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Developing and Implementing FBA-BIPs in Elementary Classrooms: A Conceptual Replication

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The majority of students with disabilities and behavioral challenges are taught in general education classrooms. Although these students may receive interventions resulting in positive behavioral changes, little is known about the collateral effects of implementing behavior intervention plans (BIP) on classroom peers with similar behavioral problems who are not receiving an intervention. The purpose of this study was to investigate the effects of functional behavioral assessments (FBAs) and BIPs for students with challenging behavior as well as their peers. We measured target student and peer academic engagement, as well as treatment integrity and social validity. As a result of the intervention, target students demonstrated increased academic engagement. In addition, results suggest that the FBA-BIPs had small effects on engagement for some peers.

Keywords: behavior intervention plans, functional assessment-based interventions, positive behavior interventions and supports

Prevalence estimates indicate there are substantially more students with or at risk for emotional and behavioral disorders (EBD) who need special education services than those who receive them in the emotional disturbance (ED) category per the Individuals with Disabilities Education Act (2004) regulations (as cited in Forness et al., 2012). In fact, fewer than 1% of students enrolled in public schools receive special education services in the ED category; however up to 12% of K-12 students have an EBD at a given point in time. Furthermore, cumulative prevalence estimates suggest that up to 25% of students have an EBD at some point during their school careers (Forness et al., 2012). These statistics indicate students with challenging behavior who may have or be at risk for developing an EBD are likely to be

receiving their education in a general education setting only.

The number of students demonstrating challenging behavior in K-12 classrooms underscores the need for general education teachers to implement evidence-based strategies for managing behavior in the classroom. And yet, general educators report feeling unprepared to work with students who have persistent behavior problems (Beam & Mueller, 2016). Teachers' lack of self-efficacy (i.e., their perceptions of their ability to affect student behaviors) in the area of classroom management may be attributed to having limited knowledge of classroom management practices (Stormont et al., 2011;Tschannen-Moran & Hoy, 2007), which is not surprising given many states do not require classroom management coursework to obtain licensure (Freeman et al., 2014). Thus, it is imperative for districts to support teachers by providing professional development (PD) focused on managing classroom behavior.

To develop teacher self-efficacy, and in turn improve teacher practices, experts recommend practice-based PD (PBPD; Ball & Cohen, 1999). PBPD involves embedding practice in classroom contexts with continual coaching and follow-up activities (Harris et al., 2009; Lane et al., 2015). Research suggests PBPD is a promising model for teacher training centered on building teachers' knowledge and application of skills (Ball & Cohen, 1999; Grossman & McDonald, 2008). This type of PD helps build content knowledge in an authentic learning environment as well as implementation of practices. The PBPD approach: (1) engages faculty members with similar needs, (2) contextualizes PD for teachers' needs by assessing prerequisite knowledge and skills, (3) models and provides opportunities for independent practice, (4) utilizes similar materials to those that will be used in the classroom, and (5) provides feedback.

In a recent mixed methods study, 16 general and special education teachers participated in a 5-session PBPD series grounded in authentic learning opportunities and building teacher self-efficacy (Ball & Cohen, 1999; Bruhn et al., 2019) related to data-based individualization (DBI) within a behavioral intervention. DBI is a systematic process for using data to (a) determine how students are responding to intervention and (b) make intervention adaptations. Between sessions, each teacher gained experience with DBI by implementing intervention with a student, collecting and analyzing data, and making individualized decisions about student response. Authors reported teachers significantly *($p < .01$)* improved their understanding of, self-efficacy with, and perceptions of DBI from before to after the training series. Participants reported their training and practice contributed to improvements in self-efficacy, though they also cited how their students' responded to behavioral intervention influenced their feelings of self-efficacy. That is, if their students improved, they felt confident in themselves. Moreover, students significantly improved their behavior during intervention ($p < .001$; Bruhn et al., 2019).

When students with behavior problems are provided proactive classroom interventions that result in desired behavioral changes and improved interactions with peers and adults, this can improve the classroom ecology and lead to a more positive classroom environment (Sprague & Perkins, 2009). As described by Simonsen and Myers (2015), proactive classroom interventions that are grounded

in applied behavior analysis emphasize prevention of problem behaviors. Specifically, teachers (a) establish expectations and routines, (b) review expectations, (c) actively engage students, (d) implement strategies to recognize and increase appropriate behaviors, and (e) select strategies to decrease inappropriate behavior.

Some students may benefit from targeted-group interventions or intensive, individualized interventions. Collateral effects such as increased academic engagement and decreases in problem behavior may also occur for students not receiving intervention. For example, Sprague and Perkins (2009) studied *First Step to Success*, a research-based, early intervention program for students with or at risk for antisocial behavior. In this study, both target students receiving intervention and their peers with problem behaviors who did not receive intervention increased their levels of academic engagement. Sprague and Perkins (2009) also reported that teachers had more positive interactions with students and their perceptions of the classroom environment improved. These findings suggest that research-based interventions may result in positive collateral effects on peers and teachers, and thus improved the classroom environment.

Functional Behavior Assessment and Behavior Intervention Plans

One practice for improving problem behavior, which is (a) mandated by the IDEA (2004) under certain conditions for students with disabilities and (b) recommended for students with chronic and persistent problem behavior, is functional behavior assessment (FBA). The FBA involves collecting data that is used to design an appropriate behavior intervention plan (BIP). The FBA-BIP process is based on the principles of applied behavior analysis and is designed to help teachers hypothesize the function (i.e., reason) of the problem behavior(s) and develop an appropriate data-driven BIP (Cooper et al., 2020).

BIPs derived from an FBA have demonstrated positive effects across a range of behaviors, such as academic engagement (Cho & Blair, 2017), stereotypical behavior (Bruhn et al., 2015), and disruptive behavior (Hansen et al., 2014). Additionally, positive effects have been found across various ages, disabilities, and settings (Gage et al., 2012). In light of these positive effects, researchers contend that school-based personnel such as general educators must be trained to implement FBA procedures, particularly given there is a high likelihood that students with or at risk for EBD are in the general education classroom (Scott et al., 2004). However, many general educators report feeling unprepared to conduct an FBA (Gable et al., 2012). Further, the FBA-BIP is generally perceived as a special education practice, despite evidence it can result in improved behavior for students without disabilities who exhibit problem behavior in the general education classroom (e.g., Lane et al., 2009).

Additionally, research on FBA-BIP has demonstrated the potential collateral effects on non-target students and teachers. Blair et al., (2007) examined the direct effects of an FBA-BIP on a kindergarten student with multiple disabilities (i.e., intellectual disability and autism) and the collateral effects on (a) a typically-developing peer who was aggressive and had negative interactions with the target student and (b) the teacher. The BIP included modifying the classroom environment and routines (e.g., providing

choices, using physical and verbal prompts, using multimedia, reducing group size), teaching replacement skills (e.g., how to gain teacher attention using communication cards), and modifying teacher response to behavior (e.g., ignoring problem behavior, reinforcing replacement behavior). A multiple-baseline-across-activities experimental design indicated the BIP resulted in a functional relation between intervention and improved behavior for the target student, while the peer and teacher also showed functionally related improvements in positive interactions with the target student. These findings were consistent across multiple activities occurring in the general education classroom (Blair et al., 2007). Though these results are encouraging, most FBA-BIP research has focused solely on the target student. Further, when comparisons or analyses of collateral effects have been conducted, they have been done with typically-developing peers, not peers with similar challenging behavior who are not receiving intervention. It is plausible that in a large general education classroom consisting of multiple students with challenging behavior, implementing an effective FBA-based intervention may improve both the target students' behavior and comparable students' behavior (Blair et al., 2007).

Sprague and Perkins (2009) also examined behavior interventions with students at-risk of antisocial behavior. Findings of this multiple baseline across participants design indicated improved academic engaged time and collateral effects on classroom peer and teacher behavior. Sprague and Perkins (2009) called for further research to examine classroom behavioral interventions. To this end, special education researchers recommend conceptual replication studies within applied school-based research (Coyne et al., 2016; Therrien et al., 2016). In conceptual replications, studies vary on one or more features from the original study (Schmidt, 2009). Conceptual replications are important because they allow for better understanding of the critical components of an intervention and for whom and under what conditions the intervention is effective (Coyne et al., 2016). This knowledge, then, contributes to the evidence base supporting the identification of effective practices. In this study, we answer the call for conceptual replications and extend previous studies by examining the effects of FBA-BIP on three target students in grades 2-5 and their same age peers (e.g., Blair et al., 2007; Sprague & Perkins, 2009). We followed the same process used in Blair et al. (2007) for conducting an FBA and designing a BIP. Similar to Blair et al., we measured effects on target students and collateral effects on peers. The current study varied in terms of participants' age, race, disability, and setting; thus it is consistent with a conceptual replication.

In light of the dearth of research on collateral effects of FBA-BIP on comparison peers, the need to address challenging behavior in general education classrooms via FBA-BIP, and the call for conceptual replications in educational research; we worked directly with general education teachers to conduct an FBA and design a BIP for three target students. Further, the application of PBPD for classroom and individualized behavioral interventions (i.e., FBA-BIPs) has been limited (i.e., Hirsch et al., 2019; Lane et al., 2015). Specifically, we sought to answer the following research questions (RQ): First, to what extent does implementing an FBA-BIP process in general education classrooms in collaboration with

general education teachers increase academic engagement of target students? Second, do changes in the behavior of the target students accompany collateral changes in academic engagement of comparison peers who have similar challenging behavior? Third, to what extent did teachers report changes in classroom management practices and self-efficacy over the course of the FBA-BIP PBPD? Fourth, how did teachers view the social validity of the PD process?

Method

Setting and Participants

Prior to beginning this study, we received approval from the university's Institutional Review Board (IRB) and school district, as well as teacher and parent consent. We conducted this study in a small city in the Southeastern US at a Title 1 elementary school with 743 K- through 5th-grade students (39.4% African American, 18.8% Caucasian, 35.3% Hispanic, 6% two or more races, 0.4% Alaskan Native, and 0.1% Asian). The school provided 16.5% of students with special education and speech services; 25.1% of students received English Language Learner services. The setting for data collection for each teacher was her classroom.

Teacher participants were nominated by the building administrators due to concerns about challenging behaviors in these teachers' classrooms. Five general education teachers were invited to attend a PD series on FBA-BIPs. All five teachers consented to attend the PD series and participate in research. However, two teacher participants did not complete the training series; therefore, we only report the findings related to three teachers.

Three general education teachers who had been teaching from one to seven years participated in the PD series on FBA-BIPs. None of the teachers had in-service training or prior experience with FBA-BIPs; however, they received a general classroom management training at the beginning of the school year. Two teachers, Ms. Boyd and Ms. Kanter, had completed a classroom management course. Characteristics of teachers and classrooms are shown in Table 1.

Two criteria were used to select eligible target students for the FBA-BIP study. First, teachers were asked to nominate a student with challenging behavior in their classroom. The teachers completed the *Social Skills Improvement System* (SSIS) Rating Scales (Gresham & Elliott, 2008) to confirm the presence of competing problem behaviors (e.g., externalizing, bullying hyperactivity/inattention). To be eligible, target students had to score more than one standard deviation above the mean on the *SSIS*. Second, the student must not have had a current FBA-BIP or be receiving other behavioral support. Three students are included in this manuscript. "Lucas" was a fifth grade Hispanic male who received English Language Learner support services. "Bob" was a fourth grade Caucasian male with an IDEA diagnosis of autism. "Noah" was a second grade Caucasian male. The *SSIS* Problem Behavior scale has a standard score mean of 100 and standard deviation of 15. All students scored one standard deviation higher in problem behaviors (see Table 1).

Table 1

Characteristics of teachers, classroom, target students with challenging behavior (bold text) and peers

Teacher						Classroom		Target Students and Peers				
Name	Gender, Age	Race	Grade	Degree	Years Teaching	Class	Eligibility	Name	Gender	Race	Eligibility	SSIS *PB Scale*
Ms. Boyd	F, 27	C	5	BS	1	M: 10 F: 12	ELL: 4	**Lucas**	M	H	ELL	126
								Peer 1	M	AA	-	
								Peer 2	M	H	-	
Ms. Sims	F, 31	C	4	BS	7	M: 9 F: 8	ELL: 6 SPED: 4	**Bob**	M	C	SPED, Autism	138
								Peer 1	F	AA	-	
								Peer 2	M	AA	-	
Ms. Kanter	F, 27	C	2	MAT	4	M: 8 F: 9	ELL: 7	**Noah**	M	C	None	134
								Peer 1	M	AA	-	
								Peer 2	M	AA	-	

Note. F = Female, M= Male, C = Caucasian, AA = African American, H = Hispanic, BS = Bachelor's Science, MAT = Masters in Teaching, ELL = English Language Learner, SPED = Special Education, SSIS = Social Skills Improvement System, PB = Problem Behaviors Scaled Score

Next, each teacher was asked to nominate two additional peers with similar challenging behaviors (i.e., students whose behavior inhibits their learning and the learning of others) who did not have an FBA-BIP at the time of the study. The purpose of including two peers per classroom with comparable behavior was to determine whether implementing an FBA-BIP for a target student with challenging behavior could also change the behavior of his peers. Due to the IRB and district policy, we collected few demographic variables (see Table 1).

The first author, who holds a doctoral degree, special education teaching certification, and behavior analysis certification, delivered all PD sessions in this study. Three doctoral students in special education conducted classrooms observations and provided technical support.

Measures

Academic Engagement

We defined *academic engagement* as a student engaging with instructional content through choral response, raising hand, responding to teacher instruction, orientating to teacher or peer (if appropriate), writing, reading with tracking, or otherwise completing assigned task. Students were marked disengaged when they were observed engaging in disruptive behavior, leaving the instructional area, or not participating in the approved activity or instruction.

The first author provided training for data collectors which included (a) reading and discussing an observation manual with operational definitions of engagement, (b) practicing data collection using video-taped classroom segments, and (c) completing in-vivo training in classroom settings. When each observer reached at least 90% agreement during in-vivo training sessions, they were deemed reliable to begin collecting direct observation data for the study.

All observations occurred during teacher-delivered academic instruction. The observation time period and setting (e.g., 10am, teacher-led mathematics) remained consistent across baseline and intervention phases. Therefore, data collectors recorded academic engagement during the same 30 min period across phases three times per week using 5-sec momentary time sampling. At an audio prompt through headphones, the observers checked the student to determine if they were engaged; at the next prompt, the observer rotated to the next student in the sequence, starting again when all students had been assessed. This sequential alternation continued throughout the entire length of the session (Cooper et al., 2020).

A second observer collected academic engagement data independently, but simultaneously, for an average of 30% of sessions across participants and phases. Interobserver agreement (IOA) was obtained by calculating the exact agreement in each observation interval and dividing the number of intervals of agreement by the total number of intervals and multiplying by 100 (Cooper et al., 2020).

Teacher Survey of Practices (TSP)

The *TSP* (Hirsch et al., 2019) highlights practices listed in literature reviews of classroom management (i.e., Simonsen et al., 2015). The 12-item, 3-point Likert-type scale prompted teachers to reflect on their implementation of classroom management practices. Teachers reported how often they implemented a practice over a previous five-day period: 80-100%, 51-79%, or less than 50% of the time.

The *TSP* has an.84 alpha which is considered acceptable (Nunnally & Bernstein, 1994).

Teacher's Sense of Efficacy Scale (TSES)

The *TSES* (Tschannen-Moran & Hoy, 2001) is a measure of teacher self-efficacy in the areas of student engagement and classroom management. Teachers rate their perceptions of 8-items on a nine-point Likert-type scale (1 = *nothing* to 9 = *a great deal*). The measure has a .90 alpha. In the present study, teachers completed this measure at three time points (i.e., prior to PD, at the completion of the PD, and two months after the training).

Social Validity of FBA-BIPs

The teachers completed a social validity survey to assess their perceptions of the intervention's goals, procedures, and outcomes. Each teacher completed the Intervention Rating Profile (*IRP-15*; Witt & Elliott, 1985) prior to implementation and at the end of the study. The *IRP-15* is a15-item measure with a scale ranging from 1 (strongly disagree) to 6 (strongly disagree). Cronbach's alpha is .98 (as cited in Elliott & Treuting, 1991). In addition, when considering the social importance of the effects, the comparison peers provide a normative evaluation of social validity (Ennis et al., 2013).

Quality Ratings of the PBPD: Social Validity

Participants completed a social validity questionnaire at the conclusion of the two PD sessions. Domitovich and Ialongo (2008) designed the social validity questionnaire to measure the teachers' ratings on the quality of training provided. The survey prompts teachers to rate 10 items related to quality of training on a scale from 0 (*strongly disagree*) to 3 (*strongly agree*). Internal consistency reliability was high (α = .96).

Treatment Integrity

Observers recorded treatment integrity of BIP implementation for each student during the intervention and withdrawal phases. The observer completed an electronic implementation protocol that contained all of the components of the BIP (see Table 2) and marked whether the teacher implemented each component of the BIP. If a component was not applicable or unable to be observed, then a note was made. A treatment integrity percentage for each session was calculated by adding all of the yes responses, dividing them by the total components observed, then multiplying the quotient by 100. Fidelity percentages were averaged across intervention sessions within each phase.

Experimental Design

A single-subject reversal design was used to evaluate the effects of the teacher-created FBA-BIPs on the academic engagement of students with behavioral concerns and their peers (Cooper et al., 2020). For two students, the baseline (A) and intervention (B) phases are repeated for a total of four phases (e.g., ABAB), allowing for three opportunities to demonstrate an effect. Data were graphed and analyzed visually for a functional relation. Visual analysis procedures included an examination of stability, trend (increase or decrease), and level changes (immediacy and magnitude) of academic engagement across phases (Horner et al. 2005; Ledford et al., 2018). To supplement visual analysis, we calculated descriptive statistics (mean and range) as well as overlap and *Tau-U* to compare phases and control for positive baseline trend (Vannest & Ninci, 2015). Rakap (2015) guidelines helped interpret the *Tau-U* scores: .65 or lower = weak or small effect; between .66 and .92 = medium to high effect; and .93 to 1.0 = large or strong effect.

Table 2

Independent Variable: Intervention Summary

	Method*	Antecedent Adjustments	Reinforcement	Extinction
Lucas	3: Adjust the Contingency	▪ Rearrange seating to provide Lucas with seating closer to instruction next and an engaged peer ▪ Teacher wear MotivAider to provide attention (FI-3) to Lucas ▪ Use revised behavior chart to explicitly state behavioral goals and reinforcement ▪ Morning check-in to review expectations ▪ *Increase opportunities to respond*	▪ Provide Lucas non-contingent attention in the morning and after school. ▪ Behavior chair includes attention and escape-based reinforcers (e.g., homework pass) ▪ *Provide BSP for engagement*	▪ Ignore and redirect Lucas if he engages in problem behavior.
Bob	1 & 2: Teach the Replacement Behavior and Improve the Environment	▪ Provide non-contingent attention, brief check-in. ▪ Teacher wear MotivAider to increase BSP (FI-3) ▪ Alter the students goal setting sheet ▪ *Teach all students how to follow directions* ▪ *Use a PowerPoint clicker to increase proximity throughout the classroom***	▪ Provide high rates of BSP ▪ Set aside time for a morning and afternoon check-in with Bob ▪ Goal sheet includes access to attention, escape-based reinforcers (e.g., activity pass)	▪ Brief redirects and reminders that "You are earning" ▪ Reminding of the appropriate behavior ▪ Ignoring off-task behavior while praising other students who are on-task ▪ *Teach students how to ignore inappropriate behavior.*
Noah	1 & 2: Teach the Replacement Behavior and Improve the Environment	▪ Alter goal setting sheet – separate AM and PM, add explicit expectations on the point sheet, new reward menu ▪ Teacher wear MotivAider during instruction to increase BSP (FI-3) ▪ *Increase opportunities to respond* ▪ *Teach all students how to follow directions*	▪ Revise reward menu (e.g., sit with a friend at lunch) ▪ When Noah meets his daily goal, notify his family (e.g., email, call)	▪ Brief redirects and reminders that "You are earning" ▪ Reminding of the appropriate behavior ▪ *Teach students how to ignore inappropriate behavior.*

Note. *Umbreit et al., 2007, **After meeting with the consultant to discuss implementation, the teacher opted to implement the PowerPoint clicker during the second intervention phase. Italics indicates an intervention tactic that may have supported other students in the class. FI-3 = Fixed Interval – 3 mins; BSP = Behavior Specific Praise

Baseline

Upon obtaining teacher and parent consent, the teachers met with the PD provider for a 3-hour meeting. During the meeting, teachers completed demographic surveys, *TSP, TSES,* and *SSIS* on their target student. Additionally, the PD provider conducted a workshop on the FBA process. The FBA training during baseline (A) ensured all participants understood the following critical components of the FBA process: (a) defining problem behavior, (b) assessing the target behavior with indirect measures such as rating scales, (c) conducting direct observations of the target behavior using Antecedent-Behavior-Consequence (ABC) data, and (d) identifying behavioral function. During the training, teachers were taught to collect ABC data to fully understand the FBA/BIP process. Although researchers served as the primary ABC data collectors, teachers were invited to collect data as well.

Each also teacher completed a modified version of the *Functional Assessment Checklist for Teachers and Staff* (*FACTS*; March et al., 2000). The information provided by the teachers helped them to arrange an observation schedule by identifying the target students' most challenging time of the day. Providing the training during baseline, also meant all participants using at least one consistent feature during the baseline condition advanced this condition beyond "treatment as usual" in group designs (Horner et al., 2005, p.168). Rather, employing an "active baseline" or "active control" condition is a way of obtaining stronger comparisons between conditions (Birnbrauer et al., 1974).

After the first PD session, the PD provider visited the classrooms and conducted direct observations of the target students' behavior (i.e., ABC Data). Data from the PD providers' observations also ensured the target students' behavior matched the dependent variable (i.e., academic engagement). After the observation, ABC observational data as well as the teachers' completed *FACTS* data and were entered into the *Function Matrix* (Umbreit et al., 2007). The *Function Matrix* is a 3 x 2 grid with six cells for imputing data which assists in the development of a behavioral hypothesis. The top row contains two functions of behavior: positive reinforcement and negative reinforcement. The left column contains three potential forms of reinforcement: attention, tangible-activities, and sensory stimulation.

The PD provider helped the teachers integrate the various sources of data into the *Function Matrix* and determine a hypothesis about the function of the target student's behavior. For example, if most of the data were plotted in the cell for positive reinforcement via attention, then the hypothesis would be that the student was displaying the target behavior to access attention. Table 3 outlines target students' *FACTS* statement, ABC Data, and *Function Matrix* (behavioral hypothesis). To summarize, during the initial baseline phase (a) students' academic engagement was observed by researchers, (b) teachers received PD on how to conduct an FBA, (c) data were gathered as part of the FBA process, and (d) no BIP was in place.

Table 3

Summary Statements based on FACTS Interviews, Observations, and Function Matrix Results

Component	Lucas	Bob	Noah
FACTS Interview			
Antecedent	Transitions, independent work	Teacher gives a task	Whole class instruction and activities, transitions, unstructured activities
Behavior	Out of area, talking to peers, refusing to work (ignoring task)	Refusal to do work, argue with teacher, play with materials	Off-task, yelling at peers, throwing materials
Consequence	Access to attention and escape academic tasks	Access preferred activities	Access to peer and adult attention
ABC Observation	Accessing teacher and peer attention	Access peer attention, avoid non-preferred activities.	Access to teacher and peer attention
Hypothesis Derived from Function Matrix[1]	When independent work occurs, Lucas talks to peers, yells out, refuses to work to access attention (teacher and peer).	When non-preferred activities occur, Bob talks to peers, yells out, refuses to work (argues with teacher, plays with materials), and access attention (teacher and peer).	When whole class activities and transitions occur, Noah engages in off task behavior (yelling, throwing materials) to access attention (teacher and peer).

Note. FACTS = Functional Assessment Checklist for Teachers and Staff, ABC Observation = Antecedent-Behavior-Consequence Direct Classroom Observation. [1]Function Matrix (Umbreit et al., 2007)

Intervention

The 2-hour PD session focusing on identifying replacement behavior(s) and drafting a BIP. This session occurred three days prior to BIP implementation. The training time (i.e., 2 hours) was based on the school's availability. The training content and process was modified from the procedures described by Umbreit et al. (2007). The training was designed to adhere to Ball and Cohen's (1999) PBPD framework. Training consisted of an overview and rationale for building FBA-based interventions. The training session started with an objective followed by a review of the previous content. The training PowerPoint slides embedded multiple examples and checks for understanding (i.e., opportunities to respond, response cards). The PD provider provided guided practice during the PD (e.g., together examine data).

The PD provider shared a four-step systematic approach to design and implement BIPs. PD materials included PowerPoint slides, FBA-BIP worksheets for the teachers to complete during the training. The format followed a direct instruction model (i.e., PD provider model, guided practice, independent practice). Each independent practice opportunity was reviewed by the PD provider. Oral and written feedback were provided as teachers moved to subsequent steps. Adjustments were made as necessary. For example, one teacher hypothesized the primary function of the students' to behavior to be accessing sensory stimulation. After speaking with the PD provider and reviewing the data as well as the *Function Matrix*, the teacher adjusted the hypothesis.

Step One. A completed *Function Matrix* was shared with each teacher during the intervention meeting. Teachers and the PD provider reviewed the information in the *Function Matrix* (i.e., ABC Data and *FACTs*). Ms. Boyd and Ms. Kanter brought their own ABC data, which they added it to the *Function Matrix*. Table 3 presents the statements from the (a) *FACTS*, (b) ABC observations, and (c) *Function Matrix* (hypothesized function).

Step Two. The *Function-based Intervention Decision Model* (Umbreit et al., 2007) guided intervention design. Each teacher answered two questions: (1) Can the student perform the replacement behavior? and (2) Do antecedent conditions represent effective practice? The answers to these questions guided teachers to select the intervention method and intervention tactics. To answer the first question, whether the students could perform the replacement behaviors, the teachers were prompted to consider whether they have observed the student performing the replacement behavior without high levels of support or reinforcement (Umbreit et al., 2007). For example, if a teacher has to prompt a student to raise his or her hand, the answer would be "no." To answer the second question, whether the antecedent conditions represent effective practice, each teacher completed an environmental checklist. The checklist, modified from the *Classroom Management Assessment* (Simonsen et al., 2015), was not intended to be a comprehensive measure of classroom management, rather a tool for teachers to evaluate their own current classroom management practices.

Step Three. The answers to the aforementioned questions led the teachers to select a specific method for focusing the BIP components: Method 1–Teach the Replacement Behavior; Method 2–Improve the Environment; or Method 3–Adjust the Contingencies (Umbreit et al., 2007). Once

the teacher selected a method, with the support of the PD provider, she identified individual intervention tactics. Each intervention contained three main components: antecedent adjustments, reinforcement of the replacement behavior, and extinction of the target behavior.

Step Four. Next, teachers were presented with potential intervention tactics. Each tactic was explained in detail with an operationalized definition paired with examples. Teachers selected tactics they were comfortable implementing and met their target students' needs. Table 2 describes each student's intervention. The interventions contained individualized supports (e.g., behavior contracts) as well as classroom level adjustments or supports. In the table, italicized tactics signify classroom management supports in which other students not targeted for intervention could reasonably expect to benefit.

The following day (two days prior to implementation), the PD provider met for 15 minutes with each teacher to review all materials and clarify questions. A list of all intervention components was provided to help implement all components, and thus, help ensure treatment integrity. On days following the brief meeting with the PD provider, teachers implemented the BIPs in their classrooms. Teachers introduced the plan to the target student individually. Ms. Boyd and Ms. Sims, also introduced behavioral expectations to their entire class.

One week later, teachers met with the PD provider for 45 minutes after school. During the meeting the PD provider shared graphs with target students' engagement and teachers' treatment integrity. Suggestions to increase intervention fidelity were provided. During the intervention phase a total of three hours were dedicated to PD.

Return to Baseline

After consultation with the PD provider, Ms. Boyd and Ms. Kanter purposely removed all intervention components (see Table 2) for three sessions. This included classroom expectation posters and MotivAiders. However, teachers still referenced the behavioral expectations when speaking to the class. At the same time, Ms. Sims unilaterally chose not to implement the intervention or use any study materials (e.g., MotivAider, point sheet). At this time during observations, teacher redirections were the only behavior observed. Although her decrease in implementation with fidelity was not planned (with the research team) it was recorded and considered a withdrawal phase. Observers collected fidelity of Ms. Sims' implementation. During this phase, redirections and reminders observed (*M* = 7%). Her low fidelity indicated a return to baseline conditions.

Reinstatement of the Intervention

After three observation sessions, Ms. Boyd and Ms. Kanter restored all intervention components (see Table 2). Ms. Sims met with the PD provider to discuss the intervention. During the meeting, she raised the concern that she was not able to provide Bob with positive reinforcement and proximity during instruction. The PD provider suggested increasing proximity and opportunities to respond. To increase proximity (away from the front of the classroom), the PD provider suggested Ms. Sims use an electronic remote for the classroom interactive white board. The use of the remote helped Ms. Sims circulate throughout the classroom. After one week of reintroducing the plans, the teachers met with the PD provider. During this meeting, they reviewed the interventions

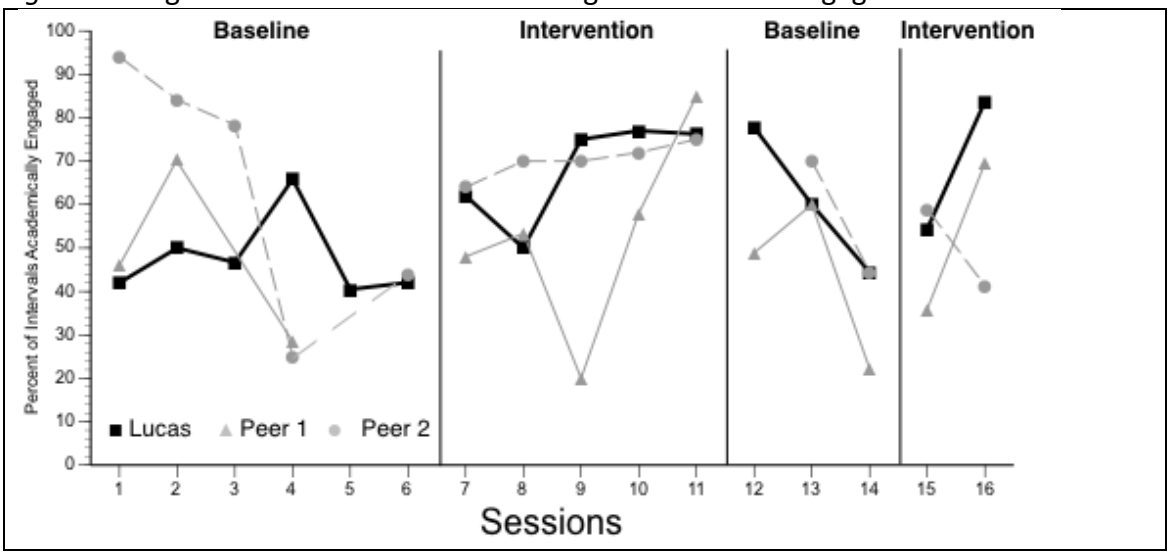
components, as well as student data and fidelity of implementation.

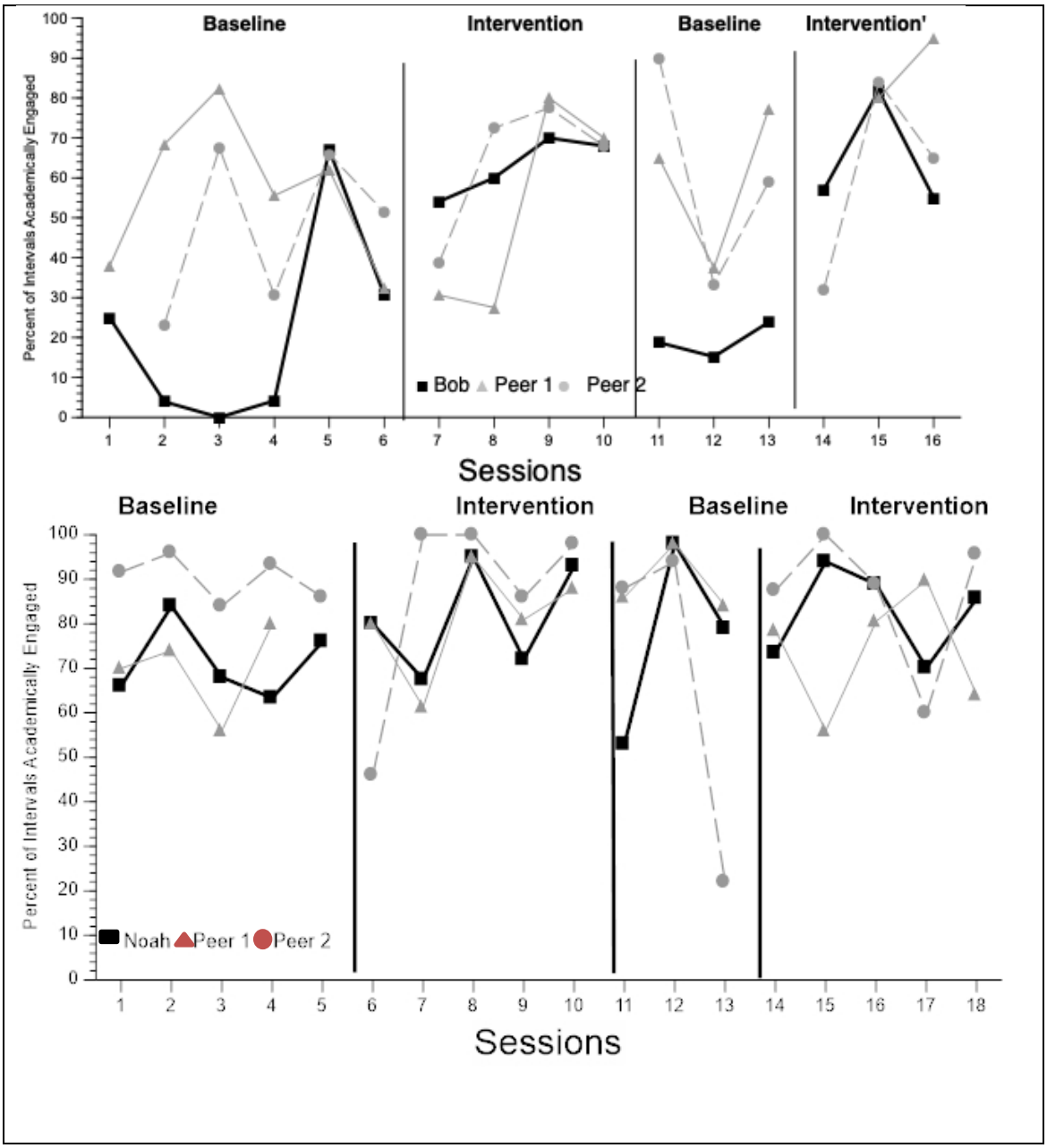
Results

Target Students' Direct Observation Data

Figure 1 displays Lucas, Bob, and Noah's percentage of engagement across phases. During baseline (A), Lucas's engagement was an average of 47.8% and slightly variable, ranging from 41.5%-65.8% (*SD* =8.7). During intervention (B), the mean level of engagement increased to 68.1%, ranging 50.0% to 77.0% (*SD* = 10.6). Visual analysis indicates an increasing trend and level were observed in Lucas' intervention condition. Treatment integrity was 82.5% (*SD* = 20.5) during this first B phase. During the withdrawal phase (A^2), visual analysis indicates a clear decreasing trend in the data (*M* = 60.7, *SD* = 13.6), ranging from 44.4% to77.8%. Treatment integrity during the withdrawal phase was 25% (*SD* = 25), indicating there were some components that were not completely removed (e.g., specific praise). When the intervention was reinstated (B^2) an increasing trend was observed (*M* = 69.1%, *SD* = 14.6). Treatment integrity for B^2 was 77.0% (*SD* = 7.1). *Tau-U* results for Lucas, suggest a moderate effect (.69, *p* = .06). The IOA was 90% during A, 80% during B, 94% during A^2, and 88% during B^2.

Figure 1. Target Student and Peers' Percentage of Academic Engagement





Overall, Noah's data showed a slight improvement. During the baseline condition (A), Noah's engagement was an average of 71.5% and slightly variable, ranging from 63.3%-84.0% (*SD* = 7.6). During the intervention (B), the mean level of engagement was 81.5%, ranging from 67.5%-95.0% (*SD* = 11.0). A slight increasing trend was observed as well as change in level. However, visual analysis indicates a high level of variability across the intervention (B) and baseline (A^2) conditions. Furthermore, visual analysis does not indicate a clear trend when the intervention was reinstated (B^2). For this phase, treatment integrity averaged 88.0% (*SD* = 1.2). During the withdraw phase (A^2), engagement decreased (*M* = 76.7%, *SD* = 18.5), ranging from 53.0%-98.0%. Evidence indicated no intervention components were

implemented during the phase (*M* = 0%, *SD* = 0). When the intervention was reinstated (B^2) a slight increasing trend was observed (*M* = 82.4%, *SD* = 9.2) as well as some variability. Treatment integrity averaged 87.0% *(SD* = 6.4). *Tau-U* results for Noah, suggest a small effect (.31, *p* = .29). The IOA was 86% during A, 93% during B, 93% during A^2, and 87% during B^2.

Classroom Peers Direct Observation Data

Each teacher identified two peers with similar challenging behavior to gauge whether implementing a targeted intervention produces collateral effects on peers. In Lucas' classroom, Peer 1 demonstrated slight therapeutic changes in engagement between baseline (*M* = 48.3, *SD* = 17.3) and intervention (*M* = 52.9, *SD* = 20.8). With the exception of one observation (Session 9), Peer 2's academic engagement demonstrated a slight positive trend. During the withdrawal phase (A^2), Peer 1's engagement decreased (*M* = 43.7, *SD* = 15.9). However, once the intervention was reinstated (B^2), engagement slightly increased (*M* = 52.7, *SD* = 16.8). *Tau-U* results for Peer 1, suggest a medium to high effect (.70, *p* = .05). In the same classroom, Peer 2 demonstrated increased engagement between baseline (*M* = 65.1, *SD* = 26.2) and intervention (*M* = 70.2, *SD* = 3.6). Peer 2's data demonstrated a positive and stable trend over the five sessions. Visual analysis indicates during the withdrawal phase (A^2), Peer 2's engagement decreased (*M* = 57.2, *SD* = 12.8) with no overlapping data points between the intervention (B) and withdrawal phase (A^2). However, engagement did not increase during the second intervention phase (*M* = 50.1, *SD* = 12.8). *Tau-U* results for Peer 2, suggest a weak or small effect (.11, *p* = .77).

In Bob's classroom, visual analysis indicates Peer 1 did not demonstrate therapeutic changes in engagement between baseline (*M* = 56.5, *SD* = 17.2) and intervention (*M* = 52.03, *SD* = 23.3). However, during sessions nine and ten of intervention phase (B) a slight positive trend is observed. Unlike Bob, during the withdrawal phase (A^2), Peer 1's engagement increased (*M* = 59.9, *SD* = 16.6). Once the intervention was reinstated with modifications (B'), engagement increased (*M* = 78.7, *SD* = 13.1). *Tau-U* results for Peer 1, suggest a small effect (.53, *p* = .86). In the same classroom, Peer 2 also demonstrated increased engagement between baseline (*M* = 47.8, *SD* = 18.0) and intervention (*M* = 64.19, *SD* = 15.1). Further during the withdrawal (A^2) phase Peer 2's engagement decreased (*M* = 60.8, *SD* = 23.2) but was not stable. Unlike Bob, Peer 2's engagement did not increase during the second intervention phase (*M* = 60.3, *SD* = 21.5). *Tau-U* results for Peer 2, suggest a small effect (.33, *p* = .30).

In Noah's classroom, Peer 1 demonstrated therapeutic changes between baseline (*M* = 70.0, *SD* = 8.8) and intervention (*M* = 81.1, *SD* = 11.3). Although the overall mean was higher, the data were rather variable and appeared to follow a data path similar to Noah's engagement. During the withdrawal phase (A^2), visual analysis indicates variability and a counter-therapeutic increase (*M* = 89.3, *SD* = 6.2). Similarly, once the intervention was reinstated (B^2), engagement decreased (*M* = 73.8, *SD* = 12.1). In the same classroom, visual analysis also indicates highly variable data that appear to follow a similar bath (except for A^2) to Noah's engagement. %). *Tau-U* results for Peer 1, suggest a small effect (.53, *p* = .86). Peer 2 slightly decreased engagement between baseline (*M* = 90.2, *SD* = 4.5) and intervention (*M* =

86.0, *SD* = 20.7). During the withdrawal phase (A^2), Peer 2's engagement decreased (*M* = 68.0, *SD* = 32.6). Engagement increased during the second intervention phase (*M* = 86.4, *SD* = 14.0). Overall, results for peers were variable and somewhat refute the hypothesis that implementing a BIP customized for a target will have positive collateral effects on non-targeted peers who have comparable behavior. *Tau-U* results for Peer 2, suggest a weak or small effect (.32, *p* = .26).

Teacher Survey of Practices

Prior to attending the PD, each teacher completed the, *TSP*. Ms. Boyd, Ms. Sims, and Ms. Kanter had scores of 83.3%, 79.2%, and 54.2% respectively. The teachers' scores after the PD were 91.7%, 95.8%, and 91.7%. All teachers reported that they increased use of classroom management practices. This reported use maintained one month later with scores of 91.67%, 87.50%, and 100%, respectively.

Self-Efficacy

Prior to commencing baseline data collection and attending the PD, each teacher completed the, *TSES*. Ms. Boyd, Ms. Sims, and Ms. Kanter had scores of 59, 53, and 58 respectively. The same teachers' scores after the PD were 65, 57, and 63, indicating an increase in self-efficacy for all three teachers. At follow-up, Ms. Boyd and Ms. Sims scores slightly declined to 62 and 54, while Ms. Kanter's score increased to 72.

Social Validity of FBA-BIPs

Prior to the implementation Ms. Kanter, Ms. Boyd, and Ms. Sims, rated the intervention favorably with the mean scores 5.9 (SD = .25), 5.2 (*SD* = 0.44), and 5.0 (*SD* = 0), respectively. Following completion of the study, all teachers were asked to complete the same survey. Ms. Kanter, Ms. Boyd, and Ms. Sims, scores decreased to 4.5 (*SD* = 0.95), 4.8 (*SD* = 0.54), and 4.93 (*SD* = 0.25), respectively. The median value for pre-social validity score was 5 (mode = 5, range = 5-6) and post-social validity score was 5 (mode = 5, range = 4-6).

Quality Ratings of the PBPD: Social Validity

In general, following both training sessions, teachers rated all items on the questionnaire highly (*2* or *3*). Scores from the training survey were very positive and slightly higher than the second training session, with a mean of 2.91 *(SD* = 0.21). When asked, **"**Did you notice changes in student behavior after attending the PD and creating an BIP" all three teachers (100%) reported that after the PBPD and the implementation of the BIP they saw improvements in target student behaviors. In addition to changes in the target student's behavior, teachers noted changes in their classrooms and other students as well. Everyone agreed that the overall classroom behaviors improved as a result of the PBPD and resulting BIP. The teachers felt that the training and emails were sufficient and effective. Additionally, all the teachers mentioned the graphs, and how they appreciated seeing the visual level of behavior change.

Discussion

Students with persistent challenging behavior may struggle in the classroom, but also, their behavior may impede their classmates' learning. To address these issues, teachers may elect to provide specific students with individualized, FBA-based interventions consisting of changes in reinforcement contingencies, extinction procedures, and environmental stimuli. To date, few studies have evaluated how to train teachers to (a) analyze their own classroom environments, (b) conduct an FBA to develop a function-based BIP in a short period of time (Gable et al., 2012),

and (c) recorded teacher self-efficacy as it relates to the FBA-BIP process. The purpose of this study was to investigate the effects of training general educators to design and implement FBA-BIPs with a focus on the classroom environment. All teachers reported an increase in classroom management practices after the PD.

A possible collateral effect of FBA-BIPs is the reduction of problem behavior in other students in the classroom. This is a logical possibility because some, though not all, BIP components such as increased opportunities to respond or behavior specific praise may be observed or experienced by other students in the classroom (in addition to the target student). However, there is limited research on the effects of FBA-BIP in general education settings and the collateral effects on students who have comparable behavior problems but are not receiving intervention. We addressed these research gaps by (a) training general education teachers in the FBA-BIP process, (b) examining the effects of the FBA-BIP on the target students' outcomes, and (c) evaluating how the FBA-BIP affected the behavior of comparable peers.

Data were analyzed according the standards set forth by Horner et al. (2005) and Ledford et al. (2018). First, as it relates to the effects of the FBA-BIP on target students' behavior and their peers, results were mixed. For Lucas, the FBA-BIP appeared to be effective as evidence by (a) the steep descending trend in his engagement when intervention was withdrawn, and (b) the increasing trend when intervention was put back in place. However, a functional relation could not be established given there were not a sufficient number of data points in the last intervention condition. Unlike Lucas, for Bob a functional relation was established between the FBA-BIP and academic engagement as evidence by a clear change in engagement upon manipulation of the independent variable and with a sufficient number of data points. Finally, Noah demonstrated slight increases in engagement, on average. However, the substantial overlap across conditions precludes a functional relation from being established. Noah's data were further complicated by his somewhat high levels of engagement during baseline which was contraindicated by his *SSIS* scores. A different, more individualized behavior may have been a more appropriate dependent variable. In sum, though each teacher attended the same FBA-BIP training and implemented interventions with moderate to high fidelity (though not perfect), students showed varying degrees of response.

Although two of three target students demonstrated improved behavior, analysis of peer comparison data revealed no clear pattern in behavior associated with the introduction and withdrawal of intervention. Whereas some students responded positively, others' behavior actually worsened with intervention, which contraindicates our original hypothesis of seeing positive collateral effects on behavior. When experimental effects are null or negative, researchers have suggested these findings may still make a useful contribution to the field so long as the study meets indicators of methodological quality including: measure of a social valid phenomenon with reliability, experimental manipulation of independent variable that was implemented with fidelity, sufficient description of study procedures, execution of a research design that controls for

threats to internal validity, and discussion of results in relation to other relative research (Kittelman et al., 2018). In this case, academic engagement is central to students' success in the classroom (i.e., a socially valid phenomenon) and was measured reliably, as demonstrated via IOA percentages. The intervention was implemented with fidelity and removed and reinstated according to target students' response, per best practice in an ABAB design (although Lucas had only two data points in the final phase). In light of the experimental rigor and previous research, our findings were unanticipated, especially given the BIP components likely to be experienced by the whole class such as increased opportunities to respond, behavior specific praise, and planned ignoring of problem behavior.

To better understand how FBA-BIPs affect comparable peers, it may be necessary to collect data on teacher interactions with the peer comparisons. It is possible that as the target students' behavior improved, teachers were able to respond to other students' problem behaviors. However, if the teachers responded with negative attention to the peers and the peers' behavior was maintained by attention, this increased attention could have exacerbated the behavior. Although some peers showed slight improvements, it is likely all peers (despite some improvement) needed more individualized supports to experience the same degree of improvements in engagement as the target students.

Finally, as it relates to socially validity, findings are also mixed. Although teachers rated the intervention favorably at the start, ratings decreased at the end. Although the ratings were still positive, the decrease indicates teachers were not as enthusiastic about the intervention after implementation. This may be due to the additional demands of implementing an individualized intervention. Also, it is plausible that because they did not see consistent collateral effects in the peer comparison students, they tempered their enthusiasm. On the other hand, given the target students' average academic engagement met or exceeded that of the peer comparisons, we can presume the outcomes for target students, especially Lucas and Bob, were socially significant.

Limitations and Future Directions

Results from this study are promising in that general educators were able to design and implement an FBA-BIP with varying effectiveness, however we encourage the following limitations to be considered. First, time constraints due to the school's PD calendar forced movement of the participants into the intervention on a specific date. More time would have been useful for direct observations and ABC data collection as well as gaining stability in Noah and Bob's data. Additional time constraints occurred toward the end of the study. Spring break, district testing, and schedule changes forced authors to withdrawal the intervention after four intervention dates for Bob and reinstate it after three days for all students. The schedule did not allow for three or more observations of Lucas during the second intervention phase. Starting sooner or including more observations per week could have led to more data being collected, and thus, a clearer understanding of effects. Second, peers were nominated by teachers for participation, however there was no formal validation of their challenging behavior. It is possible the peers were not the most comparable to the target students. For example, the function of the

peers' behavior may not have aligned with the target student. Relatedly, due to the peer consent process, we were unable to collect in-depth data on peers. Similarly, though they may have had challenging behavior, the behavior may not have been captured by a measure of engagement. Future research should involve conducting an FBA and establishing baseline equivalence between students based on a common measure that effectively captures all participants' behavior.

Third, treatment fidelity was moderate to high, but it never averaged above 90%. It is unclear if better or perfect adherence to the BIP would result in more substantial improvements for target students and peers. It is possible that because teachers were nominated to participate by their administrator, they were less committed to the process than they would have been had they elected to participate by their own volition (Klingner et al., 2003). This also has implications for the student participants. That is, Noah's engagement was rather high during baseline (75% engagement) so ceiling effects were present. A line of future inquiry involves comparing the outcomes and fidelity of volunteer and mandated participants.

Fourth, the target student BIPs incorporated multiple intervention components, therefore it is difficult to determine which tactics may have affected student academic engagement. Further, interventions consisted of individualized as well as classwide tactics, such as opportunities to respond, to increase engagement. Although these are common components of BIPs (Oakes et al., 2018), focusing on implementing low-intensity strategies first, such as explicit behavioral expectations, opportunities to respond, and behavior specific praise, may improve overall student behavior before moving to a more intensive and individualized intervention plan. Finally, for the target students who were responsive, it is unclear whether their behaviors maintained over time or if their improved behaviors generalized to other settings. To improve future studies, researchers should consider systematic programming for maintenance and generalization as well as measurement of these effects.

Educational Implications

This study demonstrated that general education teachers can be trained to design and implement FBA-BIPs successfully. This is an important finding as students with challenging behavior, those with or at risk for EBD, and even students with other disabilities are likely to spend the majority of their school day in general education classrooms. FBA-BIPs offer an effective mechanism for teachers to provide the supports necessary for improving academic engagement. However, this will require effective PD for teachers who are not already trained.

Though FBA-BIPs may improve target students' engagement, we were unable to show these practices resulted in improvements for peers who demonstrated comparable problems. This is unfortunate, as clearly when an intervention individualized for one student produces positive outcomes for other students, the overall classroom climate improves as does the cost-benefit of providing a resource-intense intervention. For teachers who have multiple students with challenging behavior, one implication of this study's findings is that each student may need an individualized intervention. However, if that seems unmanageable, a potential alternative is to implement some type of

group contingency intervention, which is a way to reinforce positive behaviors when individuals or group members meet a predetermined criterion. These types of group interventions are often recommended and advantageous when individual BIPs are not practical or feasible for multiple students.

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