

The Impact of Tier 1 Teacher Practices on Student Responsiveness to Tier 2 Interventions

By

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Chapter 1

Introduction

Students with or at-risk for emotional and behavioral disorders (EBD) experience several negative outcomes both in the context of their K-12 educational experience and longer-term post-secondary outcomes. Students with EBD have lower levels of performance in reading, math, and writing when compared to their peers without disabilities (Bradley et al., 2004; Reid et al., 2004; Wagner & Davis, 2006). When compared to students served in other disability categories under the Individuals with Disabilities Education Act (IDEA), students with EBD show the worst outcomes. Only 58% of students with EBD receive a high school diploma and 25% of students with EBD drop out of high school (U.S. Department of Education, OSERS, OSEP, 2017). These statistics have important implications for post-secondary outcomes including poor employment and increased likelihood of incarceration (Mitchell et al., 2019).

In terms of exclusionary discipline practices, students with EBD are more than twice as likely to experience a suspension or expulsion when compared to students in other disability categories (Losen et al., 2014). While the percentage of students served under the Emotional Disturbance category of IDEA is small (i.e., less than 1%), the National Research Council and Institute of Medicine estimates that between 14 and 20% of students experience a mental, emotional, or behavioral challenge at some point during their educational career. The prevalence of students at-risk for behavior disorders and the multitude of negative outcomes for this population of students indicates a need to intervene early and effectively with students who display challenging behavior in school.

Classroom Experiences of Students with Challenging Behavior

Research has identified several instructional and behavior management practices that are effective for students generally and particularly effective for students with challenging behavior. These practices include attention signals, prior-knowledge supports, teacher and student modeling, behavioral and instructional pre-corrections, frequent opportunities for student academic responding, behavior- and academic-specific praise, and a high praise to reprimand ratio (Reinke et al., 2013; Stichter et al., 2009). Unfortunately, in many schools the implementation of these practices seem to be the exception rather than the rule. In a recent observational study, Scott et al. (2017) assessed the presence of effective instructional and behavior management practices in general education classrooms during typical instruction. Findings indicate these practices occur at very low levels and are consistent with other observational studies of classroom management practices (Hirn & Scott, 2014; Scott et al., 2011; Stichter et al., 2009).

When looking at the classroom experiences of students with challenging behavior, the picture is even more bleak. Students with challenging behavior receive fewer opportunities to respond (OTRs), higher levels of negative feedback, and lower levels of praise than their peers without challenging behavior (Hirn & Scott, 2014; Scott et al., 2011; Scott et al., 2017). Unfortunately, even in an era of mandated behavioral support programs in schools, data from more recent observational studies reflect the findings of observational studies conducted more than 20 years ago, which find teachers in general education classrooms, as well as special education classrooms, rarely adapt their instruction or behavioral practices for students with EBD (Meadows et al., 1994; Wehby et al., 1995).

While observational studies have illustrated the poor instructional environments students with challenging behavior experience, teachers consistently report inadequate training in areas related to behavior management and cite managing student behavior as one of their top concerns. Teachers cite classroom management as the most challenging part of their job and managing disruptive behaviors in the classroom as a barrier to providing effective instruction to students (Epstein et al., 2008; Ingersoll, 2002; Malinen & Savolainen, 2016; Simonsen et al., 2008).

The prevalence of students with challenging behavior and teachers' lack of training in effective behavior management practices point to a need for effective and efficient interventions that address the behavioral needs of students in public schools. Importantly, observational studies point toward the need for increased use of key teacher behaviors (i.e., praise, OTRs) that are associated with improved academic and behavioral outcomes for students with challenging behavior (e.g., Goetz et al., 1975; Sutherland & Wehby, 2001).

School-wide Positive Behavior Interventions and Supports

Schools have increasingly adopted School-wide Positive Behavior Interventions and Supports (SWPBIS) to more effectively meet students' behavioral needs. School-wide Positive Behavior Interventions and Supports places behavior supports into three distinct tiers, with gradual increases in the intensity of support as students move from one tier to the next. In this way, SWPBIS helps schools and teachers allocate additional resources to students with more intensive behavior needs (Horner & Sugai, 2015). In SWPBIS, Tier 1 generally consists of the following components: (a) creating a statement of purpose; (b) establishing a set of school-wide behavior expectations; (c) creating a procedure for explicitly teaching those behavioral expectations; (d) creating and implementing a system for recognizing and reinforcing appropriate behavior, such as a school-wide incentive or reward system; (e) clearly defining and consistently

implementing a set of consequences for inappropriate behavior; and (f) collecting student behavior data and monitoring progress toward school-wide behavior goals (Lewis & Sugai, 1999).

In addition to establishing these core Tier 1 components at the school-wide level, classrooms should have Tier 1 practices in place. Classroom teachers should post, teach, review, monitor, and reinforce behavioral expectations. In an SWPBIS system, these expectations are aligned with school-wide expectations and teachers post and explicitly teach students how to engage in those expectations in different instructional contexts (e.g., large group instruction, centers, independent activities) and different settings (e.g., hallway transitions, cafeteria, recess). Once behavioral expectations are explicitly taught, teachers should actively supervise students and provide immediate, corrective feedback when students engage in behavior that is not consistent with expectations and provide immediate, behavior-specific praise when students display behavior that aligns with expectations (Colvin et al., 1997). Single-case studies have found these practices are associated with increases in academic engagement and decreases in off-task and disruptive behavior (De Pry & Sugai, 2002; Lane et al., 2003; Lo et al., 2002).

Teachers should also actively engage students in instruction through frequent opportunities to respond (OTRs) and the implementation of direct instruction strategies. Single-case studies indicate increases in OTRs are associated with increases in on-task behavior (Carnine, 1976; Sutherland et al., 2003; Van Camp et al., 2020), decreases in disruptive behavior (Carnine, 1976; Sutherland et al., 2003; West & Sloane, 1986), and increases in the number of correct student responses (Sutherland et al., 2003). A recent meta-analysis found that interventions used to increase teacher delivery of OTRs are associated with a 22.9% increase in on-task behavior and a 331% increase in student responding (Van Camp et al., 2020). The use of

direct instruction strategies are associated with gains in academic achievement and increases in on-task behavior (Engelmann & Bruner, 1974; Gersten et al., 1988).

Teachers should also have a continuum of strategies to reinforce appropriate behavior in place in classrooms. Three examples of these strategies include: (1) providing specific, contingent praise when students engage in appropriate behavior; (2) the implementation of group contingencies in which groups of students earn positive reinforcement when they engage in appropriate behavior; and (3) token economies in which students earn tokens (e.g., points, tickets) when they engage in desired behaviors that can be cashed in for a reinforcer (e.g., desired items, activities, time with adults). Providing specific praise for academic and social behavior is associated with increases in on-task behavior (Ferguson & Houghton, 1992; Sutherland et al., 2000), correct responses (Sutherland & Wehby, 2001), and work productivity (Craft et al., 1998). A recent study found that when teacher praise to reprimand ratios are approximately 9:1, the engagement levels of students with or at-risk for EBD match those of their typically developing peers (Caldarella et al., 2020).

In addition to a continuum of strategies to reinforce appropriate behaviors, teachers should have a continuum of strategies to respond to inappropriate behaviors in place. Commonly, teachers deliver reprimands in response to student misbehavior. While teachers often intend to stop or correct student misbehavior with reprimands, a cross-lag analysis of short-term longitudinal data found teacher reprimands did not result in decreases in disruptive behavior or increases in engagement (Caldarella et al., 2020). Instead, strategies to respond to inappropriate behavior should include evidence-based practices such as brief, corrective feedback, differential reinforcement, and planned ignoring. Brief, corrective feedback is provided when teachers quickly identify inappropriate behavior and tell students exactly what they should do instead in

the future. Differential reinforcement and planned ignoring are positive feedback strategies that increase desired behaviors and decrease the likelihood inappropriate behaviors will occur in the future (Simonsen et al., 2008).

As indicated above, it is essential for teachers to implement high levels of Tier 1 practices including behavior-specific praise and OTRs and low levels of negative feedback across all students. If Tier 1 practices are in place at the classroom level, research estimates around 80% of students will have their behavioral needs met (O'Connell et al., 2009). In SWPBIS, when students are non-responsive to Tier 1 supports, they receive targeted supports at Tier 2.

Tier 2 interventions. Tier 2 interventions are generally standardized interventions that can be delivered to students in small groups, making them relatively efficient and feasible for schools to implement. By definition, Tier 2 interventions require an investment of school resources above and beyond what is required at the Tier 1 level. Research estimates 10-15% of students will need Tier 2 supports (Hawken et al., 2014). Two commonly implemented Tier 2 interventions are self-monitoring and Check-in/Check-out (CICO).

Check-in/Check-out. Check-in/Check-out (CICO) is a commonly implemented and researched Tier 2 behavior intervention (Bruhn et al., 2014). Check-in/Check-out is based on widely accepted principles of behavior support including contingent reinforcement, the provision of frequent and structured access to positive feedback for appropriate behavior, and behavior-specific corrective feedback for inappropriate behavior. Check-in/Check-out procedures have been documented in a manual and consist of the following components: (a) morning check-in with a school staff member designated as a student's mentor; (b) a Daily Behavior Report Card (DBRC) with school-wide behavior expectations and places for teachers to rate student performance on those expectations; (c) teacher feedback on the DBRC at structured times

throughout the school day (e.g., between instructional blocks or class periods); (d) an afternoon check-out with the adult mentor where points are tallied and students receive a reward if they meet their point goal for the day; and (e) a parent signature on the DBRC every night (Campbell & Anderson, 2011). Studies assessing CICO for students with challenging behavior find CICO can increase appropriate behavior (Campbell & Anderson, 2011; Dart et al., 2015; Miller et al., 2015) and decrease problem behavior (Campbell & Anderson, 2011; Hawken et al., 2014).

Self-monitoring. Another widely used and researched Tier 2 behavioral intervention is self-monitoring (Carter et al., 2011). Self-monitoring interventions consist of the following components: (a) teaching students how to self-evaluate targeted behaviors; (b) providing students with a cue to self-assess their behavior at regular intervals; (c) students self-assessing their performance on each targeted behavior; and (d) students recording their self-assessment of their performance on each targeted behavior. Many self-monitoring interventions also include goal-setting, access to reinforcement based on behavioral performance, simultaneous teacher ratings of student behavior, and technology-based platforms for recording behavior ratings. Studies assessing self-monitoring interventions for students with challenging behavior find self-monitoring can improve student engagement and decrease problem behavior (Bruhn et al., 2015; Sheffield & Waller, 2010).

Relationship between Tier 1 and Tier 2. The accurate identification of students for Tier 2 interventions rests on the assumption that Tier 1 supports are implemented with high levels of fidelity in school and classroom environments and that these supports are implemented consistently across students. If this is not the case, schools may over-identify students for Tier 2 interventions when better implementation of Tier 1 practices in classrooms or with particular students may be effective. If Tier 1 practices are implemented with low levels of fidelity or not at

all in classrooms, it is likely those students identified as needing Tier 2 behavior interventions will include several false positives. In other words, students who could in fact benefit from high-quality Tier 1 supports will be identified as needing Tier 2 supports because Tier 1 supports are not in place in classrooms. If schools provide Tier 2 behavior interventions to a high percentage of students, the quality of Tier 2 supports will inherently decrease due to larger group sizes, shorter interventions sessions, fewer qualified interventionists, and less supports for interventionists. This lower quality of intervention could reduce responsiveness for those students who actually require Tier 2 interventions.

Additionally, if students with challenging behavior are exposed to lower quality or lower levels of Tier 1 supports, as reported in the observational studies cited above, they may not respond well to Tier 2 interventions unless those interventions improve a teacher's implementation of Tier 1 practices with that student. For example, in a recent single-case study assessing the effectiveness of a technology-based self-monitoring intervention for an 8th grade student, direct observations indicated the classroom had very low levels of Tier 1 practices in place. While the Tier 2 intervention yielded some behavior change for the student participant, his response was variable and he continued to engage in high levels of disruptive behavior. When researchers layered a class-wide intervention that systematically improved teacher implementation of Tier 1 practices (i.e., behavior-specific praise, explicit behavioral skill instruction) on top of the self-monitoring intervention, the student maintained high, stable levels of engagement and low, stable levels of disruptive behavior (Van Camp et al., 2021).

While it may be the case that Tier 2 interventions change teachers' Tier 1 practices with students, most studies assessing the effectiveness of Tier 2 interventions do not include measures of specific teacher behaviors that are associated with improved student behavior outcomes (e.g.,

praise, OTRs). Without this information, it is difficult to know what the active ingredients are in these interventions and whether responsiveness could be improved by adding components that systematically change teacher behaviors.

Measures of Tier 1 Practices in Tier 2 Research

Across the Tier 2 behavior intervention literature base, studies rarely measure key teacher behaviors associated with student behavior change (i.e., praise, reprimands, OTRs). Further, a small percentage of studies measure and report fidelity of Tier 1 supports. In a recent systematic review of the CICO literature (Majeika et al., 2019), only 33.9% of included studies reported Tier 1 fidelity at the school level. Even in studies that did provide measures of Tier 1 fidelity, they generally reported an overall average level of fidelity at the school level, but failed to report classroom levels of fidelity. In this literature base, even fewer studies provide specific counts of teacher praise and OTRs delivered to targeted students, which may be the most direct indication of the presence of Tier 1 practices at the individual student level. Without accurate measures of Tier 1 supports at the school level and teacher practices at the classroom level in these studies, it is difficult to conclude whether students were actually in need of Tier 2 intervention or if teachers needed additional coaching on the implementation of Tier 1 supports with students with challenging behavior.

Based on evidence from observational studies indicating students with challenging behavior receive particularly low levels of behavior-specific praise and OTRs and high levels of negative feedback, it is important to ensure these Tier 1 practices are implemented equally across students in a classroom. If they are not implemented at high levels with specific students, it may make sense to invest additional resources in improving teachers' implementation of Tier 1 practices before implementing Tier 2 interventions. Alternatively, it may be effective to further

investigate whether Tier 2 interventions improve teacher delivery of the aforementioned teacher behaviors or to enhance Tier 2 interventions to include components that systematically increase teachers' implementation of Tier 1 practices.

Summary

The review of the literature above highlights three issues: (1) Poor implementation of Tier 1 practices may lead to increased levels of Tier 2 referrals and these referrals will likely include several false positives, which could limit the effectiveness of Tier 2 interventions; (2) the effectiveness of Tier 2 interventions could be related, in part, to teacher implementation of Tier 1 practices (e.g., behavior-specific praise, OTRs) with individual students; and (3) implementation of Tier 2 interventions may impact teacher delivery of Tier 1 practices. Of these, the relationship between Tier 1 teacher practices and Tier 2 interventions may be most impactful on classroom problem behavior and teachers' ability to manage classrooms. Unfortunately, without measures of teacher behavior in Tier 2 intervention studies, it is difficult to determine to what degree teacher implementation of Tier 1 practices mediates student responsiveness to Tier 2 interventions. One may hypothesize students with challenging behavior need heavier doses of Tier 1 practices such as behavior-specific praise, OTRs, and pre-corrections. It is possible Tier 2 interventions change teacher practices with students with challenging behavior. Unfortunately, without measures of these behaviors in studies assessing Tier 2 behavior interventions, we cannot determine whether these interventions result in those changes in teacher behavior. If teacher behavior is particularly impactful in these interventions, these data could inform improvements in the development and design of Tier 2 interventions, with the potential to improve student responsiveness.

Purpose

The purpose of this study was to determine to what degree teachers implementation of evidence-based Tier 1 behavior management practices (i.e., praise, reprimands, OTRs) toward students with challenging behavior moderates and mediates student responsiveness to Tier 2 behavior interventions. Specifically, this study aimed to answer the following research questions: (1) Does MoBeGo, a Tier 2 self-monitoring intervention, change teachers' use of praise, reprimands, and OTRs with students with challenging behavior? (2) If MoBeGo results in changes in teachers use of praise, reprimands, and OTRs, to what extent do changes in teachers use of praise, reprimands, and OTRs to students with challenging behavior mediate student responsiveness to MoBeGo? (3) To what extent does teachers use of praise and reprimands with students with challenging behavior at baseline moderate student responsiveness to MoBeGo during intervention?

Chapter 2

Methods

Participants

The sample of participants in this study included 55 teacher student dyads participating in a randomized controlled trial assessing the effectiveness of a technology-based self-monitoring intervention, Monitoring Behavior on the Go (MoBeGo; IES Goal 2 Grant). Teacher participants were required to teach a core academic subject area in grade 3-8 elementary or middle school classrooms. Consented teacher participants nominated students in their classrooms who would benefit from Tier 2 behavioral supports based on levels of off-task and disruptive behaviors. Following teacher nomination, the following inclusion criteria were applied to identify student participants: (1) parent consent, (2) students score in the borderline or abnormal range on the hyperactivity or inattention subscale of the Strengths and Difficulties Questionnaire (SDQ; <http://www.sdqinfo.com>), and (3) students' average engagement during three direct observations was at or below 65%. Eligible students were then randomly assigned to a technology-based self-monitoring intervention, MoBeGo, or a business as usual (BAU) comparison condition. Demographic information about teacher and student participants by treatment group is provided in Tables 1 and 2.

Setting

This study took place in grade 3-8 classrooms in public elementary and middle schools in mid-sized and suburban school districts in a Midwestern state and an urban school district in the Southeast. Fidelity of school-wide Tier 1 SWPBIS implementation was assessed in all

participating schools. The Tier 2 intervention was implemented during a core instructional block or academic period (i.e., Math, English Language Arts, Science, or Social Studies).

Experimental Design

This study employed a block randomization design, matching student participants on grade levels within each school. To recruit teacher participants, research staff presented an overview of the study and the MoBeGo app to school staff and teachers. Research staff then met with interested teachers or grade-level teams to obtain teacher consent. During this meeting, teachers nominated student participants and received parent consent forms to send home with nominated students. Once parents provided consent, researchers conducted direct observations to confirm eligibility for participation in the study based on levels of engagement as described above and eligible teacher student dyads were randomly assigned to the treatment or BAU condition.

Procedures

Baseline and comparison conditions. Once students were randomly assigned to a BAU or MoBeGo condition, observers collected five baseline data points in comparison and MoBeGo classrooms. For students assigned to the comparison condition, teachers continued typical classroom instruction following baseline and observers collected an additional five data points. During baseline and comparison conditions, teachers were instructed to continue classroom and behavior management practices as usual.

For teacher student dyads assigned to the MoBeGo condition, teachers received training on how to collect baseline data in the MoBeGo app. The MoBeGo app is an iPad based self-monitoring intervention that maintains a record of student performance over time. During baseline training, teachers set target behaviors for students and selected the interval on which

teachers would rate and students would self-rate behaviors in the app. Teachers selected an interval between two and 10 min.

During baseline, teachers rated student behavior on a regular interval. Teachers rated behaviors on a 0-4 scale in which 0 indicates the behavior never occurred, 1 indicates the behavior occurred a little, 2 indicates the behavior sometimes occurred, 3 indicates the behavior occurred a lot, and 4 indicates the behavior always occurred. During baseline, teachers were instructed not to give students feedback on their behavioral performance and students were not given an opportunity to self-rate their behaviors. At the end of baseline, the app calculates the median of teacher ratings during baseline, adds 10%, and this value becomes the initial point goal for the student during intervention.

MoBeGo. MoBeGo consisted of teacher and student training on the MoBeGo intervention and implementation of the MoBeGo intervention with teacher and student participants. Teacher training consisted of an overview of the potential benefits of self-monitoring, instruction on how to enter data, and instruction on how to provide feedback to students based on their behavioral performance. Student training consisted of a brief introduction to the MoBeGo app, examples and non-examples of target behaviors, instruction on how to enter scores in the app, and instruction on how to review progress using the MoBeGo graphing system.

During the MoBeGo intervention, teachers provided students with brief pre-corrections for target behaviors at the beginning of each intervention session and students self-rated their behavior and teachers rated student behavior on a regular interval (i.e., between two and 10 min). MoBeGo provided an audible cue on the iPad at the end of every interval to remind the teacher to score the student's behavior. Once the teacher rated student behaviors, the student self-assessed their behavior and the app revealed the teacher ratings, highlighting where the student

and teacher agreed and disagreed. This entire process took about 20-30 s at the end of every interval. At the end of each instructional block, the teacher reviewed student performance in the app, provided the student with behavior-specific praise, and elected to provide students with an immediate reinforcer if they met their point goal. If the student did not meet their point goal, the teacher provided brief, corrective feedback. This feedback generally took about 30 s for teachers to deliver. Over time, students' point goals increased and decreased based on teacher ratings of student behavior in the app. Appendix A includes screenshots of all components of the MoBeGo app.

Data Collection Procedures

In this study, observers used the Multiple Option Observation System for Experimental Studies (MOOSES; Tapp et al., 1995) to record teacher and student behaviors for all observations across all conditions. This observation system uses timed event recording and allows for simultaneous collection of discrete behaviors (e.g., frequency of disruptive behavior, frequency of teacher praise) and continuous behaviors (e.g., duration of academic engagement). Observers conducted 15 min direct observations during a core academic subject in which the student participant displayed high rates of off-task or disruptive behavior. The teacher and student behaviors collected during direct observations are described below.

Teacher Behaviors

Praise. Teacher praise was defined as oral praise given by the lead teacher to the target student or to a group of students that includes the target student. Teacher praise included verbal statements indicating approval of student behavior above and beyond adequacy or acknowledgement of a correct response. Examples of teacher praise included: "Great job raising

your hand to get my attention!” “Table 2, thanks for getting to work right away on your writing assignment!” “I love the way Tim explained his thinking on that math problem. Great work!”

Reprimand. A reprimand was defined as a verbal statement intended to correct the target student’s behavior. Reprimands included verbal comments such as scolding, negative statements indicating disapproval with the student’s social behavior, or comments used with the intent to stop the student from misbehaving. Reprimands were coded when they were delivered to the target student individually or to a group that included the target student. Examples of reprimands included: “I told you to stand up and push in your chair.” “Group 4, the rest of class followed my directions to get lined up for specials. I’m giving you one last chance to join.” “Almost everyone is on page 55 like I asked. Emily, we’re waiting on you to get started.” “Start paying attention or your name is going on the board.”

Opportunities to respond. Opportunities to respond (OTRs) were defined as an instructional question or statement from the teacher to the target student or to a group that included the target student that seeks an academic response. Examples of OTRs included: “Could you please come to the board and work out this math problem?” “Will you please share your answer with the class?” “Everyone please fill in the answer for number 5.”

Student Behaviors

Disruptive behavior. Disruptive behavior was defined as verbal or physical displays of inappropriate behavior. This included verbal statements or physical motor movements intended to provoke, annoy, pester, draw attention, or complain. Examples of disruptive behavior included the following: throwing or tossing material across the room, hitting another student, destroying class property, tapping a pencil, verbal refusal to follow teacher directions, verbal threats

directed towards peers or teachers, engaging in conversation with a peer while the teacher delivered instruction, and talking without raising a hand.

Engagement. Academic engagement was defined as working on an assigned or approved activity or appropriately waiting for further instruction from the teacher. Examples of academic engagement included the following: responding to a question directed at the target student, reading silently with signs of scanning or page turning, and writing or solving problems during an independent activity.

Direct Observation Procedures

Training. Observers were trained PhD and masters student research assistants. Training on MOOSES consisted of three stages: (a) observers reviewed and memorized operational definitions of targeted behaviors, (b) observers independently practiced using MOOSES with videos and achieved 85% reliability with a master code for three consecutive sessions; and (c) observers reached 85% reliability with an expert coder during live observation sessions in classrooms. Observers were required to reach 85% reliability for two consecutive sessions in classrooms before conducting direct observations for the study.

Inter-observer agreement. To ensure all measures were reliable, a secondary observer was present for at least 20% of observation sessions across participants to collect inter-observer agreement (IOA) data. For outcome variables measured as frequency counts using MOOSES, IOA was calculated using a 5-s window of agreement around each frequency code (e.g., praise, reprimands) in the primary coder's file. Agreements were scored when the secondary coder's file included frequency codes that matched the primary coder's file. Inter-observer agreement for frequency codes was calculated using the following formula: agreements divided by agreements plus disagreements multiplied by 100. For outcome variables measured as duration using

MOOSEES, second-by-second agreement was calculated using the following formula: agreements divided by agreements plus disagreements multiplied by 100. Appendix B includes a codebook with operational definitions of all dependent variables.

Treatment Fidelity

At the end of each MOOSEES observation, observers completed a 5-item procedural fidelity checklist to determine the use of the MoBeGo intervention components during observation sessions (i.e., iPad is present, pre-corrects on skills occurred at beginning of session, point goal shared with student, objective feedback provided at end of session). Observers completed the 5-item procedural fidelity checklist in both MoBeGo and comparison classrooms following MOOSEES observations to ensure components of the intervention were not implemented in comparison classrooms throughout the study. Appendix C includes a copy of the procedural fidelity form.

Analyses

All analyses were conducted using Stata 14.2 (StataCorp, 2015). To assess whether data were nested at the site or school level, the intra-class correlation coefficient (ICC) was calculated across relevant dependent variables at the site and school level. The ICCs did not indicate nesting at the site or school level, meaning a multi-level model was not needed. To answer the first research question, three multiple linear regressions were conducted, each with a different teacher behavior (i.e., praise, reprimands, OTRs) serving as the dependent variable. To assess for multicollinearity across variables, Pearson's correlation coefficients were calculated across all variables included in each model. Teacher praise and OTRs showed a strong and significant correlation. For this reason, teacher praise was removed from any model that included OTRs and vice versa. Additionally, treatment fidelity and change in teacher praise from baseline to

intervention showed a strong and significant correlation. Therefore, treatment fidelity was not included in analyses conducted to answer the third research question. The following control variables were included in each of these analyses: student grade level, gender, special education status, and race/ethnicity. All control variables were coded dichotomously. Table 3 summarizes coding schemes across all relevant variables. For student grade level, students in grades 3, 4, and 5 were coded as 0 and students in grade 6, 7, and 8 were coded as 1. Males were coded as 0 and females were coded as 1. Students who were White were coded as 0 and students who were non-White were coded as 1.

To answer the first research question (i.e., does MoBeGo, a Tier 2 self-monitoring intervention, change teachers use of praise, reprimands, and OTRs with students with challenging behavior?), multiple linear regressions were conducted to assess whether MoBeGo was associated with changes in praise, reprimands, or OTRs. In the first model, change in praise from baseline to intervention or comparison was the dependent variable, assignment to the MoBeGo or comparison group was the independent variable, and student grade level, gender, special education status, race/ethnicity, and teacher reprimands were control variables.

$$Y_{praise} = \beta_0 + \beta_{condition}x_{i1} + \beta_{grade}x_{i2} + \beta_{sped}x_{i3} + \beta_{studentrace}x_{i4} + \beta_{reprimand}x_{i5} + \varepsilon$$

In the second model, change in reprimands from baseline to intervention or comparison was the dependent variable, assignment to the MoBeGo or comparison group was the independent variable, and student grade level, gender, special education status, race/ethnicity, and teacher praise were control variables.

$$Y_{reprimand} = \beta_0 + \beta_{group}x_{i1} + \beta_{grade}x_{i2} + \beta_{sped}x_{i3} + \beta_{studentrace}x_{i4} + \beta_{praise}x_{i5} + \varepsilon$$

In the third model, change in OTRs from baseline to intervention or comparison was the dependent variable, assignment to the MoBeGo or comparison group was the independent

variable, and student grade level, gender, special education status, race/ethnicity, and teacher reprimands were control variables.

$$Y_{otr} = \beta_0 + \beta_{group}x_{i1} + \beta_{grade}x_{i2} + \beta_{sped}x_{i3} + \beta_{studentrace}x_{i4} + \beta_{reprimand}x_{i5} + \varepsilon$$

The outcomes of the analyses used to answer the first research question informed the analyses conducted to answer the second research question (i.e., if MoBeGo results in changes in teachers use of praise, reprimands, and OTRs, to what extent do changes in teachers use of praise, reprimands, and OTRs to students with challenging behavior mediate student responsiveness to MoBeGo?). Assignment to the MoBeGo condition was associated with a statistically significant change in praise, but not with changes in reprimands or OTRs (see Results, pp. 22). Therefore, two mediation analyses were conducted to answer the third research question. The medeff command in Stata was used to assess whether the impact of MoBeGo on student engagement and disruptive behavior was mediated by changes in teacher praise. In the first model, change in student engagement from baseline to intervention or comparison conditions was the dependent variable, student assignment to the MoBeGo or comparison group was the independent variable, change in teacher praise from baseline to intervention or comparison conditions was included as a mediator, and student grade level, special education status, race/ethnicity, and gender were control variables.

$$Y_{engagement} = \beta_0 + \beta_{group}x_{i1} + \beta_{praise}M + \beta_{grade}x_{i2} + \beta_{sped}x_{i3} + \beta_{race}x_{i4} + \beta_{gender}x_{i5} + \varepsilon$$

$$M_{praise} = \beta_0 + \beta_{group}x_{i1} + \beta_{grade}x_{i2} + \beta_{sped}x_{i3} + \beta_{race}x_{i4} + \beta_{gender}x_{i5} + \varepsilon$$

The second model included change in disruptive behavior from baseline to intervention or comparison conditions, but was otherwise identical to the first model.

$$Y_{disruptive} = \beta_0 + \beta_{group}x_{i1} + \beta_{praise}M + \beta_{grade}x_{i2} + \beta_{sped}x_{i3} + \beta_{race}x_{i4} + \beta_{gender}x_{i5} + \varepsilon$$

$$M_{praise} = \beta_0 + \beta_{group}x_{i1} + \beta_{grade}x_{i2} + \beta_{sped}x_{i3} + \beta_{race}x_{i4} + \beta_{gender}x_{i5} + \varepsilon$$

To answer the third research question (i.e., to what extent does teachers use of praise and reprimands with students with challenging behavior at baseline moderate student responsiveness to MoBeGo during intervention?), two multiple linear regressions were conducted. In the first model, change in student engagement from baseline to intervention or comparison conditions served as the dependent variable, assignment to the MoBeGo or comparison group was the independent variable, interaction terms for baseline levels of praise and reprimands and assignment to the treatment group were included as moderators, and student grade level, special education status, student race/ethnicity, and teacher implementation fidelity were control variables.

$$\begin{aligned} Y_{engagement} = & \beta_0 + \beta_{group}x_{i1} + \beta_{praise}x_{i2} + \beta_{group*praise}x_{i3} + \beta_{reprimand}x_{i4} \\ & + \beta_{group*reprimand}x_{i5} + \beta_{grade}x_{i6} + \beta_{sped}x_{i7} + \beta_{race}x_{i8} + \beta_{gender}x_{i9} \\ & + \beta_{fidelity}x_{i10} + \varepsilon \end{aligned}$$

In the second model, change in student disruptive behavior from baseline to intervention or comparison served as the dependent variables and the remaining variables were identical to those used in the previous model.

$$\begin{aligned} Y_{disruptive} = & \beta_0 + \beta_{group}x_{i1} + \beta_{praise}x_{i2} + \beta_{group*praise}x_{i3} + \beta_{reprimand}x_{i4} \\ & + \beta_{group*reprimand}x_{i5} + \beta_{grade}x_{i6} + \beta_{sped}x_{i7} + \beta_{race}x_{i8} + \beta_{gender}x_{i9} \\ & + \beta_{fidelity}x_{i10} + \varepsilon \end{aligned}$$

Chapter 3

Results

Table 4 summarizes means and standard errors of changes in key student and teacher behaviors from baseline to intervention in the treatment and comparison group.

Inter-observer Agreement

Table 5 summarizes inter-observer agreement data. A secondary observer was present for 24.1% of observation sessions across participants and conditions. Agreement was 93.6% (range=0-100%), 91% (range=0-100%), 94.1% (range=0-100%), 92% (range=0-100%), and 96.9% (range=73.8-100%) across reprimands, praise, OTRs, disruptive behavior, and engagement respectively. Observation sessions with 0% agreement for behaviors measured using a frequency count occurred when these behaviors occurred at very low levels (e.g., 1 praise statement) and were only recorded by one observer.

Fidelity

Average implementation fidelity was 81.8% and 0.1% across teachers in the treatment and control group respectively. Implementation fidelity ranged from 45.8% to 100% during the intervention condition for teachers in the treatment group. Teachers in the treatment group most frequently failed to provide pre-corrections for targeted behaviors at the beginning of intervention sessions and feedback and reinforcement at the end of intervention sessions.

Research Question 1

Results from analyses conducted to answer the first research question (i.e., does MoBeBo, a Tier 2 self-monitoring intervention change teachers use of praise, reprimands, and

OTRs with students with challenging behavior?), indicated a significant effect of assignment to the MoBeGo group on changes in teacher praise from baseline to intervention conditions. The coefficient for group assignment indicates teachers assigned to the MoBeGo group delivered 0.74 more praise statements to target students in a 15 min observation from baseline to intervention when compared to teachers assigned to the comparison group ($p=0.01$). Other variables included in this model (i.e., grade level, student gender, student special education status, student race) did not significantly predict changes in teacher praise from baseline to intervention. There were no significant effects of the MoBeGo intervention on other teacher behaviors (i.e., reprimands, OTRs). Tables 6, 7, and 8 summarize findings for the teacher praise, reprimands, and OTR analyses respectively.

Research Question 2

Findings from analyses conducted to answer the first research question informed which analyses were conducted to answer the second research question. Because there was a significant impact of MoBeGo on changes in teachers delivery of praise to target students, two mediation analyses were conducted to assess whether changes in teacher praise mediated student responsiveness to MoBeGo as measured by changes in student engagement and disruptive behavior from baseline to intervention or comparison conditions. There was no evidence that changes in teacher praise mediated student responsiveness to MoBeGo as measured by changes in student engagement and disruptive behavior from baseline to intervention conditions. Tables 9 and 10 summarize findings across these two analyses.

Research Question 3

Results from analyses to answer the third research question (i.e., to what extent does teachers use of praise, reprimands, and OTRs with students with challenging behavior at baseline

moderate student responsiveness to MoBeGo during intervention?) indicated no significant effects of teachers baseline levels of praise and reprimands on changes in student engagement and disruptive behavior during intervention or comparison conditions. In the model that included changes in student engagement as the dependent variable, student gender significantly predicted changes in student engagement with students who were female experiencing a 12.2% larger increase in engagement in comparison to students who were male ($p=0.02$). Additionally, assignment to the MoBeGo group approached significance, indicating that MoBeGo was associated with a 32.3% increase in student engagement from baseline to intervention when compared to changes in engagement for students assigned to the comparison group ($p=0.08$).

In the model that included changes in disruptive behavior as the dependent variable, the overall model was not significant and none of the variables included in the model significantly predicted changes in disruptive behavior. Tables 11 and 12 summarize findings across the two analyses conducted to answer the third research question.

Chapter 4

Discussion

Students with or at-risk for emotional and behavioral disorders (EBD) experience several negative outcomes including academic failure, high rates of exclusionary discipline practices, high school dropout, unemployment, and an increased likelihood of incarceration (Bradley et al., 2004; U.S. Department of Education, OSERS, OSEP, 2017). While research has identified several behavior management practices that are effective for students with challenging behavior, teachers implement these practices at very low levels in classrooms (Hirn & Scott, 2014; Scott et al., 2011). When these practices are not implemented consistently across classrooms and students, schools may identify higher percentages of students for more intensive behavior supports at Tier 2 in a Schoolwide Positive Behavior Interventions and Supports (SWPBIS) system. It is important to investigate the relationship between teachers implementation of Tier 1 practices and student responsiveness to Tier 2 interventions and to determine whether Tier 2 interventions are an effective means for improving teachers delivery of Tier 1 practices with students with or at-risk for EBD.

The purpose of this study was to assess how teachers implementation of evidence-based Tier 1 behavior management practices (i.e., praise, reprimands, OTRs) toward students with challenging behavior moderate and mediate student responsiveness to a Tier 2 intervention. Additionally, this study sought to determine whether a Tier 2 intervention improved teacher implementation of Tier 1 practices. Specifically, this study answered three research questions: (1) Does MoBeGo, a Tier 2 self-monitoring intervention, change teachers use of praise,

reprimands, and OTRs toward students with challenging behavior? (2) If MoBeGo results in changes in teachers use of praise, reprimands, and OTRs, to what extent do changes in teachers use of praise, reprimands, and OTRs with students with challenging behavior mediate student responsiveness to MoBeGo? (3) To what extent does teachers use of praise, reprimands, and OTRs with students with challenging behavior at baseline moderate student responsiveness to MoBeGo during intervention?

Findings indicate MoBeGo was associated with a significant increase in teachers use of praise with students with challenging behavior. MoBeGo was not associated with a significant change in teachers use of reprimands or OTRs with students with challenging behavior. These findings may be related to the structure of the MoBeGo intervention. Each time teachers rated a student's behavior in MoBeGo, they passed the iPad to the student for self-rating of behavior. Teachers were encouraged to provide students with feedback during this exchange. For this reason, it makes sense that assignment to the MoBeGo intervention was associated with an increase in teacher praise. The MoBeGo intervention did not include any components that changed the way teachers delivered academic instruction and teacher training did not have any content related to negative feedback or reprimands. Therefore it is not surprising that assignment to MoBeGo was not associated with a change in teachers delivery of OTRs or reprimands. If there were changes in these teacher behaviors, it is likely it would have been in response to changes in student behavior. For example, if MoBeGo improved student engagement and reduced disruptive behavior, teachers may provide students with more OTRs and less reprimands. Future research should investigate the degree to which changes in student behavior are associated with changes in these teacher behaviors. Additionally, future research should explore related questions such as the amount of student behavior change needed for teacher

behavior change and the length of time it may take for teacher behaviors to change in response to improvements in student behavior.

Changes in teacher praise did not appear to mediate student responsiveness to MoBeGo as measured by changes in student engagement and disruptive behavior. This may be due to the relatively small magnitude of change in teacher praise observed in this study. Teachers use of praise, reprimands, and OTRs with students with challenging behavior at baseline did not appear to moderate student responsiveness to MoBeGo as measured by changes in student engagement and disruptive behavior. There may not have been enough variability in teachers' delivery of these Tier 1 practices at baseline to identify a moderated relationship between these variables and student responsiveness to MoBeGo. It also may have been difficult to identify a moderated effect with such a small sample of teachers and students.

Limitations

Findings from this study should be interpreted with several limitations in mind. First, the relatively small sample size in the study (n=55 teacher student dyads) may have placed constraints on researchers ability to identify significant relationships between variables included in analyses. This was a development grant from the Institute of Education Sciences, making the study exploratory in nature and underpowered in terms of sample size. While the initial study aimed to include a sample of 72 teacher student dyads, the COVID-19 pandemic resulted in a loss of intervention data for several teacher student dyads. These participants were removed from analyses. A larger sample size would improve researchers ability to answer research questions related to mediated and moderated effects and to identify small but significant relationships between teacher and student behaviors. A larger sample size would also improve the generalizability of results.

Additionally, MoBeGo is a multi-component intervention and due to resource constraints, researchers were not always able to observe every component of the intervention during 15 min observation sessions. This makes it difficult to determine the degree to which teachers implemented each of these intervention components on days when they were not observed and to determine the degree to which each intervention component contributes to changes in student and teacher behavior. Additionally, relatively short observation lengths (i.e., 15 min) and/or the small number of observations (i.e., 5 per condition) may have limited researchers' ability to capture changes in teacher and student behavior that occurred as a result of the intervention.

Implications for Research

MoBeGo, a technology-based self-monitoring intervention, targeted improvements in student engagement for students with or at-risk for EBD. While MoBeGo did not target changes in teacher behavior, the implementation of MoBeGo was associated with statistically significant increases in teachers' delivery of praise to students with challenging behavior. On average, teachers in the treatment group delivered 0.74 more praise statements during 15 min observations from baseline to intervention than teachers assigned to the business as usual comparison group. This result is equivalent to about 3 additional praise statements per hour. As indicated from observational studies, teachers tend to deliver low levels of positive feedback to students generally and especially to students with challenging behavior (Hirn & Scott, 2014; Scott et al., 2011; Scott et al., 2017). Teacher praise is associated with improvements in student engagement and reductions in disruptive behavior (Caldarella et al., 2020; Partin et al., 2010). Findings from this study indicate self-monitoring interventions may be an effective method to increase teachers delivery of positive feedback to students who engage in challenging behavior. Future studies of self-monitoring interventions and other Tier 2 behavior interventions should assess whether they

are associated with improvements in teachers delivery of positive feedback to students with or at-risk for EBD.

Findings from this study did not indicate increases in teacher praise mediated student responsiveness to MoBeGo. This could be due to the low level of praise teachers delivered to students in this study. In other words, while MoBeGo improved teachers use of praise, it may not have improved teachers use of praise to the degree necessary to result in significant changes in student behavior. Prior studies investigated the level of teacher praise needed to result in significant improvements in engagement for students with challenging behavior. Findings indicate a praise to reprimand ratio of 9:1 resulted in significant improvements in engagement for students with challenging behavior. These improvements were substantial enough that engagement levels for students with challenging behavior matched engagement levels for peer comparison students without challenging behavior (Caldarella et al., 2020). Future studies should assess whether Tier 2 interventions such as MoBeGo are more effective when they include a specific teacher praise component and the amount of teacher praise needed to result in statistically significant and practically important improvements in student engagement and reductions in disruptive behavior.

Future research should also investigate the directionality of change in teacher and student behaviors. While observational and intervention studies consistently indicate a positive association between teacher praise and student engagement and a negative association between teacher reprimands and student engagement, it is not clear whether changes in teacher behavior drive changes in student behavior. It may be the case that improvements in student engagement and reductions in disruptive behavior cause increases in teacher delivery of praise to students. Conversely, increases in teacher praise may cause improvements in student engagement. Future

research should investigate the directionality of this relationship. Findings could inform the development and refinement of interventions targeted at improving student behavior.

Finally, it is possible that certain interventions do not require changes in teacher behavior to yield improvements in student behavior. While this study did not aim to assess student outcomes associated with assignment to the MoBeGo group, findings from other analyses focused on student outcomes indicate assignment to the MoBeGo group was associated with statistically significant improvements in student engagement and reductions in disruptive behavior (Bruhn et al., In Preparation). Self-monitoring interventions such as MoBeGo aim to teach students how to self-regulate their behavior (Bandura, 1991). It may be the case that students learn self-regulation skills from the process of iteratively self-assessing their behavioral performance and that teacher feedback is not a necessary part of this process. Alternatively, it may be the case that some students learn self-regulation skills and experience improved behavioral outcomes without changes in teacher practice, but other students require self-monitoring interventions that include programmed changes in teacher behavior. Additionally, it could be the case that including programmed changes in teacher behavior in the context of self-monitoring interventions may yield even larger improvements in student behavior, enhancing the intervention's effects. Future research should investigate whether there are differences between students who are responsive and non-responsive to self-monitoring interventions. It may be that certain profiles of students require programmed increases in teacher praise, reductions in teacher reprimands, or increases in OTRs to experience behavioral improvements and learn self-regulation skills from self-monitoring interventions.

Implications for practice

In line with prior studies that assessed teacher implementation of Tier 1 practices, teacher participants in this study implemented low levels of positive feedback to students with challenging behavior. Observational studies find teachers do not implement Tier 1 behavior management practices effectively in classrooms. Specifically, studies find teachers tend to underuse teacher praise and OTRs, and overuse reprimands (Hirn & Scott, 2014; Scott et al., 2011; Scott et al., 2017). In a multi-tiered system of support such as SWPBIS, the accurate identification of students for more intensive Tier 2 and Tier 3 interventions rests on the assumption that Tier 1 practices are in place with adequate levels of fidelity in classrooms. If this is not the case, students identified for Tier 2 and Tier 3 interventions will likely include several false positives. To ensure limited school resources are invested efficiently and effectively, it is essential to identify interventions that are associated with increases in teacher delivery of Tier 1 practices and improved consistency in terms of teachers delivery of these practices across students. Findings from this study indicate self-monitoring interventions may be an effective way to improve teachers' delivery of positive feedback to students with challenging behavior. In order to improve teacher implementation of these Tier 1 practices with specific students, schools and teachers may consider the use of self-monitoring interventions.

Conclusion

This study assessed whether a technology-based self-monitoring intervention, MoBeGo, was associated with changes in teacher implementation of Tier 1 behavior management practices and whether implementation of those behavior management practices mediated or moderated student responsiveness to the intervention. Findings indicate MoBeGo is associated with changes in teacher praise, but not teacher reprimands or OTRs. Changes in teacher praise and teacher implementation of Tier 1 behavior management practices did not appear to mediate or moderate

student responsiveness to MoBeGo. To confirm these findings, additional studies with larger samples of teachers and students are necessary and will contribute to a better understanding of the relationship between teacher and student behaviors. Due to the low rates at which teachers deliver evidence-based behavior management practices to students with or at-risk for EBD, schools should consider the use of self-monitoring interventions as a strategy to improve teacher praise with students with challenging behavior.

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Table 1*Student Demographics by Treatment Group*

| | Treatment | Comparison |
|------------------|-----------|------------|
| Gender | | |
| Female | 5 | 3 |
| Male | 22 | 25 |
| Race | | |
| White | 15 | 18 |
| African American | 9 | 4 |
| Biracial | 1 | 3 |
| Hispanic | 2 | 2 |
| Asian | 0 | 1 |
| FRL | | |
| Yes | 14 | 17 |
| No | 6 | 5 |
| Not reported | 7 | 6 |
| SPED | | |
| Yes | 9 | 9 |
| No | 19 | 18 |
| Grade | | |
| 3 | 3 | 4 |
| 4 | 5 | 5 |
| 5 | 7 | 8 |
| 6 | 6 | 5 |
| 7 | 6 | 3 |
| 8 | 1 | 2 |

Table 2*Teacher Demographics by Treatment Group*

| | Treatment | Comparison |
|------------------|-----------|------------|
| Gender | | |
| Female | 22 | 25 |
| Male | 5 | 2 |
| Non-binary | 0 | 1 |
| Race | | |
| White | 23 | 22 |
| African American | 1 | 5 |
| Hispanic | 2 | 1 |
| Not Reported | 1 | 0 |

Table 3*Variable Coding Schemes*

| | Coded as 0 | Coded as 1 |
|--------------------------|-------------------------------|-------------------------------------|
| Student race/ethnicity | White | Non-White |
| Student grade level | 3, 4, 5 | 6, 7, 8 |
| Special education status | No special education services | Receives special education services |

Table 4*Mean and Standard Errors of Change from Baseline to Intervention*

| | Treatment | Comparison |
|-------------------------|--------------|--------------|
| Student behavior | | |
| Engagement | 16.28 (2.74) | 1.83 (2.15) |
| Disruptive behavior | -12.8 (2.65) | -2.32 (1.63) |
| Teacher behavior | | |
| Praise | 0.61 (0.15) | -0.12 (0.23) |
| Reprimands | -0.29 (0.29) | -0.45 (0.32) |
| OTRs | 0.52 (2.34) | -3.04 (1.7) |
| Implementation Fidelity | 81.82 (3.02) | 0.12 (0.12) |

Table 5*Inter-observer Agreement*

| | Mean IOA | Range IOA |
|---------------------|----------|-----------|
| Reprimands | 93.6% | 0-100% |
| Praise | 91% | 0-100% |
| OTRs | 94.1% | 0-100% |
| Disruptive behavior | 93% | 0-100% |
| Engagement | 96.9% | 73.8-100% |

Table 6*Changes in Teacher Praise*

| | Coefficient | SE | p | 95% CI |
|----------------------|-------------|------|------|-------------|
| Group | 0.74 | 0.28 | 0.01 | 0.17, 1.31 |
| Grade | -0.38 | 0.31 | 0.22 | -0.99, 0.23 |
| Gender | 0.61 | 0.40 | 0.14 | -0.21, 1.42 |
| SPED status | -0.05 | 0.30 | 0.86 | -0.66, 0.55 |
| Race | 0.11 | 0.29 | 0.72 | -0.49, 0.69 |
| Change in reprimands | -0.15 | 0.09 | 0.13 | -0.34, 0.04 |
| Constant | -0.07 | 0.29 | 0.82 | -0.67, 0.53 |

Table 7*Change in Teacher Reprimands*

| | Coefficient | SE | p | 95% CI |
|------------------|-------------|------|------|--------------|
| Group | 0.44 | 0.45 | 0.33 | -0.46, 1.33 |
| Grade | -1.05 | 0.44 | 0.02 | -1.94, -0.18 |
| Gender | 0.53 | 0.61 | 0.39 | -0.69, 1.76 |
| SPED status | -0.52 | 0.44 | 0.25 | -1.41, 0.37 |
| Race | 0.28 | 0.44 | 0.53 | -0.60, 1.16 |
| Change in praise | -0.33 | 0.21 | 0.13 | -0.75, 0.09 |
| Constant | 0.09 | 0.45 | 0.84 | -0.81, 0.99 |

Table 8*Change in Teacher OTRs*

| | Coefficient | SE | p value | 95% CI |
|----------------------|-------------|-------|---------|---------------|
| Group | -8.62 | 12.21 | 0.48 | -33.19, 15.95 |
| Grade | 1.36 | 3.25 | 0.68 | -5.18, 7.90 |
| Gender | 1.78 | 4.28 | 0.68 | -6.84, 10.39 |
| SPED status | -3.08 | 3.29 | 0.36 | -9.70, 3.55 |
| Race | -0.84 | 3.13 | 0.79 | -7.13, 5.46 |
| Change in reprimands | -0.97 | 0.99 | 0.34 | -2.98, 1.04 |
| Fidelity | 0.15 | 0.14 | 0.31 | -0.14, 0.44 |
| Constant | -3.12 | 3.23 | 0.34 | -9.63, 3.39 |

Table 9*Mediation Analysis for Changes in Student Engagement*

| | Coefficient | SE | p | 95% CI |
|----------------------------|-------------|------|-------|--------------|
| Group | 11.51 | 3.49 | 0.002 | 4.49, 18.52 |
| Change in praise | 2.30 | 1.64 | 0.168 | -1.00, 5.60 |
| Grade | -1.28 | 3.42 | 0.711 | -8.15, 5.60 |
| SPED status | 1.08 | 3.46 | 0.755 | -5.87, 8.04 |
| Race | 3.35 | 3.43 | 0.333 | -3.54, 10.25 |
| Gender | 13.69 | 4.78 | 0.006 | 4.08, 23.30 |
| ACME | 1.62 | | | -0.67, 4.76 |
| Direct effect | 11.39 | | | 4.79, 18.18 |
| Total effect | 13.01 | | | 6.67, 19.27 |
| % of total effect mediated | 0.12 | | | 0.08, 0.24 |

Note. ACME=Average Causal Information Effects

Table 10*Mediation Analysis for Changes in Student Disruptive Behavior*

| | Coefficient | SE | p | 95% CI |
|----------------------------|-------------|------|-------|---------------|
| Group | -7.85 | 3.24 | 0.019 | -14.36, -1.33 |
| Change in praise | -2.44 | 1.52 | 0.116 | -5.51, 0.62 |
| Grade | -0.36 | 3.17 | 0.911 | -6.74, 6.03 |
| SPED status | 3.74 | 3.21 | 0.249 | -2.71, 10.20 |
| Race | -3.52 | 3.18 | 0.275 | -9.92, 2.88 |
| Gender | -7.04 | 4.44 | 0.119 | -15.96, 1.88 |
| ACME | 1.70 | | | -5.29, 0.32 |
| Direct effect | -7.96 | | | -14.08, -1.65 |
| Total effect | -9.65 | | | -15.43, -3.56 |
| % of total effect mediated | 0.18 | | | 0.11, 0.48 |

Note. ACME=Average Causal Information Effects

Table 11*Moderation Analysis for Changes in Student Engagement*

| | Coefficient | SE | p | 95% CI |
|-------------------------------|-------------|-------|------|--------------|
| Group | 32.18 | 18.18 | 0.08 | -4.45, 68.81 |
| Baseline praise | -1.57 | 2.15 | 0.47 | -5.91, 2.77 |
| Treatment*baseline praise | -1.04 | 3.85 | 0.79 | -8.79, 6.72 |
| Baseline reprimands | 0.83 | 1.20 | 0.49 | -1.59, 3.26 |
| Treatment*baseline reprimands | -3.51 | 1.94 | 0.08 | -7.42, 0.39 |
| Grade | -4.26 | 3.75 | 0.26 | -11.81, 3.29 |
| SPED status | 3.15 | 4.21 | 0.46 | -5.34, 11.64 |
| Race | 1.44 | 3.61 | 0.69 | -5.83, 8.72 |
| Gender | 12.19 | 4.87 | 0.02 | 2.37, 22.01 |
| Fidelity | -0.09 | 0.19 | 0.62 | -0.49, 0.29 |
| Constant | 0.45 | 4.41 | 0.92 | -8.44, 9.34 |

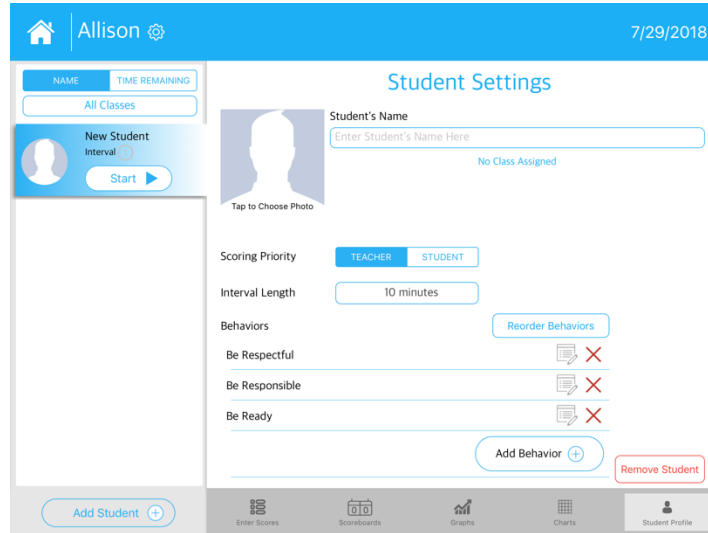
Table 12*Moderation Analysis for Changes in Student Disruptive Behavior*

| | Coefficient | SE | p | 95% CI |
|---------------------------|-------------|-------|------|---------------|
| Group | -4.11 | 17.63 | 0.82 | -39.63, 31.42 |
| Baseline praise | 1.29 | 2.09 | 0.54 | -2.91, 5.51 |
| Group*baseline praise | -1.83 | 3.73 | 0.63 | -9.36, 5.69 |
| Baseline reprimands | -0.51 | 1.17 | 0.67 | -2.86, 1.85 |
| Group*baseline reprimands | 1.66 | 1.88 | 0.38 | -2.13, 5.45 |
| Grade | 0.79 | 3.63 | 0.83 | -6.53, 8.11 |
| SPED status | 2.12 | 4.09 | 0.61 | -6.11, 10.35 |
| Race | -3.05 | 3.49 | 0.39 | -10.09, 4.01 |
| Gender | -7.83 | 4.73 | 0.11 | -17.35, 1.69 |
| Fidelity | -0.10 | 0.19 | 0.59 | -0.49, 0.28 |
| Constant | -1.31 | 4.28 | 0.76 | -9.93, 7.32 |

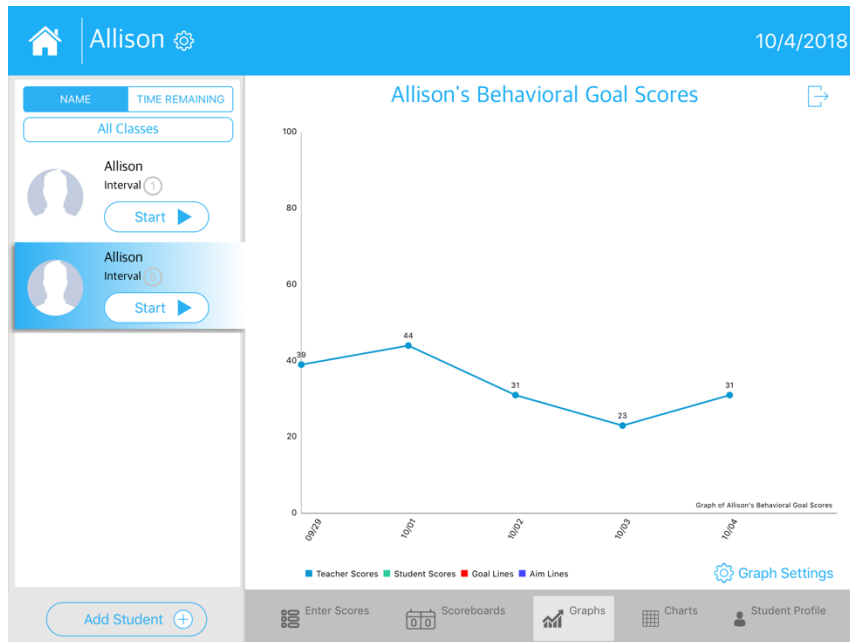
Appendix A

MoBeGo Application Components

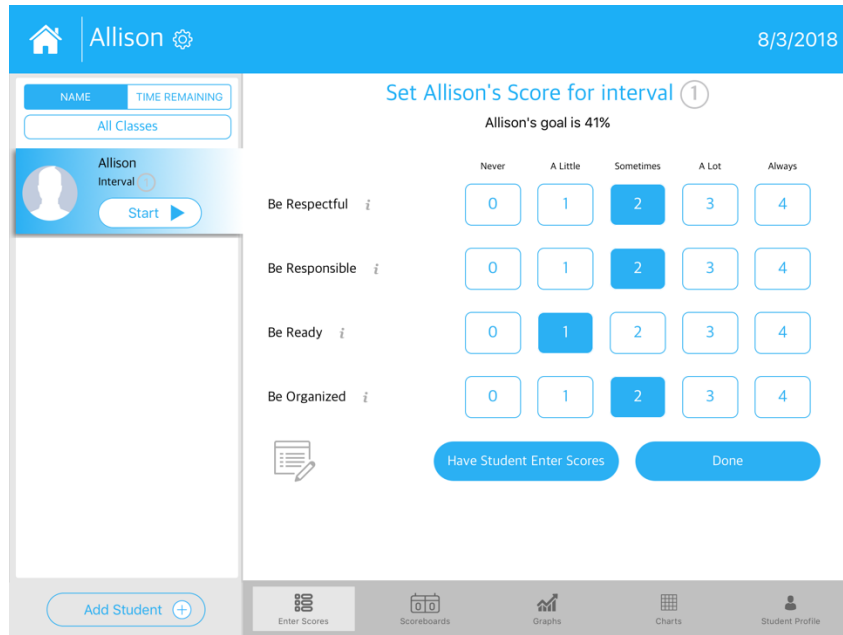
Student Profile:



Baseline Data Graph:



Teacher Scoring Screen:

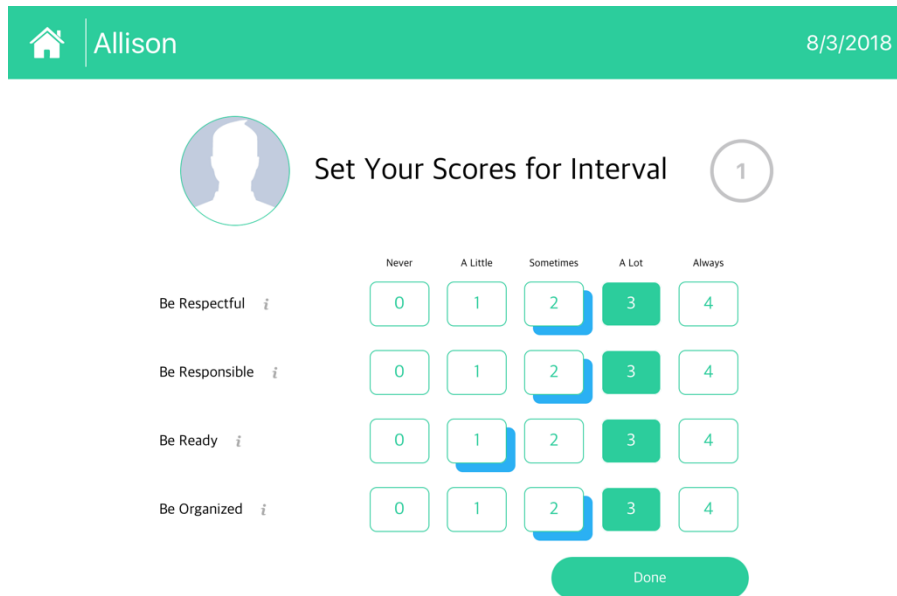


The Teacher Scoring Screen for Allison shows a goal of 41%. The interface includes a sidebar with a 'Start' button and a main area with a grid of scores for four categories: Be Respectful, Be Responsible, Be Ready, and Be Organized. The grid has five columns: Never, A Little, Sometimes, A Lot, and Always. The 'Sometimes' column is selected for all categories. Buttons for 'Have Student Enter Scores' and 'Done' are at the bottom.

| | Never | A Little | Sometimes | A Lot | Always |
|----------------|-------|----------|-----------|-------|--------|
| Be Respectful | 0 | 1 | 2 | 3 | 4 |
| Be Responsible | 0 | 1 | 2 | 3 | 4 |
| Be Ready | 0 | 1 | 2 | 3 | 4 |
| Be Organized | 0 | 1 | 2 | 3 | 4 |

Buttons: Have Student Enter Scores, Done

Student Scoring Screen:



The Student Scoring Screen for Allison shows a goal of 41%. The interface includes a sidebar with a 'Start' button and a main area with a grid of scores for four categories: Be Respectful, Be Responsible, Be Ready, and Be Organized. The grid has five columns: Never, A Little, Sometimes, A Lot, and Always. The 'Sometimes' column is selected for all categories. A 'Done' button is at the bottom.

| | Never | A Little | Sometimes | A Lot | Always |
|----------------|-------|----------|-----------|-------|--------|
| Be Respectful | 0 | 1 | 2 | 3 | 4 |
| Be Responsible | 0 | 1 | 2 | 3 | 4 |
| Be Ready | 0 | 1 | 2 | 3 | 4 |
| Be Organized | 0 | 1 | 2 | 3 | 4 |

Button: Done

Example Goal Updates:

| | |
|---|--|
| <p>Goal Update</p> <p>Allison has not been performing well over the last 3 days. Would you like to decrease the goal to 52% now?</p> | <p>Goal Update</p> <p>Allison has exceeded the current goal for five days and is due for an increased goal. Would you like to increase the goal to 70% now?</p> |
| Yes, accept new goal | Yes, accept new goal |
| No | No |

Progress Monitoring Graph:



Appendix B

MOOSES Codebook

Teacher Codes

| Code | Definition | Examples | Non-examples |
|----------------------------|---|--|---|
| OTR (frequency) | <p>An instructional question or statement from the teacher to the TC (or to a group including the TC) that seeks an academic response orally or publicly. OTRs should always be coded at the end of the question or statement.</p> <ul style="list-style-type: none"> • Code OTR for every opportunity given to the TC to respond. • Statements intended to clarify the question, or rhetorical questions should not be coded. • If students are asked to read text out loud while the teacher is pointing to the individual words (numbers problems, etc.) code that as a single OTR (except if it is a list of isolated sight words/problems and the teacher points to each one; in that case, each isolated word is a separate OTR). | <ul style="list-style-type: none"> • What is the capital of Tennessee? (Directed towards class, anyone can answer.) • Susan, could you please come to the board and work out this math problem? • Bobby, will you please share your answer with the class? • How did you do on your personal goal in math today?" (pause) "Jimmy, how did you do on your personal goal today? (1 OTR) • Teacher shows flashcards to TC with sight words. Each flashcard is asked separately. Code OTR for each flashcard. • Everyone please fill in the answer for #5. • Students, raise your hand if you think that statement is true. • Class what's 5 x 5? <i>Class answers 24.</i> Not quite, Timmy do you know the answer? (2 OTRs) | <ul style="list-style-type: none"> • Do you want to get kicked out of my class? (RepRed) • Teacher clarifications on questions asked. • It's time for read aloud. Please come find your spots on the carpet. • I already told you once to get started. Please stop talking to your table and focus on your work. (RepRed) |

| | | | |
|-------------------------------------|---|--|---|
| <p>Reprimand (frequency)</p> | <p>A social or behavioral question, command, statement, or action from a teacher that intends to correct, redirect, or reprimand the TC's behavior. This can be directed toward the TC individually or to a group inclusive of the TC.</p> <ul style="list-style-type: none"> • Reprimands include verbal comments such as scolding, negative statements about behavior indicating disapproval with the TC's social behavior, or comments used with the intent to stop the TC from misbehaving. • Redirection and statements of negative consequences by the teacher are included in this category. • Tone may be stern or punitive. • Threats should also be counted as RepRed • Code RepRed at the end of the first statement, and code them separately if <i>at least 3 seconds</i> pass between the end of one RepRed and the beginning of the next or when the content of the statement changes. • This code does not include procedural commands related to classroom norms or pre-corrects for expected class-wide behaviors (e.g., "It's time for read-aloud. | <ul style="list-style-type: none"> • I told you to stand up and push in your chair. • Group 4, the rest of class followed my directions to get lined up for specials. I'm giving you one last chance to join. • Almost everyone is on page 55 like I asked. Johnny, we're waiting on you to get started. • Start paying attention or your name is going on the board. • Teacher takes pencil from student who is playing with it and not following instructions. • Group 1 (includes TC) wasn't working so no point for them. • Don't make me write a 0 on your point sheet. • Everyone needs to quiet down, it's too loud. Group 4 (TC's group), you lose a point for not doing your work. (2 RepRed) | <ul style="list-style-type: none"> • Could everyone write down their answer to number 5? (OTR) • Who can explain their thinking in number 2 on the homework? (OTR) • Could everyone on the carpet go back to their desks and get started on this worksheet? (ignore) • Try harder on your math worksheet. I know you can do better. (ignore- unless tone is stern/punitive) • Students come back from lunch and teacher asks them to sit. (ignore) |
|-------------------------------------|---|--|---|

| | | | |
|---------------------------|---|--|--|
| | Everyone push in your chairs and join me on the carpet.”). | | |
| praise (frequency) | <p>Teacher provides praise to the TC individually or a group of students that includes the TC. Score praise for a verbal statement that indicates approval of behavior over and above an evaluation of adequacy or acknowledgement of a correct response to a question.</p> <ul style="list-style-type: none"> • This includes requests for children to give themselves a pat, high five, etc. • Tone of voice may also be indicative of praise. • Long and detailed praise statements count as one episode, unless at least 3 seconds pass between the end of one statement and the beginning of the next, or when the content changes. | <ul style="list-style-type: none"> • Good work keeping hands to self, Yvonne! • Billy, I like the way you showed your work! • Your handwriting is improving! • David, since you are sitting quietly, you may read first. • Thank you for raising your hand! • Everyone is sitting quietly, great! • Team 3 is doing a great job of following directions and reading their books as I asked; excellent job! I am very impressed by how well you are focusing and you’re doing it quietly too! Keep it up!” (1 Praise). • My whole class is so focused! Xavier (TC), you did your whole math worksheet- give yourself a point (2 Praise) | <ul style="list-style-type: none"> • Teacher says “Thank you” as she collects an assignment. • Right. (ignore) • Teacher looks at TC and smiles. (ignore) |

Student Codes

| Duration of TC's Academic Engagement | | | |
|---|--|--|--|
| Note the general rule: Is the TC doing what they are supposed to be doing? Use a 5-second count to gauge when to switch from engaged to disengaged. At the moment the TC re-engages, switch the code back. | | | |
| Code | Definition | Examples | Non-examples |
| Eng (duration) | <p>Student is working on the assigned/approved activity or appropriately waiting for directions.</p> <ul style="list-style-type: none"> • Signs of engagement include (a) responding to a question directed at TC, (b) sharing after raising hand, (c) providing answer in choral response, (d) following rules of game (e) reading aloud, (f) reading silently with signs of scanning/page turning, (g) solving problems, (h) answering during group project/discussion, and (i) participation in centers. • Signs of this behavior also include (a) quietly listening to teacher, (b) looking at material/task, (c) waiting appropriately for teacher to begin or continue with instruction (staying quiet and staying in seat), and (d) watching the teacher as he/she talks in front of the class. | <ul style="list-style-type: none"> • TC writes on assigned worksheet. • TC is actively scanning and turning pages during independent reading. • TC puts head down on her desk for 4 s and returns to watching teacher. • TC gets up to get a tissue and immediately returns to seat. • TC is not engaging in choral reading with the class but listens to reading. • Teacher asks TC to watch as the teacher demonstrates a problem. TC watches quietly. • Teacher says, "Raise your hand if you know the answer." TC fails to raise hand but is not engaging in off-task behavior. | <ul style="list-style-type: none"> • TC gets up to sharpen pencil and begins wandering the classroom for more than 5 s instead of returning directly to desk. (Diseng) • TC is not engaging in assigned activity during center time. (Diseng) • TC is playing with instructional materials during math work. (Diseng) • TC stares out the window for more than 5 seconds. (Diseng) • TC puts head on desk for more than 5 seconds. (Diseng) • TC talks to a peer about what he did over the weekend. (BD, count 5 seconds, Diseng) |
| Diseng (duration) | <p>Student is not participating in an approved/assigned activity.</p> <ul style="list-style-type: none"> • TC is not attending to the material or task, making appropriate motor responses, asking for assistance in an acceptable manner, or waiting | <ul style="list-style-type: none"> • TC has been asked to leave an activity. TC takes more than 5 s to begin transition. | <ul style="list-style-type: none"> • TC is reading out loud with the class when directed to do so. (Eng) • TC has been previously disengaged. The teacher asks the class to follow along in the |

| | | | |
|--|---|---|--|
| | <p>appropriately for the teacher to begin or continue with instruction.</p> <ul style="list-style-type: none"> • Only code after the student has not been attending to the approved/assigned activity for at least 5 seconds. | <ul style="list-style-type: none"> • TC stares away from the teacher or instructional materials for more than 5 seconds. • TC gets out of seat, walks to pencil sharpener, sharpens pencil and walks around or dawdles instead of returning to seat within 5 seconds. | <p>book and engage in choral responding. The TC is not engaging in choral reading with the class but begins looking at the page and following along with his finger. (OTR, Nonresp, Eng)</p> |
|--|---|---|--|

| Frequency of Target Student Behaviors | | | |
|--|---|--|---|
| Code | Definition | Examples | Non-examples |
| bd (frequency) | <p>A disruptive behavior is any action made by TC that interferes with participation and productive classroom activity for the TC or peers.</p> <ul style="list-style-type: none"> • This includes physical/motor disruptive behaviors and verbally disruptive behaviors. • This includes gestures that intend to provoke others, draw attention to oneself, use classroom materials inappropriately, or self-stimulate in a disruptive manner. • This includes verbal statements that have the intent to provoke, annoy, pester, mock, whine, complain, tattle, or make fun of another. • Tone and volume of voice may be an indicator of a negative verbal statement. | <ul style="list-style-type: none"> • TC is rocking in his chair, begins tapping pencil, and falls out of the chair. (bd, bd, bd) • TC throws material around the classroom (bd for each throw) • TC taps pencil loudly on his/her desk. • TC rips up a worksheet and snaps a pencil in half (bd, bd) • TC colors or writes on desk instead of paper (bd) • During floor time if TC is expected sit criss-cross, the following are coded as disruptive: turning somersaults, crawling across the floor on his hands and knees, standing up bent over with bottom in the air. • TC hits, pushes, bites, kicks, and grabs something from another | <ul style="list-style-type: none"> • Kneeling on chair to reach something that is difficult to reach when sitting. (ignore) • After class, teacher allows students to talk to one another, TC talks to a friend. (ignore) • TC asks peer for a pencil and gets started on work right away. (ignore) • Teacher welcomes choral response and the TC responds appropriately without raising his/her hand. (OTR, Resp) • Student mumbles to self about instruction. (ignore) • TC answers a question without handraising as permitted by the teacher. (OTR, Resp) |

| | | | |
|--|---|--|--|
| | <ul style="list-style-type: none"> • This code also includes laughing at a peer, chatting during work time if it is not task related or teacher permitted, and talking out when not called upon by the teacher. • This code also includes making noises such as repeated sighing, clicking the tongue, blowing air out through the lips, and any other audible distractions. • Code each “bd” separately if at least 3 seconds pass between the end of one incident and the beginning of the next, if the topography of the behavior changes, or if a teacher or peer responds to separate the events. • Note 5 second rule about continuous disruptive behavior described above. | <p>person. (bd for each different topography)</p> <ul style="list-style-type: none"> • Pulling someone’s clothes. • Making obscene hand gestures at another person. • Instructional setting is math table time in small groups. TC initiates conversation with other child about a show he/she watched last night. Other child comments and after three seconds TC starts talking about the show again. Other child responds. Teacher redirects group back to math and the children comply. (Diseng, bd, bd, RepRed, Eng) • TC answers a question without raising his or her hand (if handraising is expected by the teacher). • TC says, “Aauugh! I don’t wanna do this problem. It is too hard.” • TC threatens someone: “I’m going to cut you!” • TC protests: “Hey, that’s not fair!” • TC refuses teacher direction, “No, I won’t do it!” • TC uses curse words. | |
|--|---|--|--|

Appendix C

Treatment Fidelity

MoBeGo Procedural Fidelity Checklist: Classroom Observation

School: _____ Teacher: _____ Student ID: _____

Observer 1 (Prim): _____ Observer 2 (Reli): _____

Session Number: _____ Date: _____ Time: _____

Subject Area: ELA Math Social Studies Other: _____

Instructional Grouping: Small Group Large Group Independent Work SPED

| MoBeGo Procedures | Observed | Quality | | |
|--|--|---------|---|---|
| 1. Did the teacher deliver the student with pre-corrections on all expected behaviors and verbally state the students goal? | <input type="checkbox"/> Yes <input type="checkbox"/> No | 1 | 2 | 3 |
| 2. Did the teacher rate the student's behavior? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 3. Did the student rate the student's behavior? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 4. Did the teacher provide feedback during the self-monitoring session (e.g., behavior-specific praise, corrective feedback, positive encouragement, high five, etc.)? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | 1 | 2 | 3 |
| 5. Did the teacher provide feedback at the end of the MoBeGo session (e.g., look at data and praise, correction, encouragement, etc.)? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | 1 | 2 | 3 |
| 6. Did the teacher provide reinforcement to the student at the end of the MoBeGo session (e.g., ticket, food, computer time, etc.)? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | 1 | 2 | 3 |

Do not include items marked N/A when calculating total score.

| YES | YES + NO | % YES |
|-----|----------|-------|
| | | |

Quality Definitions:

1. Delivers student pre-correction and states the students goal

- 1 = Provides non-specific pre-correction and does not verbally tell the student his/her goal
- 2 = Completes one of the components below
- 3 = Provides pre-corrections on all behavior expectations and verbally tells the student his/her goal

5. Provides feedback during self-monitoring sessions

- 1= Provides feedback that is not behavior-specific (e.g., thumbs up, good job)
- 2= Provides quick behavior-specific feedback on some behaviors
- 3= Provides quick behavior-specific feedback on some behaviors and encourages student to continue/improve behavior

6. Provides feedback at the end of self-monitoring session

- 1= Completes one of the components below
- 2= Completes two of the components below
- 3= Provides behavior-specific feedback on all behaviors, shows student graph, and verbally states whether the student met the goal

7. Provides reinforcement at end of session

- 1= Provides reinforcement without a statement about why the student received the reinforcement OR indicates to student that the reinforcement will be given at a later time
- 2= Provides reinforcement and included a statement about why the student received the reinforcement
- 3= Provides reinforcement, included a statement about why the student received the reinforcement, and encourages student to continue behavior in the future