Using an Instructional Intervention to Reduce Problem and Off-Task Behaviors

Abstract: Functional relationships between the presentation of easy versus difficult math tasks and the occurrence of problem and off-task behaviors of students with emotional or behavioral disorder (EBD) were investigated. Subsequently, the effects of academic instruction on the accuracy of responses to difficult tasks and the occurrence of problem and off-task behaviors were assessed. The results of independent experiments conducted with two third graders indicated the existence of functional relationships between the presentation of difficult tasks and occurrences of problem and off-task behaviors among students with EBD and (b) the effectiveness of academic instruction on reduction or escape motivated problem and off-task behaviors.

Many educators believe that the use of a good curriculum increases student opportunities for academic success which, in turn, effects academic achievement and displays or appropriate social behavior. This belief is based on the assumption that academic interventions can have a collateral effect on social behavior. Therefore, the development and use of effective academic interventions are considered essential for students with emotional or behavioral disorder (EBD).

During the 1970's several studies reported on the collateral effects of reinforcement for academic performance on social behavior. In general, reductions of problem behavior were observed when reinforcement for academic performance was provided (Ayllon, Layman, & Burke, 1972; Ayllon & Roberts, 1974; Winett & Roach, 1973). However, some investigators did not observe collateral reductions in disruptive behavior when reinforcement was used to increase academic performance e.g., Ferritor, Buckholdt, Hamblin, & Smith, 1972). These inconsistent results may be due to a failure to identify students whose problem behavior was affected by factors other than academic success or failure (i.e., attention-motivated escape/avoidance problem behavior.

However, over the past 20 years, our ability to functionally assess and understand problem behavior and to develop effective and positive interventions based on this assessment has advanced significantly. First, the matching theory provides an operant explanation for how humans “choose” their behavior among concurrently available alternatives according to the magnitude of reinforcement of each alternative (Herrnstein, 1970); Mace, McCurdy, & Quigley, 1990). Magnitude of reinforcement is determined by variables such as rate of reinforcement, quality of reinforcement, delay of reinforcement delivery, and response efforts (Horner & Day, 1991; Mace, Neef, Shade, & Mauro, 1994; Neef, Shade, & Miller, 1994). For example, in an independent work session, a student may work at tasks, look around, talk to peers, or play with a pencil. According to matching theory, the student is likely to engage in on task behavior when its consequences are more positively reinforcing than consequences for engaging in other behaviors. Likewise, when the use of good instruction is associated with high rates of correct responding, the student may have more opportunities to receive positive reinforcement. As the magnitude of reinforcement increases from engaging in more on-task behavior, the engagement in problem and off task behavior decreases. In contrast in instructional conditions where students fail to learn, fewer opportunities to receive positive reinforcement for display of correct responses may extinguish on-task behavior. In addition, the student’s on task behavior is likely to result in incorrect answers that may acquire aversive qualities.
which occasions escape, contributes to reductions in on-task behavior, and increases problem and off-task behaviors. If opportunities for academic success serve as reinforcers for further engagement of on-task behavior, good instruction may be an effective intervention for certain social problem behaviors.

Second, current functional assessment approaches emphasize the identification of factors that maintain problem behavior. Research has revealed that a variety of problem behaviors are maintained by two operant processes: (a) escaping from aversive stimuli (i.e., negative reinforcement) and (b) obtaining reinforcing stimuli (i.e., positive reinforcement). Various functional assessment and analysis methodologies have been used to develop logical interventions designed to (a) weaken an operant relationship between stimuli and problem behavior and (b) establish or strengthen an operant relationship between stimuli and concurrently available alternatives in a target context (Mace, 1994; Mace & Roberts, 1993, by manipulating antecedent or consequent events. For example, if problem behavior is maintained by escape from difficult tasks, an antecedent manipulation might involve the presentation of a modified curriculum to increase rates of correct responding. The manipulation of consequent events results in increases in the use or positive reinforcement for acceptable behavior or in the use of aversive consequences for problem behavior (differential reinforcement). Researchers suggest that interventions that manipulate antecedent rather than consequent events are nonaversive, proactive, and positive strategies (Colvin & Sugai, 1988; Horner et al., 1990).

The literature is replete with examples with of research in which clear functional relationships exist between the presentation of difficult tasks and displays of problem behavior by individuals with developmental disabilities. In addition, by modifying instructional procedures so the level of task difficulty is reduced, teachers can decrease the occurrence of escape-motivated problem behavior. To date, relatively little research has examined whether similar functional relationships can be identified and manipulated for students with EBD. Because students with EBD display severe academic and behavioral deficiencies, academic failure and escape-motivated problem behavior may be functionally related, and academic interventions may serve as an appropriate treatment response.

The purpose or the present study was to assess the effects or using instruction designed to increase task accuracy or the occurrence or problem and off-task behavior displayed by students with EBD. Initially, relationships between the presentation of easy versus difficult tasks and problem and off-task behaviors were assessed. It they were functionally related, then manipulating difficult tasks through academic instructional modifications would reduce problem and off-task behaviors. In contrast, the occurrence of problem behavior that was maintained by multiple variables or a variable other than degree of task difficulty (e.g., attention, automatic reinforcer) was not expected to be affected by academic instructional modifications.

In the present study, the term component skills refers to simple, related lower-level skills that collectively make up complex higher-level skills. Many educational theorists (Bloom, 1976; Carnine, 1980; Carroll, 1963; Englemann & Carnine, 1982; Gagne, 1962, 1985) have proposed that when students possess all component skills necessary to learn a task, learning the larger task is easier and access to positive reinforcement is increased. With one or more component skills lacking, students fail to learn the complex skill; thus, access to positive reinforcement is reduced and the possibility of aversive consequences is increased. In the present study, instruction was developed to ensure that all component skills were earned before the larger target skill was taught.

Method

Participants

Two students in a special education classroom for students who were identified as having EBD participated in this study. The students were referred by their special education teacher because they had (a) math skills deficiencies and (b) displays of problem behavior associated with difficult tasks. Bill was a 9-year-old boy in third grade who was diagnosed as having behavioral problems and learning difficulties. He spent most or his time (more than 25 hours per week) in the special education classroom with some time in general education settings. Math skill assessments indicated that Bill could complete addition and subtraction tasks without renaming but had deficiencies in performing addition and subtraction tasks with renaming. Bill was not taking any medication during the time of the study.

Matt was a 9-year-old boy in third grade who was diagnosed as having EBD and attention-deficit/hyperactivity disorder (ADHD). He received math and reading instruction in a resource room with other students with learning disabilities and participated in nonacademic activities in another special education classroom with students with EBD. Math skill assessments showed that Matt had severe deficiencies in performing multiplication and subtraction tasks with renaming. Matt was taking 15mg of methylphenidate per day during the time of the study.

Setting

Data collection, instruction, and independent math work sessions were conducted in the special education classroom participants were attending. At the time of the study,
the special education classroom served as a self-contained classroom for four students and as a resource room for 10 students and included two teachers and two or three educational assistants. Each teacher and assistant worked with individual students or a small group. Data collection and instruction were conducted at the same time that multiple activities were occurring in the class.

**TASKS**

Each participant’s math skills levels were assessed using the Math Skills Assessment (MSA), which was developed as a modified version of the Instructional Sequence and Assessment Chart in *Direct Instruction Mathematics* (Silt- bert, Carnine, & Stein, 1981). From the results of the MSA, easy tasks—those on which the participant had scored better than 90%—were selected. Two sets or difficult tasks were selected from tasks on which the participant had scored lower than 33%. Each set of difficult tasks was targeted as an instructional objective during instructional phases. The first instructional phase targeted one set of difficult tasks; the second instructional phase targeted the remaining set of difficult tasks.

**MEASUREMENT**

**Dependent Measures.** During the course of the study, we determined the (a) percentage of intervals with problem behavior, (b) percentage of intervals with off-task behavior, and (c) percentage of correct math problems. All data were collected during approximately 10 minute independent work sessions conducted three to five per week. One or two observers collected behavioral data using a partial-interval time sampling recording system. During each interval, observers monitored for 10 seconds and recorded the observed behavior 5 seconds. The observers scored only problem behavior if problem and off-task behavior occurred concurrently during the same interval.

**Problem behaviors** were defined as aggression (e.g., kicking a desk, tearing paper, throwing objects; and disruptive behaviors (e.g., talking out, being out at chair, making noise, playing with objects, making faces) **Off-task behaviors** were defined as pausing, looking around, and engaging in irrelevant activities (e.g., drawing pictures) for longer than 2 consecutive seconds. The percentage of correct answers was calculated by dividing the number of correct answers by the number of problems completed and multiplying by 100.

**INTEROBSERVER AGREEMENT**

Two observers independently recorded each participant’s problem and of task behaviors. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements and disagreements on an interval-by-interval basis for each observation and multiplying by 100. Interobserver reliability data were collected in 54.5% of sessions across all experimental conditions for the two participants. Interobserver agreement across experimental conditions for the two participants averaged 93.5% and ranged from 82.5% to 100%.

**PRELIMINARY ASSESSMENT**

Descriptive functional assessments were conducted for each participant and included interviews with the teacher, reviews of school records, written math skills assessments, and direct observation of behavior (antecedent-behavior-consequence assessment) during math class. From these assessments, it was hypothesized that each participant’s problem or off-task behaviors were being maintained by escape from difficult tasks.

**EXPERIMENTAL DESIGN**

During functional analysis, A-B-A within-subject reversal designs were used to examine functional relationships between the presentation or easy versus difficult task and the occurrence or problem and off task behaviors. During instructional analysis C1-A-C2-A-C3-A or C1-A-C2-A within-subject alternating treatment designs were used to assess the effects of instruction on the accuracy of performance on difficult tasks and on displays of problem and off-task behaviors. The instructional analyses included four basic phases: (a) teaching the first set of difficult tasks, (b) performing the tasks, (c) teaching the second set of difficult tasks, and (d) performing the task.

**PROCEDURES**

The same instructional procedure was used during independent math work sessions across easy and difficult tasks. For each session, the participant was presented with either easy or difficult tasks and given the direction, “You have 10 minutes to work these problems. After completing each problem, check your answer. Put ‘+’ on the answer if the answer is correct. Put ‘0’ on the answer if the answer is incorrect. Don’t look at the answer key before working the problem.” No attention was given to problem and off-task behaviors unless they were physically dangerous. When 10 minutes lapsed or the participant completed all tasks, the session was terminated and the participant’s worksheet was collected. No assistance was provided. When the participant said, “I don’t know how to do this,” he was told, “Do the best you can.” Teacher praise, token reinforcers, reprimands, and social behavior corrections were ignored during the session.
1. **Difficult Versus Easy Tasks.** In the A phases of the functional analysis one of the two sets of difficult tasks was presented to each participant during independent math work sessions (see Table 1). In the B phases of the functional analysis, easy tasks were presented to each participant during independent math work sessions.

2. **Teaching the First Set Difficult Tasks.** Task and error analyses were conducted to identify which component skills of the targeted difficult tasks each participant was missing. Each participant received individualized component skills instruction from the first author until he performed 85% of given difficult tasks correctly. During instruction, verbal praise was provided if the participant behaved appropriately or if he responded correctly to the math problems.

3. **Teaching the Second Set Difficult Tasks.** Each participant received instruction on how to do the second set of difficult task and its component skills. The teacher used the same instructional procedure performed during the first instructional condition.

4. **Plus/Minus Discrimination Training Plus.** Plus-minus discrimination training was implemented only for Bill after his worksheet performance showed that he used subtraction rules for addition problems. Bill received 20 minutes of training to discriminate addition from subtraction tasks (circle the operation).

### Results

**FUNCTIONAL ANALYSIS**

Across the two participants, results indicated the existence of functional relationships between the presentation of difficult tasks and the occurrence or problem of off-task behaviors (see Figure 1, 2, 3, and 4). Data on the three phases of the functional analysis for Bill and Matt support the hypothesis that their problem or off-task behaviors were maintained by escape from difficult tasks. Across the difficult task phases, higher levels of off-task (Bill: M = 43.4%; Matt: M = 29.9%, and problem (Bill: M = 14.7%) behaviors were observed. Because low levels of problem behaviors were observed across difficult and easy task conditions for Matt, off-task behavior was the major concern. During the easy task phase, low levels of off-task (Bill: M = 5.5%; Matt: 12.5%) and problem (Bill: M = 2.5%) behaviors were observed.

**INSTRUCTIONAL ANALYSIS**

Across the two participants, each time instruction in component skills was provided on difficult tasks, concurrent increases in performance were observed. In addition, collateral reductions in occurrences of Bill’s and Matt’s escape-motivated, off-task, and problem behaviors were noted.

Following the component skills instruction on the first set of difficult tasks, high accuracy (Bill: M = 95.4%; Matt: M = 94.7%) and low levels of off-task (Bill: M = 8.7%; Matt: M = 7.5%), and problem (Bill: M = 0.6%) of behaviors were observed when the first set of difficult tasks was presented. In contrast low accuracy (Bill: and Matt: M = 0%) and high levels of off-task, Bill: M = 58.3%; Matt: M = 48.7% and problem (Bill: M = 15.8%) behaviors were observed when the second set of difficult tasks, which was not taught, was presented.

Results were replicated for both participants when instruction was provided on the second set of difficult tasks. High accuracy (Bill: M = 84.6%; Matt: M = 95.8%) and low levels of off-task (Bill: M = 5%; Matt: M = 8.3%) and problem (Bill: M = 0%) behaviors were observed during the conditions in which the second set of difficult task was presented.

Following the introduction or the last intervention. Bill and Matt demonstrated high accuracy (Bill: M = 94.7%; Matt: M = 95.7%) on both sets or difficult tasks, and low levels of off-task (Bill: M = 11.6%; Matt: M = 8.5%) and problem (Bill: M = 1.8%) behaviors were observed.

| Table 1. Easy and Difficult Tasks for Bill and Matt |
|---|---|---|
| Student | Easy task | Difficult task |
| Bill | Addition of a one-or two-digit number and a one-or two digit number without renaming | Addition of a two- or three-digit number and a two-digit number required renaming Subtraction of a two-digit number from a two digit number required renaming |
| Matt | Addition of a two- or three digit number and a two- or three digit number required renaming | Subtraction of a two-digit number from a two digit number required renaming Multiplication of two-digit factor and one-digit factor |
Figure 1. Bill's percentage of intervals with off-task behaviors (top panel) and percentage of answers correct for math problems (bottom panel). AI = addition instruction, SI = subtraction instruction, DT = discrimination training.
In summary, instructional analysis data indicated that component skills instruction resulted in increases in accuracy on difficult tasks and collateral reductions of escape-motivated off-task and problem behaviors.

SOCIAL VALIDITY

A teacher impression survey was administered at the termination of the study to determine each teacher’s perception of the impact of the instruction on student behavior. The teachers reported improvements in the math performance of each subject, but little improvement in on-task behaviors. After the study was terminated, Bill and Man were placed full time in general education classrooms. Six months later, both students were continuing to spend all their time in general education classrooms.

Discussion

The main purpose of the present study was to assess the impact of instruction in reducing occurrences of problem and off-task behaviors that were maintained by escape from difficult tasks. Each experiment demonstrated that good functional assessment—based instruction specifically designed to increase task accuracy resulted in collateral reductions of problem and off-task behaviors.

The second purpose of the present study was to examine possible functional relationships between the presentation of easy versus difficult tasks and the occurrence of problem and off-task behaviors among students with EBD. Much research involving individuals with developmental disabilities has documented strong functional relationships between a student’s capacity to succeed on difficult academic tasks and the occurrence of a variety of problem behaviors. The present study systematically replicated the general methodologies and outcomes of previous studies (e.g., Carr & Durand, 1985; Durand & Carr, 1987; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982) of students with EBD. In contrast to previous studies, the current research had specific procedural modifications:

1. Difficult tasks were not physically removed upon a participant’s display of problem behavior.
2. Variables that could have influenced participants’ behavior (e.g., teacher’s feedback to incor-
2. Each participant obtained feedback on his task performance through a self-correction procedure. Only the Level of task difficulty was manipulated in a natural setting.

Methodologically, the results for each experiment demonstrated the importance or understanding the functions of behavior in the development of effective interventions for students with EBD. For Bill and Matt, the functional assessment—derived intervention strategies resulted in successful reductions of problem or off-task behaviors. Meaningful reductions in problem behaviors were demonstrated only when strategies were based on accurate knowledge of what maintained problem behavior.

Educationally, the outcomes of this study suggest the potential usefulness of quality individualized instruction in improving academic performance and in reducing problem behaviors displayed by students with EBD. These students receive lower grades and fail more courses than any other group of students with disabilities (U.S. Department of Education, 1994), and less than 30% of students with EBD function at or above their academic grade level (Knitzer, Steinberg, & Fleisch, 1990). In addition, students who have academic deficiencies accompanied by behavioral problems are highly likely to drop out of school, become involved in antisocial lifestyles (e.g., gangs), engage in delinquent or criminal behavior, be unemployed, abuse alcohol and drugs, be socially maladjusted, and experience mental illnesses in adulthood (Forness, 1992; Kauffman, 1993; Kazdin, 1987; Offord & Bennett, 1994; Parker & Asher, 1987; Walker, Colvin, & Ramsey, 1995). The use of effective instruction and curriculum clearly needs to be a priority in the education of students with EBD.

In addition, the results of this study suggest the importance of systematically assessing the academic strengths and weaknesses of students with EBD. For example, before instruction, Matt completed an average of 2.4 difficult problems per minute with an average of 2.3% correct; after instruction, he completed an average of 1.8 difficult problems per minute with an average of 95.7% correct. Many studies have employed “academic productivity” as a dependent measure to assess the improvement of academic performance. However, for students with EBD, assessing only the quantity of academic productivity may not be sufficient. Assessment of the quality of academic productivity and the impact on occurrences of problem behavior also need to be considered.

Conceptually, the results from this study suggest that extinction and negative and positive reinforcement can be...
used to explain the effects observed when students are presented with difficult tasks to complete, in general, on-task engagement was maintained by academic success (i.e., correct math responses, or positive reinforcement. In contrast, making few correct responses resulted in a decrease in on-task behavior (extinction) and an increase in occurrences of problem and off-task behaviors, or negative reinforcement. In this study, each participant received immediate feedback through a self-assessment strategy, and errors made in performing difficult tasks may have been aversive, setting the occasion for escape behavior (Weeks & Gaylord-Ross, 1981). In addition, absence of correct responses may have extinguished on-task behavior. Data from each experiment revealed a positive correlation between occurrences or error and difficult tasks. Future research is needed on specific operant processes in which extinction and negative and positive reinforcement occur in various contexts with participants who are of average cognitive ability but also exhibit problematic social behaviors.

This study had several limitations that should be considered. First, the observed effects may have been influenced by other naturally occurring factors, (e.g., incidental learning skills for difficult tasks), repeated testing with similar tasks, setting events (e.g., prior conflicts with peers), or class events occurring while the study was being conducted (e.g., peer screaming, other instructional activities. In Matt’s case, although his off task behavior was associated with difficult tasks, his problem behavior in the last phase seemed to be related to setting events that were class parties and novel activities in the school week. Second, two other participants were dropped from the study because their escape behaviors were particularly severe (e.g., running away) during the first difficult task condition.

In conclusion, students who exhibit significant problem behaviors often have accompanying academic deficits. If problem behaviors are related to escape from difficult tasks, then instructional strategies that are designed to reduce the aversive features of the difficult task represent viable proactive interventions choices. Although additional research is recommended, the outcomes of this study suggest that the functional assessment and behavior support technologies that have been applied to the problem behavior of individuals with severe problem behaviors might be useful in addressing the academic deficits and problem behaviors or students with EBD.

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AUTHORS’ NOTE

The completion of this research and preparation of this paper were supported in part by the U.S. Department of Education Grant No. H029D40055. Opinions expressed herein do not necessarily reflect the policy of the Department of Education, and no official endorsement by the Department should be inferred.

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