

Mystery Motivator as an Intervention to Promote Homework Completion and Accuracy

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ABSTRACT This study investigated the effectiveness of the mystery motivator intervention as a means to remediate mathematics homework accuracy and completion problems in five fifth-grade students. An ABAB reversal design with multiple baselines across two classrooms was used. The results indicated that the mystery motivator intervention was effective for all students on one or both outcome criteria. Additionally, both the teachers and students rated the intervention positively.

Homework completion and accuracy are related to academic achievement regardless of students' ability levels (Keith, 1982; Keith and Page, 1985; Keith et al., 1986; Leone and Richards, 1989; Paschal et al., 1984). Conversely, homework incompleteness and inaccuracy are related to increased referrals to special education (Anderson et al., 1986; Hutton, 1985). The relationship between homework completion and accuracy with academic achievement justifies testing hypotheses addressing interventions. However, few experimental investigations address this issue (Harris and Sherman, 1974; Olympia et al., 1994; Schellenberg et al., 1991).

Schellenberg et al.'s (1991) investigation of free time as a reinforcement for homework completion was one of the few effective school-based interventions. Similarly, Harris and Sherman (1974) found that early release from school and to lunch when used as reinforcers improved completion and accuracy in sixth-grade students. Olympia et al. (1994) conducted an investigation with two groups of sixth-grade

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students experiencing difficulty in the accuracy and completion of their mathematics homework. They compared two treatments of student-managed group-contingency procedures with either self-selected or teacher-selected goals. They found improvement for the majority of students across both treatment types on the completion variable but only negligible improvement on the accuracy variable.

With respect to the mystery motivators (Jenson et al., 1994; Rhode et al., 1997) there is one published investigation employing it with homework (Moore et al., 1994) and few other studies that specifically use it as a treatment for various disorders (DeMartini-Scully et al., 2000; Kehle et al., 1998; Leblanc, 1998; Robinson, 1998; Valum, 1995). The mystery motivator intervention involves using an unknown reinforcer, or description of it, usually placed in a manila enveloped prominently in the classroom. Students involved in the intervention are required to meet specific objectives in order to gain access to the unknown reinforcer.

Moore et al. (1994) used the mystery motivator in an attempt to increase homework completion and accuracy in third- and fifth-grade students. Eight out of the nine participants evidenced increases in daily homework completion and experienced concomitant increases in homework accuracy. Additionally, the two participating teachers rated the intervention as 'highly acceptable and easy to implement in the classroom' (p. 112). However, the design of the Moore et al. (1994) study did not incorporate the essential component of the original mystery motivator design. Instead of ensuring that the reinforcer remained unknown, Moore et al. used a publicly posted reinforcer menu.

DeMartini-Scully et al. (2000), Kehle et al. (1998), Leblanc (1998) and Valum (1995), used mystery motivators as an adjunct to other interventions. Kehle et al. combined the mystery motivator with self-modelling, self-reinforcement, stimulus fading and spacing to successfully remediate selective mutism in three children. Since the desired behaviour was speech within the school environment, the participants needed to audibly ask for the contents of the envelope. Once that behaviour was evidenced, the students received the reinforcer.

Similarly, the Valum (1995) study combined the mystery motivator with self-management, study skills, cooperative learning, a group contingency and public posting, as an intervention to increase completion and accuracy in mathematics homework. The students received the chance to get a reinforcer based on group points earned. However, the results were not practically significant. Despite this, students reported 'positive outcomes' related to the intervention as a whole. However, since this was a packaged intervention, it was impossible to determine the effects of the mystery motivator component.

DeMartini-Scully et al. (2000) packaged the mystery motivator with precision requests, antecedent strategies and response cost. This combined intervention successfully remediated disruptive behaviours in two eight-year-old girls. Leblanc (1998) included the mystery motivator with home-school notes to reduce disruptive classroom behaviour in four kindergarten students. Similar to Moore et al. (1994), Leblanc did not ensure that the reinforcer was unknown. He also employed a reinforcer menu. Using solely the mystery motivator, Robinson (1998) reduced noncompliant bedtime behaviours in three out of four children. However, it was completed in the home by parents and thus does not speak to its effectiveness as a school-based intervention.

The present study attempted to empirically validate the mystery motivator intervention for homework completion and accuracy in a school-based setting.

Methods

Design

This study employed an ABAB reversal design with multiple baselines across two classrooms and subjects (Kazdin, 1982).

Participants and setting

Five fifth-grade students from two general-education classrooms participated in the study. Of the five students, three were from Classroom A and have the gender-reflective pseudonyms Anna, Dilbert and John. The two students from Classroom B were both males and have the pseudonyms Pedro and David. The participants represented African-American, Caucasian and Hispanic descent children from low- to middle-income families.

Initially students who historically had homework difficulty throughout their academic careers were identified by the classroom teachers and the school principal. The teachers noted the students that were exhibiting mathematics homework completion and/or accuracy problems. Based on the information gathered, five students were selected.

Dependent variables

The frequency of mathematics homework assignments completed and accuracy percentages served as the dependent variables. Homework completion was defined as the submission of 100 percent completed daily assigned homework upon arrival to class. Mathematics homework accuracy was defined as the percentage of correct responses to the assigned homework questions (Harris and Sherman, 1974). Homework completion and accuracy percentages were measured daily by the students and teacher.

Procedure

Each student had their own mystery motivator chart for each treatment phase. The chart consisted of the student's name written boldly across the top of a piece of poster board. The first treatment phase had ten intervals/assignments and the second treatment phase had 12 intervals/assignments. Eighteen of the 22 total intervals had the letter 'M' (to indicate mystery motivator) allowing for a 0.8 variable ratio percentage of reinforcement. The 'M' days were randomly selected by the researcher and were different for each student. Each interval box had a square of construction paper taped over it with a sequential number written on it to indicate day of the treatment phase. The construction paper served to mask which days had the 'M' and which were blank.

The contingency rules listed on the charts were as follows: (1) your mathematics homework must be done and handed in daily upon arrival to class; (2) you must get at least 20 mathematics homework problems accurate; (3) if you do 1 and 2 above, lift the tab for that day; (4) if an 'M' appears beneath the tab, you get whatever is in the big envelope!

Twenty correct problems were chosen because both classrooms used an identical mathematics program that had pre-delineated homework assignments with 25 problems each. Therefore, 20 correct problems represented 80 percent accuracy.

First baseline. The two teachers were instructed to record the percentage of mathematics problems done accurately if all of the homework problems were completed and turned in upon arrival to class. The teachers were also instructed to record whether the participants were absent. This phase lasted for ten days in which homework was assigned in each classroom.

Intervention. Immediately subsequent to baseline, the classroom teachers began implementing the mystery motivator intervention. Each teacher was given a bag of reinforcers, a list of instructions to follow, the participants' mystery motivator charts and a mystery motivator envelope. Students were given a chance to receive a reinforcer if their homework was completed, with at least 80 percent accuracy. This phase lasted for ten days in which homework was assigned in each classroom.

Reversal. The second baseline phase involved the continuation of homework assignments; however completion and accuracy were not reinforced. Students were told that the mystery motivator intervention was no longer in effect. All visual indicators of the intervention were removed, including the mystery motivator charts and envelope. This phase lasted for ten days in which homework was assigned in each classroom. Data were collected in the same manner as the first two phases.

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Treatment reinstatement. The intervention was reinstated in the same manner as the first treatment phase. This phase lasted for 12 days for which homework was assigned in each classroom.

Treatment and student acceptability. Teacher acceptability of the intervention was measured using a five-point Likert-type scale that addressed the major components of intervention acceptability (Martens et al., 1985; Witt and Martens, 1983). This was administered at the conclusion of the second treatment phase to assess whether the intervention was perceived as usable and effective to the classroom teachers.

Intervention acceptability by the students was also measured with an age-appropriate questionnaire. This was administered after the completion of the second treatment phase. It was similarly conducted to assess the perceptions of the students regarding the intervention's effectiveness and likability.

Treatment integrity

The integrity of the implementation of the intervention was controlled by having each teacher follow a protocol which operationally defined all treatment components. Further, the implementation procedures were reviewed with the teachers prior to each treatment phase. The procedures, as outlined in the protocol, were followed with 100 percent accuracy.

Interobserver agreement

Each homework assignment across the four phases of the study was scored for completion and accuracy by both the teacher and student. The reliability of this procedure resulted in 0.90 interjudge agreement which was the estimate used in the reliability change index (RCI) calculation.

Results

Completion

All of the students, except David, demonstrated an improvement in completed mathematics homework assignments. However, David initially had no problem with completing his homework assignments; his problem was homework accuracy. Dilbert, John and Pedro each had three out of ten incomplete assignments during the first baseline. All three students substantially improved their completion during the intervention phase. During reversal, these evidenced a return to their baseline rates. Upon reinstatement of the intervention, students again demonstrated improved homework completion. For these three

students, the implementation of the mystery motivator intervention was casual in improving the completion of their homework assignments. Note that Dilbert and John were in Classroom A and Pedro was in Classroom B. Therefore, the intervention was effective for individuals in two separate classrooms. Anna had three incomplete homework assignments for both baseline and during intervention. During reversal, Anna evidenced two incomplete assignments and during the reinstatement phase, she had no incomplete assignments.

Accuracy

As illustrated in Figure 1, Dilbert, John and David each evidenced improvement from the initial baseline to treatment. As expected, these students' accuracy diminished during reversal and subsequently improved upon reinstatement of the intervention. Specifically, Dilbert's means were 57, 70, 62 and 65 during baseline, the first treatment phase, reversal and reinstatement, respectively. John's means were 62, 77, 72 and 77 during baseline, the first treatment phase, reversal and reinstatement, respectively. David's means were 59, 65, 65 and 79 during baseline, the first treatment phase, reversal and reinstatement, respectively. Anna and Pedro's results did not indicate similar improvements. Anna's means were 46, 39, 71 and 57 and Pedro's means were 89, 71, 64 and 79 during baseline, the first treatment phase, reversal and reinstatement, respectively. However, recall that Pedro's presenting problem was with homework completion and not with accuracy.

Due to difficulty in establishing baseline stability and the existence of intrasubject variability, RCI scores (Jacobson et al., 1984) were calculated for each participant. RCI is a method to determine whether significant change occurred within one individual over time. It can be interpreted in a similar fashion as a *t*-test. Dilbert and John's results were significant at the 0.05 level and David's were significant at the 0.01 level. Thus, both visual inspection and RCI calculations showed that the results for Dilbert, John and David support the efficacy of the mystery motivator intervention.

Results of teacher and student acceptability

The teacher acceptability index consisted of seven questions that required the teachers to respond with a five-point Likert-type scale with 1 indicating Strongly Disagree and 5 indicating Strongly Agree. Questions 1 through 5 addressed issues of suitability, riskiness, time intensive-ness and ease of the intervention. The mean of these first five questions was 4.5. Question 6 assessed the teacher's likelihood of using the intervention again in the future. The mean for question 6 was 3.0. Finally, item 7 asked whether the teacher was likely to tell

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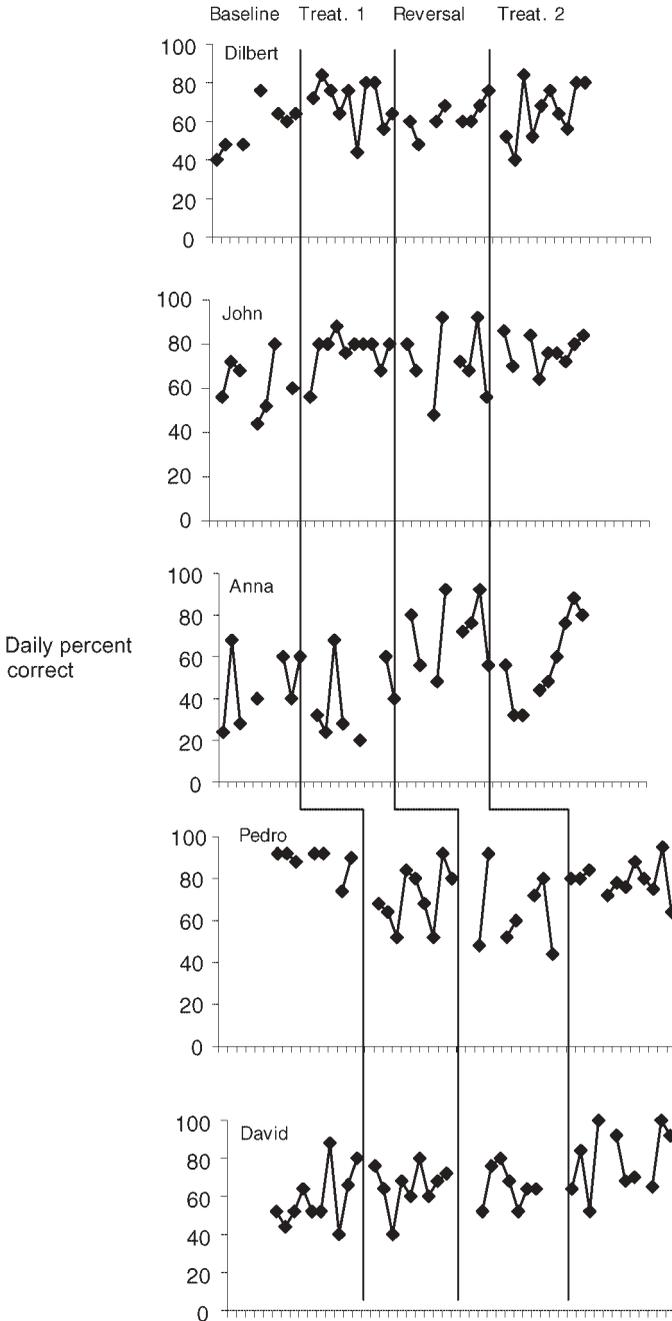


Figure 1 *Daily percentage of accurate homework for each student across all four phases*

their colleagues about the mystery motivator intervention. The result for this question was a mean of 3.5.

The student acceptability index had nine questions with three possible responses of 'yes,' 'no' and 'not sure.' The overwhelming majority of the students responded that the intervention was fun, assisted in improving their homework grades and incorporated enjoyable reinforcers. All of the students indicated that they would like to use the mystery motivator intervention again and that they thought other children would like it as well.

Discussion

Employing a combined multiple baseline and reversal design allowed for an unambiguous test of the worth of the mystery motivator intervention. The results indicated that the intervention did, in fact, cause improvement in all five students' completion and/or accuracy of homework assignments in mathematics. Specifically, Dilbert, John, Anna and Pedro all indicated positive improvement in homework completion. David's initial problem was not homework completion and therefore due to a ceiling effect, it was difficult for his data to indicate further improvement. With regard to homework accuracy, Dilbert, John and David all indicated positive improvement. Paradoxically, Anna and Pedro's data showed an actual decrease in accurate completion of their homework. However, as indicated earlier, Pedro's presenting problem was with homework completion and not with accuracy. Anna's diminished accuracy in her homework assignments was an anomaly and difficult to explain.

This study adds to the meager number of experimentally-based homework interventions in the literature. An easily-implemented intervention that can improve homework completion and accuracy for students, such as the mystery motivator intervention, may prove in future experimental investigations to affect student achievement (Keith, 1982; Keith et al., 1986). These results support the future study of the mystery motivator intervention.

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