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Interspersing additional, brief items to influence the choice behavior of students with behavioral and emotional disabilities to complete grammar assignments

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I am submitting herewith a dissertation written by Donna Ford Teeple entitled "Interspersing additional, brief items to influence the choice behavior of students with behavioral and emotional disabilities to complete grammar assignments." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Christopher H. Skinner, Major Professor

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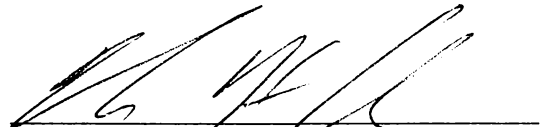
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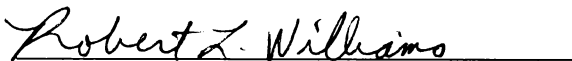
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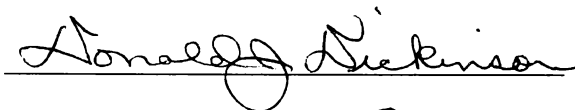
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Acceptance for the Council:



Vice Provost and Dean of
Graduate Studies

INTERSPERSING ADDITIONAL, BRIEF ITEMS TO INFLUENCE THE CHOICE
BEHAVIOR OF STUDENTS WITH BEHAVIORAL AND EMOTIONAL
DISABILITIES TO COMPLETE GRAMMAR ASSIGNMENTS

A Dissertation
Presented for the
Doctor of Philosophy
Degree
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Donna Ford Teeple
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Abstract

Students with emotional and behavioral disabilities often exhibit inappropriate behaviors, and many also experience problems related to academic skill development and achievement. Academic skill deficits and inappropriate behaviors may be related. Students who experience academic difficulties may be more likely than their peers to engage in inappropriate behaviors to escape or avoid academic demands. Furthermore, students who engage in inappropriate behaviors are choosing not to engage in academic activities, which may serve to create or exacerbate academic achievement or skill deficits. The current study attempts to extend research suggesting that interspersing relatively brief items throughout an assignment, therefore increasing item completion rate, may increase the probability of students choosing to work on that assignment without compromising the accuracy and educational significance of the assignment.

Thirty-two students identified as having emotional disturbance were each exposed to two grammar assignments. A control assignment contained a number of paragraphs that students were required to copy and punctuate. An experimental assignment was designed to be equivalent, but also contained additional, brief paragraphs interspersed throughout the assignment. Students worked on each assignment for 15 minutes and then ranked the assignments with regard to time, effort, and difficulty. Additionally, students were asked to choose either a control or interspersal assignment to complete for homework.

Results indicate that student item completion rate was higher during the experimental assignments, and significantly more students chose to complete the experimental assignment for homework. No significant differences emerged between control and interspersal assignments for student rankings of time, effort, and difficulty. Additionally, student accuracy in punctuating sentences did not differ significantly across the two assignments.

These findings suggest that when brief items are interspersed throughout a grammar assignment, students with emotional and behavioral disabilities may be more likely to choose to work on this assignment. Subsequently, student preference for an assignment may lead students to choose to engage in assigned academic activities increasing the probability that they will experience learning. Results of the current study lend support for interspersing relatively brief items throughout the assignments of students with emotional and behavioral disabilities to address both behavioral and academic difficulties.

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Chapter 1

Introduction

During the 1999-2000 academic year, over 460,000 students identified as Emotionally Disturbed received Special Education services in the United States (United States Department of Education, 2001). Although inappropriate behaviors are often the most notable and identifying characteristic of students with emotional and behavioral disabilities, many of these students also experience academic difficulties.

Some researchers suggest that academic difficulties may serve as antecedents to the behavioral symptoms that appear following prolonged periods of low academic achievement (Coutinho, 1986; Knoff, 1983). Academic activities may be perceived as more aversive to students with academic skill deficits than those without skill or achievement problems. Therefore, opportunities to escape or avoid academic activities may be reinforcing to these students (Iwata, 1987; Sprague, Sugai, & Walker, 1998). Thus, students with academic achievement problems may be more likely to engage in inappropriate behaviors that increase the probability of their escaping assigned academic activities. This learning history directly increases the probability of these students engaging in inappropriate behaviors when given academic assignments. Additionally, by avoiding engagement in assigned academic activities, academic skill and achievement deficits are likely to be exacerbated as students fall farther behind in their skill development because they are choosing to engage in other activities (Skinner, 1998). For these reasons, researchers recommend that educators address

academic deficits in order to prevent and remedy behavioral problems in student with emotional disabilities (Coutinho, 1986; Knoff, 1983).

Research suggests that interspersal procedures may address both academic and behavioral needs of students with behavioral and emotional difficulties. Interspersal procedures are based on the discrete item completion hypothesis, which proposes that discrete item completion within an assignment is a reinforcing event (e.g., completing a math problem). Thus, in accordance with matching theory, increasing item completion rates within an assignment increases the probability of students choosing to engage in that assignment, as opposed to engaging in alternative and perhaps disruptive behaviors (Skinner, 2001).

In the current study, students with behavioral or emotional disabilities were exposed to two grammar assignments: a control assignment and an experimental assignment that was similar to the control assignment except that additional brief items were interspersed. Results showed that when given a choice of which type assignment they would prefer to complete for homework, significantly more students chose the interspersal assignment. Because discrete item completion rates were significantly higher during the interspersal assignments, these results support the discrete item completion hypothesis. In addition to theoretical implications, applied implications for using interspersal procedures to address behavioral and academic problems in students with behavioral and emotional disabilities are discussed and directions for future researchers are provided.

Relevant definitions of terms are presented below in a hierarchical sequence for better understanding by the reader:

Generalized Matching Law: When given a choice of two behaviors, this mathematical formula predicts the precise amount of time allocated to each behavior based on relative rates of reinforcement for each behavior: $R = kr / r + r_e$, where R is the rate of targeted response, k is the maximum possible rate of response, r is the rate of reinforcement contingent upon the targeted response, and r_e is the rate of all other reinforcement delivered exclusive of the target response (Martens, Lochner, & Kelly, 1992).

Discrete Task or Item: A task or item with a clear beginning and end.

Target Items: Items within an assignment designed to match the instructional levels of the participating students. For the purpose of this study, target items are four-sentence paragraphs presented without punctuation requiring the student to copy the paragraph and add correct punctuation.

Interspersal Items: Items similar to the target items but designed to require significantly less time to complete that are presented at predetermined intervals throughout an assignment. For the purpose of this study, interspersal items are two-word sentences provided without punctuation, requiring the student to copy the sentence and add correct punctuation.

Interspersal Assignment: An assignment containing interspersal items placed at intervals throughout an assignment containing target items. In the current study, interspersal items were placed following every 2nd target item.

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Control Assignment: An assignment designed to be equivalent to an interspersal assignment in regard to target items, but does not include interspersal items.

Chapter 2

Review of Literature

The United States Office of Special Education Programs reported that 469,407 students were identified as having Emotional Disturbance and received Special Education services in the United States, the District of Columbia, and Puerto Rico during the 1999-2000 academic year (United States Department of Education, 2001). In Tennessee, 3, 541 students were identified as having Emotional Disturbance and received Special Education services during the 1999-2000 academic year. Students with emotional and behavioral disabilities face many challenges in their academic careers and based on the aforementioned numbers, educators can benefit from an understanding of students with emotional and behavioral disabilities as well as strategies to meet their educational needs.

Inappropriate Behaviors of Students with Emotional and Behavioral Disabilities

The behaviors of students with emotional and behavioral disabilities often frustrate teachers when interventions do not decrease inappropriate classroom behaviors. This is so common that Gresham (1991) discussed resistance to intervention as a characteristic of students with behavioral disabilities and suggests using this resistance as a criterion for identification. When inappropriate behaviors exhibited by students with emotional and behavioral disabilities fail to improve in response to traditional classroom management strategies, students are often placed in alternative settings where discipline procedures increase in severity (Grosenick,

George, George, & Lewis, 1991; Kern, Childs, Dunlap, Clarke, & Falk, 1994). Such disciplinary procedures typically focus on the consequences of the students' behaviors.

Dunlap and Childs (1996) examined research focusing on behavioral and emotional disabilities conducted from 1980 to 1993 and found that most interventions focus on the consequences of students' behaviors. These results indicate a need to develop theories and procedures designed to identify antecedents of inappropriate classroom behaviors. This information can serve as a basis for preventing future occurrences of the behaviors. For example, Dunlap and Kern (1996) discussed the role of context in inappropriate behaviors. Critical to the context in which inappropriate classroom behaviors occur are the students' curricula and individual assignments. Students' assignments can serve as antecedents to inappropriate behaviors in the classroom. If a student perceives an assignment as unpleasant enough, he or she may engage in a behavior that has a high probability of allowing the student to escape from the assignment, thus negatively reinforcing the inappropriate behavior through removal of academic demands (Iwata, 1987; Sprague et al., 1998). Researchers have suggested that this type of negative reinforcement is direct and may increase the frequency of inappropriate classroom behaviors when faced with similar demands in the future (Carr, 1977; Carr, Newsom, & Binkoff, 1980).

In order for students to learn and retain academic skills, they must engage in academic behaviors. Thus students who attempt to escape or avoid academic assignments and activities are also more likely to have achievement deficits (Skinner, 1998). Statistics indicate that many students identified as having behavior or

emotional disabilities also have academic deficits (Walker, Colvin, & Ramsey, 1995). Wagner (1989) reports that this population of students has the lowest grade point average of all disability categories.

In a review of research, Gunter, Denny, Jack, Shores, and Nelson (1993) discuss the likelihood that negative reinforcement resulting in escape or avoidant behaviors in the classroom exacerbates the academic deficiencies of students with emotional and behavioral disabilities. Academic activities, as well as instructional interactions with teachers, may serve as aversive stimuli for students resulting in inappropriate escape or avoidant behaviors. An aversion to academic tasks is linked to two factors: difficulty level and student preference. If the student perceives the activity as too hard or would prefer to do something else, the student may engage in inappropriate behaviors in efforts to escape or avoid the activity. Classroom interactions with teachers may be perceived as aversive by students due to relatively few positive statements provided to students with emotional or behavioral disabilities. When teacher interactions are present, they are most often in the form of commands to complete a task and provide little if any specific, academic instruction as guidance. Recommendations minimizing student aversion to academic activities and teacher interactions include the following considerations: (a) student aversion in the classroom should always be considered when inappropriate behaviors are present, (b) rate of positive reinforcement and feedback provided by teachers should be increased, (c) incorrect student responses should serve as a cue that he may not understand the

instructions or task, and (d) teachers should acknowledge that their own behavior is also shaped by interactions with students.

Through a more specific case study, Knoff (1983) demonstrated how classroom interactions and experiences can lead to expectations of academic failure resulting in the demonstration of inappropriate behaviors by students with learning disabilities in efforts to escape or avoid academic activities. The resulting inappropriate behavior patterns often appear consistent with maladaptive behaviors of students with emotional or behavioral disabilities. However, outside the academic environment, such behaviors may be less evident and the students may appear socially and adaptively successful.

The subject of Knoff's (1983) case study was a seventh grade male with a noted learning disability who stated that he worried about, and wished he could "stop school." When he was placed in a resource classroom to address math and reading difficulties, the potential for teacher and peer stigmatization increased, apparently diminishing his self-concept. During eighth grade, he began to exhibit more anger, impulsivity, rages mixed with tears, and a lower tolerance for frustration. He also began to break relationships with non-disabled peers. The student's newly developed emotional difficulties were more evident than, and served as a mask for, his learning disability.

Knoff (1983) explains that this student could be described as a *six-hour emotionally disturbed student*, a characteristic of which is an unwillingness to attempt academic tasks in an avoidance of failure stemmed from recurrent unsuccessful

academic endeavors. In this case, the student's perception is that it is better to be perceived as having an emotional disability or behavioral problems than a learning disability. The defining characteristic of a six-hour emotionally disturbed student is success within the social and home environments, suggesting the maladaptive behaviors are school specific in origin and exhibition. Interventions to decrease student aversion to academics resulting from difficulties in learning, and subsequently reducing emotional or inappropriate behaviors, are recommended as a preventive measure rather than a treatment of behavioral symptoms.

Coutinho (1986) also identified a pattern in which poor achievement in reading is a significant factor in the development of inappropriate behaviors. Coutinho's study examined the previous and current levels of reading achievement of 45 students identified as having behavioral disabilities and 45 students randomly selected to serve as a control group. All 90 students were enrolled in a rural public school in New England, and participating students ranged in levels from 7th to 12th grade. Scores obtained on standardized reading measures were gathered from records of all participating students to determine levels of reading achievement. Data were examined for each student beginning with scores obtained during third grade. Results indicate that the mean performance of students identified as having behavioral disabilities fell below that of the control group of students. This discrepancy held true across all comparisons of achievement and increased as students progressed to later grade levels. Most importantly, results show that reading problems may be present prior to

development of behavioral or emotional disabilities. Gender was also considered as a factor and did not interact significantly with reading achievement in any comparison.

Coutinho (1986) suggests that attribution theory may provide the best interpretation of how low academic achievement culminates into behavioral outcomes. Covington and Omelich (1981) suggest that in response to prolonged deficits in performance, students may replace diligent efforts and appropriate behavior with “low effort” strategies. Thus, academic achievement deficits coupled with negative reinforcement of inappropriate behaviors that allow students to escape or avoid academic tasks may cause students to eventually be identified as having emotional or behavioral disabilities. Therefore, interventions designed to prevent and remedy achievement difficulties may also address the inappropriate behaviors exhibited by students (Coutinho, 1986).

More recently, elementary school students considered at-risk for developing emotional disabilities have been examined in comparison to same-aged typical peers to investigate classroom dynamics that may contribute to the development of disabilities. Lago-Delello (1998) investigated teacher, student, and instructional factors as well as classroom interactions for at-risk students in comparison to not-at-risk peers. Students considered at-risk for developing emotional disabilities were identified by screening all first-grade students in two urban Florida schools. Screening processes included (a) teacher nominations and rankings of students, (b) teacher ratings of students using standardized measures, and (c) observations of student academic engagement and social behavior. Twenty-six students identified as at-risk

for emotional disabilities and 13 teachers participated in the study. Teacher, student, and instructional factors were examined in addition to classroom interactions using questionnaires, rating scales, and teacher observations. Teacher attitudes and perceptions of students at-risk and not-at-risk were compared. Student factors measured included academic engagement and student perceptions of teacher expectations. Instructional factors were investigated to identify instructional accommodations made for at-risk and not-at-risk students. Student classroom interactions were assessed for teacher and peer interactions. Data collection spanned across a two-month period near the beginning of an academic year. Results were analyzed using both qualitative and statistical procedures.

Results (Lago-Delello, 1998) for teacher factors indicated at-risk students were rated lower across pupil attributes and were more likely to be rejected by their classroom teacher in comparison to their not-at-risk peers. Student factor analyses indicated that at-risk students spent less time engaged in academic assignments than not-at-risk students. No significant differences were found for student perceptions of teacher expectations. When instructional factors were analyzed, teacher reports indicate that accommodations, including modification of tasks, materials, or teaching methods, were not feasible in their classrooms to address the needs of students who were at-risk for emotional disabilities. However, teachers did report that changes in student goals, feedback procedures, and extra practice opportunities were considered acceptable accommodations for their classrooms. Results of classroom interaction data indicated that at-risk students received significantly more negative teacher feedback

than their not-at-risk peers. Additionally, results indicated that at-risk students received more nonacademic teacher feedback than not-at-risk students.

In summary, Lago-Delello found that students identified as at-risk for developing emotional disabilities have different classroom experiences than do their not-at-risk peers. Specifically, they were rated less favorably by their teachers for ideal pupil attributes, more likely to be rejected by their teachers, received more negative and nonacademic teacher feedback, not likely to receive instructional accommodations, and spent less time engaged in academic activity. These findings suggest that notable classroom variables are present for students at-risk for developing emotional disabilities. Early identification of such variables and characteristics could lead to preventative measures in the classroom.

Interventions for Students with Emotional and Behavioral Disabilities

In efforts to address both academic and behavioral needs of students with disabilities, researchers have investigated ways to modify academic demands to enhance compliance and success without compromising the quality of learning gained from assignments and activities. The term *task variation* is used to describe the process of selecting and scheduling tasks to improve the motivation, learning, and behavior of students with disabilities (Dunlap & Dunlap, 1987). With task variation, both mastered and nonmastered tasks are intermittently presented within students' assignments. Similar procedures have been termed *interspersal* or *distributed trial* procedures. The procedures are in contrast to traditional *massed trial* procedures in which new tasks are presented repeatedly throughout students' assignments. Research

has shown that task variation and other curricular modifications have proven effective in producing efficient learning as well as more desirable classroom behaviors (Dickinson & Butt, 1989; Dunlap, 1984; Dunlap & Dunlap, 1987; Dunlap & Koegel, 1980; Dyer, Dunlap, & Winterling, 1990; Singer, Singer, & Horner, 1987; Winterling, Dunlap, & O'Neill, 1987). In addition to the benefits for students, task variation and related procedures are relatively easy to implement and inexpensive to incorporate into students' curricula.

Researchers have designed curricular or task modifications to address the academic performance and behaviors of students with emotional and behavioral disabilities. Dunlap et al. (1994) demonstrated the positive effects that choice of academic tasks has on the inappropriate behaviors and task engagement of students with emotional and behavioral disabilities. Two 11-year-old students identified as having emotional disabilities were observed during 20 to 30 minute periods of independent seatwork. Direct observation data were collected on occurrences of task engagement and disruptive behavior using 15-second continuous interval recording. Using a reversal design, both students were exposed to *choice* and *no-choice* conditions. During phases without choice, students were assigned tasks selected by the teacher and presented on the blackboard in a traditional manner. During the phases with choice, each student was given a menu containing up to 10 academic tasks. Students were told they could choose the assignment for that period and change tasks at any time. All assignments were developed with the teacher and taken from the students' curricula. Results for both students indicate that levels of task engagement

were higher during phases with choice of assignment. Furthermore, levels of disruptive behavior were reduced during phases containing choice.

Dunlap et al. (1994) conducted a second experiment in which a five-year-old enrolled in a class for students with emotional disabilities was observed under conditions with both choice and no-choice as described in Experiment One. Sessions lasted 15 minutes and the student was expected to listen to readings of age appropriate storybooks. During the choice condition, the student was allowed to choose which book would be read and change books at any time. A reversal design and 10-second partial interval recording was used to collect data for task engagement and disruptive behavior during reading sessions. Results of the second experiment were consistent with those found in the first study. Exposure to the conditions containing choice of reading resulted in higher task engagement and lower disruptive behavior in comparison to the no-choice conditions. Interpretations of results from these experiments suggest both academic and behavioral benefits when students with emotional disabilities are allowed to choose academic tasks in which they are more likely to engage. By providing choice, the student is given some sense of control within his classroom. Such interventions can be contrasted with many classroom management techniques that require high levels of external control for students with emotional and behavioral disabilities (Shores, Gunter, & Jack, 1993).

Interventions derived from matching theory. A number of interventions have been derived from Herrnstein's (1961) matching law, which is the mathematical relationship relating frequencies of response and reinforcement in concurrent

schedules of reinforcement. More simply, the matching law states that behavior will be distributed between response alternatives relative to the ratio that reinforcement has been obtained for choice of those alternatives (Myerson & Hale, 1984).

Herrnstein (1961) confirmed the matching law in basic research utilizing three, male pigeons and a concurrent choice procedure with variable-interval schedules of reinforcement. Through an alternating pattern of reinforcement, the pigeons were trained to alternate responses between two response-keys in an experimental chamber. Following preliminary training, responses to either key were reinforced on a variable-interval schedule. Schedules for each key were independent of the other key. The mean interval value ranged from one to nine minutes for each key. The total frequency of reinforcement for the two keys was held constant. Results indicate that relative response frequencies for each key approximated the relative frequency of reinforcement provided for that key.

A primary component of matching law is choice. McDowell (1988) explains that when a person is confronted with response alternatives and selects one, excluding the others, he has made a choice. Ultimately, the two choice alternatives are the target alternative and everything else. Choice can be described as continuous, meaning that the opportunity to select response alternatives is continually available. When choice is continuous, and when consequences for alternatives occur occasionally, a concurrent schedule of reinforcement exists. An understanding of this theory and its therapeutic implications can lead to improvements in intervention planning and management for a variety of populations.

Matching law is a well-established principle of behavior that may be used to prevent and remedy behavioral problems in educational settings. Myerson and Hale (1984) discussed the practical applications of Herrnstein's matching law as conceptualized from the mathematical basis of the theory. The researchers apply basic, laboratory research to human behavior in applied settings, which they suggest can also be analyzed as concurrent schedules of reinforcement. Factors unique to applied settings include topographical differences between inappropriate behaviors and competing responses, in addition to qualitative and scheduling differences of reinforcers following responses. Additionally, variable interval, as opposed to variable ratio, schedules of reinforcement are recommended when competing for the allocation of human behavior in applied settings.

Matching law was applied to the classroom behavior of an 18-year-old enrolled in a special education program for students with moderate mental retardation (Martens & Houk, 1989). The student was referred as a participant by her teacher to address disruptive and aggressive behaviors. The eight categories developed to classify student and staff/peer behavior were (a) on-task, (b) disruption, (c) instruction, (d) praise, (e) reprimand, (f) proximity, (g) attend to others, and (h) nonassigned contact. Duration of student and staff/peer behaviors were measured and correlated to functional definitions of reinforcement. The student was observed for a total of 276 minutes across 13 sessions ranging from 18 to 30 minutes. Data were collected over a three-week period and under two stimulus conditions described as (a) assignment to the teacher (145 minutes) and (b) assignment to the teaching aide (131 minutes). A range

of typically occurring classroom activities were sampled. A baseline design was used to sample the response class and stimulus conditions. Results first identified reinforcers in each stimulus condition. *Instruct* and *proximity* were identified as teacher behaviors that served as reinforcers for both disruptive and on-task behaviors. *Instruct* was identified as an aide behavior that served as a reinforcer for both disruptive and on-task student behaviors. *Praise* and *proximity* by the aide served as reinforcers for disruptive student behaviors. When Herrnstein's equation was applied to the data, the matching law accounted for 83% and 44% of the variance in student disruptive and on-task behaviors. These results validate the use of matching theory in educational settings to explain the behavior of students with disabilities.

Mace, McCurdy, and Quigley (1990) sought to examine the generality of matching theory in applied settings by exposing students to response alternatives on concurrent schedules of reinforcement. The students were expected to distribute their behavior between response alternatives in approximate proportion to the rate of reinforcement supplied for each response option. Experiment One targeted the math skills of a 16-year-old student. Prior to the experiment, preferred reinforcers (candy bars and corn chips) were identified. Experimental procedures required the student to complete three-digit by two-digit multiplication (3×2) and division ($3 / 2$) problems. The student was presented two stacks of cards; one stack contained multiplication problems and the other contained division problems. The student was told that he could choose to complete whichever he liked throughout the sessions. The dependent measure was the rate of problem completion, and was calculated by dividing the

number of problems completed per session by the duration of the session (15 minutes). Following baseline data collection, the student was exposed to five conditions of reinforcement through combined simultaneous treatments and reversal designs. The conditions were designed to expose students to (a) equal schedules of social reinforcement, (b) equal schedules of edible reinforcement, (c) reversed equal schedules of edible reinforcement, (d) unequal schedules of edible reinforcement, and (e) reversed unequal schedules of edible reinforcement. When the rate of problem completion was examined across the five phases, the effects of concurrent reinforcement were evident during the first three phases. When provided with equal rates of reinforcement for completing multiplication and division problems, the student allocated his behavior almost equally between the two response alternatives. In the fourth and fifth phases, the rate of reinforcement for one alternative was doubled while the other was held constant resulting in responses favoring the higher rate of reinforcement as suggested by matching theory.

Mace et al. (1990) conducted a second experiment and exposed a 12-year-old male with mental retardation to assembly tasks (pens and bags of silverware) taken from his pre-vocational curriculum. The experimental design and procedures were similar to those used during the first experiment. Preferred reinforcers were identified to be peanut-butter cups and M&M[®]s. Following collection of baseline data for student work rate, the phases implemented during Experiment Two were (a) equal schedules and amounts of reinforcement, (b) equal schedules and amounts with reinforcers reversed, (c) equal schedules and amounts of reinforcement-repeated, (d)

unequal schedules and reinforcer amounts favoring silverware assembly, (e) unequal schedules and reinforcer amounts favoring pen assembly, and (f) repeated unequal schedules and reinforcer amounts favoring silverware assembly. Results of Experiment Two demonstrated that when reinforcement rates and amounts were held constant and equal, response rates were similar for pen assembly and silverware bagging tasks. When reinforcer rates and amounts were doubled to favor one alternative, the student allocated more responses to the alternative providing richer reinforcement. The findings of both experiments support Balsam and Bondy (1983) who suggested that increasing the rate of reinforcement for one response alternative might suppress competing response behaviors for the individual. This pattern of responding (i.e., choosing) was present for students in both experiments.

Martens, et al. (1992) also sought to extend matching theory research to academic settings by exposing two fourth-grade students to four variable-interval schedules of reinforcement for academic engagement. The two students had no prior referrals for academic difficulties, but had been identified by their teacher as being off-task during most independent seatwork. During the experiment, the students were required to work independently at their seats on social studies, science, or reading assignments. In addition to student behaviors, adult and peer behaviors were identified and recorded during observations. Student behaviors recorded included out of seat, noise, vocalization, touching, playing, inactivity, and engagement; while adult and peer behaviors were teacher approval, teacher disapproval, individual instruction, group instruction, peer approach, and experimenter approval. A 10-second partial

interval sampling procedure was used to record data in all behavior categories except engagement, which was recorded using whole-interval time sampling procedures. Reinforcement for academic engagement was provided by the experimenter using a 20-second interval cue while wearing headphones. At variable intervals predetermined by scheduling, the experimenter delivered verbal praise such as “I like the way you are working quietly on the assignment” when the students were observed as engaged or on-task.

Four variable interval schedules of reinforcement were implemented with mean intervals ranging from five to two minutes. Following baseline observations and data collection, the four schedules were introduced in phases, increasing the richness of scheduled reinforcement from a mean of 5 to 2 minutes. Data from each phase served in contrast to the previous and subsequent phase. Sessions were conducted in a fourth-grade classroom for 12 to 30 minutes each day. Data were collected during 20 sessions for one student and 21 sessions for the second. Herrnstein’s matching equation was then applied to the resulting data, indicating that the matching law accounted for 99.1% and 87.6% of the variance in academic engagement by the students.

Although these results support matching theory, Martens et al. (1992) conducted a second experiment to address limitations regarding experimental design, low number of sessions per phase, and downward trends in data within phases. During the second experiment, two third grade students, who were also identified as off-task during independent seatwork, were exposed to the variable interval schedules of

reinforcement with mean intervals from two to five minutes used during the first experiment. Experimental procedures were similar to those implemented during the first experiment. Following baseline observations and recording, an alternating treatments design was used to expose students to the two conditions. Students were exposed to only one reinforcement schedule each day. Academic engagement data obtained for each student indicated higher percentages of behavior during the richer, two-minute (71.3%, 86.9%) schedule, than during the five-minute (47.7%, 71.3%) or baseline (44.0%, 60.0%) schedules of reinforcement. This data suggests that control over student behavior was established using the reinforcement procedures. This study extended research through evaluation of the single-alternative form of the matching theory in applied settings by altering social reinforcement. Results support the extension of matching theory principles to academic settings, specifically to teacher praise and reinforcement.

Neef, Mace, Shea, and Shade (1992) extended matching theory research by addressing the academic behaviors of students with emotional and behavioral disabilities. Effects of rate and quality of reinforcers on time allocation were examined in an educational setting. Three female students who had been identified as having emotional or behavioral disabilities were referred for participation by their teachers because they were not completing instructional tasks. The students were asked to complete math problems from two stacks of cards. Students were allowed to choose from yellow or green stacks of math cards and reinforced with either a nickel or a chip (program money that could be exchanged later for privileges or items). When an

answer was incorrect, the experimenter marked an X on the card. Each student participated in two 10-minute sessions each day, three days per week. Two experimental conditions were introduced following a prebaseline condition to determine the students' sensitivity to variable interval schedules. The *equal-quality reinforcer* condition assessed performance under two independent sets of concurrent variable interval schedules of reinforcement at 30-second and 120-second intervals. Reinforcers were used alternatively across sessions but held constant across the two stacks of math problems. This showed that both nickels and chips served as reinforcers for the students. Also, the extent of matching with equal-quality reinforcers could be compared to unequal-quality reinforcers. Nickels were identified as high-quality reinforcers while chips were determined to be low-quality reinforcers. The *unequal-quality reinforcer* condition assessed performance under 30-second variable interval schedules in which the students earned chips, and 120-second schedules in which nickels were earned for correct responses. Conditions were alternated using a reversal design.

Results obtained during the equal-reinforcer condition indicated that students allocated their time and behavior in proportion to the rate of obtained reinforcement. However, during the unequal-reinforcer condition this matching was disrupted when students favored the high-quality reinforcer regardless of schedule. The researchers suggest that the disruption of matching relationship during the unequal-reinforcer condition mimics most natural choice situations. The research described here supports

the use of interventions based on matching theory and serves as a basis for additional techniques derived from the theory when using tangible reinforcers.

Interventions based on the discrete item completion hypothesis. Application of interspersal procedures in academic settings is one line of research that extends matching theory to academic settings. Skinner (2001) reviews interspersal research supporting conclusions that discrete task or item completion within an assignment serves as a reinforcing event for students (i.e., completing a math problem within an assigned worksheet). This conclusion is known as the *discrete item completion hypothesis*. In accordance with matching theory, and as suggested by researchers, discrete task or item completion should affect students' choice behavior much like rates of reinforcement (Martens & Houk, 1989; Mace, et al., 1990; Martens, et al., 1992; Neef, et al., 1992; Neef, Shade, & Miller, 1994). In other words, rates of item completion may serve to influence students' choice to engage in an assignment or an inappropriate behavior during academic seatwork. If this theory holds true, classroom interventions based on these principles would appear relatively favorable to teachers. When using item completion as a reinforcer, the teacher would not be required to deliver social (i.e., praise) or tangible (i.e., nickels) reinforcers during independent seatwork as suggested with many behavioral interventions.

The assumption that a discrete task or item serves as a reinforcing event within a larger assignment is based on classical conditioning (Pavlov, 1927). A student may learn that assignment completion will be reinforced, thereby classically conditioning the student to perceive assignment completion as a reinforcing stimulus (Skinner, et

al., 1999). As Pavlov (1927) indicated, any event consistently preceding assignment completion should become a conditioned, reinforcing event. When assignments are comprised of discrete items, completion of each discrete item should be a reinforcing event (Skinner, 2001). If discrete item completion serves as a reinforcing event, then rates of reinforcement should increase as task completion rates are increased. Therefore, if a student is given a choice of two assignments, their choice to allocate time and behavior toward an assignment should favor the assignment with higher rates of item completion.

Interspersal procedures modify the rate of item completion by adding, or interspersing, additional briefer items (i.e., items that take less time to complete) throughout an assignment. Skinner, Robinson, Johns, Logan, and Belfiore (1996) demonstrate this by exposing college students to math assignments containing problems that can be completed relatively quickly interspersed with problems that require more time and effort to complete. During Experiment One, undergraduate students were exposed to two different math assignments during one session. Both assignments contained 16, 3 x 2 problems. The experimental, or interspersal, assignment contained six additional 1 x 1 problems following every third 3 x 2, or target problem. Students were allowed 305 seconds to work on each assignment. After working on both assignments, students were asked which assignment required the most time and effort to complete, and which was more difficult. In addition to these questions, students were told they would be completing a third assignment similar to one of the previous two assignments. Students were asked which type of assignment

they would prefer to complete. Results indicate that significantly more students ranked the interspersal assignment as requiring less time (65%), less effort (69%), and as less difficult (65%) to complete. Additionally, a significant number of students (71%) chose an interspersal assignment for their third assignment. Mean problem completion rates showed that students completed significantly more problems on the interspersal assignment (13.53) than on the control assignment (9.94). No significant differences were found for accuracy of problem completion across assignments.

Skinner et al. (1996) conducted a second experiment to control for novelty effects. Procedures during this experiment were similar, but required the 31 undergraduate students to work on three math assignments prior to ranking the assignments for time, effort, and difficulty. The additional assignment replaced the 1 x 1 interspersal problems with 3 / 2 problems. Results of this experiment replicated findings of the first experiment indicating that students ranked the assignment containing the relatively easy and short 1 x 1 problems as requiring less time (77%), less effort (70%), and as less difficult (80%) to complete. Additionally, a significant number (77%) of students chose an interspersal assignment containing 1 x 1 problems for their next assignment. Accuracy rates for target problems within the control assignment, and interspersal assignments containing 1x1 and 3 / 2 problems were relatively consistent with 67.67%, 60.25%, and 65.36% respectively. Problem completion rates indicate that students completed more problems during interspersal assignment with 1 x 1 problems (13.60) than during control (10.37) or interspersal (10.37) assignments with 3/2 problems.

Skinner et al. (1996) conducted a third experiment in which the interspersal problems were removed from both experimental assignments. Results confirmed that the three assignments did not differ significantly with respect to the 3 x 2 problems contained in each. In general, the findings in these experiments support the theory that item completion is a reinforcing event. When given a choice, significantly more students chose to complete the assignments containing relatively easier, and briefer 1 x 1 problems that resulted in greater problem completion rates. Additionally, the brief, easy problems did not appear to interfere with performance on the targeted problems, lending support for this technique in instructional settings.

Skinner et al. (1999) also investigated student preference for assignments containing interspersed items. During two sessions, 109 undergraduate students were exposed to four pairs of math assignments. Four control assignments were constructed to contain 18, 4 x 1, 4 x 2, 4 x 3, or 4 x 4 problems. Four interspersal assignments were also constructed to contain similar target problems with six 1 x 1 problems interspersed following every third target problem. Students were allowed 225 seconds to work on each assignment. Students were then asked which assignment required more time and effort to complete, and which was the most difficult. Students were told they would be given a third assignment for homework and allowed to choose one similar to either the control or interspersal assignment.

Using a within-groups design, student ranking and choice data for the assignments were analyzed. Results indicate that students ranked the interspersal assignment as requiring less time, effort, and as less difficult to complete than the

control assignment for the 4 x 2, 4 x 3, and 4 x 4 assignment pairs. For the 4 x 1 assignment pair, students ranked the interspersal assignment as requiring less effort, and as less difficult, but not as requiring less time to complete. Across all four assignment pairs, students chose to complete interspersal assignments over the control assignments indicating a preference for the former. Performance data indicates that interspersing 1 x 1 problems did not affect accuracy in comparison to the control assignments, suggesting that the interspersal procedure may increase student preference for targeted work without compromising instructional significance. Additionally, total problem completion rates were higher during interspersal than during control assignments across all assignment pairs. Mean problem completion rates were 13.9, 5.4, 3.1, and 2.0 for the 4 x 1, 4 x 2, 4 x 3, and 4 x 4 interspersal assignments respectively. When the relationship between problem completion rates and student assignment choice was examined, researchers found that the probability of students choosing the interspersal assignment increased as problem completion rate increased. The probability of favorable student ratings for time, effort, and difficulty also increased as problem completion rates increased. These findings support the theory that item completion is a reinforcing event and can increase student preference for assignments containing multiplication problems.

Cates, et al. (1999) conducted research to determine if students would prefer more work when using interspersal assignments. Researchers exposed 66 undergraduate students to two assignments to determine if students would prefer an assignment containing more work (i.e., 3 x 2 target problems) if the assignment also

contained easier, briefer interspersed items. The control assignment contained 15 3×2 items and the experimental assignment contained 18 3×2 problems (20% more than the control) with six 1×1 problems interspersed following every third target problem. The students were given 240 seconds to work on each assignment. Students ranked the interspersal assignment with 20% more target problems as easier and requiring less effort to complete. Additionally, more students chose to complete the interspersal assignment over the control as their homework assignment, thus indicating preference for this assignment. Target problem completion and accuracy rates did not differ across assignments. Total problem completion rates indicate that students completed more problems during interspersal than during control assignments across all assignment pairs. This study showed that students chose to engage in more independent seatwork (i.e., 20% more target problems) when given an interspersal assignment as compared to a more typical academic math assignment.

In a subsequent investigation, Cates and Skinner (2000) exposed secondary, remedial math students to three pairs of assignments. Each control assignment contained 15, 3×2 problems. Control assignments were paired with comparable experimental assignments containing 0%, 20%, or 40% more target problems than the control, in addition to 1×1 interspersal problems following every third target problem. Across all assignment pairs, significantly more students ranked the interspersal assignments more favorably in regard to time, effort, and difficulty. In addition, significantly more students chose to complete interspersal assignments for homework. Student performance data indicated that total problem completion rates

were significantly higher during interspersal assignments across all pairs and did not compromise problem accuracy. The findings support the interspersal procedure, demonstrating strength in prompting students to choose assignments with more work. Most importantly, students who were identified as having academic difficulties in math chose to complete assignments with more targeted math problems.

Interspersal procedures have also proven successful in math assignments requiring students to complete word problems (Wildmon, Skinner, McCurdy, & Sims, 1999; Wildmon, Skinner, & McDade, 1998). Wildmon, Skinner, and McDade (1998) exposed 76 undergraduate students to two assignments. The control assignment contained eight $2 \times 2 + 2 \times 2$ math reading problems, and an interspersal assignment contained eight equivalent target problems and three interspersed $4 + 4$ math reading problems designed to be easy and brief. After working on both assignments for nine minutes, students were asked to choose which assignment was more difficult, and which required more time and effort to complete. They were also asked which type assignment they would prefer to complete for homework. Data for student performance indicated that students completed significantly more total problems during the interspersal assignment, but no differences for problem accuracy emerged. Student ratings of the two assignment types show that the interspersal assignment was perceived as requiring less effort and as less difficult, but no significant differences were found for time. Additionally, significantly more students chose the interspersal assignment for homework.

Wildmon, et al. (1999) sought to replicate the previous findings with 80 high school students whose academic curriculum was more similar to the $2 \times 2 + 2 \times 2$ math reading problems. Materials, procedure, and design were similar to that used by Wildmon et al. (1998). Results indicate that significantly more students chose the interspersal assignment for homework, and ranked it as less difficult than the control assignment. No significant differences were found for time or effort ratings. Once again, students completed significantly more total problems during interspersal than during control assignments, and no significant differences were found for problem accuracy. These results coupled with those found by Wildmon et al. (1998) extend interspersal research beyond math computation problems and indicate that students will again choose to engage in more academic work without losing accuracy when problem completion rates are increased by adding brief, interspersed items throughout an assignment containing word problems.

When students are choosing to engage in academic work, they are choosing not to engage in inappropriate classroom behaviors (Myerson & Hale, 1984). McCurdy, Skinner, Grantham, Watson, and Hindman (2001) investigated effects of the interspersal procedure on the task engagement of elementary school students during math assignments. A fourth-grade student was exposed to two math assignments in her classroom. The control assignment was taken from her math curriculum and the interspersal assignments were designed to be equivalent with a brief problem following every third target problem. An alternating treatments design was used to compare the student's on-task and off-task behavior during each type assignment.

Each session lasted from five to 15 minutes. Observers used a momentary time sampling procedure to record the data. Data indicated the student chose to engage in academic tasks at a higher rate while working on interspersal assignments. The mean rate of on-task behavior during interspersal assignments was 72.5% compared to 55.5% during control assignments. Results of this study support matching theory in that if a student perceives an assignment as more favorable, the student will choose to engage in a higher rate of task completion, therefore decreasing the rates of inappropriate behaviors. These findings have implications for the development of interspersal-based interventions to address behavioral as well as academic difficulties of students.

Students with emotional and behavioral disabilities are perhaps most in need of interventions that will address both academic and behavioral difficulties in the classroom. Skinner, Hurst, Teeple, and Meadows (in press) applied interspersal procedures to the math assignments of five students identified as having emotional disabilities. Researchers constructed four sets of assignments containing target problems requiring (a) simple addition, (b) addition with carrying, (c) simple subtraction, and (d) subtraction with borrowing. For each type assignment, two control and two interspersal assignments were constructed. Control assignments contained 30 target problems, while interspersal assignments contained equivalent target problems in addition to $1 + 1$ or $1 - 1$ problems for addition and subtraction assignments respectively. Students' on-task behavior was observed and recorded across 16 sessions. Alternating treatments designs were used to compare each student's behavior

across assignments. A momentary time-sampling procedure with five-second intervals was used to record student behaviors. Results indicate that the interspersal assignments improved the task-engagement of four of the five students who participated. Student performance data indicates variability in accuracy rates across assignments. The successful extension of interspersal procedures to students with emotional disabilities is relevant to treatment planning for this population. As previously stated, if students are not engaged in academic activities, they are less likely to learn (Skinner, 1998) and may be at risk for developing emotional or behavioral disabilities (Coutinho, 1986; Knoff, 1983).

Although interspersal procedures have proven effective in increasing task engagement and student preference for assignments, researchers failed to find similar results when similar procedures were applied to the reading assignments of seventh grade students (Martin, Skinner, & Neddenriep, 2001). Forty-eight students were asked to read aloud both control and experimental passages. The control assignment contained two passages determined to be at a sixth grade level of abilities. Experimental passages were constructed to be equivalent to the control with additional second and fourth passages containing 16 words considered to be at a first grade level of abilities. These passages were designed to be relatively easier and briefer to read than the control passages. Following completion of both assignments, the students were asked which type assignment would require less effort and time to complete, which they liked the most, and which they would prefer to work on again. In contrast to previous studies, results indicated that students ranked the control passages as

requiring less time to complete, but no significant differences were found for effort, choice, or preference. Based on these results, researchers suggested that interspersing additional tasks throughout assignments that are comprised of continuous tasks may prove ineffective because rather than enhancing discrete task completion rates and rates of reinforcement, this procedure may merely increase the time and effort required to complete one task. Recommendations are made for breaking continuous tasks into discrete units and as well as adding additional discrete, brief tasks to make the assignment more acceptable to students.

Purpose

The purpose of the current study is to replicate and extend research on interspersal procedures. Previous researchers investigating interspersal procedures have exposed students to math and reading assignments. The current study extends this research to grammar assignments. Previous researchers have also investigated effects of interspersal procedures on academic engagement in students with behavioral disabilities (Skinner, Hurst et al., in press). However, no studies have been conducted investigating the effects of interspersal procedures on assignment perception or assignment choice behavior in students with behavioral or emotional disabilities. The current study extends research on interspersal procedures to this group of students.

In the current study, 32 students identified as have emotional disturbance were exposed to control and experimental grammar assignments. Experimental assignments were similar to control assignments with respect to target items. The experimental assignment contained additional interspersed, briefer items following every second

target item. Academic performance data were collected on discrete item completion rates and item accuracy levels for each assignment to test the hypothesis that students would complete more discrete items during interspersal assignments, without reducing accuracy levels on target items. Student perceptions of time, effort, and difficulty were also assessed and analyzed to determine if significantly more students ranked the experimental assignment more favorably (i.e., less effort and time to complete and less difficult) than the control assignment. Finally, after exposure to both assignments students were given a choice of which new assignment they would complete for homework, an experimental formatted assignment or a control formatted assignment, and an analysis was conducted to determine if significantly more students chose the experimental assignments.

Chapter 3

Methodology

Participants and Setting

Participants were 32 students enrolled in a self-contained adaptive education school in the southeastern United States. The school was housed within a public school system and served children in elementary through high school grade levels. The school was designed to serve students with behavioral and emotional disabilities whose psychoeducational needs could not be met within the system's school-level self-contained classrooms.

Of the 32 participants, 30 were male and 2 were female. Participants ranged in age from 12 to 17, and were in the 7th through the 12th grades. Students had been diagnosed with emotional disabilities as defined by the state department of education and considered to have one or more of the following characteristics that has had an adverse effect on educational performance for an extended period of time, and to a marked degree: (a) Inability to learn that can not be explained by intellectual, sensory, health, or learning disability factors; (b) inability to build or maintain interpersonal relationships with peers, teachers, or significant others; (c) inappropriate types of behavior or feelings in normal circumstances; (d) a general pervasive mood of unhappiness or depression; and (e) a tendency to develop physical symptoms or fears in association with personal or school problems (Tennessee State Department of Education, 1993). Although many of the participants carried secondary diagnoses, this information is secured in special education records to which access was not permitted.

Prior to soliciting participants, approval was obtained from the school district's research coordinator, the school principal, and the University Institutional Review Board. Following approval from the aforementioned sources, classroom teachers at the school were informed of the research project and asked to participate. Five teachers were interested and volunteered their classrooms for participation. All students enrolled in the five participating classrooms were given parental permission letters and an informed consent form to return to their teachers with parental signatures. Initially, 43 parental permission letters were distributed and 35 were returned with parental consent. Only one student returned a letter in which parental consent was denied. Upon entering the classrooms, those students who obtained consent were given student assent forms providing a description of the requirements of participation. The primary researcher also verbally presented the content of the assent form. Students were then asked to sign the assent form if they agreed to participate. Assent was obtained from 33 students across five classrooms. One student withdrew his participation shortly after beginning the first assignment, which resulted in 32 students participating throughout the entire study.

Materials

Students were asked to work on two different grammar assignments. Each assignment contained a one-letter title (J or K) capitalized and in bold at the top of each page within the assignment. Following the title, a grammar assignment was presented in which the students were required to copy a paragraph and add punctuation at the end of each sentence. Spaces and capitalization cues were provided

where punctuation should be added. Sentences were designed so that a period would be correct following each sentence. Paragraphs were taken from elementary language textbooks (Ragno, Toth, & Gray, 1996; Toth, Ragno, & Gray, 1996). All paragraphs presented were presented at third and fourth grade reading levels to accommodate the ability levels of the participants.

Two equivalent 15 multi-sentence assignments were initially constructed. These served as the control assignments (see Appendix). A ruled area was provided below each paragraph in which students were asked to rewrite the paragraphs adding appropriate, ending punctuation. The experimental assignments were constructed by adding eight one-sentence paragraphs to the control assignments (see Appendix). The experimental paragraphs were arranged placing two multi-sentence, or target paragraphs following each one-sentence, or interspersal paragraph.

Each assignment consisted of five pages containing paragraphs on one side of white sheets of paper measuring 8.5 by 11 inches. Three multi-sentence paragraphs were placed on each page within the assignments. In addition to the multi-sentence paragraphs, the experimental assignment contained one or two one-sentence paragraphs on each page.

During assignment completion, students were presented one packet containing both a control and interspersal assignment. The assignments were stapled and presented with a page following each assignment exhibiting a stop sign. In addition, each packet contained a cover sheet soliciting information regarding sex, age, and grade level of each participant. The final page in each packet required students to

respond to the following questions: (a) Which assignment required more time to complete? (b) Which assignment required more effort to complete from start to finish? (c) Which assignment was easier? (d) Which assignment would you like to work on for homework tonight? Each question was presented with the letters J and K provided as response choices.

Procedure

Participants were given a packet containing a total of fourteen pages as previously described. After completing the information sheet attached to each packet, the experimenters informed students that the two assignments would replace their typical English or grammar lesson for the day. The students were instructed to (a) copy each sentence adding punctuation, (b) start at the top of each page and work down, (c) not skip any sentences, (d) raise their hands if they need assistance, and (e) stop working when they reach a stop sign, or were told to “stop working.” Students were instructed to begin as the experimenter started the stopwatch. After 15 minutes, the experimenter instructed the students to stop working. The same procedures were followed during the second assignment. After working on each assignment for 15 minutes, the students were asked to circle the title (J or K) of the assignment they had been working on. This was done to increase students’ awareness of assignment title prior to making relative judgments of assignments.

After working on the second assignment for 15 minutes, students completed the final page of the packet containing the four questions relating to the time, effort, and difficulty in completing the assignments and choice of homework. These

questions were read aloud as students worked through the questions. Upon completion of the final form, the students were informed that because they had cooperated so well, they would not be required to complete a homework assignment as suggested by the questioning.

Experimental Design, Dependent Variables, and Data-Analysis Procedures

A within-groups design was used to compare students' performance across two assignments as well as choice and ranking data obtained from each participant. The control and interspersal assignments were counterbalanced across packets to control for sequencing effects by alternating the order in which the two assignments were presented in the packet. Additionally, sequencing effects were also addressed by alternating the titles (J or K) assigned to each assignment. The two assignments were equated by matching the same number of letters in corresponding control and interspersal multi-sentence paragraphs. For example, the first multi-sentence paragraph in J has 141 letters and the first multi-sentence paragraph in K also has 141 letters. The paragraphs ranged in number of letters from 118 to 143. Each one-sentence paragraph contained 10 letters. Each multi-sentence paragraph contained four sentences.

Student performance data were collected and analyzed for each assignment. Performance dependent variables were (a) total number of items completed, (b) the number of target (multi-sentence paragraph) items completed, and (c) percentage of sentences accurately punctuated in completed items. Sentences ending with periods or

exclamation points were scored as correct. Items partially completed by students were not included in calculations.

Student performance data were analyzed using paired samples t-tests. All differences were considered significant at $p < .05$. Data for student ratings of time, effort, and difficulty and homework choice were nominal; therefore, a chi-square goodness of fit test was used to examine differences across assignments. All differences were considered significant at $p < .05$.

Reliability and Validity

Interscorer agreement. Interscorer agreement was obtained for 20% of the assignments. A second experimenter independently recorded scores for number of items completed and accuracy of each item. Agreement for number of items completed was calculated by dividing the total number of scored agreements by the total number of items scored by both experimenters. Mean interscorer agreement for number of items completed was 100%. Agreement for accuracy of sentence punctuation was calculated by dividing the number of scored agreements by the total number sentences scored by both experimenters. Mean interscorer agreement for accuracy was 92%. Poor student handwriting is one explanation for discrepancies in scoring accuracy.

Experimental integrity. Five classroom teachers were presented checklists and asked to monitor the primary experimenter's implementation. The steps and procedures monitored to ensure consistency were (a) distribution of students assent forms, (b) explanation of student assent, (c) collection of student assent, (d)

distribution of assignment packets, (e) completion and clarity of instructions read at each stage, (f) accuracy in time keeping, (g) monitoring students as they worked, (h) appropriate responses to any questions, (i) collection of assignment packets, and (j) explanation of hypothetical homework assignment to students. Experimental integrity was 100% for all classroom administrations.

Chapter 4

*Results**Target Item Accuracy*

Based on previous research where students worked on math problems, the first hypothesis was that the interspersal procedure would have no impact on accuracy levels for target items. Paired samples *t*-tests comparing accuracy levels for target items support this hypothesis. Mean percentages of sentences accurately punctuated are displayed in Table 1. Results of a paired samples *t*-test show no significant difference between the control and interspersal assignments for percentages of sentences punctuated correctly, $t(32) = .646, p > .05$. These data also show that students performed fairly well on both assignments (average scores were above 80%). Omission of punctuation was the primary factor leading to sentences scored as incorrect.

Item Completion Rate

Seatwork assignments are typically used so that students may practice skills they have already acquired. Analyses of accuracy data suggest that students had already acquired the punctuation skills required to complete the target problems in these assignments. The second analysis was conducted to determine if interspersing the additional problems decreased students' opportunities to practice target items. The mean number of target items completed for both the control and interspersal assignments are displayed in Table 2. Results of a paired samples *t*-test show no significant difference between the number of target items completed during the control

Table 1

Target Item Accuracy Levels For Control and Interspersal Assignments

	<u>Control</u>		<u>Interspersal</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Percent of Punctuation Completed Accurately	85.0625	26.3732	83.8750	23.8622

Table 2

Item Completion During Control and Interspersal Assignments

	<u>Control</u>		<u>Interspersal</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Number of Target Items Completed	3.6250	1.8622	3.4375	2.0310
Number of Total Items Completed	3.6250	1.8622	5.9375	3.1412*

**p < .05*

and interspersal assignments, $t(32) = .311, p > .05$. These data show that interspersing the additional brief problems did not significantly reduce students' opportunities to practice target items.

Researchers have suggested that interspersal procedures are effective because the technique increases discrete item completion rates, which constitutes an increase in the rates of reinforcement for engaging in assigned work. Thus, the goal of the interspersal procedure is to enhance total problem completion rates. Table 2 displays the mean number of total items completed for both the control and interspersal assignments. Results of a paired samples t -test show a significant difference between the number of total items completed during the control and interspersal assignments, $t(32) = .000, p < .05$. Students completed significantly more items during the interspersal assignment with a mean problem completion rate of .396 items per minute, than during the control assignment with a mean problem completion rate of .242 items per minute. These results confirmed early research, which showed that the interspersal procedure could be used to increase discrete math problems completion rates without decreasing opportunities to respond to target items.

Assignment Preference Data

One goal, and perhaps the primary goal of the interspersal procedure, is to improve students' perceptions of assignments without making them easier or briefer (sometimes referred to as watering down the curriculum). In the current study, students' perceptions of assignments were assessed with four forced choice items (time, effort, difficulty, and choice). Table 3 displays student preference data. Results

Table 3

Choice, Effort, and Time Rankings, for Control and Interspersal Assignments

	<u>Control</u>		<u>Interspersal</u>	
	<i>n</i>	%	<i>n</i>	%
Homework Choice	8	25.00	24	75.00*
Less Time to Complete	12	37.50	20	62.50
Less Effort to Complete	16	50.00	16	50.00
Less Difficult	14	43.75	18	56.25

* $p < .05$

of chi-square tests show no statistically significant student preferences for time, $\chi^2(1, N = 32) = .157, p > .05$, effort, $\chi^2(1, N = 32) = 1.0, p > .05$, and difficulty, $\chi^2(1, N = 32) = .480, p > .05$. These findings failed to confirm some earlier studies where students worked on control and interspersal math assignments.

With respect to all three of these findings, it is important to note that students did not rate the control assignment more favorably than the interspersal assignment. This is most significant for the time and effort ratings. Although the interspersal assignment contained more items (i.e., the additional brief items) students did not rate this assignment as requiring more time and effort to complete.

While these specific questions about assignments provide some indication of students' perceptions, the final question which required students to choose an assignment for homework may provide the best indication of preference. A chi-square analysis showed significantly, $\chi^2(1, N = 32) = .005, p < .05$, more students chose to complete an interspersal assignment as homework than chose the control assignment. Results indicate that students did prefer to work on the interspersal assignment rather than the control assignment when given a choice.

Chapter 5

Discussion

General Discussion

Students with behavioral and emotional disabilities may engage in inappropriate and disruptive classroom behaviors in efforts to escape or avoid academic assignments. Previous researchers have shown that interspersing relatively brief items throughout an assignment can enhance general education students' perceptions of assignments without compromising accuracy and educational significance. The current study sought to extend this research to students with behavioral and emotional disabilities.

The current results showed that when given a choice of homework assignments, significantly more students chose the grammar assignment containing interspersed items. This finding is consistent with previous research using interspersal procedures (Cates et al., 1999; Cates & Skinner, 2000; Skinner et al., 1996; Skinner et al., 1999; Wildmon et al., 1998; Wildmon et al., 1999). However, students did not rate the interspersal assignment as requiring less time and effort to complete, or as easier in comparison to the control assignment. This finding conflicts with previous research on interspersal procedures conducted with general education students.

Comparisons of academic performance across assignments were consistent with previous findings. Total item completion rates were higher during interspersal assignments than during control assignments, which confirm previous research showing that interspersing additional brief items throughout an assignment enhances

discrete item completion rates. Target item accuracy level (i.e., percent correct) across interspersal and control assignments did not significantly differ, supporting previous research that has shown that interspersal procedures do not reduce or enhance academic accuracy. Finally, no differences were found for target item completion rates across interspersal and control assignments, confirming previous research showing that interspersal procedures did not reduce student opportunities to respond.

Limitations and Future Research

The current results have applied and theoretical implications. However, each of these implications should be considered in light of the limitations associated with the current study. The current study had a number of limitations regarding the students who served as participants. Several students were receiving medication, either before arriving or while at school, to address psychological or behavioral needs. During participation in the study, some students appeared tired or sleepy. Teachers reported this type behavior was most likely an effect of prescribed medication. However, information regarding specific medication was considered confidential and was not released to the researchers. Therefore, in some cases student behavior or performance may have been influenced by medication. Thus, the current results may have been influenced by interactions between the interspersal procedure and medication effects. Researchers may wish to obtain student medication data in future projects in efforts to separate the effects of interspersal procedures and medication.

All participating students were enrolled in the self-contained school due to behavioral or emotional disabilities. However, many of the students also carried

secondary diagnoses such as Attention-Deficit Hyperactivity Disorder, Bi-polar disorder, or specific learning disabilities. This information was considered confidential and was not released to the researchers. Thus, a second limitation with the current study is that it is not clear if there are differential effects of the interspersal procedure across students with dual diagnoses. Additional research is needed to adequately evaluate the effects of interspersal procedures for students with specific disabilities.

In the current study, 32 participants were male and only two were female. Although this rate of participation is consistent with the overall percentage of female students enrolled in the school, the current study does not allow conclusions to be drawn with respect to the effects of interspersal procedures with females with emotional-behavioral disabilities or compare the effects of interspersal assignments across males and females with behavioral disabilities. Future studies with adequate numbers of female and male students with behavioral or emotional disabilities enrolled in the same program are recommended to address these limitations.

Another limitation in this study was the varying levels of academic and cognitive abilities of students enrolled in the school. The punctuation task was designed at a third or fourth grade level of abilities. This level was chosen by the participating teachers to ensure that all students could perform the task without assistance. Although this may have reflected the current level of functioning for some students, many were functioning at a higher level. Future researchers may wish to seek participants with behavioral and emotional disabilities who are more similar in ability

levels. In such a study, academic tasks could be designed to meet the instructional level of all students.

Additionally, one limitation of the procedure used in the current study is the possible cumulative effect that interspersal procedures may have on target, or educationally significant, item completion over time. Although target item completion rates did not differ significantly in the current study, student completion rates of target items during the interspersal assignment was slightly lower than during the control assignment. Due to the cumulative effect of completing fewer target items in multiple assignments over long periods of time, students who are exposed to interspersal assignments may be exposed to fewer educationally significant items than their peers. Additional research is needed to examine the educational impact of such a cumulative effect.

Theoretical Implications and Future Research

Although there are limitations associated with the current study, results do have both applied and theoretical implications. Researchers have posited that interspersal procedures are effective because discrete item completion is a reinforcing event. Thus, by increasing discrete item completion rates, the interspersal procedure increases rates of conditioned reinforcement. Consistent with previous research, this increase in rate of reinforcement is posited to cause students to choose to complete an interspersal assignment. The current study provides support for the discrete item completion hypothesis. However, additional studies investigating this hypothesis are needed to replicate and further extend interspersal and discrete item completion

research with students with behavioral and emotional disabilities and to additional assignment types.

An alternative causal hypothesis is that interspersal procedures cause students to perceive assignments as requiring less time and effort to complete, and as less difficult, and these perceptions prompt students to choose the interspersal assignment for homework. The current results failed to support this cognitive behavioral interpretation as no differences were found for perceptions of time, difficulty, and effort.

In previous studies, significantly more general education students selected interspersal assignments as being less difficult, and as requiring less time and effort to complete. In the current study, students with emotional and behavioral disabilities did not rate the interspersal assignment more favorably across these variables. Thus, the students with emotional behavioral disabilities in the current study were more accurate than the college and general education students in previous studies with respect to their response to the time, effort, and difficulty questions.

One reason for this inconsistency across studies is that students with emotional and behavioral disabilities may be more susceptible to environmental stimuli and response demands (Pierce, 1998). Perhaps these students are better able to judge effort required to complete tasks as well as subsequent consequences, such as escape or avoidance, than their non-disabled peers. Additional research with this population and the interspersal technique is needed to further develop this hypothesis.

Applied Implications and Future Research

The current findings support the discrete item completion hypothesis and interspersal procedures in applied settings. Implications for application across students, academic subject areas, and tasks can be drawn from the current study. Interspersal procedures have proven successful in increasing student preference for assignments with college students, general education students, and currently with students with behavioral and emotional disabilities. Additional research is needed to determine if such procedures are effective with other populations that are often included in general education classrooms and require assignment modification such as students with Attention-Deficit Hyperactivity Disorder and Learning Disabilities.

Interspersal procedures are particularly applicable to educational settings due to the ease of use by classroom teachers. An interspersal assignment is a relatively independent activity and is designed to provide reinforcement while working on the assignment. Therefore, teachers are not required to provide tangible reinforcers or frequent feedback as required during many behavioral classroom techniques. Interspersal procedures may be particularly useful for teachers who are required to simultaneously monitor the classroom behaviors of numerous students functioning at varying academic and behavioral levels.

Another applied implication is the extension of the discrete item completion hypothesis. Interspersal assignments have been successful in various math assignments, and now a grammar assignment, but may also be applicable to other activities such as physical education exercises. Future research is needed to determine

if discrete item completion during physical activity, such as sit-ups or weightlifting, can be modified with interspersal procedures to increase student preference and engagement in these activities.

The discrete item completion hypothesis and interspersal procedures could also be applied outside educational settings. An assembly line is one example of a non-educational setting that might benefit from additional, interspersed tasks. In general, there are many settings and tasks where interspersal procedures could be applied and researchers should conduct studies designed to extend the external validity of such procedures.

Summary and Conclusion

The current findings suggest that when brief items are interspersed throughout an assignment, discrete item completion rates can be increased and students with behavioral and emotional disabilities will choose to complete this assignment in comparison to more traditional academic assignments. This suggests that interspersing additional brief tasks may lead students with emotional disabilities to choose to engage in academic activities instead of inappropriate classroom behaviors. Students may choose to engage in academic activities if the rate of reinforcement for engagement in the assignment is greater than the rate of reinforcement for all other behaviors exhibited in the classroom. When engaged in academic activities, students are more likely to learn and experience academic success. Future researchers should conduct longitudinal studies to determine if interspersal procedures can prevent or

remedy both behavioral and academic problems of students with emotional and behavioral disabilities.

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Appendix

Control Assignment Items

Assignment J

Dr Leidy hunted for dinosaur bones in America. Workers in New Jersey discovered bones. They also uncovered some dinosaur teeth. Today people look at those bones in museums.

The travelers have packed the large wagons. The men had washed the canvas coverings. The women had collected the wood. They have also loaded the barrels of food.

Everyone was busy inside the fort. Blacksmiths made small iron tools. These were traded with the Indians for food. Of course someone always had to stand guard.

Sacagawea saw the tracks. She looked carefully. From the way the moccasins were made, she knew what tribe these belonged to. "These are friendly Indians," she told the Captain.

It was spring. High in the mountain the snow was melting. The icy water flowed into the Missouri and flooded the river. It made it difficult for the boats to fight upstream.

Life in the Middle Ages was not like life today. Peasants worked on the large farms. Other peasants made foods like bread and cheese. The life of a peasant was a very hard one.

Earth and Venus are alike in several ways. They are both planets traveling around the sun. They are nearly the same size. They both have clouds in their skies too.

What are you doing with that loom in your house? I am weaving a rug for my parents. Do you like my design with the many colors? I designed the pattern myself.

Marie Curie lived in Poland for a long time. Later she moved to France. She studied science there and was very successful. She won two Nobel Prizes during her life.

Did you see the comet last night? We went down to the shore with my parents to watch. The comet was quite large in the sky. What a thrill it was to see it!

Peggy and Jack ride in an old-fashioned sleigh A pony pulls the sleigh around the city park Peggy holds the pony's reins The pony trots along in the snow

Lilia and Cathy hiked along mysterious trails They heard bubbly streams nearby They saw golden butterflies in a meadow Sharp noises made them turn around

Frank and I are writing some poems for school We wrote a poem about the stars The other students are helping Frank and me Ms Thompson has given us much encouragement

Fire trucks are meteors It pushes through the traffic like a meteor through the air People stop to stare at the fiery red streak The truck's lights are like sparks

Benjamin Franklin led an interesting life He started the first library His discoveries about electricity won him praise His name is on the Declaration of Independence

Assignment K

The explorers went across the mountain Then they had rivers and plains ahead of them They came to the Mississippi The river was difficult to cross but the explorers did it

The men used axes and handsaws They cut down trees and trimmed off the branches They built two rows of log cabins Each cabin had one square room with no windows

We have seen every home game this year at the stadium The last game is tonight and everyone is excited Ted went early for a good seat He knew it would be crowded

Kites had many different uses in the past The people of Samoa used kites to pull their canoes People in Korea used kites for fishing A large kite behaved like a sail in the wind

Many people join hobby clubs Hobbies help people increase their knowledge A fossil collection is a good example The collector learns something new with each fossil

Puritans believed that everyone should learn to read In Puritan towns school was required School was in the home of a teacher Puritans became better known as Pilgrims

In some ways the moon and the earth are alike both are covered by rocks and soil The earth's surface is always being changed The moon's surface does not change

People read about Mars curiously Mars is correctly called the Red Planet It certainly appears rust-red Windstorms fiercely stir the reddish dust

Skiers must watch out for a snowslide Snow can bury people Specially trained dogs will save skiers Rescue workers found three people after a storm using dogs

Warm sunshine pours in the windows Basker the cat lies in the sun When she hears me she stretches on her little round rug The she comes to greet me

The Chinese were the first people to print papers They carved pictures on wood blocks Next they put ink on the surface Last they pressed the paper on top

Peter Faberge was a good jeweler and a goldsmith He created jeweled eggs His eggs were gifts for Russian royalty People collect these beautiful eggs today

We learn about colors in class We mixed primary colors last week The mixture created three different colors We will experiment with other combinations next week

Penguins are unusual birds Land and water are both comfortable places for penguins A penguin is an excellent swimmer Flippers help the penguin swim in the water

Samuel Adams should not have worn shabby clothes He was a leader from Massachusetts People want to be proud of their leaders They do not want them to wear ugly frayed coats

Experimental Assignment Items

Assignment J

Mary shouts

Dr Leidy hunted for dinosaur bones in America Workers in New Jersey discovered bones They also uncovered some dinosaur teeth Today people look at those bones in museums

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Greg paints

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Rosie runs

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What are you doing with that loom in your house I am weaving a rug for my parents Do you like my design with the many colors I designed the pattern myself

Amy studies

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Amy studies

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trained dogs will save skiers Rescue workers found three people after a storm using
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Vita

Donna Ford Teeple was born in Crossville, TN on February 20, 1976. She was raised in Sparta, TN and graduated from White County High School in 1994. From there, she went to Tennessee Technological University in Cookeville, TN and received a B.S. in psychology in 1998. She received her Ph.D. in Education with a concentration in School Psychology from The University of Tennessee, Knoxville in 2002.

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