12-2008

The Effects of a Self-Monitoring Package Using a Tactile Cueing Device on Student On-Task Behavior in Special Education and General Education Settings

Elizabeth Johnson
Utah State University

THE EFFECTS OF A SELF-MONITORING PACKAGE USING A TACTILE CUEING DEVICE ON STUDENT ON-TASK BEHAVIOR IN SPECIAL EDUCATION AND GENERAL EDUCATION SETTINGS

by

Elizabeth Jane Johnson

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Special Education

Approved:

Ben Lignugaris/Kraft Committee Chair	Thomas Higbee Committee Member
Charles S. Salzberg Committee Member	Byron R. Burnham Dean of Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

2008

ABSTRACT

The Effects of a Self-Monitoring Package, Using a Tactile Cueing Device on Student On-task Behavior in Special Education and General Education Settings

by

Elizabeth Jane Johnson, Master of Science

Utah State University, 2008

Major Professor: Ben Lignugaris/Kraft PhD
Department: Special Education and Rehabilitation

Research has shown that self-monitoring can be effective in different settings and with a range of students as well as problem behaviors. However, teachers who use self-monitoring techniques have difficulties in using an effective cueing system as well as generalizing the newly acquired skill into the general education classroom. This study extends the literature by utilizing a tactile cueing device to increase the percentage of intervals of on-task behavior as well as increasing the intervals of on-task behavior in an inclusive general education classroom setting.

(75 pages)

CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Self management is the personal application of behavior change tactics to produce a desired change in behavior (Cooper, Heron, & Heward, 2007). The goal of self management is for people or students to control or manage their own behavior (Rhode, Jenson, & Reavis, 1992). One self management procedure is self-monitoring. Self-monitoring is a procedure where a person observes their own behavior and records the occurrence or nonoccurrence of one or more of their own target behaviors (Cooper et al.).

Many studies have been conducted on the effects of self-monitoring with a variety of students across a variety of settings (Amato-Zech, Hoff, & Doepke, 2006; Cooper et al., 2007; Dunlap, Dunlap, Koegel, & Koegel, 1991). For example, Crum (2004) conducted a study with an 8-year-old boy with a behavior disorder. The goal of this study was to increase the participant's on-task behavior in his general education class. During baseline, an independent observer collected data on the target behavior. The data sessions lasted for 15 minutes and a 10-second interval recording system was used. The baseline data showed that the boy was only on-task for 17.3% of the intervals. Once the intervention began, the boy was instructed to collect data on his own on-task behavior. He was given a recording form, instructed how to use it, and taught to recognize the expected behaviors. Throughout the class period, the classroom teacher reminded the boy to record his behavior. At the end of the sessions, the boy was praised for meeting his goal and could earn 10 minutes of free time. Free time choices included: listening to music or a story using headphones, playing with a puzzle, coloring or drawing. A new, more rigorous on-task contingency was instituted each week. Near the end of the study the boy was able to get his data sheet, start self-monitoring, and calculate the on-task intervals without being prompted

by the teacher. His on-task behavior increased to 66.4% of the intervals. The results of this study showed that self-monitoring can increase on-task behavior.

Agran et al. (2005) obtained a positive outcome when a self-monitoring strategy was used with six middle school students with moderate to severe disabilities. The students monitored their own ability to follow directions. Students affirmed they heard the direction, verbally restated the direction, performed the direction and then self-monitored the behaviors performed. The students marked a plus each time they completed a step in the task analysis (affirmation of direction, restate directions, performed direction) or a minus if they did not complete the task. After training, the students started the self-monitoring strategy in multiple general education classrooms (Art, Social Studies, Instructional Technology, and Family and Consumer Science). The behaviors that were monitored were generalized and maintained. In general, self-monitoring may be easily implemented in the classroom, takes little time to teach to students, and is manageable for the teacher (Smith, Young, Nelson, & West, 1992). Self-monitoring strategies also shift responsibility from teachers to students who then are given the opportunity to regulate their own behavior instead of relying on others (Agran et al.; Hughes et al., 2002).

Self-monitoring systems in classrooms are generally intrusive. A beep tape or the classroom teacher serves as the cue to record. This process interrupts the lesson and can distract students. A system is needed to cue students to self-monitor but it needs to be done in a way that is private. In general education classrooms, it may be particularly embarrassing and quite disruptive to use a self-monitoring cueing system that informs peers that a student is using a self management program. One silent, non-intrusive device that

may be used to cue to self–monitor is a MotivAider. The MotivAider is worn on students' belts or kept in their pocket. It vibrates on a programmable schedule to cue individual students to record their behavior.

Using a personal cueing device to self-monitor is practical and may extend the application of self-monitoring strategies to new settings and students. The purpose of this experiment is to examine the effects of self-monitoring using a tactile cueing device on a student's on-task behavior in a special education and a general education class. The following research questions will be addressed:

1. To what extent does a self management package that includes self-monitoring and contingent reinforcement and uses a tactile cueing device increase the percentage of intervals of on-task behavior with students with learning disabilities in a special education resource math classroom?
2. Given an increased percentage of on-task behavior in the special education class as a function of the self-monitoring and contingent reinforcement program, to what extent does the percentage of intervals of on-task behavior increase in an inclusive general education science class with students with learning disabilities?
3. To what extent does a self management package that includes self-monitoring and contingent reinforcement program and uses a tactile cueing device increase student's percentage of correct work and percentage of completed work in a special education resource math classroom and a general education science classroom?

REVIEW OF LITERATURE

Self-monitoring is a procedure where a person observes their behavior and records the occurrence or nonoccurrence of a target behavior (Cooper et al., 2007). When used as an intervention strategy, self-monitoring is often paired with self-evaluation and reinforcement for meeting either self or teacher selected goals (Cooper et al.; Peterson, Young, Salzberg, & Hill, 2006; Rhode et al., 1992). Students record the occurrence of desirable behaviors, evaluate whether they have met predetermined goals, and give themselves an identified reinforcer if they meet predetermined goals (Peterson et al.; Smith, Young, West, Morgan & Rhode, 1988). In this review, studies that utilized self-monitoring with students with disabilities will be analyzed.

Literature Search

For the present study, a literature search was completed through ERIC, Google Scholar, and Ebsco Host databases. The following terms were used to find articles: self-monitoring, self-recording, on-task, cueing system, and MotivAider. Eleven self-monitoring studies were reviewed and five were rejected. The five studies were rejected because the studies did not include either a teacher matching component or the use of a cueing device. The six studies that were reviewed were chosen due to demographics of participants (middle or high school students, learning or emotional disabilities). Also, the type of the self-monitoring intervention was another criterion for chosen studies. Many of the studies reviewed included a teacher matching component which is similar to the current

study. Below is a summary of the demographics of the studies reviewed, an analysis of the various self-monitoring systems used in the studies, and a summary of study outcomes.

Study Demographics

Participants in the studies included students with learning disabilities and/or behavioral disorders, students with severe disabilities, and students without a disability in regular education. The ages of the participants in the studies reviewed varied from elementary students, middle schools students to high school students. In the various studies, the range of target behaviors to decrease included: talk-outs, off task behavior, and inappropriate behaviors. Conversely the range of behaviors that were increased included: on-task behavior, attending during class, following classroom rules and following directions.

Self-Monitoring

Broden, Hall, and Mitts (1971) conducted an early study on the effects of self-monitoring in the classroom. Two students participated in the research. Liza, an eighth-grade girl, wanted to increase attending to a history class, and Stu, an eighth-grade boy, was referred to the counselor by his math teacher for help to decrease talk-outs.

During the intervention, Liza was given a recording sheet by the counselor and gave her instructions on how to mark the sheet. In the first phase, the counselor instructed Liza to self record when she thought about it during her history class. In the second phase Liza self recorded when she was studying and when she was not studying. Also, the

history teacher was instructed to attend to Liza whenever he could and to give her praise. An independent observer collected data on Liza's attending during history class at least once per phase using a ten second interval recording system. During baseline, Liza was only attending for about 30% of the observed intervals. During self-recording and self-recording plus praise her attending increased to 80% and 88% of the recording intervals.

The second participant, Stu, was given a data sheet, at the beginning of each math class and told to make a tally mark every time he talked out without permission. An independent observer collected data on Stu's talk-outs during class. During baseline Stu was talking out without permission an average of 1.1 times per minute during the first half of class and 1.6 times per minute for the second half of class. During the self recording intervention the talk-out rate decreased to an average of 0.3 times per minute.

The results for both participants indicated that self-recording procedures alone can modify students' behavior. For both students self-recording was linked to an undesirable event. For Stu, the cue to record was a talk out. If Liza recorded when she was not studying the recording cue was linked to a negative event (not studying and talk-outs) and resulted in decreases in negative target behavior, but it is not clear if it also resulted in increases in positive behaviors.

Self-Monitoring with Teacher Matching

While the studies above show that self-monitoring can decrease negative behaviors, it is not always clear that students record their behavior reliably. Peterson et al. (2006) addressed this issue by adding a student to teacher matching procedure to a self-

monitoring intervention. The study involved five middle school (seventh and eighth grade) students who were in a regular education setting. These students were pulled out of class for one period per day and taught social and self-management skills. The teachers and students focused on six behaviors to monitor. The behaviors were on and off task, following instructions, accepting no for an answer, accepting teacher feedback and appropriately getting teacher attention. The students were taught how to monitor their behavior. The teachers scored the students on their behavior during class and the students scored themselves as well. Both the students and teachers used a four point rating scale, H (honor), S (satisfactory), N (needs improvement) and U (unsatisfactory).

If the student's scores closely correlated with the teachers, the students were awarded a specific number of points: 18 for an H, 16 for an S, 2 for an N, and 1 for a U. If they matched exactly, bonus points were given. If the scores were not within the targeted range, then no points were given to the student. At the end of the week the students could redeem their points for rewards such as: edibles, computer time, game time, and tangible objects.

Once the predetermined criterion was met, the students used this strategy in a general education classroom. After the students met the criterion in the first general education class, they used the strategy in another general education class. Student's behavior improved more when the students compared their scores to the general education teachers than when they simply monitored their behavior without a teacher check.

There were, however, limitations to this study. First, students were held to different expectations in each classroom. Each of the teachers rated the students differently, and was not trained with a uniform system. Second, time prohibited extending this study into more general education classrooms to further replicate the results. One final limitation is that there was no cueing system to signal the students to self-record. The students recorded only once, at the end of each period. Self-recording only once might increase unreliable recording due to the amount of time between the behavior and self-recording. More frequent opportunities are likely to increase recording reliability. In addition, the more often they are reminded about appropriate behaviors, the more likely they may be to engage in targeted replacement behaviors. Thus, it may be easier to develop new repertoires when students self-record more frequently.

In a similar study, Smith et al. (1992) taught students to self-monitor and then students matched their recorded data to teacher recorded data. This study involved eight high school male students with special education services. The goal of the study was to increase academic performance and increase on-task behavior in both the general education and special education classroom settings.

The special education teacher taught students about the self-monitoring system, expectations, rating scale for behavior, and examples and non-examples of expected behavior. Students marked their data sheet every 10 minutes according to the rating scale. At the same time the teacher independently rated each student. At the end of the period students earned bonus points for matching the teacher within one point. At the end of

each class period, the students totaled their points and exchanged them for backup reinforcers. This phase lasted until the students matched the teacher's rating three times.

The next phase of the intervention involved matching the teacher and setting academic goals in a special education resource room. The number of sessions that the students were required to match the teacher was reduced across time after students met criterion performance. The phases were then repeated in a general education English classroom. The phases were almost identical in the general education classroom, however, peers served as the teacher and they matched behavior rating with the participants.

During baseline in the special education classroom, the students were off-task only about 20% of the session, yet during baseline in the general education classroom (after the first treatment of the intervention) the students were off-task 40% of the sessions. The results show that the students failed to improve their behavior in the general education setting without the self-monitoring intervention. One major shortfall of this study is the obtrusiveness of the cue to self-monitor. The classroom teacher had to stop the lesson every ten minutes, tell the students to record, and then continue the lesson. The teacher took time out of the lesson and the students stopped working to record.

Self-Monitoring with a Cueing Device

There has been research on the effects of using a cueing device, however, there is limited research using a cueing device for self-monitoring. Shabani et al. (2002) looked at the effects of a tactile cueing prompt (JTECH Series 27 pager) with three kindergarten-

aged boys diagnosed with autism. The purpose of the study was to evaluate the effects of the tactile cueing prompt on verbal initiations and responses to peer initiations. Each student was taught three different phrases in relation to a toy or play activity. During training the students were then introduced to the tactile cueing prompt. One at a time each student sat on the floor with an adult. The cueing device was placed in the students pocket and every minute the adult activated the device. Immediately after each prompt, the adult provided a verbal model of an initiation statement, the student then modeled the statement. This process was faded until the students made independent initiations. The next phase in this study implemented the same procedures as in the training sessions, only this time the students interacted with peers instead of adults. Once every 25 seconds the cueing prompt was activated and the students made either a verbal initiation or response to a peer. The frequency of prompts was faded over time based on the amount of initiations of peers who participated in the sessions.

Results indicated that verbal responses and initiations to peer initiations increased to a mean of 77% with a range of 71-88% (baseline data was below 5%). This study showed that the tactile cueing prompt was effective in increasing behavior in an unobtrusive manner.

Self-monitoring with a teacher matching strategy is an effective intervention to increase some desired behaviors with students with disabilities (Peterson et al., 2006; Smith et al., 1992). Yet sometimes the cueing system is distracting to students, interrupts the lesson and could be aversive to some students (Amato-Zech et al., 2006). Amato-Zech et al. showed that a non obtrusive device, a MotivAider (cueing device), may be

used to increase on-task behavior with elementary aged students in a special education classroom. A MotivAider is a small object that vibrates at a predetermined time interval. The MotivAider provides a tactile reminder for students to record their behavior. Thus, classroom teachers do not have to verbally remind the students to record their behavior.

During baseline, students were on-task a mean of 55% of the observation intervals. When students used the MotivAider they were on-task a mean of 90% of the intervals (Amato-Zech et al., 2006). Interestingly, the MotivAider appeared to be an effective tool for increasing students on task behavior even though it appeared that the students were not reinforced for accurate self-monitoring or for increasing their on-task behavior.

Even though students demonstrated improved on task behavior, Amato-Zech et al. (2006) did not explore whether on task behavior would remain at a high level and examine how this self-monitoring strategy could be utilized in inclusive general education classrooms.

Navarrete (2006) extended the work of Amato-Zech et al. (2006) by adding a teacher matching component to verify the accuracy of student recording. In this study, three sixth and seventh grade students used a MotivAider to self-monitor and self record the percentage of on-task behavior at one minute intervals in an academic class. The students and the teacher both had a MotivAider and synchronized the device to vibrate at the same time. After the data session, the students compared their data to the teacher's data. If the students' data matched 90% of the intervals with the teacher, the student could earn a backup reinforcer. Importantly, the reinforcement was contingent on

accurately recording on-task behavior, regardless of the level of the student's on-task behaviors (Navarrete).

After the first phase of self-monitoring with the MotivAider and matching the teacher, baseline was taken in another academic class. In this class, the students continued to demonstrate low rates of on-task behavior. Students' were once again given the MotivAider and told to record their on-task behavior at one minute intervals and their data would be compared to the teachers at the end of the session.

Results indicated high rates of on-task behavior during the self-monitoring phases for all students. When the intervention was withdrawn, the students' rates of on-task behavior decreased significantly. While Navarrete demonstrated the utility of the MotivAider device, he did not demonstrate how the device might be used to produce generalized behavior change to inclusive general education classrooms and how targeted behaviors might be maintained when the self recording device is faded or removed.

Self-Monitoring and Generalized Behavior Change

The previous studies all shared one limitation: generalization to the general education classroom. Rhode, Morgan, and Young (1983) set out to demonstrate that a self-monitoring system can decrease inappropriate behaviors in the special education classroom and then generalize into the general education classroom.

Rhode et al. (1983) selected six students with behavior problems. The first phase of the intervention took place in the special education classroom. Classroom rules were introduced, discussed and modeled with the students. The students were then asked to

rate their behavior and the teacher also rated the students' behavior. The students received feedback at the end of each fifteen minute interval. Students received points for their ratings, and bonus points for matching the teacher within one rating. The points were later exchanged for small toys, candy or snacks.

The study then moved into the next phase in which the length of the monitoring intervals were increased. The recording intervals were systematically increased from 10 to 20, 30, and finally 60 minutes. The students still received daily reinforcement for self-monitoring, however, the number of students who received bonus points for matching the teacher decreased to 3 of 6 students, then to 2 of 6 students and finally, only one randomly selected student received reinforcement on any given day. Thus, not all the students received reinforcement daily for matching the teacher. Every two or three days, the teacher randomly conducted surprise teacher matching checks.

Booster sessions were given to students when their target behavior fell below 80% for three consecutive sessions. During booster sessions the special education teacher reviewed the target behavior with the student, discussed what problem behaviors were occurring and then modeled the target behavior. Booster sessions usually lasted ten to fifteen minutes. Out of the six participants, one student had a total of six booster sessions and a second student had three booster sessions.

Rhode et al. (1983) tried to achieve generalization and maintenance of the treatment gains in the general education class. First, the researchers introduced the self-monitoring system to the general education teacher and explained the rating scale and other essential program components. After the students were in the general education

classroom, they self-monitored their behavior and recorded every thirty minutes without matching the teacher. The teacher was independently recording the students' behavior and would conduct a surprise check every two or three days. The intervention was faded further in the general education class. The next self-monitoring intervals were increased to 60 minute and the students were reinforced randomly 2 or 3 days per week. In the final condition, the students continued to self-monitor, only recording once in 60 minutes, they received only praise and verbal reinforcement. Teachers reported that the intervention was easy to use and that they would use the same intervention system again. The students had sufficient practice monitoring and getting feedback in the resource room. This might be why generalization in the general education classroom was successful.

In summary, self-monitoring procedures can be used to modify a variety of student behaviors. An important key to self-monitoring is an effective cueing system. As shown in Rhode et al. (1983) the classroom teacher served as the cue for students to record. This interrupted the lesson and was not a convenient way to remind students to record. Both Navarrete (2006) and Amato-Zech et al. (2006) used a MotivAider to assist the students in recording behavior in a non-obtrusive manner. In addition, assuring generalized changes in behavior into regular education classrooms is an important factor when implementing behavior change (Rhode et al.; Smith et al., 1988). This study will replicate Navarrete et al.'s study by using a tactile self-monitoring system (use of MotivAider and a teacher matching strategy) to increase on-task behavior with students with disabilities. Finally, this study will examine the effects of the self-monitoring system

in the special education classroom and then generalizing the desired behavior into the general education classroom.

METHOD

Participants and Settings

Three students participated in this study. The participants were seventh-grade students and each received 135 minutes (three classes of 45 minutes each) of special education services per day. Table1 reports test scores which qualified each student for special education services under the Individuals with Disabilities Education Act (IDEA), as well as student's ethnicity. To participate in this study the participants exhibited low rates of on-task behavior during class time. Sessions took place in both special education math and regular education science classrooms.

Participants' math grades in the resource classroom ranged from 75% to 92% during the first semester of the school year. Participants' science grades in the general education class ranged from 53% to 65% during the same period (see Table 1).

Self-monitoring and contingent reinforcement were integrated within the context of everyday instruction. In the special education class, there were 5 to 7 other students with disabilities. In the general education science class there were 27 to 32 other students. The math setting included a certified special education teacher, and a student teacher. The lesson format during math classes included review questions of previously learned materials, lecture and guided practice, followed by independent work. In the science classroom a similar class structure occurred. The lesson began with review questions, the teacher presented a lecture, discussed or asked students questions about the material, and

Table 1

Student Demographics

Name	Wechsler Individual Achievement Test II	Wechsler Intelligence Scale for Children IV	Classification	Ethnicity	Math	Science
Nick	Word Reading: 83 Reading Comp: 69 Numerical Operations: 63 Math Reasoning: 55 Written Expression: 59	Verbal Comp: 85 Perceptual Reasoning: 88 Working Memory: 77 Processing Speed: 70 Full Scale IQ: 75	Specific learning disability	Caucasian	1st Semester Grade: C+ (77%) 50 of 65 assignments turned in (77%)	1st Semester Grade: C- (65%) 63 of 89 assignments turned in (71%)
Jackie	Word Reading: 85 Reading Comp: 85 Numerical Operations: 61 Math Reasoning: 70 Written Expression: 68	Verbal Comp: 93 Perceptual Reasoning: 75 Working Memory: 74 Processing Speed: 62 Full Scale IQ: 72	Specific learning disability	Caucasian	1st Semester Grade: C (75%) 53 of 65 assignments turned in (82%)	1st Semester Grade: D- (53%) 60 of 89 assignments turned in (71%)
Oscar	Word Reading: 94 Reading Comp: 92 Numerical Operations: 111 Math Reasoning: 97 Written Expression: NA	Verbal Comp: 89 Perceptual Reasoning: 104 Working Memory: 83 Processing Speed: 97 Full Scale IQ: 91	Speech or language impairment	Caucasian	1st Semester Grade: A-(92%) 66 of 79 assignments turned in (84%)	1st Semester Grade: D+ (60%) 31 of 38 assignments turned in (82%)

the students worked independently in small groups or completed lab work. The lesson structure of the two classes is provided in Table 2.

Dependent Variable

The dependent variable, on-task behavior, is defined by each activity during class. During the review portion of the lesson, students were marked on-task if they wrote

answers to review questions without talking, sat quietly at their desk until the review time was over, raised a hand to answer questions, stayed in their seats with feet on the floor, or faced toward the front of the classroom. In the special education math class, students were asked to solve each problem independently and after writing their answers were asked to verbally answer the question. During the lecture and guided practice section of each class, students were marked on-task when they looked at the teacher or board quietly, and if the students followed teacher directions to take notes, open their books or follow along. During independent work time, students worked quietly at their seats on the assigned problems. If they had a question about the task, they raised their hand and waited until the teacher attended to them. When there was a lab activity or small group work, the students were marked as on-task if they worked on the assigned task, and worked with the assigned group members. On-task also included writing on assignments and answering assigned problems during independent seat work or when otherwise instructed.

Students were marked off-task if they talked out of turn, played with objects, were out of seat without permission, touched others, had their head on the desk or were looking around the room for more than one minute. If students looked in their binder for papers for more than one minute, they were marked off-task. If students picked their nose and or chewed on fingernails they were marked off-task. Other behaviors marked as off-task included: tapping pencil/object on their desk, staring at one object for more than one minute, playing or rapidly pushing buttons on calculators during interactive instruction,

Table 2

Lesson Structure

Review	Lecture/guided practice	Independent/lab work	Activities during which no data are collected
* Daily housekeeping: announcements, reminders, student of the month, handing in/out papers. *Students write in planner or on quick start paper. * Teacher asks students a question(s) that they learned about previously. *Students independently answer the questions orally or written. *Teacher discusses review questions with class, gives further explanation or discussion.	* Teacher presents new material to the class via PowerPoint or lecture. *Students are listening, taking notes or answering teacher questions about new material. * Teacher or student asks a question about new material. * Teacher hands out notes or worksheet that deals with new material. * Teacher works with (helps answer the questions together) the whole class on worksheet or assignment. *While teacher is helping class with the assignment, students have a minute to independently answer questions but the class is still working together.	*Students working on worksheets either alone or with a partner. *Students work on the actual lab experiment. *Students are completing a lab activity alone or with a partner. * Group work. *Quiz or test on recently learned material.	*Movies * Core testing *Activities that do not fit into the prescribed categories.

sharpening a pencil slowly while looking around the room, or drawing on themselves, their desk or a book.

A trained observer used a 15-second momentary time sample to collect data on participants' on-task behavior. If the student was on-task the observer marked a (+) on the data sheet and if the student was not on-task a (–) was marked on the data sheet. In addition, the observer indicated the current classroom activity; review, lecture and guided

practice, independent or lab work. See Appendix A for a sample observer data collection sheet.

Data were collected on two additional dependent variables percentage of completed work and percentage of correct work. Assignments included work sheets, lab activities, and quizzes. To calculate the percentage of completed work the number of items completed was divided by the number of items included in the assignment. To calculate the percentage of correct work the number of items correct was divided by the total number of items completed.

Interobserver Agreement

Interobserver agreement was taken on on-task behavior and the activity identification in at least 22% of the sessions for each participant, across phases. The data collectors' MotivAider and the student MotivAider were synced at the beginning of the session. Interobserver agreement was calculated separately for on-task and the activity variable using the point by point agreement method, which was found by dividing the total number of agreements by the total number of agreements plus disagreements and then multiplied that number by 100 to yield a percentage score.

Interobserver agreement was collected on Nick's on-task behavior in the math class for 25% of the sessions. There was a mean of 97% agreement with a range of 91 to 100%. In science, interobserver agreement was collected for 22% of the sessions. Interobserver agreement ranged from 80 to 97% with a mean of 89%.

For Jackie in math, interobserver agreement was collected for 25% of sessions with a mean of 95% agreement and a range of 79 to 100%. In science, interobserver agreement was collected for 23% of sessions. The mean of agreement was 89% with a range of 86 to 99%.

Interobserver agreement was collected during math class on Oscar's on-task behavior for 24% of the data sessions with a mean of 97% agreement and a range of 93 to 100%. In science, interobserver agreement was collected for 24% of the sessions. The mean agreement was 89% with a range of 80 to 98%.

Independent Variable

During the self-monitoring intervention students used a tactile cueing device (a MotivAider) to prompt self-monitoring. Each student was given their MotivAider at the beginning of class each day. The MotivAider was set to 1-minute intervals. The classroom teacher synced the participants MotivAider with their MotivAider so the intervals were set to go off simultaneously. Once the MotivAider vibrated, the participant circled a + (on-task) or – (off-task) on their self-monitoring sheet. See Appendix B for student self-monitoring sheet.

Treatment Integrity

An independent second observer recorded data on whether the critical features of the intervention were implemented. These features included: if the students had their MotivAider at the beginning of the class, if the teacher synced the MotivAider, if the

target students marked their self-monitoring sheet, if the target students data sheet included the same number of marks as the teachers' data sheet, if, during the matching condition, the teacher informed the students how closely they matched, and if the reinforcer was delivered if earned. See Appendix C for the treatment integrity data sheet.

Treatment integrity was collected for at least 30% of sessions across all intervention conditions. To evaluate treatment integrity a second observer marked whether the critical aspects of the intervention were implemented. The total number of components implemented was divided by the total number of components scored (5 or 6 depending on the condition) and then multiplied that number by one hundred to yield a percentage score.

During math, treatment integrity for Nick averaged 91% with a range of 80 to 100%. In science, the mean was 95% with a range of 80 to 100%. In both settings, the critical aspects in which Nick did not get full marks were the amount of intervals that he marked. Nick sometimes forgot to mark his self-monitoring sheet. He was preoccupied with other tasks such as: sharpening his pencil, asking or answering a question, blowing his nose, and or going to the bathroom.

Treatment integrity for Jackie in math averaged 89% with a range of 83 to 100%. In the science setting, there were only two days in which treatment integrity data was collected, both days the percentage of critical aspects attained 80%. Similar to Nick, Jackie missed marking all of the necessary intervals on the self-monitoring sheet.

In both math and science, treatment integrity for Oscar averaged 100%.

Research Design

A multiple baseline design across students replicated across settings was used to examine student's self-monitoring in the math classroom and the generalized effects of self-monitoring to the general education classroom. The design consisted of three conditions implemented sequentially: baseline, self-monitoring in the special education math classroom, and self-monitoring in the general education science classroom. Observers collected baseline data on on-task behavior in the general education science class throughout each condition. Each condition is described below.

Pre-Baseline Activities

Prior to beginning the study, the student completed a reinforcer survey. Students first read through a list of possible reinforcers (see Appendix D for sample reinforcer survey). They selected five reinforcers they liked the most. Once the top five choices were selected, the resource teacher conducted a four item multiple stimulus preference assessment without replacement (Carr, Nicolson, & Higbee, 2000) using the five selected reinforcers (see Appendix E for data sheet). Once the SPA was completed for all students, the mean for each reinforcer was calculated and a numerical value was attached to each reinforcer. The reinforcer that was selected most frequently was ranked first, and the reinforcer that was selected least frequently was ranked fifth (see Table 3 for reinforcer rankings). Students used the points they earned to purchase specific reinforcers (Appendix F). The more desirable the reinforcer, the more points it was worth.

Table 3

Reinforcer Rankings

Nick's rankings		Jackie's rankings		Oscar's rankings	
1.3	5 problems off	1.3	25¢ to ala carte	1.3	$20 class bucks
1.6	Computer Time	1.6	Pop	2.3	Pop
3	Counselor	3.3	Leave 1 minute early	3	Pirate Coin
4.3	10¢ to ala carte	3.6	Pencil	3.3	10¢ to ala carte
4.6	Small Candy Bar	5	Small Candy Bar	5	5 minutes of free reading

According to Nick's preference assessment the following items were ranked from most to least reinforcing: five problems off any assignment in math or science, talk with the counselor, 10¢ towards ala carte in the lunch room, and a small candy bar.

The reinforcers that were most to least reinforcing for Jackie included 25¢ towards to ala carte in the lunch room, a soda pop, leave one minute early from math or science, a pencil, and a small candy bar.

Oscar's preferences of reinforcers from most to least included: $20 math class bucks, a soda, a pirate coin that was used in the school wide behavior management program, 10¢ towards ala carte in the lunchroom, and five minutes of free reading time. (See Appendix F for each student's reinforcer menu.)

In addition to completing the reinforcer survey, the data collectors spent time in each setting to acclimate the students to the observers.

Baseline

Baseline was collected on each participant's on-task behavior in the special education math classroom and the general education science classroom. The observer watched students during class in both settings and recorded students' on-task and off-task behavior as well as the change in classroom activities. At least three stable data points of low rates on on-task behavior were collected before moving into the self-monitoring in the special education math class.

Self-Monitoring in the Special Education Classroom

Prior to the first self-monitoring session the resource teacher taught each of the participants what self-monitoring is and how to do it. The teacher showed the participants how to use the MotivAider and they practiced using it. Each student also learned what on-task behaviors look like and students were provided with examples and non-examples of on-task behavior. The teacher also asked the students to demonstrate examples of the target behavior.

The resource teacher then practiced taking self-monitoring data with the students. The students had a card placed in the top portion of their desk. The card was sectioned into two columns; one for on-task and the other for off-task. The students practiced and role played marking on or off-task behaviors with the resource teacher.

The teacher synced the MotivAider to 1 minute intervals (teacher's MotivAider was set to 15-second intervals which then matched up with the student's 1-minute intervals). The teacher and student then placed the MotivAider in their pocket or other inconspicuous place and began taking data.

The student and the teacher each had an interval recording sheet on which they recorded the date, and the class period. On each 1-minute interval both the student and teacher circled a + if the student was on-task and a - if the student was off-task.

At the end of the class the teacher and student compared their data. The student and the teacher independently counted how many pluses they recorded and wrote it on the bottom of the data sheet. They then examined the data interval by interval. If the student and teacher exactly matched their on-task intervals then the student earned 5 points. If the student matched the teacher within one interval, the student earned 3 points. If they matched within two intervals the student earned 1 point. If the student and teacher did not match within two or more intervals, the student earned no points for that class session. At the end of each class the student either chose to spend their points on a backup reinforcer or save their points for later purchases.

Students received edible or tangible reinforcers at the end of each class period. When the students selected computer time, problems off an assignment, time with the counselor or leave early, they received a coupon that they could exchange for the desired reinforcer on another day (see Appendix G for reinforcer coupons).

After two consecutive days in which the participant matched the teacher within two intervals, the intervention moved into a second phase. During phase 2 the student matched the teacher data and had a high percentage of on-task intervals. The procedures for this phase were the same as phase 1. In addition to earning points at the end of each class, the student also earned points for the percentage of intervals marked as on-task. If the percentage of on-task intervals was 77 to 81%, the student earned 1 point. If the

percentage of on-task intervals was 82 to 86%, the student earned 2 points and if the percentage was greater than 86% the student earned 3 points (these percentages were based on a sample of student's on-task behavior in the math class and the science class).

After each student matched the teacher within 2 intervals and was at least 80% on-task for two consecutive data points, the self-monitoring system was faded.

Fade Self-Monitoring in the Special Education Classroom

During the first phase of this condition, students continued to self-monitor in the special education math class (see Table 4). During the first fading phase, students were reinforced daily for on-task greater than 80% based on the data they collected. On 4 of 5 days each week, students matched with the teacher and received additional reinforcement for matching within two intervals. After students matched with the teacher within two intervals and were at least 80% on task for 4 days a second fading phase was implemented. During this phase teacher matching was faded to two random days per week. The students received reinforcement daily for high on-task based on the data they collected and additional reinforcement on days when teacher matching was implemented. After the students matched the teacher data and were on-task for at least 80% of the intervals on the two randomly selected days during a week, a third fading phase was implemented. During this phase teacher matching was faded to one random day per week. The students received reinforcement for high on-task daily based on the data they collected and additional reinforcement if they matched the teacher within two intervals on the randomly selected teacher matching day. In addition, self-monitoring was implemented in the science classroom.

Table 4

Fade Descriptions

	Reinforce Teacher Match	Reinforce On-task
Phase 1	2 consecutive days match teacher within 2 intervals	
Phase 2	2 consecutive days match teacher within 2 intervals	80% or greater on-task behavior
Fade 1	4 of 5 days match teacher within 2 intervals	Daily 80% or greater on-task percentage
Fade 2	2 of 5 days match teacher within 2 intervals	Daily 80% or greater on-task percentage
Fade 3	1 of 5 days match teacher within 2 intervals	Daily 80% or greater on-task percentage
Fade 4 (Nick)	1 of 5 days match teacher within 2 intervals	1 of 5 days 80% or greater on-task percentage
Fade 5 (Nick)	3 of 5 days match teacher within 2 intervals	3 of 5 days 80% or greater on-task percentage

Nick experienced an additional fade phase during which he was only reinforced one random day per week. On days in which he received reinforcement, he earned points for high on-task percentage and for matching the teacher based on the data he collected. No reinforcement was provided on other days.

The students continued to self-monitor in the math class and match with the teacher one random day per week while self-monitoring in science.

Self-Monitoring in the Science Classroom

In this final condition of the study, self-monitoring was implemented in the science classroom on the faded schedule (fade 3) used in the math classroom. That is, the students were only required to match with the teacher one randomly selected day per week. They were reinforced for high on-task behavior daily based on the data they collected and provided additional reinforcement on the one randomly selected matching day each week. During this condition, the students earned points for the percentage of on-task intervals they recorded and on matching days earned additional points for matching with the teacher. The points for matching and on-task intervals were the same as described above.

A thinner reinforcement schedule was implemented after Nick matched the teacher within two intervals on one randomly selected day a week and was on-task for at least 90% of the session. He was then given points on one random day per week for both high on-task behavior and matching the teacher based on the data he collected (fade 4). No points were provided on other days. However, due to a decrease in on-task performance in the science classroom, the reinforcement schedule was changed to giving Nick points on three random days per week (fade 5) for both high on-task behavior and matching the teacher based on the data he collected. No points were provided on other days.

Peer On-task Behavior

Data on peer on-task behavior in the science classroom was collected on three random students. Three data sessions were conducted at the end of the study using the same data collection procedures as used across conditions and settings.

RESULTS

The purpose of this study was to examine the effects of self-monitoring using a tactile cueing device on students' on-task behavior. The primary research question addressed the students' on-task behavior during both the special education math and regular education science classes. In addition, student's assignment completion and percentage of assignment correct was examined in both the math and science classes. While data were collected during each section of the lesson, participants' on-task behavior was not differentiated by lesson section. Thus, the data reported reflect on-task behavior during the entire lesson.

On-Task Performance and Assignment Completion in Math

Nick's on-task performance in math is shown in Figure 1. During baseline, Nick's on-task performance ranged from 48% to 72% of observation intervals with a mean of 62% (*SD* = 9%). When the self-monitoring intervention was initially implemented and when he was only required to match the teacher, Nick's on-task behavior increased to a mean of 94% of the observation intervals, with a range of 91% to 96% (*SD* = 4%). During this condition, Nick matched the teacher on two sessions. In both sessions, he matched the teacher within one interval. After Nick matched the teacher within two intervals for two consecutive days, Nick was required to match the teacher within two intervals and remain on-task for at least 90% of the observation intervals. He was on-task for a mean of 95% of the observation intervals with a range of 92 to 98% (*SD* = 4%). He

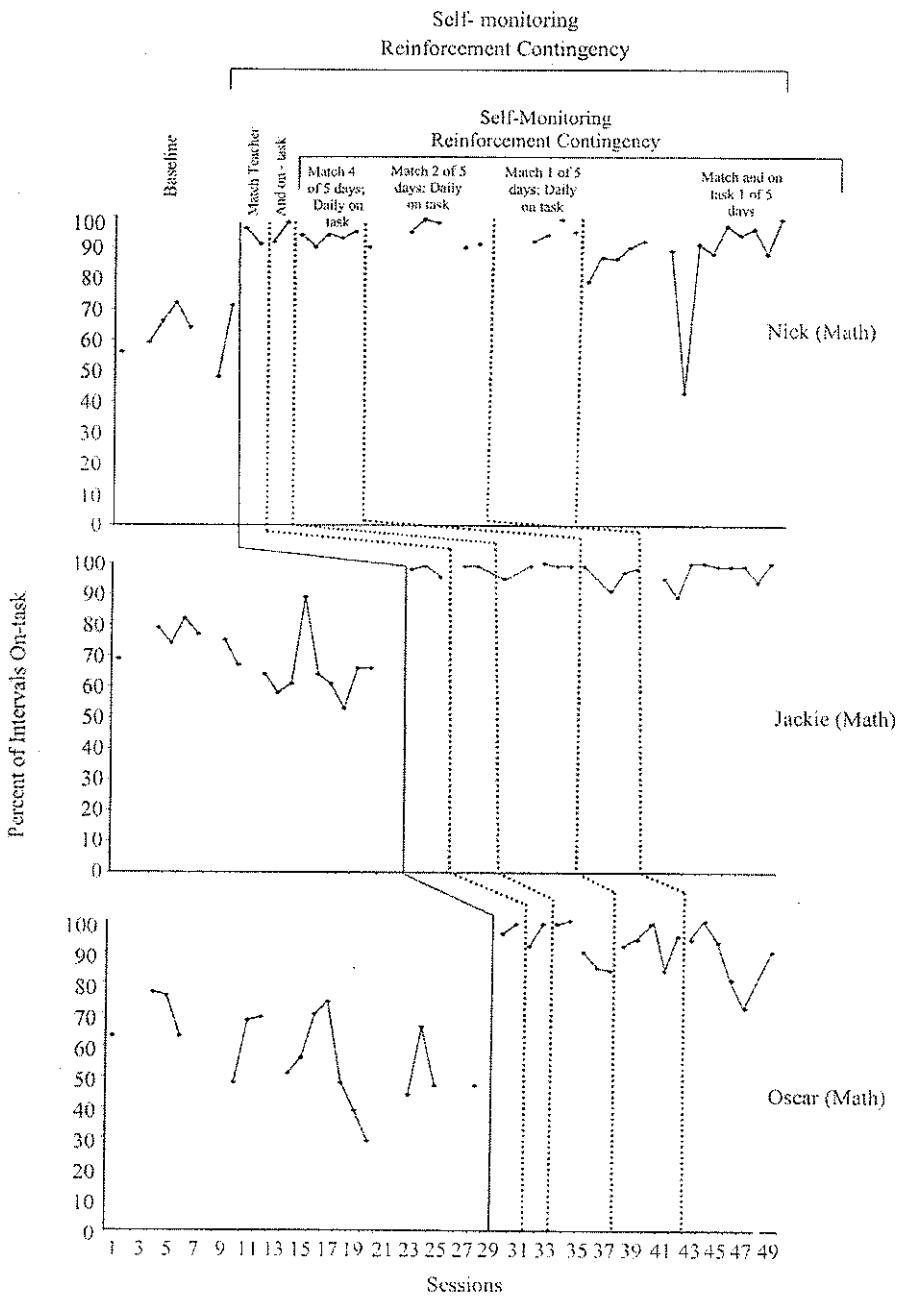

Figure 1. Participant's on-task performance in math class.

matched the teacher within one interval and during the second session he matched exactly.

The reinforcement schedule was reduced to matching the teacher 4 of 5 days. Nick received reinforcement daily if his on-task behavior was greater than 80% and additional reinforcement if he matched the teacher within two intervals on matching days. During this fading phase, Nick was on-task for a mean of 93% of the observation intervals with a range of 90 to 95% (*SD* = 8%). Also during this fading phase, Nick matched the teacher within two intervals and earned an additional point. He then matched exactly with the teacher for the next three sessions and earned an additional 5 points for each matching session. When Nick received daily reinforcement for 80% on-task or greater and the teacher matching schedule was faded to 2 of 5 days, he was on-task for a mean of 94% of the observation intervals with a range of 90 to 99% (*SD* = 4%). During fading phase, Nick matched the teacher within two intervals and earned an additional point. He then matched the teacher exactly during the second matching session and earned an additional 5 points for each matching session. The reinforcement schedule was then thinned to matching the teacher once every 5 days and receiving daily reinforcement for 80% or greater on-task behavior, Nick was on-task an average of 94% of the observation intervals with a range of 91 to 99% (*SD* = 3%). He matched the teacher within two intervals during fade 3. During the final fade phase in math, Nick was required to match the teacher once out of 5 days; however, only on the matching day did Nick receive reinforcement. During this fading phase Nick was on-task an average of 87% of the observation intervals with a range of 43 to 99% (*SD* = 14%). Nick matched

the teacher within 3, 5, 3, 2, and 4 intervals, respectively, during fade 4 of the intervention. He earned points for on task on all reinforcement days and received points for matching with the teacher on only one of the five reinforcement days. Importantly, while Nick's on-task behavior was higher than baseline, his on-task performance was generally more variable during this fading phase than during baseline.

During baseline in math, Nick had an assignment every 2.3 days and completed a mean of 65% of each assignment with a range of 35 to 100%. Of the work he completed, he accurately answered a mean of 66% of the problems with a range of 50 to 90% (see Table 5). During intervention, Nick had an assignment every 1.1 days and increased the percentage of completed assignments to 92% with a range of 43 to 100%. The accuracy of his work also increased to a mean of 92% with a range of 67 to 100%. In sum, both the percentage of assignments completed and the average accuracy of problems Nick completed increased from baseline to the self-monitoring condition. This resulted in an improvement in Nick's overall math grade from B- for the second quarter to B+ for the third quarter.

Jackie's on-task behavior during baseline was slightly higher than Nick's on-task behavior averaging 69% of the observation intervals per session with a range of 53 to 89% ($SD = 9\%$). In math, Jackie's on-task behavior remained within the range of previous sessions when Nick began intervention. Once Jackie began the self-monitoring intervention and was only required to match the teacher, her on-task behavior increased to a mean of 98% with a range of 96 to 99% of the observation intervals ($SD = 2\%$). She

Table 5

Student Assignments in Math

Nick's assignment data	Math baseline	Math self-monitoring
% of assignment completed	65% range:35 to 100%	92% range: 43 to100%
accuracy of completed problems	66% range: 50 to 90%	92% range: 67 to100%

Jackie's assignment data	Math baseline	Math self-monitoring
% of assignment completed	94% range: 40 to 100%	98% range: 67 to100%
accuracy of completed problems	76% range: 42 to100%	83% range:33 to100%

Oscar's assignment data	Math baseline	Math self-monitoring
% of assignment completed	91% range: 60 to100%	98% range: 75 to100%
accuracy of completed problems	86% range: 62 to100%	88% range: 40 to100%

matched the teacher within three intervals during the first session and did not earn additional reinforcement, and then matched the teacher within one interval for the next two sessions during this condition and earned an additional 3 points. Jackie's on-task behavior was stable 99% of the observation intervals when she was required to match the teacher and have a high on-task percentage. She also matched the teacher within one interval and then matched the teacher exactly earning 5 points for the first session and the maximum number of additional points for both sessions. When the reinforcement schedule was faded to matching the teacher 4 out of 5 days and being reinforced daily for 80% or higher on-task behavior, Jackie's on-task behavior remained high, averaging 98%

of the observation intervals with a range of 95 to 100% (*SD* = 2%). During this fading phase, Jackie matched the teacher exactly on three consecutive matching sessions and the final session matched within one interval. When the self-monitoring reinforcement contingency was reduced to a variable schedule of matching the teacher 2 out of 5 days and receiving daily reinforcement for 80% or greater on-task behavior, Jackie maintained her high performance level with little variability (mean of 97% of the observation intervals and a range of 91 to 99%, *SD* = 3%). Jackie matched the teacher exactly and then within two intervals during fade 2 of the intervention. Finally, when the reinforcement schedule was faded to matching the teacher 1 out of 5 days and daily reinforcement for 80% or greater on-task percentage; Jackie was on-task for a mean of 97% of the observation intervals with a range of 89 to 100% (*SD* = 4%). She matched the teacher within two intervals and earned 1 additional point, and then matched the teacher exactly during the last fade phase of the study earning the maximum number of additional points. While the variability in Jackie's performance during this fading phase was lower than during baseline, similar to Nick, the variability in Jackie's performance increased as the contingency for teacher matching was thinned.

In session 41 both Nick's and Jackie's on task behavior decreased to their lowest point since the self-monitoring intervention was initiated (43% and 89% of the observation intervals, respectively). This decrease may be due to a substitute teacher in the math classroom that day.

During baseline Jackie had an assignment every 1.6 days and completed an average of 94% of her assignments with a range of 40 to100% (see Table 5). Even though

Jackie completed a high percentage of her assignments, her accuracy averaged 76% with a range of 45 to100%. During self-monitoring Jackie's assignment completion remained high (98% of her assignments with a range of 67 to 100%) and the accuracy of her work increased to a mean of 83% with a range of 44 to100%. During the self-monitoring intervention, Jackie had an assignment every 1.3 days. While Jackie maintained high assignment completion during self-monitoring, similar to Nick, there was a marked improvement in assignment accuracy from baseline to self-monitoring. This resulted in an improvement in Jackie's overall math grade from C+ for the second quarter to B for the third quarter.

Oscar's on-task behavior during baseline in the math classroom averaged 58% of the observation intervals with a range of 29 to 77% (*SD* = 14%). While both Nick and Jackie were in the self-monitoring condition, Oscar's on-task behavior remained low, but was somewhat variable. In fact the variability in Oscar's on-task behavior was greater than either Nick's or Jackie's on-task behavior. When Oscar began the self-monitoring intervention and was only required to match the teacher, his on-task behavior increased to a mean of 98% with a range of 96 to 99% of the observation intervals (*SD* = 2%). He matched with the teacher exactly for both sessions. During the teacher matching and high on-task percentage condition, Oscar was on-task for a mean of 95% of the observation intervals with a range of 92 to 99% (*SD* = 5%). During this condition, he matched the teacher within one interval during both sessions and received an additional 3 points. Oscar's on-task behavior remained at a mean of 92% of the observation intervals with a range of 84 to100% (*SD* = 8%) when he was required to match the teacher 4 out of every

5 days while still receiving daily reinforcement for 80% or greater on-task behavior. During this fading phase Oscar received additional points on each opportunity, matching the teacher within 0, 0, 2, 2, intervals, respectively. When the reinforcement was faded to two out of five days for matching the teacher and daily reinforcement for 80% or greater on-task behavior, Oscar's on-task behavior averaged 93% of the observation intervals with a range of 84 to 99% (*SD* = 5%). He matched the teacher exactly for both matching sessions during this fading phase. When the reinforcement schedule for self-monitoring was decreased to matching the teacher 1 day per week, and daily reinforcement for 80% or greater on-task behavior, Oscar's on-task behavior decreased slightly overall and increased in variability. Oscar was on-task an average of 88% of the observation intervals with a range of 72 to 100% (*SD* = 10%). He matched with the teacher within two intervals during the last fade phase. Similar to Jackie, the variability in Oscar's performance increased as the contingency for teacher matching was thinned.

Even though Oscar's on-task behavior was quite low during baseline, his assignment completion and accuracy was relatively high. He had an assignment every 2.1 days and completed a mean of 91% of his assignments with a range of 60 to 100% (see Table 5). Of the work that he completed, he completed the problems with a mean of 86% accuracy with a range of 62 to 100%. During the self-monitoring intervention Oscar had an assignment every 1.3 days and continued to complete his assignments (98% mean with a range of 75 to100%). Oscar completed his work slightly more accurately during the self-monitoring condition (accurately completed 88% of the problems with a range of 40

to 100%). Oscar earned a B- grade in math during the second quarter and continued to earn a high grade in math, a B, for the third quarter.

On-Task Performance and Assignment Completion in Science

Participant's on-task behavior during science is presented in Figure 2. In the science classroom, baseline data for Nick's on-task behavior was at a mean of 48% of the observation intervals with a range of 26% to 67% (*SD* = 11%). The self-monitoring strategy and reinforcement contingency was implemented in science using daily reinforcement if his on-task behavior was greater than 80% and additional reinforcement if he matched the teacher within two intervals on one random day per week. Nick's on-task behavior immediately increased to a mean of 93% of the observation intervals with a range of 88% to 98% (*SD* = 5%). Nick matched the teacher within one interval during this fading phase in the science classroom. Once Nick matched the teacher within two intervals and was at least 90% on-task, Nick was reinforced once every 5 days for matching the teacher and a high percentage of on-task. During this phase Nick's on-task decreased to a mean of 74% of the observation intervals with a range of 47% to 89% (*SD* = 11%). He matched the teacher within six intervals during the first matching session and within four intervals during the second session and did not receive points for matching the teacher. While his on-task performance was generally higher than baseline levels, the variability in his on-task behavior during this phase was similar to variability during baseline. When Nick's on-task behavior decreased to 47% of the observation intervals, he was reinforced once every three days for matching the teacher and on-task behavior.

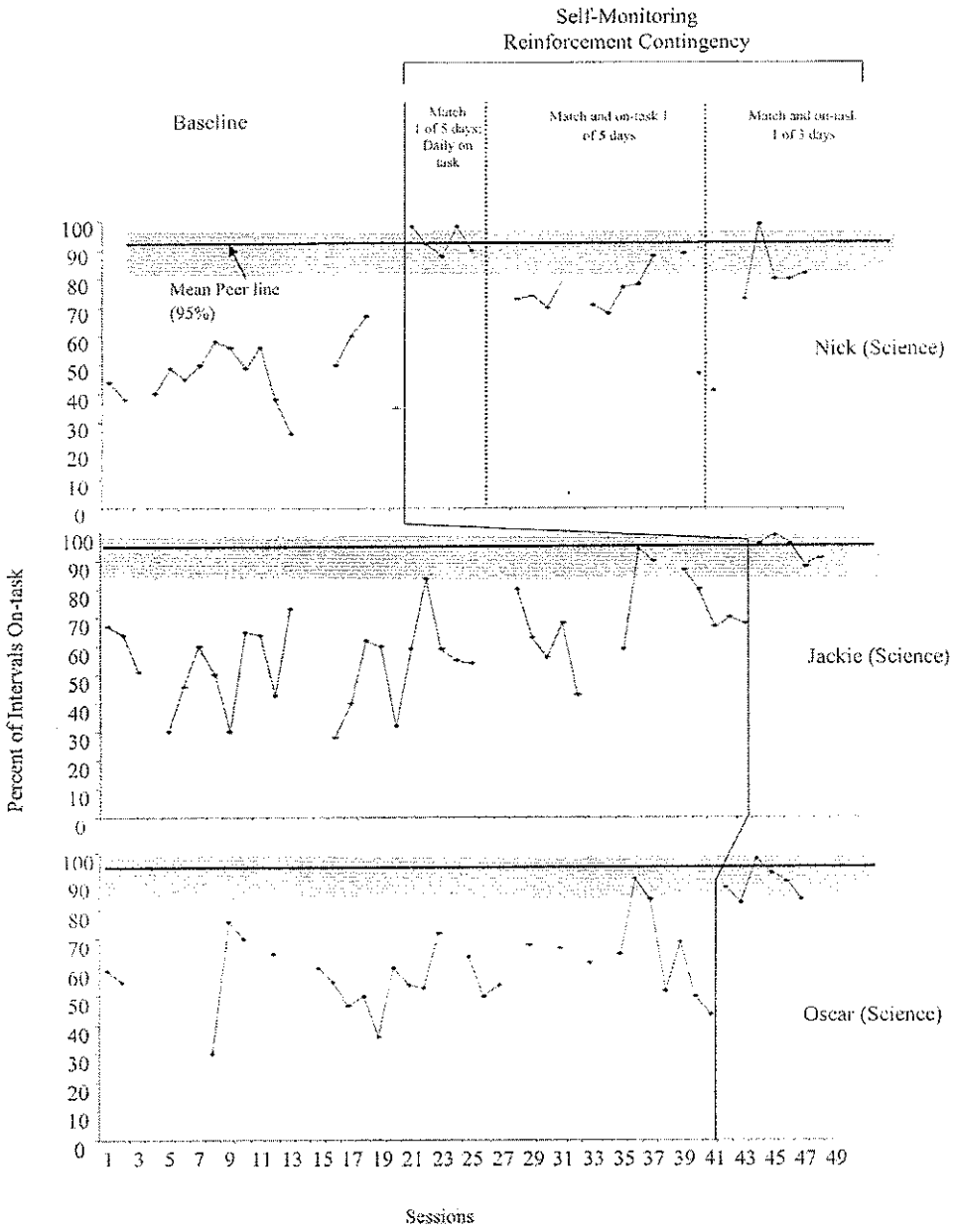

Figure 2. Participant's on-task performance in science class.

When the change in reinforcement schedule occurred, Nick's on-task behavior increased to a mean of 76% of the observation intervals with a range of 41 to 99% (*SD* = 19%).

During this fading phase Nick matched the teacher within eight intervals during both matching sessions and did not receive points for matching the teacher.

On-task data were collected on a random sample of three students in the general education science class at the end of the study. The average general education student was on-task 95% of the observation intervals with a range of 83 to 99%. During the initial self-monitoring phase, Nick's on-task behavior was within the range of the general education students who were sampled. Once the reinforcement schedule was changed to a thinner schedule, Nick's on task behavior was generally slightly below that of the sampled general education students.

During baseline Nick had an assignment every 2.6 days and completed an average of 87% of each assignment, with a range of 67 to 100% and he accurately completed a mean of 89% of each assignment with a range of 77 to 100% (see Table 6). During the self-monitoring intervention, Nick had an assignment every 2.0 days and completed an average of 78% of each assignment with a range of 20 to 100%. He accurately completed an average of 78% of the problems with a range of 7 to 100%. Nick's grade in science during the second quarter was a C- and during the third quarter was a C.

During baseline, Jackie was on-task an average of 60% of the observation intervals with a range of 56 to 94% (*SD* = 17%) (see Figure 2).When Nick began intervention in the science class, Jackie's on-task data increased from 59% to 84% of the observation intervals. However, after Nick's initial self-monitoring day and Jackie's high on-task percentage, she then returned to previous baseline levels. When Jackie met the criterion in the math class, the self-monitoring intervention began in the

Table 6

Student Assignments in Science

Nick's assignment data	Science baseline	Science self-monitoring
% of assignment completed	87% range: 67 to100%	78% range: 20 to 100%
accuracy of completed problems	89% range: 77 to 100%	79% range: 7 to 100%

Jackie's assignment data	Science baseline	Science self-monitoring
% of assignment completed	78% range: 5 to 92%	98% range: 93 to 100%
accuracy of completed problems	83% range: 27 to 100%	78% range: 33 to 100%

Oscar's assignment data	Science baseline	Science self-monitoring
% of assignment completed	84% range: 39 to 100%	89% range: 67 to100%
accuracy of completed problems	94% range: 74 to 100%	100% range: 100%

science classroom. Her on-task behavior jumped to a mean of 91% of observation intervals with a range of 88 to 96% (*SD* = 4%). Jackie's average on-task behavior fell within the range of sample general education students and the variability in her on-task behavior reduced as well.

During baseline in science, Jackie had an assignment every 2.6 days and completed an average of 78% of her assignment with a range of 5 to 92% (see Table 6). Of the work that she did complete, she accurately answered an average of 83% of the questions with a range of 5 to 92%. Once the self-monitoring intervention was in place Jackie had an assignment every 1.7 days and completed the assignments with a mean of

98% of the problems on her assignment with a range of 93 to 100%. The accuracy of her work averaged 78% with a range of 33 to 100%. There were only three assignments during the intervention phase that were collected. The accuracy of the assignments was 100%, 100% and 33%. Without the low score of 33%, Jackie completed problems more accurately during the self-monitoring intervention than during baseline. Jackie earned a D- during the second quarter in science and a C during the third quarter in science.

In the science classroom, during baseline, Oscar was on-task for a mean of 59% of observation intervals with a range of 30 to 91% (*SD* = 13%). Oscar's on-task behavior increased to a mean of 89% of observation intervals with a range of 83 to 98% (*SD* = 6%) during the self-monitoring intervention. Similar to Jackie, Oscar's on-task behavior during self-monitoring was within the range of other students sampled in the science class.

Oscar had an assignment every 2.3 days and completed the assignments at an average of 84% of each assignment with a range of 39 to 100% during baseline in science (see Table 6). Of the work that Oscar completed, he averaged 94% correct with a range of 74 to 100%. Once the self-monitoring intervention was implemented, Oscar had an assignment every 2 days, completed an average of 89% of each assignment with a range of 67 to 100%. He accurately completed 100 % of the problems on all assignments. Oscar's grade in science during the second quarter was D+ and during the third quarter was an A.

During sessions 36 and 37 all three students were on-task for a relatively high percentage of intervals and in the following sessions, on-task behavior decreased to

previously observed levels. The science teacher conducted 12 different scientific experiments that highly engaged the students. The experiments addressed density of the atmosphere, density of gasses, air pressure in a vacuum chamber (boiling water, balloon, shaving cream, aluminum can), temperature of different solutions, dry ice properties, and chemical changes (baking soda and vinegar). These high interest and unusual classroom activities may well have generally increased on-task behavior for students in the class.

DISCUSSION

Self-monitoring when paired with a teacher matching and on-task reinforcement contingency was effective for each participant. All of the participants increased their on-task behavior in both the math and science classrooms. During the self-monitoring intervention the student's on-task behavior was often within range of regular education students.

The self-monitoring strategy was most effective when students were reinforced daily for high on-task and required to match the teacher on two or more randomly selected days each week. When the matching requirement was faded to one day per week the variability in on-task performance in math increased for Jackie and Oscar, while Nick's on-task performance in math remained stable. When the fading procedure was applied to Nick's on-task reinforcement schedule in science, his on-task behavior decreased and was more variable. This procedure was not replicated with either Jackie or Oscar for two reasons. First, the end of the school year was approaching and there was not adequate time to apply additional procedures. Second, since we had not determined how to fade the on-task reinforcement schedule with Nick, it did not seem prudent to begin fading the on-task reinforcement schedule with either Jackie or Oscar.

Similar to this study, Smith et al. (1988) gradually faded the teacher matching component of the contingency. However, rather than fading the number of days in which students received reinforcement as was attempted in this study, Smith et al. lengthened the intervals in which student's recorded information and they continued to receive reinforcement on a daily basis. Initially, Smith et al. used ten minute intervals and

required the students to match their data to the teacher data daily. In the next phase of the intervention the students self-recorded every 15 minutes and were required to match the teacher within one point daily. The students then self-monitored just one time during the 30-minute session and were required to match the teacher daily. Finally, after 5 weeks of self-monitoring in the special education classroom, the students began self-monitoring in the general education classroom. In the general education classroom, the students marked their self-monitoring record once in a 30-minute session. The regular education teacher also marked their data sheet during this session. The following day in the special education classroom, the students received reinforcement for the data from the previous day in the general education classroom. By using this procedure students continued to receive daily reinforcement for accurate recording and high levels of on task. It is not clear if Smith and colleagues' procedure might eventually be lengthened to a point where students continue to self monitor but receive reinforcement for on-task behavior on a variable schedule such as the schedule attempted with Nick in this study.

Rhode et al. (1983) also extended the length of the recording intervals. In addition, they modified the schedule of reinforcement for matching with the teacher. At first the six students in the class self-monitored every 15 minutes, and received daily reinforcement and bonus points for matching the teacher. The recording intervals were systematically increased to 20, 30, and finally 60 minutes. The students received daily reinforcement for self-monitoring; however, the number of students who received bonus points for matching the teacher decreased systematically from 100% of the participants to 50%, 33%, 16%, and 0%. Booster sessions were given to students when their target

behavior fell below 80% for three consecutive sessions. Only two out of the six participants received booster sessions. The intervention was faded further in the general education class by increasing yet again the length of the intervals and the frequency of reinforcement. Rhode et al. (1983) reported that the students increased their target behavior in both settings. Clearly, additional research is needed to examine how the reinforcement schedule for high self-recorded on-task behavior might be thinned further while maintaining high performance levels. This research is important to further reduce the burden on the teacher for implementing the intervention and for transferring student on-task performance to the natural consequences in the classroom.

Another reason that variability in Nick's on-task behavior might have increased as the schedule of reinforcement for on-task behavior was faded is that the reinforcers might have lost some of their effectiveness over the course of the study. A lot of planning and preparation went into choosing each reinforcer and the point value for each student and it is possible that the effectiveness of the reinforcers diminished over time. A possible solution might be to conduct weekly or biweekly reinforcer preference assessments and adjust what types of reinforcers are offered and the value of those reinforcers to meet student preferences.

It is likely that Smith et al. (1988) extended their recording interval from 10 to 30 minutes to make the self-monitoring strategy more amenable to general classroom teachers. In this study the paraprofessionals were the primary data collectors and were responsible for collecting data to match with student data. The classroom teachers had little to do with matching with the students and giving the reinforcers to the students.

Data were recorded every 15 seconds which would have been unrealistic for a busy classroom teacher. If the recording intervals were increased, similar to that employed by Smith et al. or Rhode et al. (1983), the intervention would be more feasible for classroom teachers.

One problem with self-monitoring that was encountered during the study was that Nick and Jackie both missed recording during some intervals occasionally in both settings. Oscar, however, marked all intervals in both settings. It is not clear if Nick and Jackie simply started to become accustomed to the vibration emitted by the recording device or if they simply ignored the signal to record because they were involved with an assignment or some other task. If self recording is extended over a long time period it may be necessary to retrain students or to provide a contingency for recording in each interval. Perhaps one advantage of extending the recording interval as employed by Smith et al. (1988) and Rhode et al. (1983) is that it is less likely that students will forget to mark their self recording sheets. However, neither Smith et al. nor Rhode et al. indicated if students occasionally missed self-recording intervals so it is not clear if this problem is unique to the self-monitoring cueing device used in this study.

Finally, it is not clear how the various activities, lab assignments, lectures, quizzes and independent work in science might have contributed to variability in on-task behavior. It is possible that some of the variability in on-task behavior during baseline in science was due to assignments that were less interesting than those that were provided during the self-monitoring condition. In a similar vein, the on-task behavior of peers in the science classroom was relatively high and should be interpreted cautiously (mean of

95% with a range of 83 to 99% of the observed intervals). It is possible that the activities sampled were high interest activities. Since only three students were sampled on three sessions, the on-task levels of the general education students might not represent the majority of the students in the class or the broad range of activities that students engaged in the science class.

It is difficult to draw firm conclusions about the effectiveness the self-monitoring system on student assignments. In the math class, all three students completed a higher percentage of their assignments as well as increased the amount of correct work. However, the average number of assignments in math during self-monitoring was lower than during baseline. Thus, it is not clear if the increase in the average percent of assignments completed and average percent of problems correct is a function of the self-monitoring intervention, fewer assignments or both. In the science setting the average percent of assignments completed increased during self-monitoring for Jackie and Oscar, but decreased for Nick. The percent of items correct decreased for Jackie and Nick and increased for Oscar. Moreover, similar to the math class, the average number of assignments decreased during the self-monitoring condition for all students. While it is not clear if the self-monitoring intervention is responsible for the increase in assignment completion and percent correct in math, the benefit to the students of completing their work correctly is that they learned the material presented, they did better on assignments, quizzes and tests and therefore received a higher grade than the previous semester. The ultimate purpose for being on-task is to improve student outcomes as reflected in overall class grades. While a number of questions about how best to fade the self-monitoring

intervention remains, based on student grades, it is clear that the students in this study benefited from the self-monitoring intervention.

REFERENCES

Agran, M., Sinclair, T., Alper, S., Cavin, M., Wehmeyer, M., & Hughes, C. (2005). Using self-monitoring to increase following-direction skills of students with moderate to severe disabilities in general education. *Education and Training in Developmental Disabilities*, *29*, 3-13.

Amato-Zech, N. A., Hoff, K. E., & Doepke, K. J. (2006). Increasing on-task behavior in the classroom: Extension of self-monitoring strategies. *Psychology in the Schools, 43,* 211-221.

Broden, M., Hall, R. V., & Mitts, B. (1971). The effect of self-recording on the classroom behavior of two eighth grade students. *Journal of Applied Behavior Analysis, 4*, 191-199.

Carr, J. E., Nicolson, A. C., & Higbee, T. S. (2000). Evaluation of a brief multiple-stimulus preference assessment in a naturalistic context. *Journal of Applied Behavior Analysis, 33*, 353-357.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis*. Upper Saddle River, NJ: Prentice Hall.

Crum, C. F. (2004). Using a cognitive-behavioral modification strategy to increase on-task behavior of a student with a behavior disorder. *Intervention in School and Clinic*, *39*, 305-309.

Dunlap, L. K., Dunlap, G., Koegel, L. K., & Koegel, R.L. (1991). Using self-monitoring to increase independence. *Teaching Exceptional Children*, Spring, 17-22.

Hughes, C., Copeland, S. R., Agran, M., Wehmeyer, M. L., Rodi, M. S., & Presley, J. A. (2002). Using self-monitoring to improve performance in general education high school classes. *Education and Training in Mental Retardation and Developmental Disabilities, 37*, 262-272.

Navarrete, J. R. (2006). The effects of a self-monitoring package, including the use of tactile cueing devices, on student on-task behavior. Unpublished master's thesis, Utah State University, Logan, Utah.

Peterson, L. D., Young, R. K., Salzberg, C. L., & Hill, M. (2006). Using self-management procedures to improve classroom social skills in multiple general education settings. *Education and Treatment of Children, 29,* 1-21.

Rhode, G., Jenson, W. R., & Reavis, H. K. (1992). *The tough kid book: Practical classroom management strategies.* Frederick, CO: Sopris West.

Rhode, G., Morgan, D. P., & Young, R. K. (1983). Generalization and maintenance of treatment gains of behaviorally handicapped students from resource rooms to regular classrooms using self-evaluation procedures. *Journal of Applied Behavior Analysis, 16*, 171-188.

Shabani, D. B., Katz, R. C., Wilder, D. A., Kenneth, B., Taylor, C. R., & Fischer, K. J. (2002). Increasing social initiations in children with autism: Effects of a tactile prompt. *Journal of Applied Behavior Analysis*, *35*, 79-83.

Smith, D. J., Young, R. K., Nelson, J. R., & West, R. P. (1992). The effects of a self-management procedure on the classroom and academic behavior of students with mild handicaps. *School Psychology Review, 21*, 59-72.

Smith D. J., Young, R. K., West, R. P., Morgan, D. P., & Rhode, G. (1988). Reducing the disruptive behavior of junior high school students: A classroom self-management procedure. *Behavioral Disorders, 13,* 231-239.

APPENDICES

Appendix A

Observer Data Collection Sheet

Observer Data Collection Sheet

(Review, Lecture/Guided Practice, Independent or Lab work)

+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L
+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L	+ - R LGP I/L

Appendix B

Student Self-Monitoring Data Sheet

Student Self-Monitoring Data Sheet

+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
+ -	+ -	+ -	+ -
Date	Math Science	Total + /40	% of on-task

Appendix C

Treatment Integrity Data Sheet

Treatment Integrity Data Sheet

1. Did the target students have their MotivAider at the beginning of class?	YES	NO
2. Did the teacher sync the MotivAider at the beginning of class?	YES	NO
3. Did the target students self-monitor (mark their self-monitoring sheet)	YES	NO
4. Did the target students mark their self-monitoring sheet the appropriate amount of intervals?	YES	NO
5. During the matching condition, did the teacher inform the students how closely they matched?	YES	NO
6. If the student earned the reinforcer, was it delivered?	YES	NO
Student Name		Math Science
Total yes _____ total no _____ % of yes _____	Date	

Appendix D

Reinforcer Survey

Reinforcer Survey

Please list the items from 1 to 10. 1 being your favorite item and 10 being your least favorite item.	Write your rankings here:
1. 5 minutes of computer time	
2. Leave 1 minute early from class	
3. Small Candy Bar	
4. Time with the teacher	
5. $ to ala carte during lunch	
6. Small Tootsie Roll	
7. 5 minutes to read your free reading books	
8. Be excused from 5 problems on assignment	
9. Pencil	
10. Pirate Coin	

Appendix E

Stimulus Preference Assessment Data Sheet

Stimulus Preference Assessment Data Sheet

Preference Assessment Data Sheet (Carr, Nicolson, & Higbee; 2000)					
Student: Nick					Assessed By: Johnson
Date: 1/17/2008					Time: 1:15 pm
	Trial				
Stimulus Items	1	2	3	Sum of 1,2,& 3	Overall Rank (Smallest sum is #1)
Counselor	3	3	3	9	3
Computer time	2	2	1	4	2
Small candy	4	5	5	14	5
Ala carte	5	4	4	13	4
5 problems	1	1	2	3	1

Preference Assessment Data Sheet (Carr, Nicolson, & Higbee; 2000)					
Student: Jackie					Assessed By: Johnson
Date: 1/17/2008					Time: 1:30 pm
	Trial				
Stimulus Items	1	2	3	Sum of 1,2,& 3	Overall Rank (Smallest sum is #1)
Ala carte	2	1	1	4	1
Pop	1	2	2	5	2
Small candy	5	5	5	15	5
Pencil	4	4	3	11	4
Leave 1 minute early	3	3	4	10	3

Preference Assessment Data Sheet (Carr, Nicolson, & Higbee; 2000)					
Student: Oscar					Assessed By: Johnson
Date: 1/17/2008					Time: 1:00 pm
	Trial				
Stimulus Items	1	2	3	Sum of 1,2,& 3	Overall Rank (Smallest sum is #1)
Ala carte	4	2	4	10	4
20 Class bucks	2	1	1	4	1
Pirate coin	3	3	3	9	3
Pop	1	4	2	7	2
Free reading	5	5	5	15	5

Appendix F

Student Reinforcer Menu

Student Reinforcer Menu

Nick

1 point	Small candy bar
3 points	10¢ to ala carte
5 points	Talk w/ counselor
10 points	Computer time
15 points	5 problems off

Jackie

1 point	Small candy bar
3 points	Pencil
5 points	Leave 1 minute early
10 points	Pop
15 points	25¢ to ala carte

Oscar

1 point	5 minutes of free reading
3 points	10¢ to ala carte
5 points	Pirate Coin
10 points	Pop
15 points	$20 class bucks

Appendix G

Reinforcer Coupons

Reinforcer Coupons

This coupon can be used to get a pop. Give this to Mrs. Johnson when you want to get your pop.

This coupon can be used to leave 1 minute early in math or science.

This coupon can be used **to get a pencil** anytime you need it.

This coupon can be used for **5 minutes of free reading time** in science or math.

This coupon can be used **10¢ to ala carte**.

This coupon can be used for **5 problems off any assignment** in math or science.

This coupon can be used for **5 minutes of computer time** in math.

This coupon can be used for **a 5 minute visit with the counselor** the end of class.