (I) who completed no assignments and received all zero grades, three students who completed only one of six baseline assignments, and one other who failed to complete half of baseline math assignments. Ten students failed to turn in homework assignments on two or more days during initial baseline. When the intervention was implemented, all 20 students completed most, if not all of their math homework assignments. Thirteen students had perfect completion rates and five others finished at least 80% of their assignments (i.e., minimal reward criteria). Only four students failed to fully complete all

assignments. These treatment effects were replicated across most students during subsequent experimental phases. Aside from students who maintained consistently perfect homework completion rates, all participants increased their math homework completion rates. An additional visual representation of the impact of three jars on the class' homework completion rates can be seen in Table 2. As depicted, there were a total of 40 instances of students not turning in math homework during the initial baseline phase. This represented 33% of all required assignments. When three jars were implemented for the first time, there were only six instances (.05) of student failure to complete homework. Interestingly, all six occurrences happened within the first two days that the intervention was in effect. When three jars were removed, the number of students failing to complete homework assignments doubled to 12. During the final intervention phase, there was only one instance of a student failing to hand in a completed homework assignment.

Homework Accuracy. Data relevant to the accuracy of math homework can be seen in independent line graphs for all participants (see Figure 2). As shown, three jars produced immediate and noticeable improvements in all students' homework accuracy. These performance increases mirrored completion data with very few overlapping data points across adjacent phases for individual pupils. The students who made the greatest increases in math accuracy included those with failing baseline averages during initial baseline (e.g., students A, B, C, G, K, & R) while the smallest gains were evidenced by students S and T. Additional data on pupils' homework accuracy and effect sizes can be seen in Table 3. These data show each pupil's mean grades across the four experimental phases and calculated effect sizes. As seen, everyone's math homework averages increased from baseline to intervention phases. These gains averaged about

22% (i.e., baseline M = 64% to Intervention M = 86%) over the course of the investigation. This represented over a two letter grade improvement in pupils' math homework grades (D to B).

Individual effect sizes were then calculated using the *Approach One: No Assumptions* model Busk and Serlin (1992). Effect sizes were calculated by taking the difference between baseline and intervention means and dividing by the standard deviation of the baseline phase. Positive effect sizes of 0.8 or greater indicate a significant decrease in the percentage of the observed behavior between the two phases whereas a negative effect size of -0.8 or less indicates a significant increase in the observed behavior between the two phases (Volker, 2006). Over 50% of the students (N=11) obtained large effect sizes ranging from -0.91 to -0.2.84. Five students showed improvement in homework accuracy rates with moderate effect sizes ranging from -0.54 to -0.74. Unfortunately, effect sizes for four participants (Student C, G, I, and K) could not be calculated because there were an insufficient number of baseline data points to calculate standard deviation and effect sizes. Students C and K, however, have higher scores than the single baseline data points for each student, while Students G and I comparison can only be made between the withdrawal and intervention phases. For both students, accuracy during intervention always exceeded baseline levels. Additional visual representation of student accuracy scores can be seen in Table 4.

Consumer Satisfaction Ratings. Student responses on the intervention's consumer satisfaction survey can be seen in Table 5. As shown, students rated most intervention goals quite highly. They reported that it was very important for them to complete their daily math homework (M = 4.5), do well in 7th grade math (M = 4.2), and complete homework accurately M = 4.1). Students also rated most three jars procedures positively as well. They provided the highest acceptability rating for "choosing mystery motivator envelopes" (M=4.5), followed by

"using Jar #3 rewards" (M = 4), and "enjoy playing the three jars game" (M = 3.8). The lowest rated item was "using Jar #2 to determine whose homework completion or accuracy would be monitored" (M = 2.8). While the major of anecdotal comments were positive, one student did comment that, "I did not like when I did good on my homework and did not get a reward because my classmates did bad." Student satisfaction ratings also varied quite a bit as well. However, most students felt fairly positive about intervention outcomes. The highest rated outcome was "three jars should be used in other classes" (M = 4.0), followed by "effectiveness in improving your homework behavior" and "three jars game was fair" (M = 3.7), and "three jars motivated me to complete homework" (M = 3.5). There were only two students that rated the intervention as ineffective (>3.0). More than half of students felt that the intervention should be used in other classes.

Social validity results for the general and special education teachers were also very positive. In general, they felt that the intervention was effective, feasible to implement, and fair to students. Both teachers indicated that they would use this or a similar intervention in their classroom again.

Discussion

The present study showed that the three jars intervention was very effective in improving the homework completion and accuracy of a 7th grade inclusive math class. During initial baseline, the class was only completing about 60% of their math assignments and with a daily accuracy rate of about 63%. Fifteen students (75%) had failing homework averages in math. The intervention produced immediate increases in the class' completion and accuracy rates. Completion rates soared to almost 100% when the game was in effect and students' math averages were 87%. The class average improved by almost four letter grades (F to B+) when the

three jars were in effect. More importantly, no students had a failing math homework average while the intervention was being used. Completion and accuracy rates dropped substantially when the intervention was removed, but improved noticeably once again when three jars were put back into effect. The current findings take on added significance given that they were achieved in an inclusive educational setting that contained 12 students with IEPs.

The present results are also consistent with previous research on the positive effects of group contingencies with randomized components (e.g., Kelshaw-Levering et al., 2000; Lynch et al., 2009; Reinhardt et al., 2009; Skinner, Williams, & Nedenriep, 2004; Theodore et al., 2009) and mystery motivators (e.g., Bennett, 2007; Madaus et al., 2003; Murphy, Theodore, Aloiso, Alric-Edwards, & Hughes, 2007) on students' academic and behavioral performance. The present data extend the literature in both areas to a new student population, geographic location and different outcome measure. Importantly, these data showed that the performance of all students, including those with IEPs, can be enhanced in inclusive settings taught by a general education teacher. There is a dire need for effective academic interventions that can improve the performance of all students in inclusive settings (e.g., Heward, 2009).

While three jars had a clear and immediate effect on pupils' homework completion and accuracy rates, the contributors to these improvements are less obvious. Obviously, randomized criteria for rewards as well as the rewards themselves played a big role in improving pupil performance. By randomizing reward criteria, students were motivated to improve their behavior but they didn't know exactly which criteria (e.g., 80%, 85%, 90%, 95%, or 100%) were in effect. With respect to randomized rewards, the suspense or mystery surrounding the identity and availability of the mystery motivator certainly contributed to pupil excitement. Rewards never lost their appeal because students did not know what they were going to win in the first place.

They were never disappointed that they did not receive a particular reward. Positive peer interactions also appeared to be a contributor to improved pupil performance. A classroom community was created as students worked toward common goals (i.e., to improve math homework completion and accuracy). On several occasions, students were observed helping each other with math homework by explaining procedures or checking outcomes. Not only did this "peer tutoring" aid in the mastery and fluency of the math material, but it helped foster respect and self-esteem within the classroom. The needs of the lowest and highest functioning students were met.

The three jars intervention also appeared to be both feasible and socially acceptable to students and teachers. This finding is also consistent with previous research that shows positive consumer satisfaction evaluations for jar-related studies (Skinner et al., 2009). Students rated most intervention goals as important, the majority of intervention procedures as acceptable, and provided fairly high satisfaction ratings for most items. It was important to see that they thought the three jars game should be used in other classes as well. However, one surprising outcome was that two students rated the intervention as ineffective, even though the data showed that they clearly made noticeable progress. In the era of evidence-based practice, identifying class-wide interventions that are effective for all, feasible for implementation, and socially acceptable is very important. This research-to-practice investigation employed an evidence-based intervention in an applied setting that would parallel most classrooms across the country. Therefore, three jars would be well-suited for improving academic performance in inclusive educational settings.

Although current findings are promising, there are a few study limitations that may reduce their utility of present findings to some extent. First, the study was conducted with only one group of students (N=20), in one geographical location, and in one narrow facet of academic

curriculum (i.e., math homework completion and accuracy). Generalizations to other grade levels, geographic settings, and subject areas are not warranted at this time. Future research should replicate the present study across various subject areas, age ranges, settings (special education and inclusive classrooms), and populations. Second, the study was conducted for a relatively short duration (26 days) and no generalizations and maintenance data were collected. Therefore, it is not appropriate to conclude that the same effects would be obtained over a longer time period and/or that benefits would generalize to other areas of math performance (e.g., in class work completion, quiz/test performance, and active in-class participation) and/or be sustained in the absence of the intervention. Future research should include longer intervention durations and explicit generalization measures for examining potential "spillover effects". Further, if intervention duration were increased then it may be necessary to change occasionally the criteria and rewards to prevent satiation and a lack of interest. In addition rewards should be used on a thinning variable schedule by using blank paper slips in the "Reward" jar. Finally, the current findings are limited because the investigator also served as the primary data collector and evaluator. Although procedures were used to monitor fidelity of implementation, one cannot rule out potential experimenter bias effects at this time. Future research should utilize independently-trained data collectors.

In summary, the present study examined the effects of the three jars game, a combination of dependent and interdependent group contingencies with randomized components and mystery motivators, on the homework completion and accuracy of 7th grade students in an inclusive math classroom. With a minimum of teacher time and effort, the three jars game produced immediate and substantial improvements in the math homework completion and accuracy rates of all 20 students including 12 with special needs. The general education teacher was able to implement

the game with a high degree of accuracy and both teachers and pupils rated the game favorably. The findings indicated that the three jars game was a powerful and efficient tool for getting all participants to complete more homework assignments and achieve higher grades. Obviously, more research is needed on the potential utility of the three jars game as a means of improving pupils' academic competence.

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Figure 1 shows the daily class average completion rates across experimental conditions.

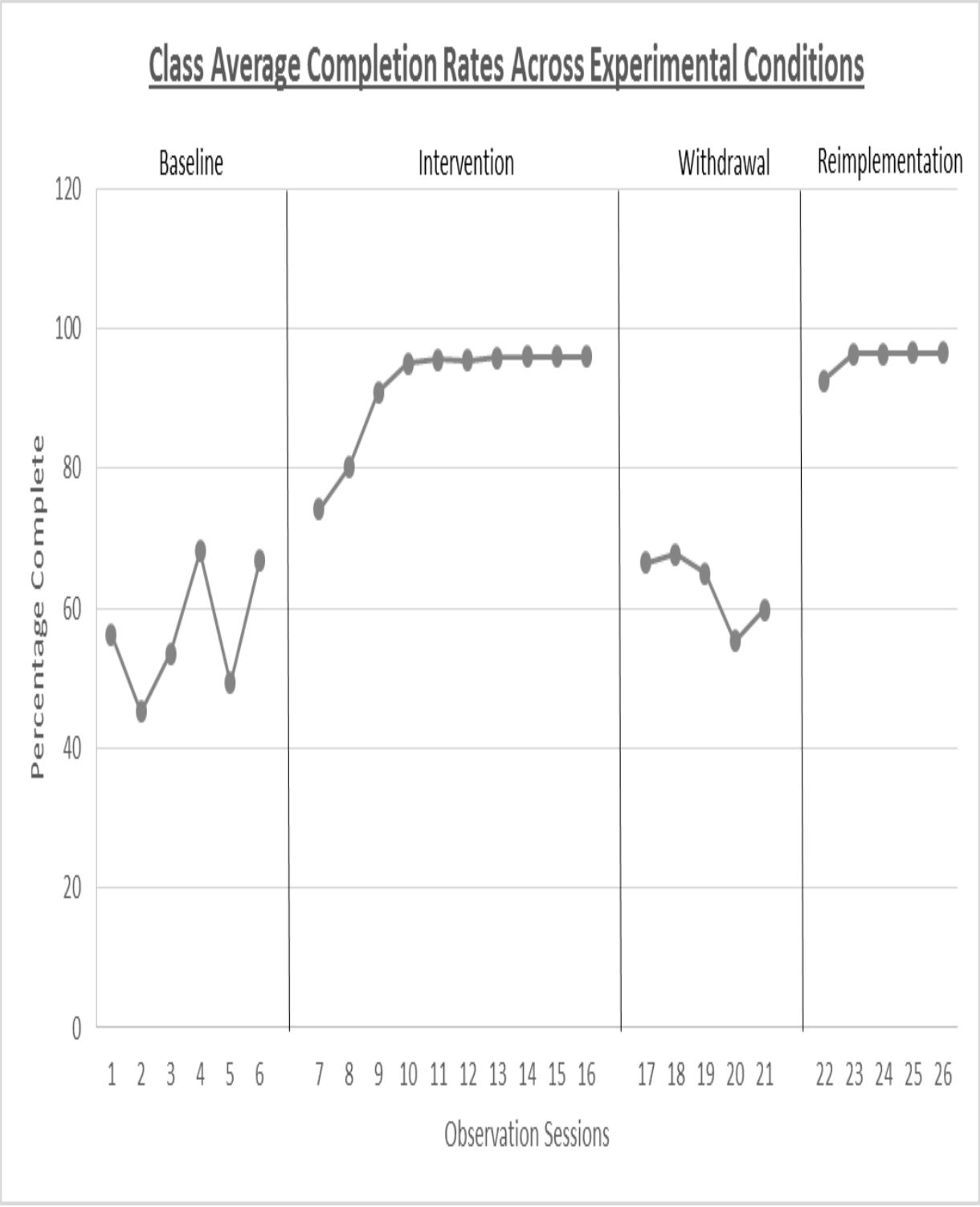
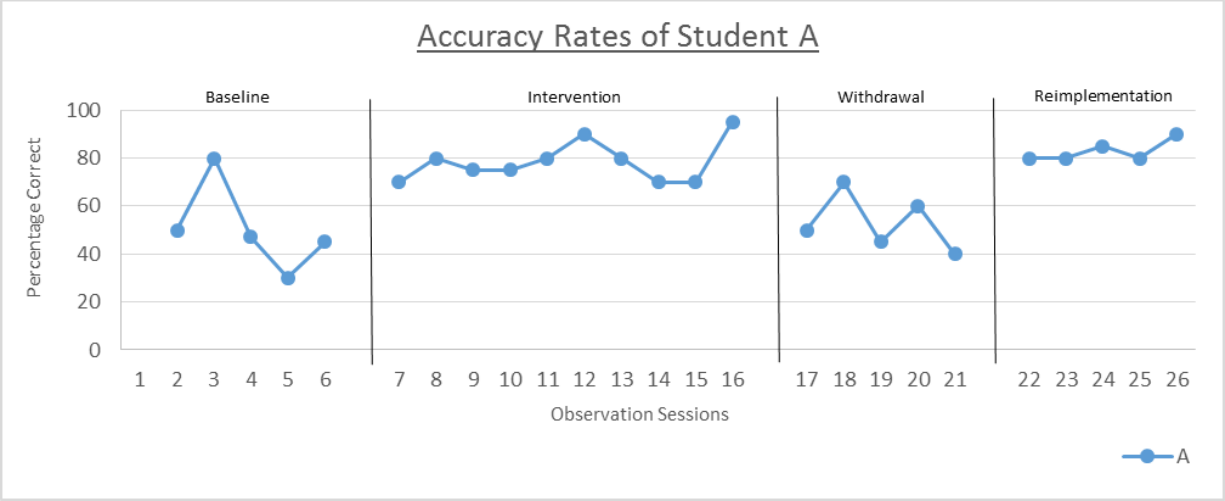
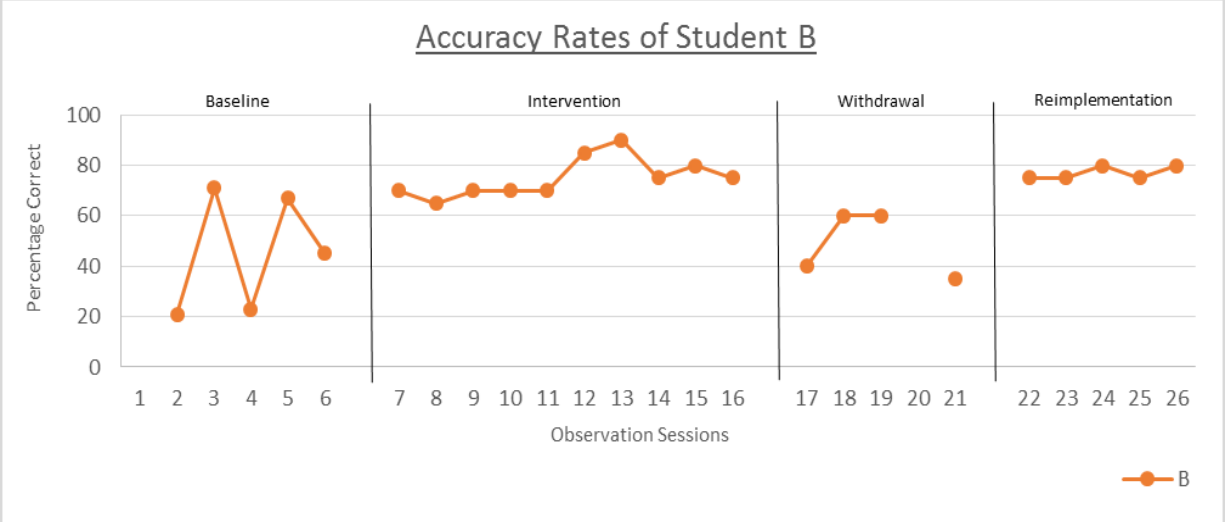
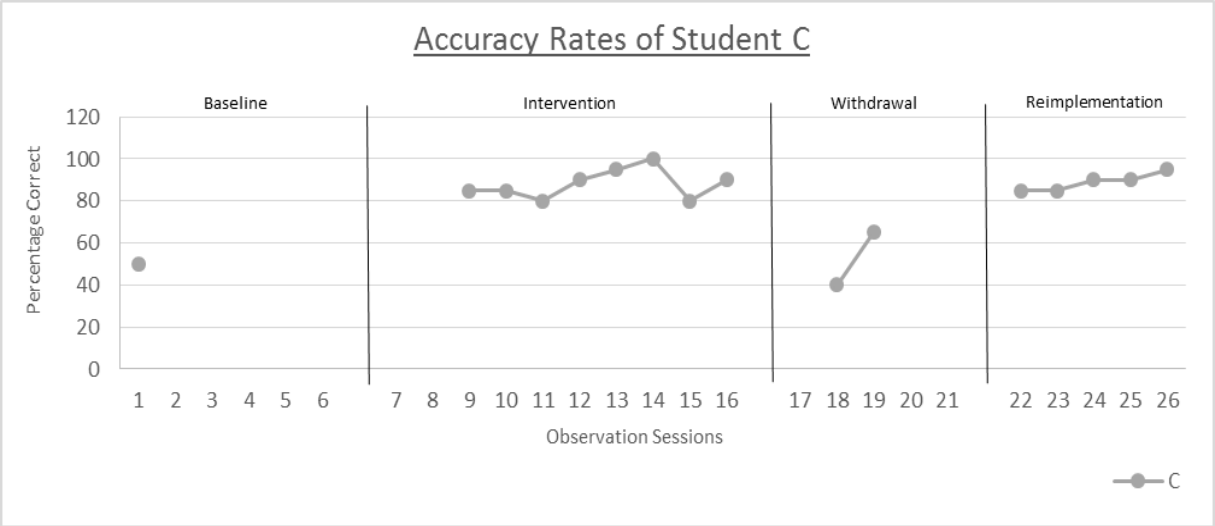


Figure 2 displays the percentage of accuracy on homework assignments for each participant across all days of the study.



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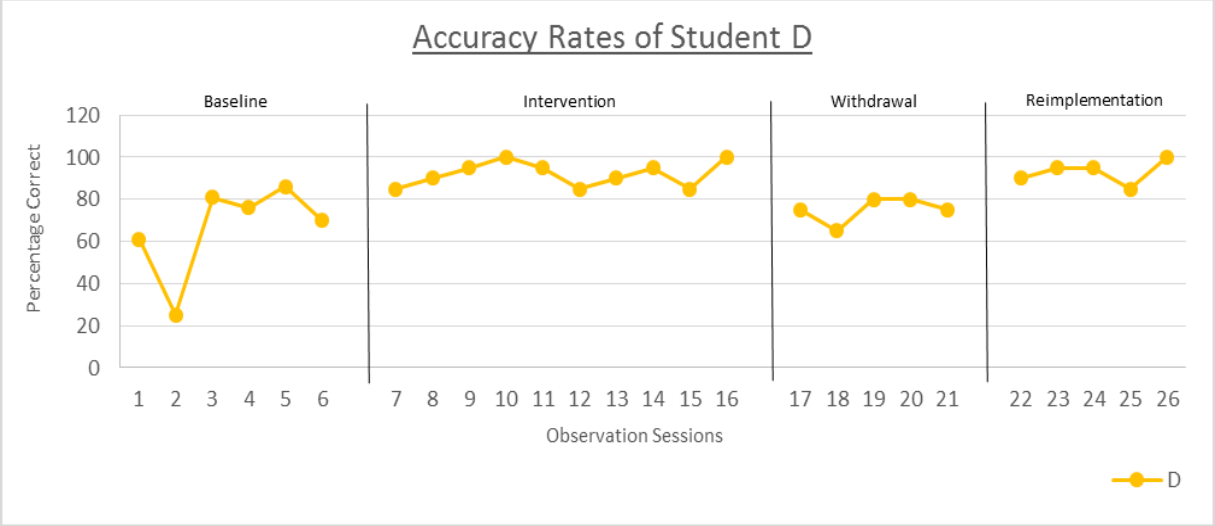
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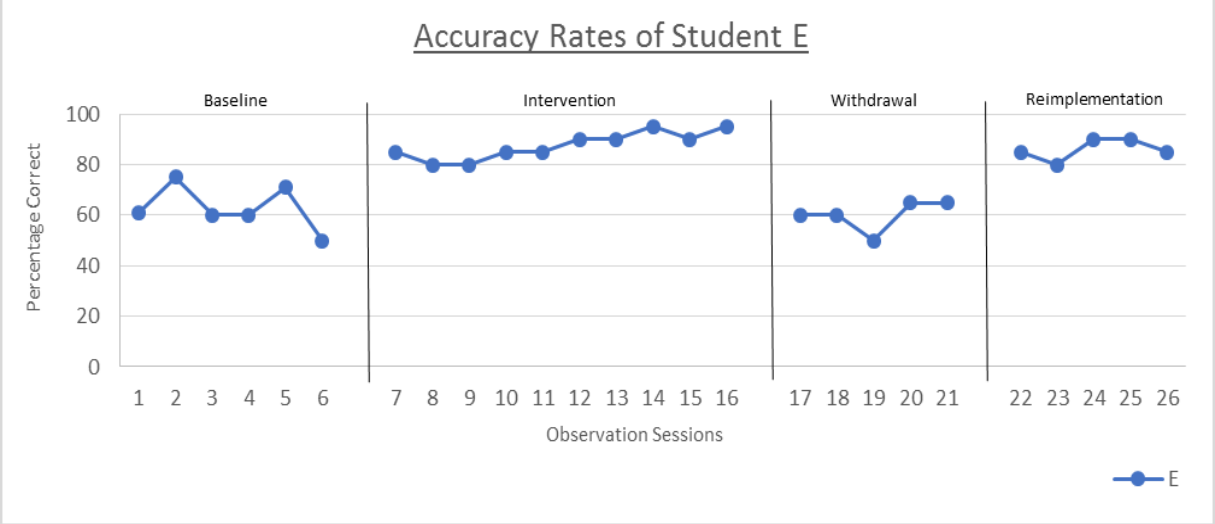
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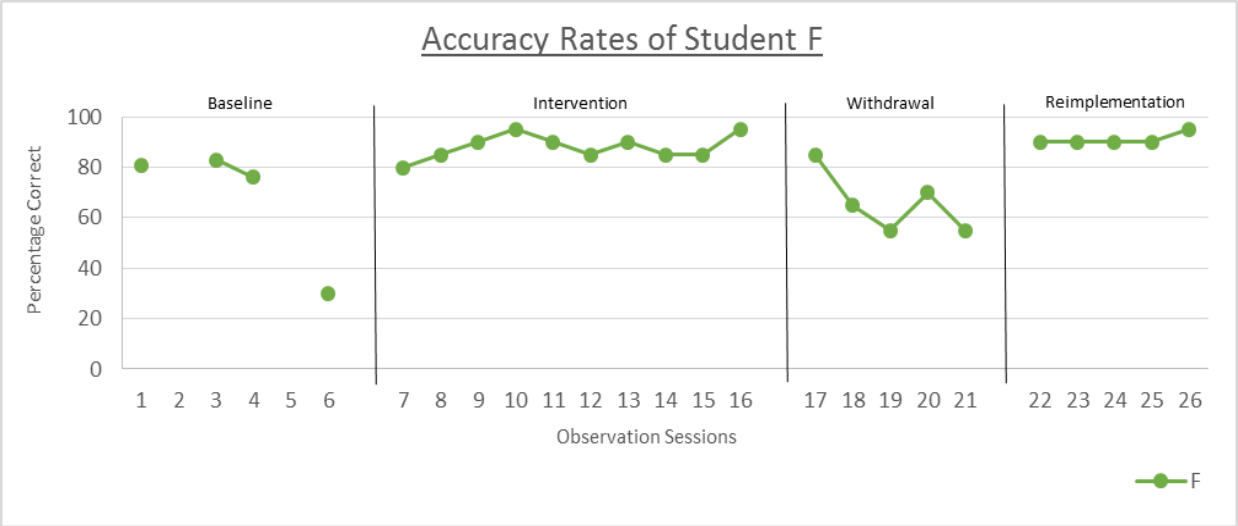
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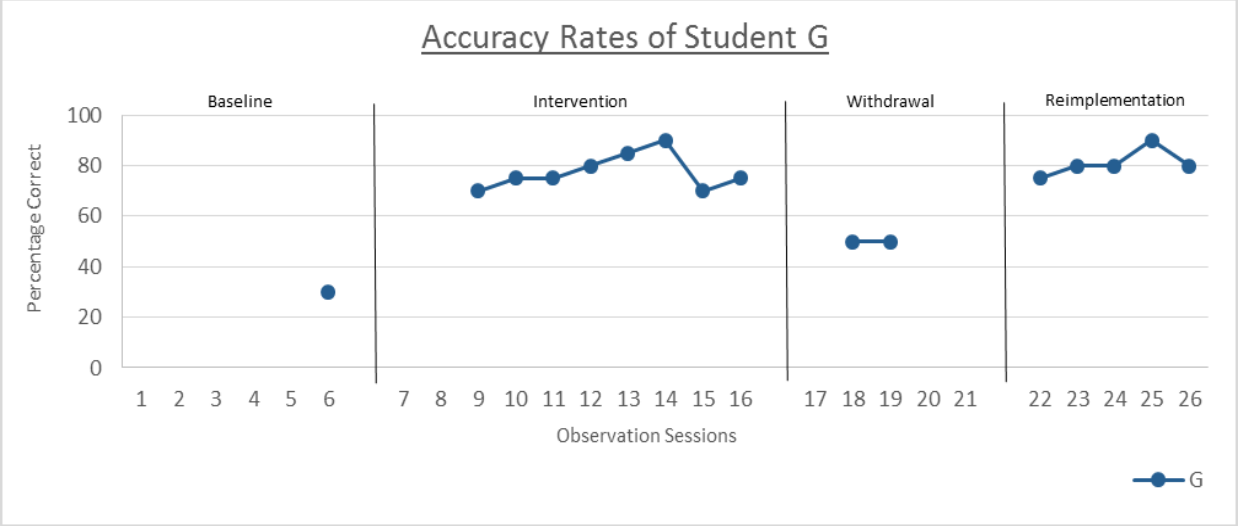
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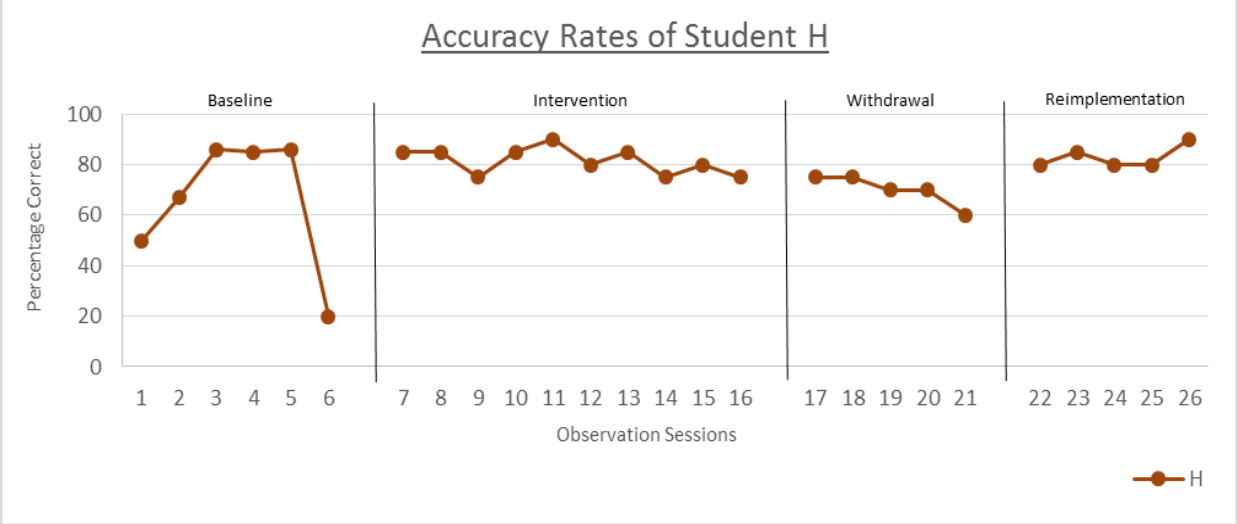
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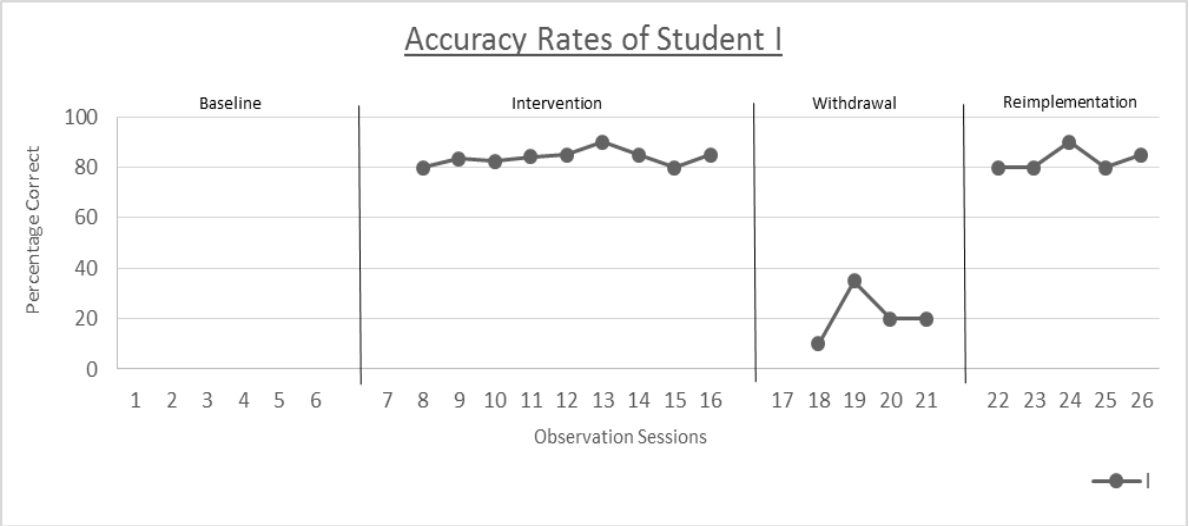
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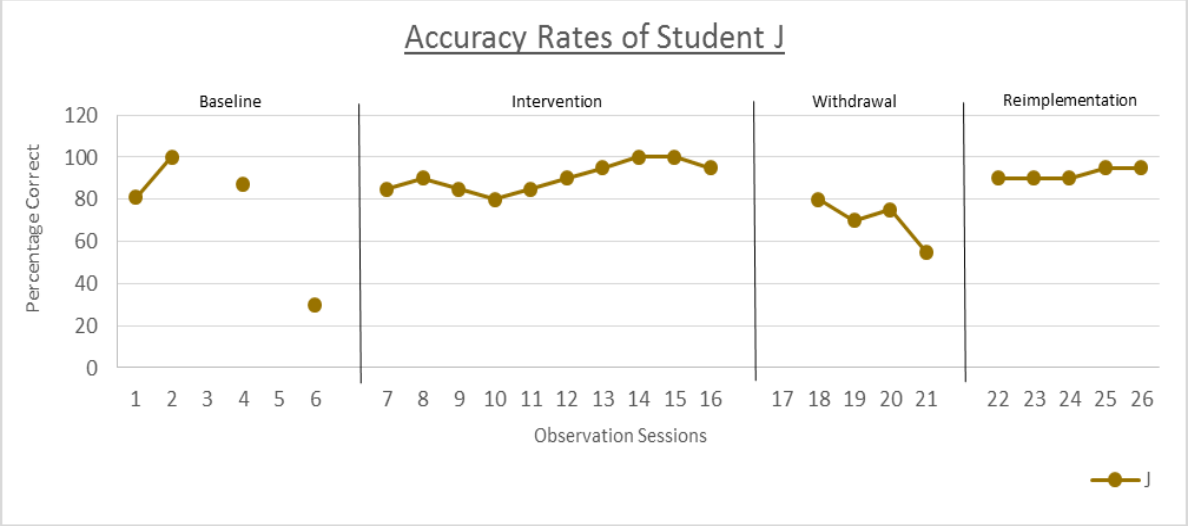
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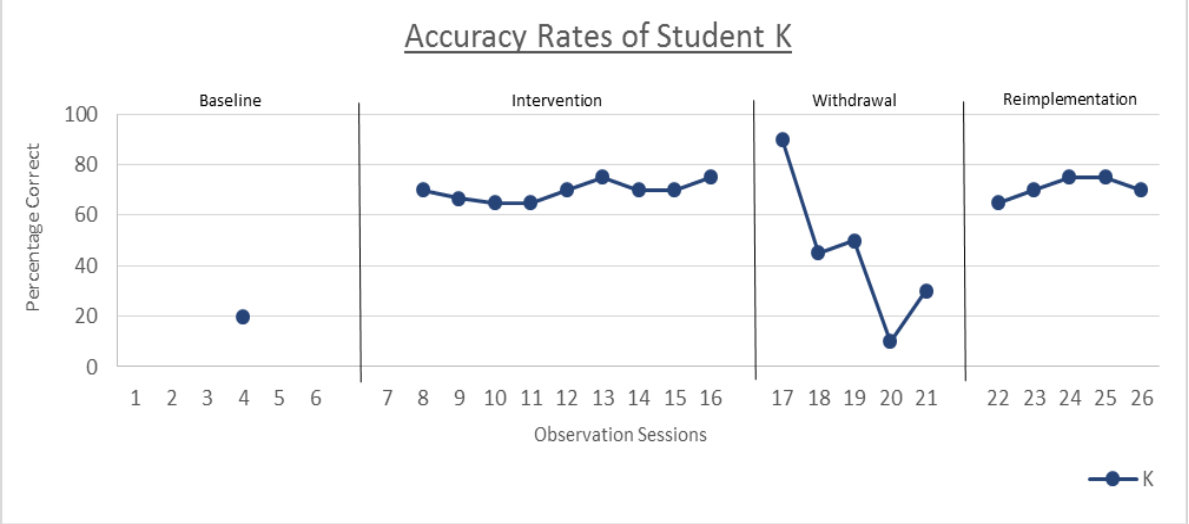
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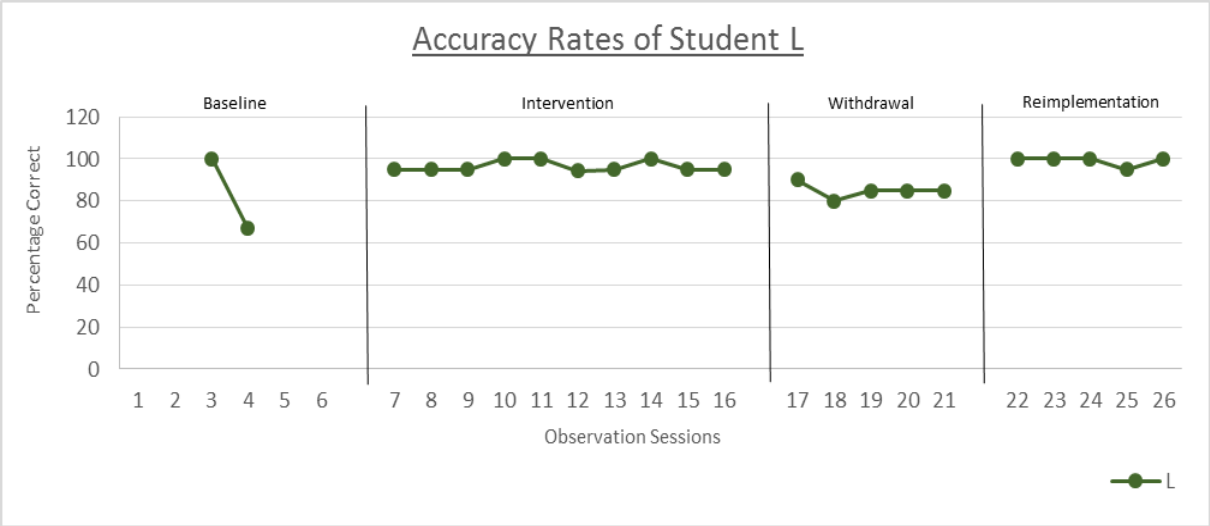
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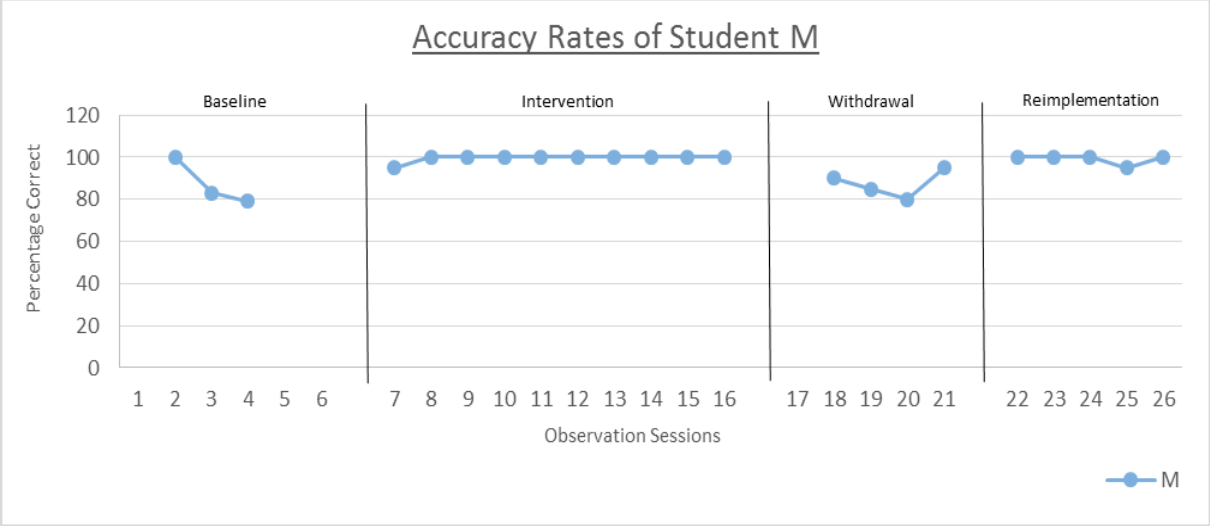
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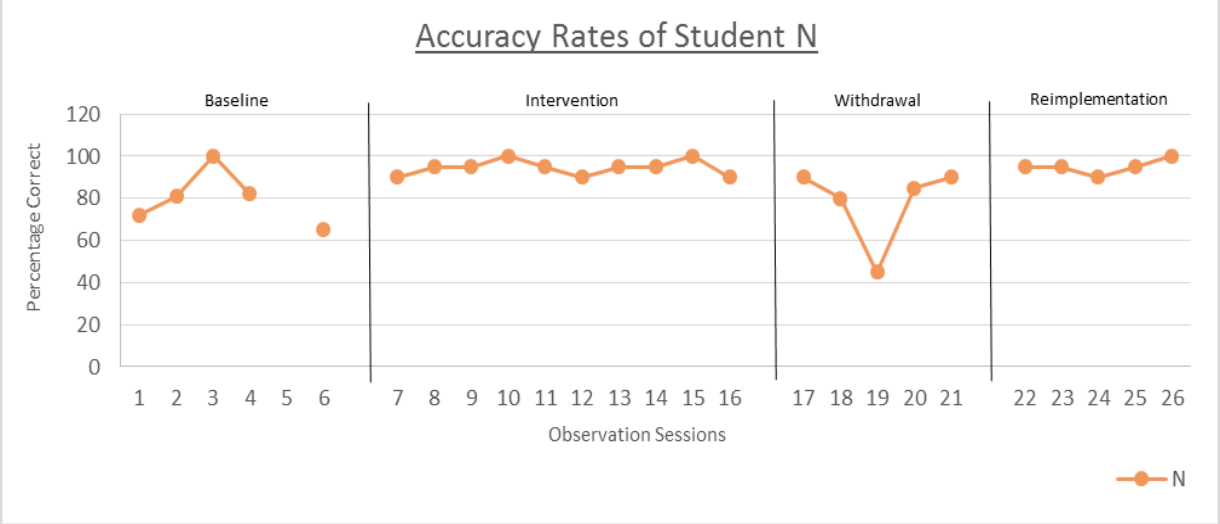
Observation Sessions
M


Accuracy Rates of Student N
Baseline
Intervention
Withdrawal
Reimplementation
Percentage Correct
120
100
80
60
40
20
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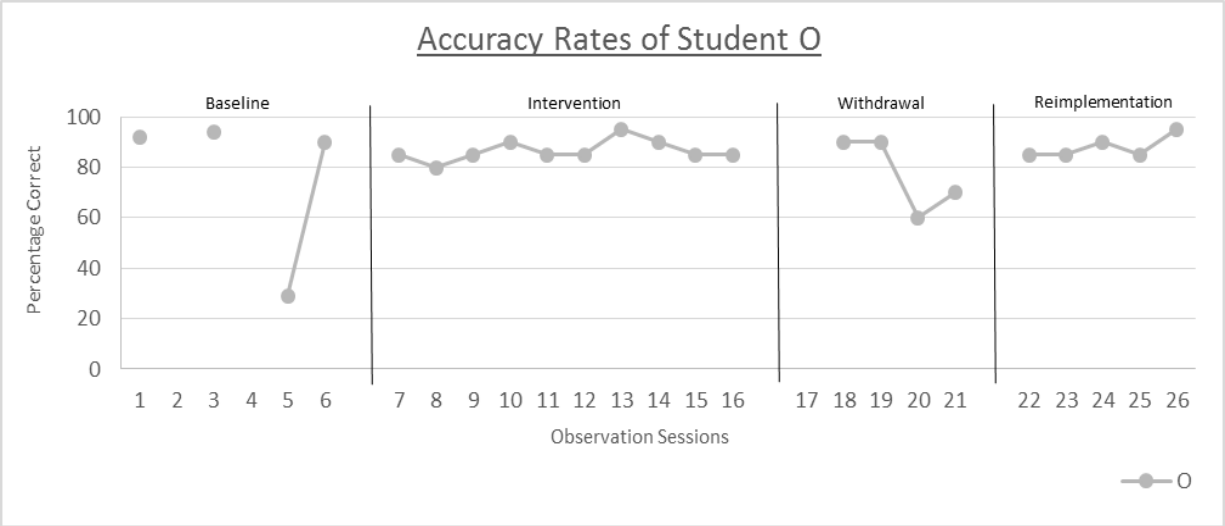
Observation Sessions
N


Accuracy Rates of Student O
Baseline
Intervention
Withdrawal
Reimplementation
Percentage Correct
100
80
60
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20
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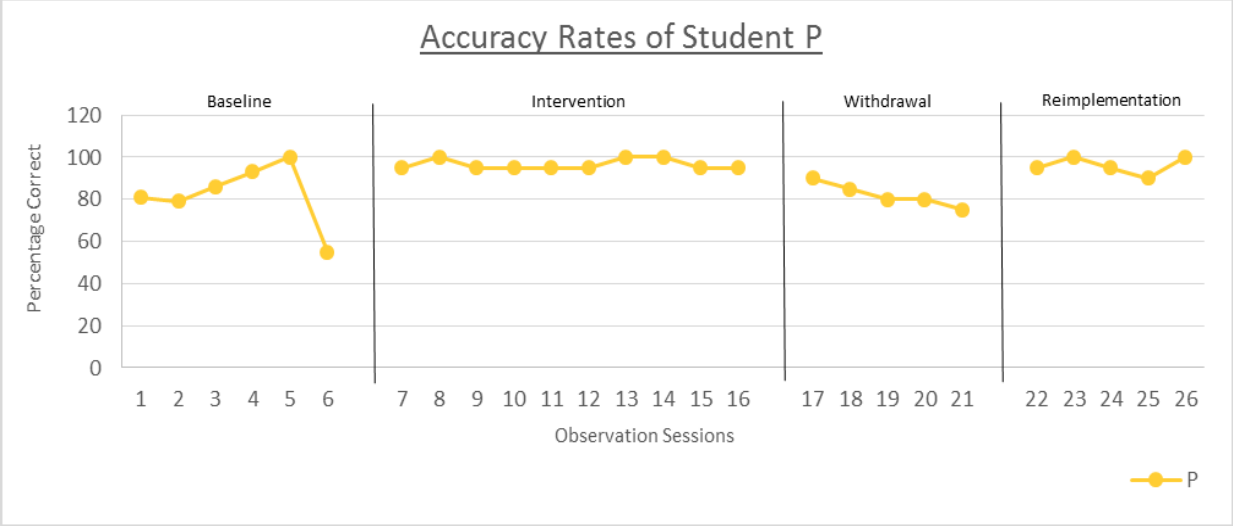
Observation Sessions
O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Baseline
Intervention
Withdrawal
Reimplementation
Percentage Correct
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80
60
40
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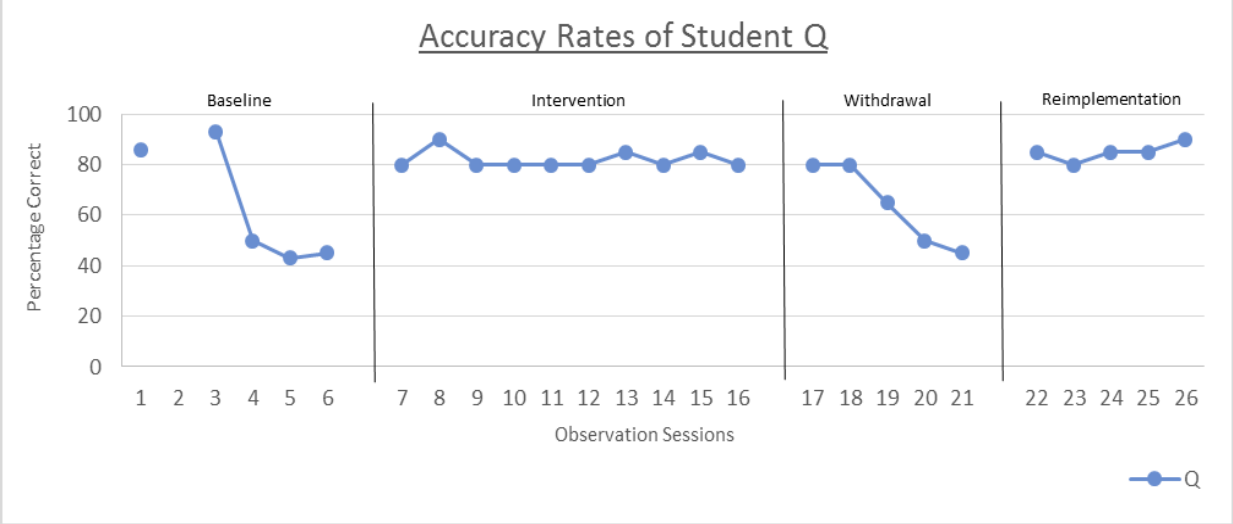
Observation Sessions
P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Baseline
Intervention
Withdrawal
Reimplementation
Percentage Correct
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60
40
20
0
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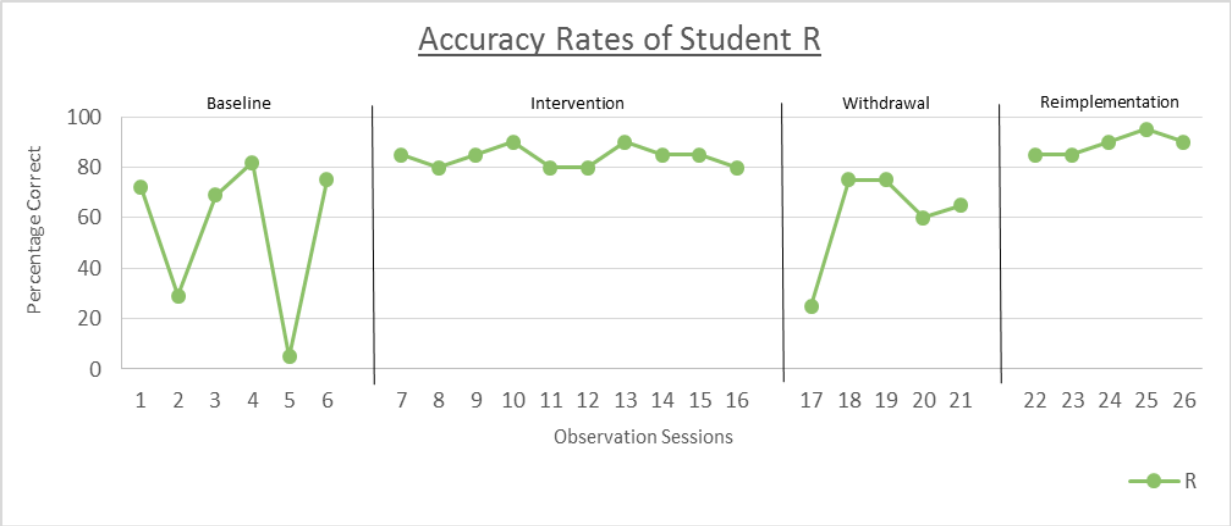
Observation Sessions
Q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Baseline
Intervention
Withdrawal
Reimplementation
Percentage Correct
100
80
60
40
20
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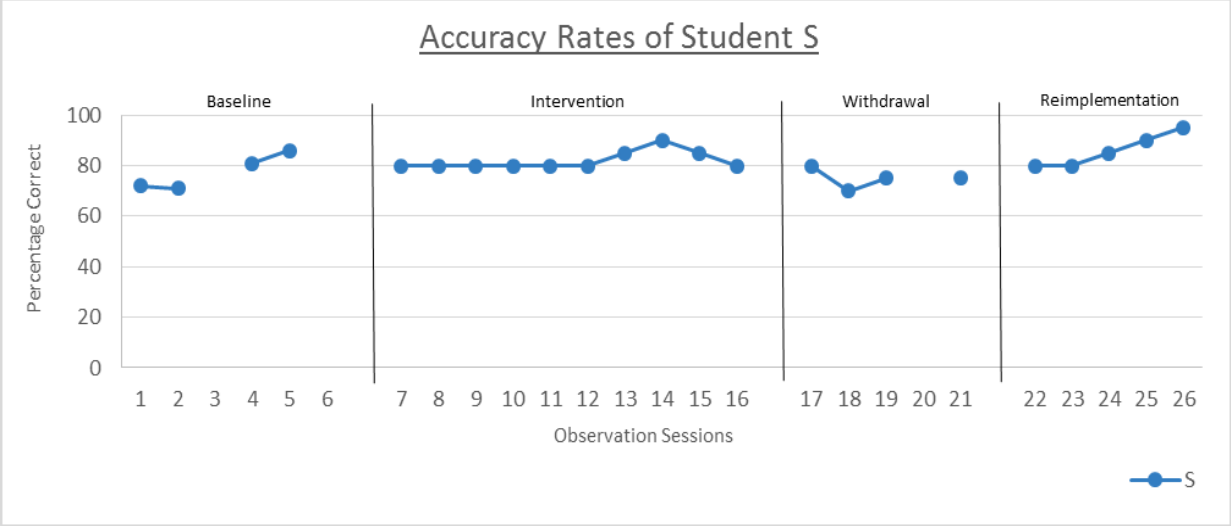
Observation Sessions
R


Accuracy Rates of Student S
Baseline
Intervention
Withdrawal
Reimplementation
Percentage Correct
100
80
60
40
20
0
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Observation Sessions
S

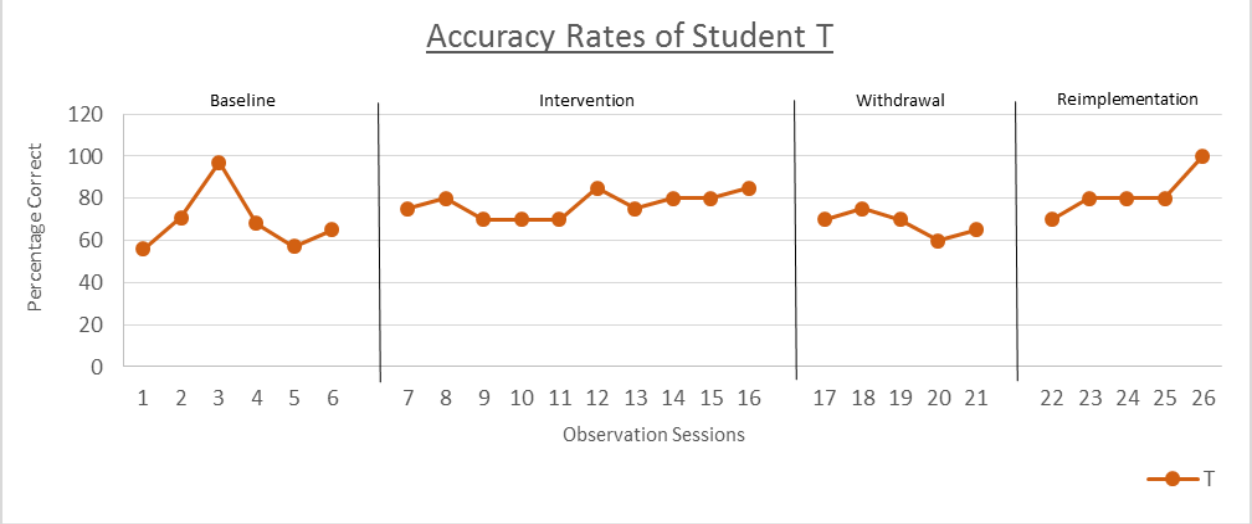
Accuracy Rates of Student T
Baseline
Intervention
Withdrawal
Reimplementation
Percentage Correct
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Observation Sessions
T

Table 1 depicts the mean homework completion rates for all participants across all phases of the study.

Average Completion Rates Across Experimental Conditions				
Students	**Baseline %**	**Intervention %**	**Withdrawal %**	**Reimplementation %**
A	55.67	100.00	67.00	100.00
B	67.83	100.00	72.00	100.00
C	10.00	80.00	11.00	100.00
D	100.00	100.00	100.00	100.00
E	100.00	100.00	100.00	100.00
F	60.67	100.00	74.00	100.00
G	16.67	75.00	17.00	100.00
H	100.00	100.00	100.00	100.00
I	0.00	76.50	12.00	84.00
J	38.17	100.00	38.00	100.00
K	14.67	84.00	41.00	100.00
L	15.17	99.00	41.00	100.00
M	29.83	100.00	30.00	100.00
N	81.67	100.00	100.00	100.00
O	58.33	95.00	59.00	100.00
P	86.83	100.00	77.00	100.00
Q	81.67	100.00	82.00	100.00
R	100.00	100.00	100.00	100.00
S	66.67	100.00	80.00	100.00
T	100.00	100.00	100.00	100.00
Mean	59.19	95.48	65.05	99.20

Table 2. Daily math homework completion rates for each pupil.

	Baseline Data						Intervention Data										Withdrawal Data					Intervention Reimplementation				
Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
A	0	17	61	56	100	100	100	100	100	100	100	100	100	100	100	100	100	60	75	60	40	100	100	100	100	100
B	0	100	33	88	86	100	100	100	100	100	100	100	100	100	100	100	100	100	80	0	80	100	100	100	100	100
C	60	0	0	0	0	0	0	0	100	100	100	100	100	100	100	100	0	30	25	0	0	100	100	100	100	100
D	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
E	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
F	90	0	100	74	0	100	100	100	100	100	100	100	100	100	100	100	100	70	80	80	40	100	100	100	100	100
G	0	0	0	0	0	100	0	0	50	100	100	100	100	100	100	100	0	40	45	0	0	100	100	100	100	100
H	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
I	0	0	0	0	0	0	0	25	60	85	95	100	100	100	100	100	0	10	20	10	20	20	100	100	100	100
J	60	25	0	44	0	100	100	100	100	100	100	100	100	100	100	100	0	70	45	40	35	100	100	100	100	100
K	0	0	0	88	0	0	0	50	90	100	100	100	100	100	100	100	100	30	25	40	10	100	100	100	100	100
L	0	0	3	88	0	0	100	100	100	100	100	90	100	100	100	100	100	30	25	40	10	100	100	100	100	100
M	0	4	75	100	0	0	100	100	100	100	100	100	100	100	100	100	0	35	30	45	40	100	100	100	100	100
N	90	100	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
O	100	0	50	0	100	100	50	100	100	100	100	100	100	100	100	100	0	60	75	80	80	100	100	100	100	100
P	90	100	100	88	43	100	100	100	100	100	100	100	100	100	100	100	100	100	40	65	80	100	100	100	100	100
Q	90	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	80	70	80	80	100	100	100	100	100	100
R	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
S	100	100	0	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100	100
T	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 3. Homework accuracy means across experimental phases and effect sizes.

Average Accuracy Rates Across Experimental Conditions				
Baseline	Intervention	Withdrawal	Intervention Reimplementation	*SD* Baseline
50.40	78.50	53.00	83.00	18.26
45.40	75.00	48.75	77.00	23.55
50.00	88.13	52.50	89.00	
66.50	92.00	75.00	93.00	22.12
62.83	87.50	60.00	86.00	8.93
67.50	88.00	66.00	91.00	37.24
30.00	77.50	50.00	81.00	
65.67	81.50	70.00	83.00	26.58
N/A	83.88	21.25	83.00	
74.50	90.50	70.00	92.00	30.71
20.00	69.63	45.00	71.00	
83.50	96.44	85.00	98.00	23.33
87.33	99.50	87.50	99.00	11.15
80.00	94.50	78.00	95.00	13.17
76.25	86.50	77.50	88.00	39.27
82.33	96.50	82.00	96.00	15.49
63.40	82.00	64.00	85.00	24.09
55.33	84.00	60.00	89.00	30.95
77.50	82.00	75.00	86.00	7.23
69.00	77.00	68.00	82.00	14.95
63.55	85.53	64.43	87.35	24.16

Table 4. Daily math homework accuracy scores for each pupil.

	Baseline Data						Intervention Data										Withdrawal Data					Intervention Reimplementation				
Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
A		50	80	47	30	45	70	80	75	75	80	90	80	70	70	95	50	70	45	60	40	80	80	85	80	90
B		21	71	23	67	45	70	65	70	70	70	85	90	75	80	75	40	60	60		35	75	75	80	75	80
C	50								85	85	80	90	95	100	80	90		40	65			85	85	90	90	95
D	61	25	81	76	86	70	85	90	95	100	95	85	90	95	85	100	75	65	80	80	75	90	95	95	85	100
E	61	75	60	60	71	50	85	80	80	85	85	90	90	95	90	95	60	60	50	65	65	85	80	90	90	85
F	81		83	76		30	80	85	90	95	90	85	90	85	85	95	85	65	55	70	55	90	90	90	90	95
G						30			70	75	75	80	85	90	70	75		50	50			75	80	80	90	80
H	50	67	86	85	86	20	85	85	75	85	90	80	85	75	80	75	75	75	70	70	60	80	85	80	80	90
I								80	83.3	82.4	84.2	85	90	85	80	85		10	35	20	20	80	80	90	80	85
J	81	100		87		30	85	90	85	80	85	90	95	100	100	95		80	70	75	55	90	90	90	95	95
K				20				70	66.7	65	65	70	75	70	70	75	90	45	50	10	30	65	70	75	75	70
L			100	67			95	95	95	100	100	94.4	95	100	95	95	90	80	85	85	85	100	100	100	95	100
M		100	83	79			95	100	100	100	100	100	100	100	100	100		90	85	80	95	100	100	100	95	100
N	72	81	100	82		65	90	95	95	100	95	90	95	95	100	90	90	80	45	85	90	95	95	90	95	100
O	92		94		29	90	85	80	85	90	85	85	95	90	85	85		90	90	60	70	85	85	90	85	95
P	81	79	86	93	100	55	95	100	95	95	95	95	100	100	95	95	90	85	80	80	75	95	100	95	90	100
Q	86		93	50	43	45	80	90	80	80	80	80	85	80	85	80	80	80	65	50	45	85	80	85	85	90
R	72	29	69	82	5	75	85	80	85	90	80	80	90	85	85	80	25	75	75	60	65	85	85	90	95	90
S	72	71		81	86		80	80	80	80	80	80	85	90	85	80	80	70	75		75	80	80	85	90	95
T	56	71	97	68	57	65	75	80	70	70	70	85	75	80	80	85	70	75	70	60	65	70	80	80	80	100

Table 5. Individual pupil responses to each item on the consumer satisfaction survey.

		Items	Student Ratings																					Mean
Importance of Instructional Goals	1	How important is it for you to do well in 7th grade Math class?	4	3	5	4	5	4	5	5	4	4	5	2	5	4	3	5	3	2				4.2
	2	How important is it for other students in your class to do well in Math class?	4	4	4	3	4	4	4	3	4	4	3	1	5	4	2	5	3	2				3.6
	3	How important is it for students to complete homework assignments in Math class?	4	4	5	5	5	4	5	4	4	5	5	5	5	5	3	4	4	5				4.5
	4	How imporatnt is it for students to complete math homework accurately?	4	4	3	4	4	4	4	5	5	5	4	5	5	4	5	5	3	2				4.1
Acceptability of Instructional Procedures	5	How did you feel about not knowing the target behavior and criteria?	3	2	3	3	3	1	5	3	2	4	3	1	4	3	3	4	4	4				3.0
	6	How much did you like completing accurate homework assignments each day	1	3	4	1	4	3	4	4	1	4	3	5	1	4	3	2	3	4				3.1
	7	How much did you like using Jar #1 to determine the homework completion or accuracy goal each day?	3	3	3	3	3	2	3	2	3	4	3	3	1	3	4	4	4	4				3.1
	8	How much did you like using Jar #2 to figure out whose homework completion or accuracy would be monitored each day?	3	3	3	2	4	2	3	2	1	3	3	3	1	3	2	1	5	4				2.8
	9	How much did you like using Jar #3 to determine what reward the class earned each day?	3	3	5	5	5	5	1	4	5	5	4	3	5	4	3	5	5	1				4.0
	10	How much did you enjoy playing the 3 Jars game?	2	3	4	3	3	4	4	3	5	4	4	4	5	4	3	5	5	3				3.8
	11	How much did you like choosing one of the mystery motivator envelopes?	4	4	5	4	5	4	5	5	5	5	4	4	5	3	5	4	5	4				4.5
Satisfaction with Strategy Outcomes	12	How satisfied are you with your overall perfromance in Math class?	4	3	3	3	5	4	4	5	1	3	3	2	5	4	2	2	4	3				3.4
	13	How satisfied are you with your performance when using 3 Jars?	3	3	3	3	5	3	4	4	3	3	3	4	1	3	2	3	4	3				3.2
	14	I feel the 3 Jars game helped me to learn Math content better.	3	2	4	3	4	3	4	2	5	4	3	5	5	3	2	2	5	2				3.4
	15	The 3 Jars game motivated me to complete homework assignments.	3	4	3	3	4	4	4	3	4	4	4	4	5	3	2	2	3	3				3.5
	16	The 3 Jars game should be used in other classes.	4	5	5	4	4	4	5	3	4	4	4	4	5	3	4	3	3	3				4.0
	17	The 3 Jars game has the potential to be harmful to other students	1	1	5	3	2	4	3	1	1	2	1	3	5	2	1	1	1	1				2.1
	18	The 3 Jars game was fair to everyone in class.	5	5	3	3	4	1	3	4	3	3	5	2	5	3	3	5	4	5				3.7
	19	Other students thought that I was smarter after using 3 Jars.	3	3	3	3	2	2	2	2	1	4	3	3	2	5	2	3	1	2				2.5
	20	Rate the effectiveness of the 3 Jars game on your homework behavior.	3	3	3	3	4	4	4	4	5	5	4	4	4	5	3	2	2	4				3.7
	21	How did you feel about not knowing which reward you would get?	4	3	4	3	5	2	3	3	1	5	4	3	3	3	3	3	5	3				3.2

Appendix A

Three Jars

Student Consumer Satisfaction Survey

Directions:

Please read each item aloud to your students and ask them to *circle the number* that best represents their feelings about that particular item. Emphasize the importance of completing the rating *individually and privately.*

I. Importance of Instructional Goals

1. How important is it for you to do well in **7th grade Math** class?				
1	2	3	4	5
Not at all		Somewhat Important		Very Important

2. How important is it for **other students** in your class to do well in Math class?				
1	2	3	4	5
Not at all		Somewhat Important		Very Important

3. How important is it for students to **complete homework** assignments in Math class?				
1	2	3	4	5
Not at all		Somewhat Important		Very Important

4. How important is it for students to complete math homework accurately?				
1	2	3	4	5
Not at all		Somewhat Important		Very Important

II. Acceptability of Instructional Procedures

5. How did you feel about not knowing the target behavior and criteria?				
1	2	3	4	5
Awful	Bad	Neutral	Good	Great

6. How much did you like **completing accurate homework** assignments each day?				
1	2	3	4	5
Not at all		It was OK		Liked it a lot

7. How much did you like **using Jar #1 to determine the homework completion or accuracy goal** each day?				
1	2	3	4	5
Not at all		It was OK		Liked it a lot

8. How much did you like **using Jar #2 to figure out whose homework completion or accuracy would be monitored** each day?				
1	2	3	4	5
Not at all		It was OK		Liked it a lot

9. How much did you like **using Jar #3 to determine what reward the class earned** each day?				
1	2	3	4	5
Not at all		It was OK		Liked it a lot

10. How much did you enjoy **playing** the **3 Jars** game?				
1	2	3	4	5
Not at all		It was OK		Liked it a lot

11. How much did you like **choosing one of the mystery motivator envelopes**?				
1	2	3	4	5
Not at all		It was OK		Liked it a lot

III. Satisfaction with Strategy Outcomes

12. How satisfied are you with your **overall performance** in Math class?				
1	2	3	4	5
Very Unsatisfied		Neutral		Very Satisfied

13. How satisfied are you with your **performance when using *3 Jars***?				
1	2	3	4	5
Very Unsatisfied		Neutral		Very Satisfied

14. I feel the *3 Jars* game **helped me to learn** Math content better.				
1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

15. The *3 Jars* game **motivated me** to complete homework assignments.				
1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

16. The *3 Jars* game **should be used** in other classes.				
1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

17. The *3 Jars* game has the **potential to be harmful** to other students.				
1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

18. The *3 Jars* game was **fair** to everyone in class.				
1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

19. Other students thought that **I was smarter** after using the *3 Jars*.				
1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

20. Rate the **effectiveness** of the *3 Jar* intervention on your homework behavior?				
1	2	3	4	5
Extremely Ineffective		Neutral		Extremely Effective

21. How did you feel about **not knowing** which reward you would get?				
1	2	3	4	5
Awful	Bad	Neutral	Good	Great

Additional Comments/Suggestions:

_____

_____

_____

_____

_____

_____

_____

Appendix B

Teacher Social Validity Questionnaire

Directions: Please complete the following survey regarding the use of the Mystery Motivator intervention that was just completed in your classroom. Each question has a scale after it that indicated your level of agreement with that item. The scale is 1 to 5 with "1" meaning "strongly disagree" and "5" meaning "strongly agree".

Acceptability

1. I was excited to use this intervention.

   1 2 3 4 5

2. I liked the procedures used in this intervention.

   1 2 3 4 5

3. This intervention is a good way to handle classroom management involving mathematics homework.

   1 2 3 4 5

4. I would not be interested in implementing this intervention again.

   1 2 3 4 5

5. I would be resistant to use this intervention again.

   1 2 3 4 5

6. This is an acceptable intervention strategy to improve homework completion and accuracy in mathematics.

   1 2 3 4 5

7. I had positive attitudes about implementing this intervention.

   1 2 3 4 5

8. Overall, the intervention was beneficial for the students.

1 2 3 4 5

9. I was motivated to try this intervention.

1 2 3 4 5

10. This intervention was reasonable for the problem of homework completion and accuracy.

1 2 3 4 5

11. This intervention would be an effective choice for addressing a variety of classroom management problems.

1 2 3 4 5

12. I would implement this intervention again with a good deal of enthusiasm.

1 2 3 4 5

13. The intervention was a fair way to improve homework completion and accuracy behaviors in my classroom.

1 2 3 4 5

14. Use of this intervention would save time spent on classroom management.

1 2 3 4 5

Understanding

15. I understood how to use this intervention.

1 2 3 4 5

16. I was knowledgeable about the intervention procedures.

1 2 3 4 5

17. I knew what to do when I was asked to implement this intervention.

1 2 3 4 5

18. The directions for using this intervention were clear to me.

1 2 3 4 5

19. I understood the procedures of this intervention.

1 2 3 4 5

20. I had the skills needed to implement this intervention.

1 2 3 4 5

21. The requirements for implementing this intervention are unclear.

1 2 3 4 5

Feasibility

22. The amount of time required for record keeping with this intervention was reasonable.

1 2 3 4 5

23. The intervention was implemented for the duration of time as prescribed.

1 2 3 4 5

24. The intervention was implemented with the intensity as prescribed.

1 2 3 4 5

25. The amount of time required to use this intervention was reasonable.

1 2 3 4 5

26. This intervention was implemented as frequently as described.

1 2 3 4 5

27. This intervention was not disruptive to other students.

1 2 3 4 5

28. All pieces of this intervention were implemented precisely.

1 2 3 4 5

Appendix C

Group Contingencies with Randomization of All Contingency Components

Three Jars Intervention Fidelity of Treatment Record

Investigator: _____ Date: _____

Observer: _____

Time session began: _____ Time session ended: _____

Directions: Observe the investigator as s/he implements the intervention and use the scoring code below to note the presence and/or absence of each tutoring component.

Scoring Code: + Goal demonstrated

\- Goal not demonstrated

NA Not applicable

Score	General Implementation
	1. The investigator selects and announces the homework completion or accuracy goal that students must meet to earn reinforcement. The investigator selects the student(s) that must meet the goal; the names of student(s) remain anonymous to the class. The reward is selected if the student(s) meet the goal.
	2. The investigator announces possible rewards if students successfully meet the pre-established criteria.
	3. Possible rewards were identified by seeking pupil input (e.g., asking students, observing students, having students complete reinforcement menus, and/or using suggestions from anonymous box). (You may need to ask the investigator how rewards were identified)
	4. Classroom rules are posted and reviewed by the investigator.
	5. The investigator has a checklist of students (represented by letters) and spaces to record checks for target behaviors.
	6. Investigator provides a halfway check to entire class.
	7. Three labeled jars are visible in classroom; Jar #1 is homework completion and homework accuracy goals; Jar #2 is student(s); and Jar #3 is rewards.
	8. At the start of the class period, when the students are getting out their homework assignments, the investigator selects a piece of paper from Jar #1 to identify the targeted homework goal.

	9.	The investigator then selects a slip of paper from Jar #2 (pieces of paper with the words "Whole Class", "Row...", or "Student..."
	10.	The investigator then evaluates pupil performance on basis of first two jar selections. If pupils meet pre-established criteria, then the investigator congratulates students and randomly selects one pupil to pick a reward from Jar #3.
	11.	If the individual or group fails to reach criteria, then the investigator announces that the goal was not met and encourages students to work harder the following day.
	12.	The teacher does not mention the name of individuals when criterion is not reached.
	13.	Following the session, the investigator makes a smooth transition to the next instructional activity.

Total: _____/13

(Please record the number of behaviors observed plus the number of NA)

Procedural Fidelity: _____ %

Anecdotal Comments:

_____

_____

_____