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I, Talia M Johnson, hereby submit this original work as part of the requirements for the degree of Doctor of Philosophy in School Psychology.

It is entitled:
Examining the Effectiveness of Cover Copy and Compare with Student Goal Setting to Increase Mathematics Fluency

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Examining the effectiveness of Cover, Copy, and Compare
with student goal setting to increase mathematics fluency

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Abstract

An adapted alternating treatment design with baseline was used to compare the effects of Cover, Copy, and Compare (CCC) alone, CCC with student-selected goal setting (CCC + SSG), and a control condition on the mathematics fluency of four students in grades 5-6. Math facts were divided into three mutually exclusive problem sets, with each set randomly assigned to one of the three experimental conditions. Data on digits correct per minute were analyzed visually and by percentage of non-overlapping data, and effect size was used to determine the differential effects of the experimental conditions. The results indicated that CCC and CCC + SSG led to an increase of digits correct for 3 of the 4 students. However, student performance was not significantly different across the CCC and CCC + SSG conditions.

Keywords: cover copy compare, student goal setting, mathematics fluency
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Introduction

The use of mathematic skills is essential to complete functional daily tasks. These tasks include grocery shopping, using measuring instruments to prepare meals, and balancing one’s checkbook. Despite the need for basic mathematic skills, many people struggle to complete basic math tasks. According to Philips (2007), 58% of American adults cannot calculate a 10% tip. Mathematical skills are also essential to success in the workforce and success in the global economy. According to the International Survey of Adult Skills Americans performed 21st out of 23 economically advanced countries (National Center for Educational Statistics, 2013a). The growth of jobs in science and engineering career paths, that are considered mathematically intense, is outpacing overall job growth by 3:1 (National Math Panel [NMP], 2008).

The need for educational reform to increase mathematical proficiency has been addressed by international researchers, national panels and national reforms. The No Child Left Behind Act (2002) increased schools’ accountability for adequate yearly progress in both mathematics and reading skills by mandating state assessments that allow for monitoring of student performance and use scientifically based interventions. However, data suggest that the effectiveness of the educational reforms, which have coincided with implementation of annual testing, have been limited. According to the National Report Card, only 41% of fourth graders and 34% of students in the eight-grade were performing in the proficient range (National Center for Educational Statistics, 2013b). In 2006, a National Math Panel was created to investigate what pedagogies, curricula, and evidence-based strategies produce the greatest gains in mathematic achievement. Despite providing suggestions to increase mathematical competency, the panel’s report also highlighted the need for more rigorous research studies to identify what specific skills are necessary for students to experience success in math. Although there is debate about the best way
to conceptualize mathematics instruction and to measure learning, there are means to assess and compare students’ development of specific mathematic skills, and practices that allow one to make meaningful comparisons of student performance.

**Math Skill Development**

Haring, Lovitt, Eaton & Hansen (1978) developed an instructional hierarchy which can be used to explain how students learn math concepts. According to the instructional hierarchy, learning of new skills progresses through four stages: acquisition, fluency, generalization and adaption. Acquisition is the stage between the onset of the desired behavior and accurate performance of the behavior. The focus of instructional strategies used during this stage includes discrimination activities, such as modeling, frequent performance feedback and guided practice (Haring & Eaton, 1978). Once a student demonstrates accurate responding, instructional practices are changed to address the student’s fluency with the skill. During the fluency stage, the goal of mathematics instruction is to increase the rate of accurate responding. Students that have skill deficits at this stage typically demonstrate accurate responding but fail to exhibit the skill at acceptable rates. Problems during this phase of learning have also been referred to as performance deficits (Carson & Eckert, 2003). Performance deficits have been defined as the failure to perform a skill at acceptable rates despite the presence of the skill at acceptable levels (Skinner, 1998). School-based interventions to address performance deficits typically include providing performance feedback, contingent reinforcement, and setting performance goals (Carson & Eckert, 2003). While fluency interventions address the student’s proficiency with a skill across time, interventions in the next stage, the generalization stage addresses a student’s proficiency with a skill across contexts. Generalization is the third phase of skill development. After a student has demonstrated fluency with the skill the use of the skill is applied to novel
situations. Students who have problems with generalization typically confuse what stimulus is needed in order to signal the use of one strategy as opposed to another. Instructional practices at this stage focus on student’s ability to discriminate when to exhibit the appropriate skill. The final stage is adaptation. During this final stage, the student is able to demonstrate when to use the skill in novel situations but has not demonstrated the ability to adapt the skill to fit a variety of contexts. Unlike the previous stages, in which the student can demonstrate a level of proficiency, the student’s ability to adapt skills to fit novel situations is refined throughout the student’s life. This instructional hierarchy has been used to describe and compare how students learn academic skills; it also allows one to make meaningful comparisons of learning within and between students.

Within the field of mathematics, scholars debate the need for fluency with basic math facts (Thomas, 2012). These debates have increased with the use of calculators to complete basic math facts as well as the acceptability of the use of calculators on standardized math assessments. Students in the United States have lower fluency rates with automatic recall of addition, subtraction, multiplication, and division facts when compared to their peers internationally, as well as compared to U.S. students of previous generations (NMP, 2008). According to the National Math Panel, these deficits may be due to a lack of practice opportunities, and limits in the pedagogy associated with mathematics instruction. To date, mathematic curricula have been developed with the assumption that students should be taught math in steps based on developmentally appropriate guidelines. This belief has led to a mathematics curriculum that is largely driven by age-grade levels and developmental appropriateness instead of using formative assessments to guide instruction (NMP, 2008).
Mathematic fluency has been conceptualized differently across educational disciplines and has led to different emphases in pedagogy and research. In behaviorally focused disciplines, fluency has been defined as demonstrating accurate and quick rates of responding to allow for observations of rate of performance (Thomas, 2012). However, the NMP (2008) suggest that mathematic fluency includes accuracy and quick rates of responding as well as deeper understanding of the mathematical principals associated with the behavior. This concept coincides with Bruner’s (1960) argument for conceptual fluency. Bruner (1960) argued that if students participate in the process of learning, instead of being expected to demonstrate mastery of a technique, then students are more likely to generalize the skill to novel and new situations and make meaningful connections between skills as their mathematic development continues.

Instruction in early mathematics competence begins in Kindergarten. Mathematic instruction begins focusing on number identification and one to one correspondence, followed by a focus on addition, subtraction, multiplication and division (Carson, & Eckert, 2003). Due to the nature of early mathematics instruction, early difficulties in mathematics are often due to performance deficits in the student’s ability to fluently recall basic math facts (Figarola, Gunter, Reffel, Worth, Hummel & Gerber, 2008). According to Fuchs, Fuchs & Karns (2001), children’s mathematical skill knowledge may span more than four grade levels as early at the end of Kindergarten. By fourth grade, it is expected that students have mastered basic math skills and instruction begins to focus on higher level problems. Despite changes in the instructional focus, research suggests that many students have not obtained enough opportunities to practice basic mathematics skills (Codding, Chan-Ianetta, Palmer & Lukito, 2009).

Providing additional practice opportunities is the first step in increasing students’ computational fluency; however, motivating students to complete additional practice and drill
activities is equally as important. Typically practice opportunities include the use of math fact drills which may include the use of worksheets or flashcards. However, the novelty of these practice interventions decreasing with time and students may be less likely to attend to the drills. Self-managed interventions have been used to increase student motivation and the social validity of practice drill activities (McDougall, 1998). Student managed interventions provide students choice about instructional practices. Contingencies and completion rates have also been correlated with increased student performance on academic tasks (Carson & Eckert, 2003).

**Cover, Copy, and Compare**

Cover, Copy, and Compare (CCC) is a self-managed academic intervention that has been used across academic skills and subjects. CCC has been used most often to increase students’ academic performance in spelling and mathematics (Joseph, Konrad, Cates, Vajcner, Eveleigh & Fisher, 2012). CCC includes three important components of evidence-based interventions: modeling, guided practice, and immediate performance feedback (Joseph et al., 2012). CCC utilizes these components in five steps. For math CCC, students (a) look at a mathematics problem with the solution, (b) cover the problem and solution, (c) rewrite the problem with the solution, (d) uncover the original problem and solution, and (e) compare the answers. If the student response is inaccurate, the student repeats the CCC procedure until an accurate response is provided. The skill is modeled as students examine the mathematic problem and solution and practice is provided when students cover the model and begin to write the problem and solution. When students compare their problem and solution with the model, they are provided with immediate performance feedback.

CCC allows students to work independently and also allows for the differentiation of instruction and practice (Skinner, McLaughlin, & Logan 1997). Students are able to get immediate
feedback about their accuracy and continue to practice the skill until they are able to respond correctly. CCC trials are brief and students are able to complete many learning trials in short durations of time. According to study by Skinner, Ford and Yunker (1991), one student was able to complete 90 learning trials in 2 minutes using CCC. The simple discrete steps included in the CCC procedure allow students to use the intervention with accuracy. This additional practice with the skill also increases the student’s fluency and allows for overlearning of the skill.

To advance the CCC research, researchers examined the conditions under which CCC is most effective. Recent research by Codding et al. (2009) suggests CCC is most effective as an intervention for students who are demonstrating low rates of accurate responding, and students’ with higher performance levels, although still below desired fluency levels, may be less motivated to engage in the procedures. CCC has been demonstrated as an effective intervention at increasing both accuracy and fluency (Skinner, McLaughlin & Logan, 1997). CCC has been effective at increasing academic performance in a variety of subject areas; however, the effects of the intervention increased when combined with other evidence-based methods such as goal setting, increased opportunities to respond, and the use of token economies (Joseph et al., 2012).

Skinner, Bamberg, Smith and Powell (1993) used a variation of CCC to increase the fluency with division facts of three elementary students with behavioral disorders. The variation of CCC used in this study added a cognitive component students were trained to look at the model problem and answer, cover the model, and say the problem and answer to themselves. Then, the students were instructed to uncover the problem and answer and compare their verbal solutions to the model problem. If they made an error, students were to repeat the procedure. The study employed a multiple baseline design. Two of the three students increased their rate of responding to mastery level following the intervention. The third student required feedback and
goal setting in order to achieve mastery. Eight months after the intervention students continued to perform at the mastery level in division facts.

**Goal Setting Interventions**

Goal setting is another strategy that has been found to have a positive effect on academic performance across academic content areas including reading, writing, and math (Lee & Tindal, 1994; Page-Voth & Graham, 1999; Schunk, 1985, von Mizener & Williams, 2009). Goal setting involves multiple steps, including identifying present performance and using that information to create performance objectives for future behavior. Locke, Shaw, Saari & Latham (1981) reviewed the effects of goal setting on performance and found that, in 90% of the studies, specific goals led to higher performance than easy goals, prompts to do your best, or no goals. It has been hypothesized that student-selected goals (SSG) may increase motivation and serve as a structure that allows students to measure their effort while providing performance feedback (Schunk, 2001). According to Locke and Latham (2002), there is a positive linear relationship between the goal difficulty of student-selected performance standards and student effort and performance. While the data suggest that SSG may increase performance, von Mizener and Williams (2009) examined whether the increase in performance was due to student selection of goals or if the results were due to student choice alone.

von Mizener and Williams (2009) synthesized literature which included student choice about (a) performance goals or standards, (b) type of assignment, and/or (c) type of rewards for academic performance. This review differed from previous reviews of student choice in that 86% of the studies included general education students as the target population, whereas previous reviews on student choice focused on students with problem behaviors or academic deficits. The review also differed in its inclusion criteria. von Mizener and Williams (2009) limited the
review to include studies that included a choice that was linked to an academic activity. Based on their analysis, student choice had mixed results on academic performance. von Mizener and Williams (2009) noted that this may be due to the inclusion of general education students and proposed that choice may be a greater factor when working with students with disabilities. Another limitation was with the design of the various studies. It was noted that, for single case designs, students may not have been able to discriminate between the choice and no choice conditions. Despite the mixed results, the type of choice that had the highest success overall was goal and standard setting (von Mizener & Williams, 2009).

One of the earliest studies comparing SSG and assigned goals was conducted by Lovitt and Curtiss (1969). The study included a 12-year-old participant. Goals were set based on a token economy in which the participant could earn tokens for correct performance on academic assessments and exchanged for time in a high-interest room. The teacher assigned the criteria for points earned per academic responses in the beginning and end of the study, while the student assigned the criteria in the middle phase. The student’s academic response rates were higher in the student selection phase than the teacher selection phase. However, the student tended to award himself more points per academic response than the teacher assigned condition. Due to the student awarding himself more points, a second study was completed to confirm that the student’s behavior was influenced by having the choice of points instead of the quantity of points earned. The results of the second experiment verified that the student’s behavior was the result of student choice. One limitation of the study is the small sample size. Another limitation is that the student awarded points across content areas. Therefore, one cannot determine if the student assigned different contingencies based on preference or perceived difficulty in a particular
content area, or if student awarded different point values based on particular skill sets within a content area and if these differences may have had effects on the student’s performance.

Glynn’s (1970) investigation extended Lovitt and Curtiss’ (1969) research. In the study, students could earn points for answering items correctly on a 20-item multiple choice test. General education students were randomly assigned to four different conditions/classes. In the first condition, the teacher assigned the number of points needed to earn tokens; tokens could be exchanged for inexpensive prizes. In the second condition, students chose the points needed to earn a token but could not receive more than five tokens per test. In the third condition, students were given tokens based on the standard selected by a student in the student choice condition. In the final condition, students received no reinforcement. Scores on the daily test were higher for the student-selected criterion condition and the experimenter-selected criterion condition than the no reinforcement condition. However, the difference between the student-selected criterion and teacher-selected criterion was not significant. Felixbrod and O’Leary (1974) systematically replicated the study in a general education setting and found similar results.

Fuchs, Bahr, and Reith (1989) also investigated the effects of student-selected and teacher-assigned goals. This study investigated the effects of goal setting and performance contingencies on the math performance of students with disabilities. Their study differed from the previous studies by providing students with a choice of three goal levels rather than assigning points per academic response. Based on the level of the goal chosen (i.e., easy goal, moderate goal or stringent goal), students could gain access to a video game. More stringent goals were associated with more access to the video game. Students who picked the stringent goal could play for 90 s compared to 30 s of play for the easy goal. This study included 20 urban high school students with disabilities. Students were assigned to the 4 groups using stratified random
assignment, while controlling for mathematic achievement. The dependent variable was number of correct digits on randomly generated computer assisted drill and practice sessions. These facts included addition, subtraction, multiplication, and division problems. This study included 4 conditions, assigned goal and non-contingent, student-selected goal and non-contingent, assigned goal and contingent, and student-selected goal and contingent. The results of the study indicated that math performance was unrelated to game contingency (goal level vs. goal attainment), and goal level (easy, moderate, stringent). However, students in the student-selected goal conditions, across both contingent and non-contingent conditions, improved more than students in the assigned goal condition. This study provides further evidence of the positive effect of SSG for student with disabilities. This study was also the first study to compare SSG with contingencies and without contingencies and provided further evidence that SSG without contingencies may be more effective than assigned goals.

Several studies have been conducted to compare the effectiveness of SSG, other selected goals, and no goals. The studies have conceptualized goal setting as student choice of performance standards. These standards have been conceptualized to include points per correct response or choice of goal levels. The majority of the studies investigating student choice have utilized experimental designs, which included three or more groups with academic response as the dependent variable. Although goal setting was investigated in each of the studies described above, it was still used as a multi-element treatment. Students were motivated to meet their goals to earn access to a preferred activity, social, or token reinforcement.

**Comparing Teacher-Selected and Student-Selected Goals**

To examine the effect of SSG independent of extrinsic reinforcers, Schunk (1985) compared the effects of SSG, assigned goals, and no goals on the math performance of middle
schools students. Students were selected to participate by teacher nominations due to low performance on math subtraction facts. Using a group design, students were assigned to three groups; SSG, assigned goals, and a no goal condition. Goals were based on the number of math pages completed per session. To control for goal difficulty in the student-selected goal condition, students had to select a goal between 4 and 10 pages. These numbers were selected based on results of a pilot study in which the average student was able to complete 7 pages within the session. In the assigned goal condition, students’ goals were based on the average number completed in the group for the previous session. Using pre-post measures of subtraction skills, Schunk (1985) found that the students in the student-selected goal condition demonstrated higher subtraction skills than the other two conditions. There was no difference between the subtraction skills of the students in the assigned goal or no goal conditions.

Codding, Lewandowski, & Eckert (2005) investigated the effects of SSG and assigned goals for students with Attention Deficit Hyperactivity Disorder (ADHD). The study included seven fifth and sixth grade students with a medical diagnosis of ADHD. Students were nominated by their teachers for participation in the study due to deficits with basic math facts. Teacher nomination was validated using math fluency and math calculation subtests from standardized achievement batteries. Prior to the investigation, students completed math probes to assess for accuracy with basic math facts. Only skills in which the student displayed accurate responding but low rates of responding were included. Targeted skills included single and double digit addition or subtraction, except for one student in which the target skill was triple digit addition. Dependent variables included the number of correct and incorrect digits per minute. In order to assess improvement across time, students were provided with curriculum based measures. Students completed the 49 problem probe for 1 min each session. The probe included
one targeted math skill. Pre and post measures included comparisons of instructional levels on the math calculation and fluency achievement battery subtest as well as the total number of problems completed during the initial and final assessments.

An alternating treatment design was used to compare performance feedback with assigned goal setting and performance feedback with student-selected goal setting. Treatments were alternated across days and were counterbalanced across sessions. To help students discriminate between the two treatments, students were informed how the current session differed from the previous day. The probes for each condition were also printed on different colored paper to further distinguish the two treatments. The final phase included the use of the treatment in which the student had the highest number of digits correct. During the assigned goal condition, students were told their baseline performance (or that of the previous session) and provided with a bar graph indicating digits computed correctly. The student was then provided with the prompt to try to complete more problems than the previous session. During the student-selected goal condition, students were again provided information about their performance on the previous session and provided a bar graph indicating the digits completed correctly during the last assessment. The student was then asked to select a goal for the current session. In both conditions, students were told the number of digits computed correctly and asked to graph their performance on a bar graph.

Codding et al. (2005) found that performance feedback and goal setting increased mathematics fluency for all of the students. Three students’ math performance declined in the student-selected goal condition but increased in the assigned goal condition. However, the differences in the decline for these students were not significant between the two conditions. SSG were more effective for two students. While there was an increase in performance overall
for the other five students, the two treatments appeared to be equally effective at increasing overall math performance. However, as in previous studies, the students rated the student-selected goal condition more favorably than the assigned goal condition.

While this study provides further evidence of the social validity and effectiveness of using SSG, there are several limitations of the study. The first limitation was that students reported being unable to discriminate between the two conditions. Secondly, conditions differed in the type and specificity of goals. In the student-selected goal condition, students were instructed to choose a numerical performance standard. However, in the assigned goal condition, students were prompted to do better than their previous performance and no specific amount was given. According to research by Locke et al. (1981) students’ performance increases when goals are specific in nature. Therefore, the two conditions differed more not only in goal assignment, but in goal specificity.

**Cover, Copy, and Compare and Goal Setting**

Codding et al. (2009) compared the effects of CCC alone and with goal setting. Using random assignment of ten classrooms (n=173 students), classes were assigned to either a control condition, CCC, CCC and goal setting for correct problems, and CCC and goal setting for errors. Students were provided with the CCC procedure twice a week for 6 weeks. Subtraction was selected as the targeted skill due to high levels of accurate responding by the student sample. Students were not provided with subtraction practice outside of the intervention sessions. Progress monitoring of subtraction occurred on the same day as the CCC procedures. Each probe included 49 problems, and 15 additional problems were added due to students’ growth. Students in the control condition were provided with the progress monitoring probe twice a week using the same procedures as those in the treatment groups.
In the CCC condition, students completed a progress monitoring probe prior to completing the CCC procedure. The CCC procedure was provided on worksheets so that the model was on the left side and the same problem without an answer was on the right side. Students were trained on the CCC procedures during the first three sessions. Students completed the CCC procedures for 3 min. In the CCC conditions with goal setting of correct problems and goal setting for errors, students were presented with a bar graph prior to completing the progress monitoring probe. Goals were selected by the researcher, and student’s goals were to be a one problem increase or one error decrease over the last session. Goals were presented on the bar graph both visually and with a text box. In the goal setting for errors if the student had no errors during the previous setting the goal remained at zero. After completing the progress monitoring probe, students completed the CCC procedures for 3 minutes.

Fluency for all of the students in the study increased; however, as expected, students in the control group made the fewest gains, followed by the students in the CCC condition with goal setting for errors. Students in the CCC condition with goal setting for correct problems solved demonstrated the greatest growth between sessions and, at the end of the intervention, they also had higher levels of generalization and retention of skills. Despite being the least effective treatment, CCC with goal setting for errors was rated by the students as the most acceptable treatment. The researchers postulated that this may be due to the ecological validity of receiving error feedback in academic settings. A limitation of this study was that students were assigned to conditions based on class membership which may not have accounted for skill differences within each classroom.
Current Study

The current study was designed to extend the research demonstrating the effects of CCC and student-selected goal setting on mathematic fluency. The study provides additional research on the effectiveness of student choice and goal setting on academic performance. Specifically, the study compared the effects of CCC with and without student goal setting. While Codding et al. (2009) found that students in the goal setting for correct problems condition did better than the control condition, CCC condition, and CCC with goal setting for errors, the goals were assigned by the researchers and students were not provided the opportunity to select their own goals. Studies comparing the effectiveness of student-selected versus other selected goals have produced mixed results; however, in most of the studies, those in the student-selected goal condition did better than their previous baseline scores and the control group.

While CCC has traditionally been used as an intervention to increase fluency, Codding et al. (2009) suggest that CCC may be most effective for students in the acquisition stage of learning; postulating that students who have accurate rates of responding may find the procedure frustrating due to the overlearning and over practice of the skills. According to Codding et al. (2009), adding a goal setting component may increase the social acceptability of the procedure for students who are demonstrating accurate rates of responding. CCC may be most effective when combined with additional performance feedback such as goal setting or token economies (Codding et al., 2009; Joseph et al., 2012). However, studies examining the effectiveness of CCC and goal setting have employed teacher or other assigned goals. One of the benefits of using CCC is that it is a self-managed intervention; however, if goals for performance are selected by adults instead of students, student control is diminished. Also, teacher goal setting would require more time of the teacher, possibly decreasing the ecological validity of using CCC.
in traditional classroom settings. If students are able to complete CCC procedures and select goals for their performance, they may be able to manage their learning and challenge themselves independently.

The current study addressed the following research questions.

1. Does the use of SSG with CCC (CCC + SSG) lead to greater gains in mathematic fluency than CCC in isolation?

2. Does the addition of SSG to CCC procedures lead to greater performance gains for students who are demonstrating accurate levels of responding compared to those who are still acquiring the skill?

3. Does the addition of SSG to CCC procedures lead to higher levels of intervention acceptability?

Method

Participants

Student/Teacher Selection. The classroom teacher volunteered to participate in the study due to her desire to provide additional mathematic interventions in her classroom. Only one teacher was selected to participate in to minimize any differences in math instruction during the study. The primary researcher, a licensed school psychologist, and the classroom teacher provided the intervention. The study included four teacher-nominated students in an intermediate self-contained classroom for students in need of increased behavior supports. Written parental permission and student assent was obtained for all students. All of the students received special education supports. The students in the study were in grades five and six and included three males and one female student.
Students were selected for inclusion based on their performance on district benchmarks and universal screeners. Students in the class participated in benchmarking of academic skills every four weeks. Students’ skills were assessed using a standardized criterion-referenced assessment developed to monitor students’ growth on grade-level indicators. The assessment was developed by the school district’s assessment and research office and included questions from previous state assessments and teacher-developed questions created to address common core standards. Based on students’ performance on the grade-level indicator, they were designated as needing to be retaught the skill, more practice with the skill, or enrichment activities. Students who scored in the reteach and practice categories in mathematics fluency of basic mathematic facts in addition, subtraction, division or multiplication were further screened by their classroom teacher using mathematics computation fluency probes from Aimsweb that allow for comparison of students’ performance on math facts to national norms (Pearson Education, 2012). Based on the students’ performance on grade level benchmark assessments and Aimsweb math probes, students were screened by their classroom teacher using a researcher-developed single-skill math probe. Each student completed one researcher-developed math probe to provide additional data about the student’s performance prior to participation in the study. The type of facts included on the probe was chosen based on the students’ performance during screening and teacher preference and included multiplication fact fluency.

Students were eligible to participate in the study if they performed within the frustrational to instructional level on the researcher-developed, multiplication fact, curriculum-based measurement (CBM) probe. The frustrational level for students in the fourth grade and higher is 20 digits per min and below (Deno & Mikin, 1977; Shapiro, 2004). Students who performed within the frustrational level would benefit from explicit instruction and immediate performance
feedback of the skill. The instructional level for students in fourth grade and higher is between 20-39 digits correct per minute (Deno & Mirkin 1977; Shapiro, 2004). Students who perform within the instructional level have acquired the skills to complete the problems with accuracy but would benefit from continued practice with the skill (Shapiro, 2004).

*Students.* All of the students in the current study transitioned back into the traditional school setting during the fall, after spending at least two years in a specialized educational setting, due to their need for increased behavioral supports. All of the students’ school history included day-treatment. Day-treatment is an alternative school placement that includes a mental health focus combined with an abbreviated school day, where instruction in reading and math occurs for less than two hours a day. Typically, students who attend separate facilities during their primary years have gaps in the instruction of basic mathematic skills including those related to math fact fluency.

Mark was an 11-year-old African American male in the fifth grade. He attended a traditional school for kindergarten through second-grade before attending separate facilities for third and fourth-grade. Mark’s time at the separate facilities included one year in a day-treatment program, and the second year in an alternative educational program. Mark transitioned to the self-contained classroom in the fall of his fifth-grade year. Mark’s performance on district assessments indicated that he would benefit from additional practice in all areas of mathematics fluency. When screened using the researcher-developed CBM multiplication probe Mark scored within the instructional range on multiplication facts.

Alexis was a 10-year-old African-American female in the fifth-grade. She received her education in a traditional school setting from kindergarten until the middle of third-grade when she transitioned to a separate facility. Alexis completed the second half of third-grade in a day-
treatment program and completed fourth-grade at an alternative educational program. Alexis transitioned to the self-contained classroom in the fall of her fifth-grade year. Alexis’ scores on district benchmark assessments indicated that she would benefit from additional instruction in subtraction, multiplication and division math facts. When screened using the researcher-developed CBM multiplication probe, Alexis scored in the instructional range on multiplication facts.

Terrence was an 11-year-old African-American male in the fifth-grade. Terrence attended a traditional elementary school for Kindergarten through mid-first grade before transitioning to a separate facility for the remainder of first-grade through fourth-grade. Terrence attended a day-treatment program for a year and a half before transitioning to an alternative educational setting to complete third and fourth grade. Terrence transitioned to the self-contained classroom in the fall of his fifth-grade year. Terrence’s scores on district benchmark assessments indicated that he would benefit from additional practice with addition and subtraction facts and additional instruction with multiplication and division facts. Terrance scored within the frustrational range on multiplication facts, when screened using the researcher developed CBM probe.

Andre was an 11-year-old African-American male in the sixth-grade. Andre received his education in a traditional school setting for kindergarten and first-grade before transitioning to a separate facility for second through fifth-grade. Andre completed second-grade in a day-treatment program, before transitioning to an alternative educational setting to complete third through fifth grade. Andre has received his special education services in a self-contained classroom since the fall of his sixth-grade year. Andre’s district benchmark assessments indicated that he would benefit from additional practice with subtraction and additional facts and
instruction in multiplication and division facts. According to the researcher developed CBM probe, Andre scored within the frustrating range on multiplication facts.

**Teacher.** The classroom teacher was a female intervention specialist. It was her seventh year as an intervention specialist within the school district; however it was her first year providing support in a self-contained classroom.

**Setting**

The study was conducted at an elementary school within an urban school district in the Midwestern United States. The school enrollment was 590 students (48% African-American, 38% Hispanic, 7% Caucasian, and 6% Multi-racial). Twenty-three percent of the students enrolled in the school were students with disabilities and 96% of the students were economically disadvantaged.

Student participants received instruction in a self-contained special education classroom designed to support students transitioning from more less restrictive settings in need of increased behavior supports and to support students from more restrictive school settings into a traditional school setting. To aid with student transitions, the classroom included the use of positive behavior supports, explicit instruction of behavioral expectations, and a structured reinforcement system. Students received all academic instruction in small groups and were provided additional instruction in reading, which included the use of a computer-based comprehension program; however, there was no structured math intervention or programming outside of the use of the universal district curriculum. Students received math instruction for 45 minutes a day. Due to the range in grade and skill level, math instruction was provided in small groups. Students rotated among (a) direct instruction stations with the intervention specialist, (b) practice stations with the classroom paraprofessional to allow for immediate performance feedback of skills learned with
the intervention specialist, or (c) a computer station where students completed math problem solving problems to progress through a leveled video game. At the time of the current study, no instruction or practice of multiplication facts was provided to students.

**Experimental Design**

An adapted alternating treatments design with baseline was used to compare the effects of CCC alone, CCC + SSG, and a control condition. In an alternating treatments design, two treatments are administered alternating one another. In the adapted design, a control condition is implemented along with the alternating treatments to allow for the comparison of the two treatments, while also collecting data to support the internal validity and account for effects such as history, spillover, and testing (Poncy, Skinner, & McCallum, 2012). The replication of effects across participants serves as evidence of internal validity. Following baseline, the three experimental conditions (i.e., CCC alone, CCC + SSG, and control) were presented to students in an alternating fashion, with the order of presentation counterbalanced. Each condition used a distinct math fact problem set.

**Dependent Variable**

Mathematics CBM probes were used to assess multiplication fact fluency and included the use of a single dependent variable. CBM are brief probes administered repeatedly to allow for direct assessment of academic skills. These measures are sensitive to growth and allow for the monitoring of academic skills as a result of academic interventions (Deno, Marsten & Tindal, 1985-1986; Deno & Mirkin, 1977; Shapiro, 2004). Mathematics CBMs can be used to progress monitor robust indicators of elementary math skills such as math fact fluency. Typically, mathematics fluency measures are 1 or 2 minute single operations or mixed fact probes. The reliability of the robust math fact fluency probes has been strong, with coefficients of .80 or
higher (Foegen, Jiban, & Deno 2007). Hintze, Christ and Keller (2002) found that single probe CBMs could be used to make valid comparisons of students’ performance when making comparisons of: a set criterion, between student performance, and across time. Based on student’s performance during screening, it was determined that multiplication fact fluency would be targeted. A pool of multiplication facts using the digits 0-12 was created and divided into three mutually exclusive problem sets containing 21 problems (Appendix A). Each problem set was randomly assigned to one of the three experimental conditions: CCC, CCC + SSG, and control. Following a procedure similar to Poncy et. al (2012), 6 math probes were developed for each set. Each probe consisted of 48 problems with 8 rows of 6 problems. Each probe included 21 distinct problems which were repeated twice. Similar problems, including the inverse of facts (i.e., 8 X 4 and 4 X 8), were separated by at least two rows. Math probes were scored by counting the total number of digits correct per minute. Students were given 1 minute to complete each probe. A digit correct per minute is more sensitive to growth than counting a problem correct or incorrect. In scoring a math problem whose solution includes two digits, the student has the opportunity to earn a point for each digit; if one digit in the solution is incorrect the student would earn a point for the correct digit. Using this method, students can earn partial points that allow for emerging skills to be included in the student’s overall score. Previous studies have found number of digits correct is a valid and reliable measurement of mathematics fluency (Foegen, et al., 2007; Shapiro, 2004).

**Procedures**

The duration of the study was three weeks, due to university and district time restraints. Baseline data were collected during the first three sessions. Only three baseline sessions (e.g., versus waiting for stabilized data) were conducted with each student due to frequent student
absence, school closings due to weather, and the teacher’s desire to keep the research within the agreed upon time frame. Following baseline, each intervention session lasted approximately 5 to 10 minutes, with the duration of the student goal setting session closer to 10 minutes. The collection of the control condition data took approximately 2 minutes per day, including the amount of time it took to pass out and collect math probes. Control data were collected each morning during the intervention phase. In total, the intervention took approximately 20 minutes each day. Research-related activities took place in an extended learning area outside of the students’ classroom. Students worked individually the primary researcher.

Following the first baseline session, students received training in CCC procedures. The CCC alone and CCC + SSG conditions were counterbalanced with one intervention occurring in the morning and one in the afternoon, five times a week. After the first day of the CCC intervention, control probes were administered at the beginning of each day and the remaining two probes were administered prior to intervention sessions in counterbalanced order across days.

**Baseline.** During the baseline condition, students were prompted to complete three, single-skill multiplication fact probes for 1 minute each (one probe from each problem set). Students were instructed to read each problem carefully and complete the problems to the best of their ability. After 1 minute, students were instructed to turn in their papers. After the assessment, the primary researcher counted the total digits correct per minute. Students were not given any information about their performance but were given praise for trying their best.

**Training of CCC procedure.** Students were trained in a group by the primary researcher on how to complete the CCC procedures (Appendix B). The training lasted for 30 minutes and took place on the final two days of baseline data collection. To avoid practice effects, the
training used lower-level addition facts. The training began with the primary researcher modeling and explaining the steps of CCC. The students were then given a sheet that outlines the steps (Appendix C) and the training packet. Following the modeling of the steps, students were asked to complete a training sheet that includes five problems. In order to participate in the study, students were required to demonstrate the correct steps of CCC for all five practice problems. All students were able to demonstrate the correct steps.

**CCC.** After the initial session, students were asked to complete a progress monitoring probe at the start of each CCC condition. The researcher then instructed students to complete a CCC work packet for 3 minutes. They were told to place their names across the front of the first page and reminded to follow the steps outlined on the included worksheet (Appendix C). The work packet included 21 problems (one problem set) that were repeated. The left side of the each sheet in the packet included the problem and the solution and the right side had the same problem without the solution (see Appendix D). The primary researcher instructed the students to work on their CCC packet until she said stop.

**CCC + SSG.** In this condition, students were asked to develop goals based on their performance on the 1 min mathematics probe. Prior to setting goals, students were given a line graph that reflected their digits correct per minute during previous goal settings conditions. The graph also included the digits solved correctly next to the data marker on the graph. During the initial CCC + SSG condition, students were provided with a line graph of their performance during the CCC + SSG baseline condition. The line graph was made by the primary researcher. Students also were given a goal setting worksheet (Appendix E). The students were prompted to look at their previous performance on the graph and write the number of digits computed correctly on the appropriate line on the goal setting worksheet. Next, students were instructed to
make a goal for the number of digits they would like to compute correctly for the current trial and transpose the number to the goal setting worksheet. To insure that students were selecting meaningful goals, students were instructed that their goals had to be at least three digits greater than the number of digits correct of their previous performance (Lee & Tindal, 1994). Then, the researcher passed out the math probe and instructed students to begin. Students had 1 min to complete the assessment. After completing the assessment, students passed in their math probes to be scored by the primary researcher. Then, students were given 3 minute to complete the CCC packet. Once the students completed their 3 minute CCC packet, they were given their 1 minute math probes with the digits correct per minute across the top. The students were prompted to write the number of digits correct for that assessment on their goal setting worksheet. After completing their worksheets, the students were asked to turn in their goal setting worksheet and math probes.

**Treatment Integrity**

Treatment integrity data were collected for student adherence to the procedures for 20% of the sessions, sampled across conditions, using a treatment integrity checklist (see Appendix F). Data were collected twice per student per condition. Treatment integrity data were collected by the primary researcher, by using a checklist and checking off each step as they were completed. Treatment adherence was 100% for all observed sessions.

**Social Validity**

Social validity questionnaires were administered to students and the teacher upon completion of the study. The questionnaires were scored on a 5-point Likert scale (Appendix G & H). The questionnaires were designed to address (a) the ecological validity of the interventions, (b) student’s rating of effectiveness of interventions, (c) acceptability of the
intervention, (d) preference of treatment between the CCC and CCC + SSG conditions, and (e) the students’ and the teacher’s willingness to use the intervention in the future.

**Results**

The purposes of the current study were to examine: a) if the use of SSG with CCC led to greater gains in mathematic fluency than CCC alone? b) if the addition of SSG to CCC procedures led to greater performance gains for students who are demonstrating accurate levels of responding compared to those who are still acquiring the skill? and c) if the addition of SSG to CCC procedures lead to higher levels of intervention acceptability? Visual analysis was the primary method for analyzing the data. Data were graphed and analyzed by examining trends, levels, and variability between the conditions for each participant within and across phases (Kennedy, 2005). Trend was determined by creating a slope of the dependent variable. Variability was assessed by comparing how much the data fluctuates around the mean. Level is examined by comparing the means between the conditions (Horner, Carr, Hall, Odom & Wolery, 2005). Figures 1-4 display student DCM data across conditions and phases of the study and Table 1 reports summary data.

Data also were evaluated using percentage of non-overlapping data points (PND). PND is calculated by counting the number of intervention data points that are higher than the highest baseline point (if an increase in performance is desired) and dividing the number by the total number of intervention points. A PND of at least 80% is considered a large effect (Riley, Tillman & Burns, 2009). In addition, to calculating PND to evaluate difference between baseline and intervention phase performance, PND was also calculated to evaluate overlap between data paths within the intervention phase. Table 2 includes PND data. Due to PND only accounting for one point in the baseline condition, PND does not provide information about slope of the data;
therefore, one outlier or high variability within a data set may lead to either high levels of effectiveness or low levels of effectiveness. Another limitation is the inability to compare PND with other measures of effectiveness.

Effect size was used to allow for standardization of data and allow for comparisons across scores (Daly, Chafouleas, & Skinner, 2005). Effect sizes were calculated to describe the effects of CCC and CCC + SSG on mathematics fluency. To examine intervention effects as compared to baseline, effect size was calculated by subtracting the mean of baseline from the mean of intervention and dividing by the standard deviation of baseline (Kratochwill, Elliot & Busse, 1985). Based on data in the alternating treatments phase, effect sizes were calculated to compare CCC to control (mean of CCC – mean of control/ standard deviation of control), CCC + SSG to control (mean of CCC + SSG – mean of control/ standard deviation of control), and CCC to CCC + SSG (larger intervention mean – smaller intervention mean/ standard deviation of smaller mean intervention condition). According to Cohen (1992), small effects are defined as 0.2, medium effects as 0.5 and large effects as 0.8. However, these guidelines for effect size were derived from large group research. According to Kratochwill, et al. (1895), effect sizes of +1.0 or greater represent practical change of significant magnitude. Effect size data are reported in Table 3.

Baseline data were collected for every student across three instructional days to establish a point of comparison for intervention data and to establish the equivalence of the three problem sets in terms of difficulty. However, baseline data collection was expedited due to instructional needs and teacher request. Therefore, stable performance levels were not observed across all problem sets for all students before moving on to the alternating treatments phase.
Mark

Mark’s baseline data reflected relatively similar performance levels on the math fact sets assigned to the CCC alone ($M = 24.67$; range, 24-29) and CCC + SSG conditions ($M = 28.00$; range, 22-37). However, Mark’s performance on the control problem set was at noticeably higher levels ($M = 48.33$; range, 43-50), suggesting that the three problem sets were not of equal difficulty for Mark (Figure 1 and Table 1).

Figure 1. Mark’s Digit Correct per Minute Data across Phases and Conditions
Baseline data from the CCC alone problem set demonstrated a slight increasing trend, which carried over into the intervention phase, limiting interpretations regarding the effectiveness of the CCC intervention (Figure 1). Although data from the CCC + SSG condition did immediately improve in level upon intervention introduction (CCC + SSG baseline $M=28.00$; CCC + SSG intervention $M=37.29$), intervention phase data remained somewhat variable and overlapped with baseline data ($PND=42.86$). However, the variability decreased and an increasing trend was observed for the last three data points (Figure 1). Control condition data also were variable throughout the intervention phase, but had more overlap with the baseline phase data ($PND=14.29$) than did the CCC and CCC + SSG data (Table 2). The introduction of both CCC interventions was followed by improvements in performance as compared to baseline for Mark (CCC intervention vs. CCC baseline $ES=4.31$; CCC + SSG intervention vs. CCC + SSG baseline $ES=1.43$).

<table>
<thead>
<tr>
<th>Students</th>
<th>Control</th>
<th>CCC</th>
<th>CCC + SSG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline</td>
</tr>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Alexis</td>
<td>16.89</td>
<td>4.10</td>
<td>21.29</td>
</tr>
<tr>
<td>Terrence</td>
<td>21.00</td>
<td>2.16</td>
<td>23.43</td>
</tr>
<tr>
<td>Andre</td>
<td>18.66</td>
<td>10.27</td>
<td>32.29</td>
</tr>
</tbody>
</table>

Table 1 Digits Correct Per Minute Means and Standard Deviations across Conditions and Phases
<table>
<thead>
<tr>
<th></th>
<th>Baseline vs. Intervention Phase Data</th>
<th>Intervention Phase Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>CCC</td>
</tr>
<tr>
<td>Mark</td>
<td>14.29</td>
<td>85.71</td>
</tr>
<tr>
<td>Alexis</td>
<td>0.00</td>
<td>28.57</td>
</tr>
<tr>
<td>Terrence</td>
<td>42.86</td>
<td>85.71</td>
</tr>
<tr>
<td>Andre</td>
<td>42.86</td>
<td>14.29</td>
</tr>
</tbody>
</table>

Table 2 Percentage of Non-Overlapping Data Points

There was no clear differentiation of data paths according to condition during the alternating treatments phase, with significant overlap of data across conditions (Figure 1 and Table 2). Due to Mark’s performance on the control problem set during baseline, accurate comparisons cannot be made between his performance on control and CCC intervention probes during the alternating treatments phase. However, for Mark, data suggest that the CCC condition was slightly more effective at improving his DCM performance than the CCC +SSG condition, resulting in a small effect size of 0.26 (Table 3).
### Table 3 Effect Size Estimates

<table>
<thead>
<tr>
<th></th>
<th>Baseline vs. Intervention Phase Data</th>
<th>Intervention Phase Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>CCC</td>
</tr>
<tr>
<td>Mark</td>
<td>-2.39</td>
<td>4.31</td>
</tr>
<tr>
<td>Alexis</td>
<td>1.07</td>
<td>1.51</td>
</tr>
<tr>
<td>Terrence</td>
<td>1.13</td>
<td>2.41</td>
</tr>
<tr>
<td>Andre</td>
<td>1.34</td>
<td>0.37</td>
</tr>
</tbody>
</table>

**Alexis**

Alexis’ baseline data reflect high variability in her performance on each of the problem sets (Figure 2). During baseline data collection, Alexis demonstrated an increasing trend on the control probes (Figure 2), a decreasing trend on the CCC alone probes, and a decreasing trend on the CCC + SSG problem set. As displayed in Table 1, mean baseline performance was slightly higher on the CCC problem set ($M = 24.67$) than the control ($M = 16.89$) and CCC + SSG ($M = 20.33$) problem sets, but overall the data suggest Alexis’ knowledge of the math facts on each problem set was similar prior to the start of the intervention.
Figure 2 Alexis’ Digits Correct per Minute Data across Phases and Conditions

Upon the start of the alternating treatments phase, there was an immediate decrease in Alexis’ performance on the control probes, with little variability throughout the intervention phase (Figure 2). Comparing performance on the control problem set during baseline and the intervention phase, there was 0% of non-overlapping data, providing evidence of stable behavioral performance when no intervention is introduced. Upon intervention implementation, data from the CCC condition increased and continued to have an increasing trend throughout the intervention phase (Figure 2), with 28.57% non-overlapping data as compared to baseline performance on the CCC problem set. Effect size data indicate that the CCC intervention was very effective \((ES = 1.51)\) at improving Alexis’ performance as compared to baseline (Table 3). An immediate increase also observed in the CCC + SSG condition data upon intervention implementation (Figure 2) with 71.43 \(PND\) (Table 2). Effect size data suggest that the CCC + SSG had a very large effect \((ES = 1.57)\) on student performance as compared to baseline (Table 3). However, interpretations are limited due to the increasing trend observed during baseline.
Overall, data suggest that both CCC interventions increased Alexis’ performance on the probes from baseline (Figure 2).

Comparing data across conditions within the alternating treatments phase, data from the CCC and CCC + SSG conditions were at higher levels than control condition data fairly consistently throughout the phase (Figure 2). PND data reveal little overlap between CCC and control data ($PND = 100$) and between the CCC + SSG and control ($PND = 85.71$) and effect size data indicate that CCC and CCC + SSG had large effects compared to control (CCC vs. control $ES = 5.01$; CCC + SSG vs. control $ES = 3.34$). There was, however, overlap between the CCC and CCC + SSG data paths ($PND = 0.00$). $ES$ data indicate that the CCC condition was moderately more effective than the CCC + SSG condition ($ES = 0.83$; Table 3).

**Terrence**

During baseline data collection, Terrence demonstrated an increasing trend on the control probes, a decreasing trend on the CCC alone probes, and stable performance on the CCC + SSG probes (Figure 3). There was significant overlap among the data series, providing evidence that the probes were of equal difficulty.
With the introduction of the alternating treatments phase, control data showed little variability throughout the phase, with levels similar to baseline ($PND = 42.86$; Table 2). With the implementation of the CCC intervention, performance on the CCC probes immediately increased in level, but was variable throughout the phase (Figure 3). However, overall CCC intervention phase data were at higher levels on average than baseline performance on the CCC problem set (CCC baseline $M = 18.00$; CCC intervention $M = 26.57$; Table 1), resulting in a large effect ($ES = 2.41$). With the introduction of the CCC + SSG intervention, data showed a slight increasing trend throughout the phase, with intervention mean performance at higher levels than during baseline (CCC + SSG baseline $M = 15.00$; CCC + SSG intervention $M = 23.00$), resulting in large effects ($ES = 3.70$). Data suggest both interventions were very effective in increasing DCM performance as compared to baseline.
There was significant overlap across data paths within the alternating treatments phase (Figure 3), suggesting there was no clear differentiation in performance based on condition. Summary data reflect slightly higher mean performance levels in the CCC condition ($M = 26.57$) as compared to the control ($M = 23.43$) and CCC + SSG condition ($M = 23.00$), which resulted in similar performance levels. CCC had a moderate effect on performance as compared to the control ($ES = 0.74$) and small to moderate effects as compared to the CCC + SSG condition ($ES = 0.46$).

**Andre**

During baseline data collection, Andre had a decreasing trend on control probes and high variability in both CCC conditions (Figure 4). Despite the variability, Andre’s mean performance levels on the three problem sets were similar (Table 1), suggesting that the probes were of somewhat equivalent difficulty for Andre.

![Figure 4 Andre’s Digits Correct per Minute Data across Phases and Conditions](image_url)
Upon the implementation of the alternating treatments phase, there was an immediate increase in performance on the control problem set, with data displaying a slight increasing trend throughout the phase (Figure 4). There was an immediate decrease in performance in both the CCC conditions when the intervention was introduced. However, baseline data for both CCC problem sets ended with a relatively high data point resulting in a significant amount of overlapping data across phases (CCC intervention vs. CCC baseline $PND = 14.29$; CCC + SSG intervention vs. CCC + SSG baseline $PND = 28.57$; Table 2), limiting the ability to make interpretations about intervention effectiveness. Summary data do reflect that mean performance levels were higher in the CCC intervention conditions as compared to baseline performance on these problem sets, resulting in small to moderate effect sizes (CCC intervention vs. CCC baseline $ES = 0.37$; CCC + SSG intervention vs. CCC + SSG baseline $ES = 0.40$; Table 3).

Within the alternating treatments phase, there continued to be significant overlap between the data paths across conditions (Figure 4). Summary data indicate that the highest mean performance levels during this phase occurred on the control probes (Table 1), resulting in large negative effect sizes as compared to the intervention conditions (Table 3). There was high variability during the CCC and CCC + SSG condition intervention data, with mean performance levels slightly higher in the CCC + SSG condition and resulting in a small to moderate effect ($ES = 0.34$) compared to the CCC condition.

**Student Acceptability**

Social validity questionnaires were administered to students and the teacher upon completion of the study. The questionnaires were scored on a 5-point Likert scale (Appendix H & I), with 5 indicating strong, positive views on the interventions. The questionnaires were designed to address the ecological validity of the interventions, student’s rating of effectiveness...
of interventions, acceptability of the intervention, preference of treatment between the CCC and
CCC + SSG conditions, and the students’ and the teacher’s willingness to use the intervention in
the future.

The students’ believed the study targeted a socially valid skill (Table 4; $M = 4.75$, range 4-5) and believed completing the CCC intervention improved their mathematic performance ($M = 5$). Although the study data suggests differently, the students believed they did better on the mathematic probes when they set goals on how many problems they could solve ($M = 5$). Students also desired to continue the use of the CCC intervention and setting goals for their performance ($M = 5$). The teacher also rated the intervention as ecologically valid, and rated that she would like to continue to use the CCC and goal setting intervention in the future. She also believed the intervention improved her student’s mathematics fluency (Table 5).

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning to complete math problems correctly is important.</td>
<td>Mean = 4.75</td>
<td>Range = 4-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completing the Cover, Copy and Compare math work packets improved my math performance on the 1 minute math test</td>
<td>Mean = 5</td>
<td>Range = 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I liked the Cover Copy and Compare math work packets</td>
<td>Mean = 5</td>
<td>Range = 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I did better on my Cover, Copy and Compare packets when I set goals for how many problems I could solve</td>
<td>Mean = 5</td>
<td>Range = 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would like to continue to use the Cover Copy and Compare math practice packets</td>
<td>Mean = 5</td>
<td>Range = 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would like to continue setting goals for my math facts.</td>
<td>Mean = 5</td>
<td>Range = 5</td>
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</tr>
</tbody>
</table>

Table 4 Summary of Student Acceptability Ratings
Table 5 Summary of Teacher Acceptability Ratings

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning to complete math facts and increasing fluency is important.</td>
<td></td>
<td></td>
<td></td>
<td>Mean =5</td>
<td></td>
</tr>
<tr>
<td>Completing the Cover, Copy and Compare intervention improved the students’ math fluency</td>
<td></td>
<td></td>
<td></td>
<td>Mean=5</td>
<td></td>
</tr>
<tr>
<td>I liked the Cover Copy and Compare intervention</td>
<td></td>
<td></td>
<td></td>
<td>Mean=5</td>
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<td>My students did better when they were able to set their own academic standards</td>
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**Summary of Results**

Data suggest that both CCC interventions led to improvements in DCM performance as compared to baseline performance on targeted problem sets for all participants, though to varying degrees, based on visual analysis and mean performance levels. When comparing the effectiveness of the CCC interventions during the alternating treatments phase, three of the four students (Mark, Alexis, and Terrence) demonstrated relatively higher performance levels (with small to moderate effect size estimates) during the CCC alone condition as compared to the CCC + SSG condition, with the results being unclear for one participant (Andre). However, there were clear limitations to data analysis, including a lack of stable baseline data, failure to establish the equivalency of problem sets for Mark, and overlapping data paths and performance variability within the alternating treatments phase.
Discussion

The purpose of the current study was to determine if adding SSG to CCC procedures would enhance their effectiveness for improving multiplication fact fluency. Specifically, the study was designed to address the following research questions:

1. Does the use of SSG with CCC lead to greater gains in mathematic fluency than CCC in isolation?
2. Does the addition of SSG to CCC procedures lead to greater performance gains for students who are demonstrating accurate levels of responding compared to those who are still acquiring the skill?
3. Does the addition of SSG to CCC procedures lead to higher levels of intervention acceptability?

The current study extended the research on math fact fluency by providing additional evidence of the effectiveness and social validity of CCC. The study also provided additional data about the use of SSG as a component of self-managed academic interventions.

Goal setting interventions have been used to increase student performance in a variety of academic areas. It was hypothesized that the use of CCC + SSG would lead to greater gains than CCC alone; however, the results of the current study do not support this hypothesis. In fact, one student, Alexis, performed better during the CCC condition than the CCC + SSG condition. The remaining three students (Mark, Terrence and Andre) performed similarly across the CCC conditions.

Goal setting interventions have been used to increase student motivation and increase student performance. It was hypothesized that the two students (Mark and Alexis) who were performing at the instructional range during baseline would demonstrate greater gains during the
CCC + SSG condition compared to the CCC condition than their peers performing within the frustrational range. However, both Mark and Alexis performed better during the CCC condition, with only a small effect for Mark ($ES = .26$). Terrence, who performed within the frustrational range during baseline, also performed better on the CCC condition ($ES = .46$) when compared to the CCC + SSG condition. Only one student, Andre, performed better when comparing performance between the CCC and CCC + SSG conditions ($ES = .34$). However, Andre’s performance in both CCC conditions remained lower than his performance during the control condition. Overall, these data suggest CCC + SSG did not result in clear improved performance as compared to CCC alone for any participant.

Goal setting interventions have been used to increase student motivation and performance on academic tasks. Based on previous research suggesting that goal specificity increased student performance compared to vague or standard based goals, students in the current study were prompted to set numerically specific goals for digit corrects per minute (Locke et al., 1981). Despite this prompt, there were no clear performance differences between the goal setting condition and the CCC condition and often mean performance levels were slightly higher in the CCC condition as compared to the CCC + SSG condition. It is possible that CCC was more effective for some participants due to the simplicity of the procedures, as compared to CCC + SSG. Students may have been distracted by the multiple steps involved in the CCC & SSG intervention. However, it does appear that students believed CCC + SSG intervention was more acceptable and desired to continue setting goals for their performance in the future. This finding is consistent with previous findings in which student choice led to greater acceptability of the intervention (Locke & Latham, 2002). These results also support Codding (2009), who found
that adding a goal setting component to CCC interventions increased the treatment acceptability for students who were demonstrating accurate rates of responding.

**Limitations**

Several limitations affect the interpretation and significance of the results. First, the research study did not begin until February. Due to snow days and logistical concerns regarding timing and study completion, the intervention duration was abbreviated and students only received the intervention across 15 instructional days. Over the course of the study, the students missed at least one day of school each week due to weather and/or planned professional development days. These breaks in instruction and routine may have affected the students’ engagement during the intervention, especially given that many of the students included in the current study require predictability, consistency, and routines in order to increase time on task, academic engagement and retention of new skills. It is likely that these breaks also contributed to the variability seen in the student data, in addition, to the numerous other potential influences and setting events that were not documented in this study (i.e. changes in medication, family circumstances and peer relationships).

Given the brevity of the intervention period, students in need of additional instruction had limited exposure to CCC intervention conditions. CCC was used to provide instruction for 3 minutes in each session, or a total of 6 minutes per day. The total time of instructional time for the duration of the study was approximately 42 minutes. While this time may have been sufficient for Mark and Alexis, who scored within the instructional range during baseline and reached mastery level (i.e., > 40 DCM; Figures 1 and 2) on at least once occasion by the end of the study, Terrance and Andre may have benefited from additional instructional. It should be noted, however, that Terrence and Andre were performing within the instructional range by the
end of the study (i.e., 20-39 DCM) as compared to their performance in the frustrational range during screening. In addition to these time constraints, other limitations of the study include threats to internal validity such as research design, treatment-assessment interference, target skill selection, student variation of practice opportunities, and threats to external validity such as the limited sample population.

**Research design.** Although using the adapted alternating treatment design has many benefits, there are also some limitations. Alternating treatment designs are best employed when the alternating treatments are independent and a change in one behavior is not expected to affect a change in the other behavior. Although mutually exclusive math sets were developed to aid in decreasing any interference between the conditions, as noted by Poncy, Skinner & McCallum (2012), developing math fact fluency may require the same set of skills and processes, which may increase the possibility of spillover effects and limit the ability to create truly independent conditions. Another limitation is that math fact fluency is a skill that develops over time and the skill development is usually correlated with exposure to practice opportunities. Alternating treatment designs are effective at demonstrating behavioral change when the skill is likely to change as a result of each session and are less effective at demonstrating changes in skills that develop gradually over time or require a longer duration of time before changes in behavior are evident (Codding, 2002). Despite the limitation of the research design, many of the students’ data demonstrated an increasing trend during the final three sessions which may suggest that continued exposure to the intervention may have led to a greater increase of digits correct per minute.

**Treatment-assessment interference.** A second limitation may be due to treatment assessment interference. Once the goal-setting intervention was introduced, students attended
more to the assessment probes than the CCC practice sessions. Although this is based on anecdotal evidence, in the future this treatment-assessment interaction may need to be balanced with the use of reinforcement for attending to the CCC practice worksheets, or setting goals for on-task behavior during the CCC condition. During the study, students were instructed to select goals for their probes that were at least 3 digits higher than their previous performance. This prompt appeared to prime the students to write down how many more problems they desired to complete rather than the total number of problems they would like complete. Future studies may want to examine if the goal type (i.e., how many total problems do you want to complete versus how many more problems do you want to complete) may have differential effect on student performance.

**Target skill selection.** Multiplication fact fluency was selected as the target skill due to student performance on baseline measure and teacher preference to focus on this skill. However, only two of the four students, Mark and Alexis, scored within the instructional range during screening, while Andre and Terrance scored within the frustrational range. Due to the brevity of the intervention and, given that the expected rate of improvement for digits correct is 0.75 digits correct per minute per week (Fuchs Bahr & Hamlett, 1993), students in the frustrational range were not likely to make significant gains during the course of the intervention. While CCC has been proven to be an effective intervention for students preforming in the frustrational range, the goal setting component may prove to be more effective for students who have demonstrated more mastery with the skill and may be more likely to benefit from performance feedback to increase the accuracy of their responding (Coddington, 2009).

Another limitation was due to the student performance on the researcher developed probe. While the probes were developed to randomize multiplication facts 0-12, Mark performed
better on the control probes throughout the study than the probes used for the other two conditions. In the future, it may be beneficial to develop the probes based on each student’s mastery of skills. Tailoring the probes to the student’s skill set would ensure that one set of probes does not include more facts that the student has mastered than another and that each probe is of equal difficulty.

**Sampling population.** The study included four students with behavioral disorders whose motivation varied throughout the sessions. Fuchs et al., (1989) postulated that the effect of self-selected goals may decrease due to performance ceilings or due to the novelty of goal setting decreasing over time. Students with behavioral disorders typically respond better to interventions that include multiple and varied components to increase novelty, which may also lead to an increase in engagement (Joseph et al., 2012). The sample size is also a limitation. A larger population of students may have allowed for the observation of additional trends, or patterns in student performance. Future research, should examine the effectiveness of adding a goal setting component to CCC interventions using a larger population.

**Future Research**

Due to these limitations, further research is necessary to investigate the use of CCC + SSG. CCC has been demonstrated to be an effective intervention at increasing academic performance across content areas (Skinner, 1997). Although goal setting has been suggested as a component that may increase CCC effectiveness, further research is needed. Future research should continue to investigate the effectiveness of goal setting, including SSG, goal specificity, and performance feedback when used in isolation or as part of a multi-component treatment. Directions for future research include replicating the study using different research designs,
different selection criterion, larger student samples, and allowing for peer comparison data when having students select goals.

Future research should examine the effectiveness of CCC with goal-setting, using designs that are more appropriate for measuring skills that are likely to increase over time. While adapting treatment designs are appropriate to demonstrate changes that are likely to increase rapidly, using a multiple baseline design to compare CCC with goal setting to baseline or CCC with no goal setting condition may provide additional evidence about the effectiveness of goal setting and CCC across time. It would also be beneficial to collect maintenance data to determine the long term effects of goal setting when combined with CCC.

In the current study, students attended more to the assessments than the CCC intervention. Based on observation of the primary researcher, students demonstrated more off-task behavior during CCC intervention sessions (staring into space, taping their pencil, staring at the same problem set on the CCC worksheet or skipping problems they believed they had mastered), but appeared to be more engaged when completing the math probes. This increase in engagement may have been due to the goal setting component being completed prior to working on the math probes or due to the student’s learning histories which include taking timed math assessments. To increase student attentiveness to the intervention, future studies should provide some reinforcement for attending or monitoring of on-task behaviors during the CCC intervention. Data about average trials completed per session may also be beneficial to determine if the number of trials completed per session led to greater gains. Information about ceiling effects would also be beneficial; specifically, what number of practice trials or time spent completing a problem set is the maximum needed before the average student reaches mastery.
Future research should examine the effectiveness of CCC with goal setting for students at different levels of mastery. Although all the students in the current study rated the goal setting condition favorably, additional information about if the goal setting component caused more frustration for students performing in frustrational level compared to those who are demonstrated more accurate rates of responding would be beneficial. Furthermore, future research should examine if the goal setting condition is more effective for students who have demonstrated mastery but whose performance vary based on motivation to complete or attend to the tasks.

Due to the small size and specificity of the current sample, future research should examine the effectiveness of goal setting and CCC with different student populations. It may beneficial to examine the effect of the intervention as a class-wide intervention. Given the acceptability of the intervention procedures, completing the intervention as a class-wide intervention would allow comparison of the effectiveness of the condition by having a control classroom, CCC classroom and CCC with goal classroom. The current study was completed within a self-contained classroom in which all students received special education services due to their need for increased behavioral interventions. Future research should examine the effectiveness of the intervention with general education students as well as special education students that receive support in more inclusive settings.

According to Codding (2005), future research should examine the use of student-selected goal by addressing goal specificity. The current study included a goal setting prompt that primed students to set specific yet difficult goals; however, due to the limits of the current study no conclusions can be made about the effect of the type of goals on student performance. Future studies should investigate if goal type or specificity would lead to greater increases in student performance. Students may also benefit from goal setting interventions that include a peer
comparison. Providing a peer comparison may afford students with a means to compare their performance with other grade-level peers. Furthermore, providing students data about the weekly rate of improvement for the target skill may eliminate frustration for students who did not believe they were making reasonable gains within the intervention period. Having a peer comparison also may motivate students’ whose performance varies across sessions and may lead to an increase in students’ performance due to their desire to exceed or meet peer performance. Future research, should compare the effect of goal setting of errors to examine if monitoring errors lead to an increase in accuracy. The current study only measured digits correct per minute; however, information about improvements in accuracy of performance would allow one to examine if students are more likely to attend to the CCC intervention when they observe increases in the accuracy of their performance.

If the current study was completed again the following changes would be recommended (a) including a greater sample of students performing across skill levels (instructional, frustrational, mastery), (b) applying a multiple baseline design, (c) collecting maintenance data, (d) collecting data on the number of CCC trials completed per session, (e) collecting data about error patterns/total number of digits incorrect, and (f) conducting additional pre-assessments of math fact fluency to insure equal levels of difficulty across problem sets (g) providing intervention procedures for a longer period of time.

Although the current study found CCC + SSG to have little effect on student performance when compared to CCC alone, the study has implications for practitioners and the future delivery of academic interventions. The acceptability of the CCC intervention and goal setting procedures contribute to the literature that students desire to use self-managed interventions as part of their academic programming. While improvements were not made across conditions, once students
begin using the goal-setting worksheet they were able to set their goals independently, which suggests, if given the opportunity and instruction, students can use data to set their performance goals with little teacher assistance. The students also rated the CCC intervention favorably and desired to continue the intervention after the study was completed. This suggests that once trained in CCC procedures students would also be able to manage their own instructional intervention. This is important for practitioners, due to ability to individualize the skills that are being addressed within the CCC intervention, which would allow for differentiation of instruction and immediate performance feedback for all students without requiring additional adult support.

Conclusion

Due to the limitations of the current study, no internally valid arguments can be made about the use of SSG as part of a multi-component CCC intervention. However, three of the four students’ performance increased with the introduction of both CCC conditions, providing additional evidence for the effectiveness of CCC. Given the acceptability of the student selected goals and the similar performance across both CCC conditions, adding goal setting to CCC procedures may increase student engagement compared to CCC alone.

In spite of these limitations, treatment acceptability was high across students and with the classroom teacher. Treatment acceptability is an important component because teachers are more likely to provide interventions that they believe are efficient and are ecologically valid given the structure of their classroom. Students’ ratings of treatment acceptability were also high. This is also important given that CCC + SSG can be provided as self-managed intervention. Students are more likely to attend and adhere to interventions that they like and that they believe will lead to
an increase in their performance. Future research should continue to examine the potential positive effects of including SSG to academic interventions.
References


doi:10.1177/002246698501900307


Appendix A

Problem Sets

Control

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CCC

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CCC + SSG

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Appendix B

Cover Copy and Compare Training Script

- Today we are going to learn about Cover Copy and Compare. We can use Cover Copy and Compare to help us complete our math facts. Today I am going to show you how to use Cover Copy and Compare and then you will have some time to practice. (pass out cover copy and compare worksheet and worksheet that include the steps of cover copy and compare)

- “On the left side of you worksheet are math problems with answers, the right side of the answer to the answer is left blank. The first step is to spend some time looking at the problem and answer on the left side of the sheet.”

- “Once you have looked at the problem then you cover the problem with your index card” (Teacher covers problem)

- “Then you go to the right side of your worksheet and solve the problem. “

- “Then you pick up your index card and compare your problems. If you get the correct answer you can move to the next problem if you get the wrong answer you would start from the beginning and spend some time looking at the problem on the left side of your worksheet.” The teacher would then model an incorrect problem

- “Do you have any questions about Cover, Copy and Compare?”

- “Who can tell me the steps of Cover, Copy and Compare?” (wait for the students to respond with the correct steps in the correct order)

- “Now it is your turn to practice Cover Copy and Compare. On your worksheet you have 5 problems. I want you to practice using the steps of cover, copy and compare to
complete your worksheet. I selected problems you would already know how to complete so you could concentrate on using the steps.”

- “If you have any questions you can raise your hands”

- Once the students have completed the worksheets. The researcher will collect the worksheets and state “Now I’m going to check you work.”

*Students that completed the steps correctly are finished with training. Those that missed steps will be pulled aside to demonstrate mastery of the steps. If the student is unable to demonstrate after the second training they will not be included in the study.**
Appendix C

Cover Copy and Compare (CCC) Steps

1) Look at the problem and answer on the left side of your worksheet.

2) Quietly say the problem and answer to yourself.

3) Cover the problem with your index card

3) Solve the problem on the right side of your worksheet

4) Remove your index card and compare the problems

5) Check to see if you solved the problem correctly

   a. If yes move on to the next problem

   b. If no then try the problem again
Appendix D

Sample CCC Worksheet

\[
\begin{align*}
9 \times 4 &= 36 \\
10 \times 5 &= 50 \\
6 \times 3 &= 18
\end{align*}
\]
Appendix E

Goal Setting Worksheet

Name____________________________________

Setting goals allows us to look at what we did last time and make a target for how we want to do in the future. However, sometimes we can set goals that may be too hard accomplish. Realistic goals are goals that cause us to work hard, however unrealistic goals are goals that even with our best work may be too far out of reach.

1) Last time during cover copy and compare I completed ____ digits correct.

2) This time I believe I can solve _______ digits correct.

3) During this session I solved ________ digits correct.

Session #_____
Appendix F

Treatment Integrity Checklists

Treatment Integrity Checklist for Baseline Condition

Please check the steps that are performed by the classroom teacher.

If a step is skipped do not check the box.

Baseline/Control Condition

☐ The teacher tells the students that they are going to take a 1 minute math practice test

☐ Students are asked to read each problem carefully and work each problem in the order presented starting at the first problem on the page from the left to the right

☐ Students are told they cannot skip problems, if they do not know how to complete the problems they should mark it with an X and move on. Once students have tried all the problems in order they may go back to the beginning to try to complete problems they skipped.

☐ Students are told to keep working until they have completed all the problems or until the teacher informs them to stop

☐ The teacher asks if there are any questions

☐ The teacher passes out the math probe

☐ Students place their name, teacher name and date on each page of the worksheet and then they are to turn the sheet over

☐ The teacher prompts the students to begin and starts her stop watch

☐ Students are given 1 minute to complete the worksheet

☐ After 1 minute has elapsed students are informed to put their pencils down.

☐ The teacher collects the math probes
Treatment Integrity Checklist for CCC

Please check the steps that are performed by the classroom teacher.

If a step is skipped do not check the box.

Cover Copy and Compare (CCC)

☐ The teacher tells the students that they are going to take a 1 minute math practice test

☐ Students are asked to read each problem carefully and work each problem in the order presented starting at the first problem on the page from the left to the right

☐ Students are told they cannot skip problems, if they do not know how to complete the problems they should mark it with an X and move on. Once students have tried all the problems in order they may go back to the beginning to try to complete problems they skipped.

☐ Students are told to keep working until they have completed all the problems or until the teacher informs them to stop

☐ The teacher asks if there are any questions

☐ The teacher passes out the math probe

☐ Students place their name, teacher name and date on each page of the worksheet and then they are to turn the sheet over

☐ The teacher prompts the students to begin and starts her stop watch

☐ Students are given 1 minute to complete the worksheet

☐ After 1 minute has elapsed students are informed to put their pencils down.

☐ The teacher collects the math probes

☐ Each student is given a CCC work packet & the CCC steps worksheet

☐ Each student is given an index card

☐ The teacher instructs the students to put their name on their CCC work packet

☐ The teacher then prompts the students that they can begin working on their CCC worksheet and should continue to work until she says stop
☐ The teacher begins her stop watch

☐ Students are given 3 minutes to work on their CCC work packet

☐ After 3 minutes have elapsed students are instructed to put down their pencils

☐ The teacher collects the cover, copy and compare work packet

**Treatment Integrity Checklist for CCC + SSG**

Please check the steps that are performed by the classroom teacher.

If a stepped is skipped do not check the box.

☐ Each student is given a goal setting worksheet

☐ Each student is given a bar graph of their digits correct from the previous 1 minute math test

☐ The teacher instructs the students to look at their bar graphs and write the total number of digits computed correctly from the previous session on the worksheet

☐ The teacher then asks the student to write the number of digits they believe they can complete correctly during the current session, students are reminded that the goals they set must be at least 3 digits higher than the digits correct per minute of the previous session

☐ The teacher tells the students that they are going to take a 1 minute math practice test

☐ The teacher passes out the math probe

☐ Students are asked to read each problem carefully and work each problem in the order presented starting at the first problem on the page from the left to the right

☐ Students are told they cannot skip problems, if they do not know how to complete the problems they should mark it with an X and move on. Once students have tried all the problems in order they may go back to the beginning to try to complete problems they skipped.

☐ Students are told to keep working until they have completed all the problems or until the teacher informs them to stop

☐ The teacher asks if there are any questions
Students place their name, teacher name and date on each page of the worksheet and then they are to turn the sheet over.

The teacher prompts the students to begin and starts her stop watch.

Students are given 1 minute to complete the worksheet.

After 1 minute has elapsed students are informed to put their pencils down.

The teacher collects the math probes.

Each student is given a CCC work packet & CCC steps worksheet.

Each student is given an index card.

The teacher instructs the students to put their name on the work packet.

The teacher then prompts the students that can begin working on their worksheet and should continue to work until she says stop.

The teacher begins her stop watch.

Students are given 3 minutes to complete their CCC packet.

After 3 minutes have elapsed students are instructed to put down their pencils.

The teacher collects the CCC work packet.

The teacher grades the math probe and returns it to the students.

The student places the digit corrects per minute for the session on their goal setting worksheet.

The teacher collects the CCC work packet, goal setting worksheet, and bar graph.
Appendix G

Student Social Validity Questionnaire

1. Learning to complete math problems correctly is important.

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
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<tr>
<td>1</td>
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</table>

2. Completing the Cover, Copy and Compare math work packets improved my math performance on the 1 minute math test

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
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<tbody>
<tr>
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3. I liked the Cover Copy and Compare math work packets

<table>
<thead>
<tr>
<th>Disagree</th>
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<th>Agree</th>
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4. I did better on my Cover, Copy and Compare packets when I set goals for how many problems I could solve

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
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5. I would like to continue to use the Cover Copy and Compare math practice packets

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
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6. I would like to continue setting goals for my math facts.

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
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Appendix H
Teacher Social Validity Questionnaire

1. Learning to complete math facts and increasing fluency is important.
   Disagree  2  Not Sure  3  Agree  4

2. Completing the Cover, Copy and Compare intervention improved the students’ math fluency
   Disagree  2  Not Sure  3  Agree  4

3. I liked the Cover Copy and Compare intervention
   Disagree  2  Not Sure  3  Agree  4

4. My students did better when they were able to set their own academic standards
   Disagree  2  Not Sure  3  Agree  4

5. I would like to continue to use Cover Copy and Compare in my classroom
   Disagree  2  Not Sure  3  Agree  4

6. I would like my students to continue to set goals for their math facts on timed probes
   Disagree  2  Not Sure  3  Agree  4