THE EFFECTS OF AN ELECTRONIC DAILY BEHAVIOR REPORT CARD ON
CHALLENGING STUDENT BEHAVIOR

A Dissertation in
Special Education

by
Benjamin S. Riden

© 2018 Benjamin S. Riden

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

August 2018
The dissertation of Benjamin S. Riden was reviewed and approved* by the following:

Jonté C. Taylor  
Assistant Professor of Special Education  
Dissertation Adviser  
Chair of Committee

Mary Catherine Scheeler  
Associate Professor of Special Education  
Professor in Charge

David L. Lee  
Professor of Special Education  
Head of the Department of Educational Psychology, Counseling, and Special Education

Andrea V. McCloskey  
Associate Professor of Education

*Signatures are on file in the Graduate School.
ABSTRACT

Classroom behavior management is the foundation on which positive student outcomes are built. Despite years of research discussing the importance of classroom behavior management, teachers struggle to effectively manage challenging classroom behavior. Challenges managing classroom behavior add stress to teachers, contribute to teacher burnout, and is one reason special education teachers leave the field. A daily behavior report card is one strategy that has shown promise in the literature for reducing challenging student behavior. After a review of the literature the author identified a need for empirical evidence on using technology to individualize behavior management programs. The author developed the electronic daily behavior report card (eDBRCs) to test the effectiveness of this tool in reducing challenging student behavior. This study investigated the effects of eDBRCs when implemented by preservice teachers during their capstone field experience. The author also examined the fidelity of implementation by preservice special education teachers. Results indicate a functional relation between eDBRCs and student variables. Moreover, results suggest preservice teachers can implement an intensive intervention with high levels of fidelity. Implication of results and future research are discussed.

Keywords: challenging behavior, classroom management, disabilities, electronic daily behavior report cards, preservice teachers, technology
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>ix</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>x</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>The Importance of Behavior Management in Schools and Classrooms</td>
<td>1</td>
</tr>
<tr>
<td>Applied Behavior Analysis and Behavior Management</td>
<td>3</td>
</tr>
<tr>
<td>School-Wide Positive Behavior Intervention and Supports</td>
<td>4</td>
</tr>
<tr>
<td>Electronic Behavior Management Programs (eBMPs)</td>
<td>6</td>
</tr>
<tr>
<td>Research on Daily Behavior Report Cards (DBRCs)</td>
<td>7</td>
</tr>
<tr>
<td>Purpose of Present Study and Research Questions</td>
<td>10</td>
</tr>
<tr>
<td>METHOD</td>
<td>10</td>
</tr>
<tr>
<td>Participants and Setting</td>
<td>10</td>
</tr>
<tr>
<td>Dependent Variables</td>
<td>11</td>
</tr>
<tr>
<td>Independent variables</td>
<td>12</td>
</tr>
<tr>
<td>Electronic Daily Behavior Report Card (eDBRC)</td>
<td>12</td>
</tr>
<tr>
<td>eDBRC Implementation Treatment Integrity checklist</td>
<td>13</td>
</tr>
<tr>
<td>Experimental Design</td>
<td>13</td>
</tr>
<tr>
<td>Training</td>
<td>14</td>
</tr>
<tr>
<td>Participant Training</td>
<td>14</td>
</tr>
<tr>
<td>Preservice Teacher Participant Trainings</td>
<td>14</td>
</tr>
<tr>
<td>Student Participant Training</td>
<td>14</td>
</tr>
<tr>
<td>Parent Participant Training</td>
<td>15</td>
</tr>
<tr>
<td>Data Collection Procedures</td>
<td>15</td>
</tr>
<tr>
<td>Pre-Baseline</td>
<td>15</td>
</tr>
<tr>
<td>Baseline</td>
<td>15</td>
</tr>
<tr>
<td>Intervention</td>
<td>16</td>
</tr>
<tr>
<td>Fading</td>
<td>16</td>
</tr>
<tr>
<td>Maintenance</td>
<td>17</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>17</td>
</tr>
<tr>
<td>Reliability, Fidelity, and Validity</td>
<td>18</td>
</tr>
<tr>
<td>RESULTS</td>
<td>20</td>
</tr>
<tr>
<td>Effects of eDBRC on Students Classroom Behavior</td>
<td>20</td>
</tr>
<tr>
<td>Visual Analysis</td>
<td>20</td>
</tr>
</tbody>
</table>
Effect Size Analysis
Preservice Teachers eDBRC Implementation Fidelity
Social Validity of eDBRC

DISCUSSION
Development and Utility of the eDBRC
Implementation Fidelity
Social Validity of eDBRC

LIMITATIONS AND FUTURE RESEARCH

IMPLICATIONS

REFERENCES

TABLES AND FIGURES
Table 1
Table 2
Table 3
Table 4
Table 5
Table 6
Figure 1
Figure 2
Figure 3
Figure 4
Figure 5
Figure 6
Figure 7

APPENDIX A: Electronic Behavior Management Programs: A Review of the Literature
Title Page
Abstract
Introduction
Method
Inclusion and Exclusion Criteria
Study Coding
Data Extraction & Analysis
Research Quality Indicators
Inter-coder Agreement
Results
V. Student Social Validity Survey.......................................................... 105
VI. Parent Social Validity Survey.......................................................... 107
APPENDIX C: Study Timeline............................................................... 109
LIST OF TABLES

TABLE 1
Participant Demographic Information......................................................... 40

TABLE 2
Results of Visual Analysis........................................................................ 41

TABLE 3
Results of Statistical Analysis and Forest Plot........................................... 43

TABLE 4
Preservice Teacher Participant Responses to Social Validity Survey............. 44

TABLE 5
Student Participant Responses to Social Validity Survey............................. 45

TABLE 6
Parent(s)/Guardian(s) Participant Responses to Social Validity Survey........... 46
LIST OF FIGURES

Figure 1
Example of Electronic Daily Behavior Report Card……………………………………………….. 47

Figure 2
Electronic Daily Behavior Report Card Summary Sheet…………………………………………. 48

Figure 3
Treatment Integrity Checklist…………………………………………………………………………… 49

Figure 4
Frequency Count for Student Participant One’s Off-task Behavior....................................... 50

Figure 5
Frequency Count for Student Participant One’s Talks Out Behavior.................................... 51

Figure 6
Frequency count for student Participant Two’s off-task behavior......................................... 52

Figure 7
Frequency count for student Participant Two’s non-compliant behavior.............................. 53
ACKNOWLEDGEMENTS

First and foremost, the completion of this program and dissertation would not have been possible without the never-ending love, support, and encouragement of my wife, Jen. You were always understanding of the late nights, long weekends, and seemingly unending travel schedule. There are too many examples to list where you captained the ship while I was in the weeds. For this and the endless other examples, I cannot thank you enough! To my daughter Nora, although you are too little to understand the joy and happiness you bring me, your love is a constant inspiration to me.

To my committee, I will be forever grateful for the opportunity to work side-by-side with the most brilliant and supportive individuals I could imagine. Each of you was always willing to meet with me at any time during this process. Without your guidance and support I would not be half the academic I am today. I look forward to our continued friendships and collaborations. To my chair, Jonté, from day one you have been in my corner and pushed me to do more than I ever thought was possible. I look forward to continuing our work in the future, thank you.

Finally, a thank you to the faculty and fellow doctoral students who have shaped me over the years is necessary. Whether it was bouncing research ideas off of one another, navigating the first years as doctoral students, or proofreading my work, I would not be here without your help. A special thank you to Sal and Andy who supported me from the beginning and were willing to answer any and all questions I had. I look forward to our continued friendship, thank you.

The contents of this report were developed under a grant from the US Department of Education, #H325D130021. However, those contents do not necessarily represent the policy of the US Department of Education, and you should not assume endorsement by the Federal Government. Project Officer, Patricia Gonzalez.
INTRODUCTION

Classroom behavior management is key for effective teaching that maximizes academic learning time, student engagement, and achievement (Sugai & Horner, 2002). Evertson and Weinstein (2006) broadly define classroom management as the actions a teacher takes to create an environment that supports and facilitates both academic and social-emotional learning. Despite classroom behavior management being the foundation for effective instruction, teachers report being ill prepared to manage challenging and disruptive behavior in their classes (Melnick & Meister, 2008; Westling, 2010).

Issues surrounding behavior management are considered such a burden that some teachers leave the field of education (Algozzine, Christian, Marr, McClanahan, & White, 2008; Billingsley, Carlson, & Klein, 2004; Butler & Monda-Amaya, 2016). Disruptive behavior in classrooms is a significant challenge for learning in schools and a risk factor for students’ academic achievement as well as significant source of teachers’ work-related stress (Närhi, Kiiski, & Savolainen, 2017). These stressors contribute to teacher burnout and loss of teacher efficacy (Butler & Monda-Amaya, 2016). In order to ease teacher stress surrounding behavior management many researchers are applying a science shown to positively impact student behavior.

The Importance of Behavior Management in Schools and Classrooms

Challenging and disruptive academic and social classroom behaviors severely impact student outcomes (Gunter, Jack, DePaepe, Reed, & Harrison, 1994). These outcomes include: Removal from inclusive settings (Butler & Monda-Amaya, 2016); interfering with student learning processes (Sutherland, Alder, & Gunter, 2003; Sutherland, Wehby, & Yoder, 2002); and a reduction in teaching efficacy (Klassen & Chiu, 2010; Perrachione, Rosser, & Petersen, 2008). Disruptive student behavior is simply not advantageous to learning. Moreover, student disruptions reduce academic learning time and contribute to negative interactions with teachers and peers, thereby creating a cause for concern in schools (Pas, Cash, Brennan, Debnam, & Bradshaw, 2015).
Teachers report that disruptions, noncompliance, and disengagement are among the most consistently challenging behaviors they deal with on a daily basis (Alter, Walker, & Landers, 2013; Gage, Scott, Hirn, & MacSuga-Gage, 2018). Further, teachers indicate feeling underprepared to manage behaviors that disrupt their instruction (Coggshall, Bivona, & Reschly, 2012; Melnick & Meister, 2008; O’Neill & Stephenson, 2012). Teachers regularly recognize student behavior and classroom discipline as areas of concern and need (Meister & Melnick, 2003; Veenman, 1984). Further highlighting teachers’ need for knowledge and support, Moore et al. (2017) note via teacher self-reports, that teachers need additional training on effective classroom management strategies for students with problematic behaviors. Teachers are particularly concerned about managing the most problematic student behaviors (e.g., talking out, work completion, following classroom rules), and they described that the classroom management content during their preparation programs focused on ideal classroom environments where students were assumed to be generally well behaved (Meister & Jenks, 2000).

Although effective classroom management practices have been identified, a significant gap exists between the effective classroom management research base and teacher preparation (Freeman, Simonsen, Briere, & MacSuga-Gage, 2013). Wesley and Vocke (1992) provide one example of the lack of teacher preparation in classroom management. The authors studied 111 preparation programs and found only 36.9% of the programs had a course specifically focusing on classroom management. Further, two recent reports (Greenberg, Putman, & Walsh, 2013; Oliver & Reschly, 2010) criticized teacher preparation programs for their perceived lack of comprehensive coverage of research-based strategies to prevent and reduce problem classroom behaviors indicating little change over time. Specifically, only 27% of special education preparation programs sampled by Oliver and Reschly (2010) contained a specific classroom management course. The issues in teacher preparation programs surrounding behavior management go on to impact teachers in the field. Moore et al. (2017) surveyed 160 Pre-K through fifth grade elementary teachers to explore teachers’ knowledge about and implementation of behavior and classroom management strategies. Their results suggest that the majority of teachers in the sample reported to have no or limited knowledge or to be only somewhat knowledgeable for teaching replacement behaviors and
for designing, implementing, and evaluating behavior interventions. In response, many schools have adopted three-tiered public health prevention models for social behavior, such as SW-PBIS, to support prosocial student behaviors and prevent disruptive behaviors (Reinke et al., 2014). Included in these tiered are behavior management strategies at the school-wide, classroom, and individual levels.

**Applied Behavior Analysis and Behavior Management**

Applied behavior analysis (ABA) is a science devoted to the understanding and improvement of human behavior (Cooper, Heron, & Heward, 2007). Further, ABA is the scientific study of behavior that stresses precise measurement of observed behavior, recognizes the role of the environment immediately before and after a behavior occurs, and provides the technology to predict and influence behavior. When using ABA in the classroom there are several basic principles that can be used to effectively manage a classroom to help teachers create a positive learning environment (e.g., function of behavior, Premack principle, reinforcement strategies). This science can be applied to school settings with a variety of behaviors displayed by students and teachers.

Alberto and Troutman (2013) provide details on the uses of ABA for teachers. Most notably the authors highlight pinpointing and operationally defining behavior, creating quality behavioral objectives, and evaluating student performance. Both Cooper et al. (2007) and Alberto and Troutman (2013) provide strategies and tactics that can be used when designing behavior interventions at the school-wide, class-wide, or individual levels. Hypothesizing function of behavior, teaching replacement behaviors, and identifying potential reinforcers are the foundation behavior change programs are built upon.

Prior to the arrival of functional analysis, problem behavior was typically treated by installing powerful arbitrary contingencies of reinforcement or punishment over existing but often unknown sources of reinforcement for problem behavior (Mace, 1994). By contrast, by identifying contingencies that currently maintain problem behavior, relevant consequences and their associated discriminative stimuli and establishing operations may be altered to reduce problem behavior (Hanley, Iwata, & McCord, 2013) while reinforcing replacement behaviors with items identified via preference assessments. Principles of ABA can be seen in school-wide positive behavior interventions and supports (SW-PBIS), class-wide
behavior management programs (CBMP), and individual behavioral interventions such as daily behavior report cards (DRBCs).

Anderson and Kincaid (2005) note, PBIS meets the seven dimensions used to define ABA (i.e., generality, effective, technological, analytic, conceptually systematic, applied, and behavioral). The impact of behavior analysis on PBIS is most clear in (a) the emphasis on operational definitions of behavior and intervention elements, (b) the logic model used to select environmental manipulations designed to alter student and staff behavior, and (c) an unrelenting commitment to measurement of both implementation fidelity and the impact of PBIS on student outcomes (Horner & Sugai, 2015). Horner and Sugai (2015) acknowledge there is a debate in the field as to whether or not PBIS is based solely in ABA or only draws some components from ABA. Regardless of this argument, PBIS includes several ABA principles and uses them to modify behavior and create positive school climates. The principles of ABA form the foundation for many behavior interventions used in schools including but not limited to group contingencies, behavior contracts, and classroom rules and routines.

**School-Wide Positive Behavior Interventions and Supports**

Beginning in the late 1980’s, SW-PBIS began to take shape to reduce challenging behaviors in school and maintain a positive school culture that makes schools a more effective learning environment (Horner & Stonemeier, 2016). Positive behavior intervention and supports rely on principles of applied behavior analysis to develop behavior management practices by (a) emphasizing operational definitions of behavior and intervention elements, (b) selecting environmental manipulations designed to alter student and staff behavior, (c) committing to both implementation fidelity and the impact on student outcomes (Horner & Sugai, 2015). Two themes that define SW-PBIS center around the school-wide unit of intervention (Biglan, 1995; Mayer, 1995) and the development on intervention aligning to the intensity of a three-tiered framework (Fuchs & Fuchs, 2006). According to Sugai and Horner (2002), SWPBS is based on data-driven decision-making that targets measurable outcomes attributed to specific practices implemented across settings capable of supporting these practices. The approach requires school personnel to “define, teach, and reward expected behaviors, develop peer support systems, and implement
clear consequences for inappropriate behavior” (Taylor-Greene et al., 1997) and is usually implemented across three tiers (Chitiyo, May, & Chitiyo, 2012).

Tier one involves primary prevention strategies to reduce the likelihood of problem behavior that is proactive and designed to be administered before error patterns develop (Sugai, Sprague, Horner, & Walker, 2000). Because all students receive Tier one supports, these practices must be highly efficient and logically integrated with all other elements of the environment (Horner & Sugai, 2015) which is implemented school-wide. Tier one supports are designed to meet the needs of 80 – 90% of the student population. Tier two practices focus on moderate intensity supports that address the most common needs of student with ongoing problem behaviors. Tier two supports are added to Tier one supports and are designed for the 10 – 15 % of students who benefit from additional structure, more overt, and frequent antecedent prompts, a higher rate of positive recognition, and elevated training in both behavioral expectations and self-regulation skills (Sugai, Simonsen, Bradshaw, Horner, & Lewis, 2014) supports at this level are often provided at the classroom level. Lastly, Tier three is characterized by individualized assessment and support plans to meet the needs of individual students (Horner & Sugai, 2015). An important addition to Tier three support practices is a formal process for monitoring both if a support plan is being implemented as well as if it is being effective (Pinkelman, 2014). Within Tier three behavior supports, teams consider behavioral, academic, mental health, physical, social, and contextual variables (Crone, Hawken, & Horner, 2010), intended for 5% or fewer students within a school. These three tiered public health models guide prevention and intervention strategies for responding to problem behaviors by concentrating on the behavior and the environmental context in which the behavior occurs (Sugai et al., 2000). The success of behavioral interventions depends not just on the quality of procedures employed but also on the extent to which procedures are implemented (Pinkelman, 2014). However, not all teachers in PBIS schools receive the same support, which can lead to a lack of proper implementation (Lipsey, 2009). In 2014, Ficarra and Quinn conducted an investigation examining teachers’ self-reports on knowledge and competency surrounding the implementation of evidence-based classroom management practices. Their findings suggest teachers who work in SW-PBIS schools rated themselves significantly
higher than teachers not working in SW-PBIS schools. The authors theorize that the differences in teacher self-reports are due to the professional development in classroom management practices (e.g., token economies, positive and negative reinforcement strategies) delivered to teachers as part of the SW-PBIS framework. The behavior and classroom management skills that teachers need to optimize student success are not being acquired in pre-service training or consistently as professional development. As teachers attempt to find ways to support students who struggle behaviorally, many turn to the resources they have available to fill gaps in their behavior management skill set. Consequently, an additional consideration in behavior management is the role of technology. As schools and teachers integrate technology in classrooms, using technology to assist in behavior management is increasingly inevitable. These technological advances have led to the development and use of electronic behavior management programs (eBMPs).

**Electronic Behavior Management Programs**

The developers of eBMPs purport to model the programs on evidence-based practices such as use token economies and positive and negative reinforcement strategies. These programs take evidence-based behavior management strategies and use laptops, computers, mobile phones, and tablets along with software-based applications (apps) and programs to manage classroom behavior. Electronic behavior management programs are being introduced in classrooms throughout the world as a tool for managing problematic classroom behaviors. The authors examined ten studies to evaluate the effectiveness of eBMPs on student’s classroom behaviors (see Appendix A). Three eBMPs were identified in the literature: ClassDojo (an app used to reward positive classroom behavior), ScoreIt (an app that prompts students and teachers to assess students’ behavior at regular intervals throughout the school day), a daily behavior report card (DBRC; a pen and paper behavior management intervention shared with parents via email). Results of the statistical and visual analysis suggest eBMPs have varied effectiveness. See Appendix A for a complete literature review of eBMPs. Consequently, while there is some evidence to demonstrate the use of eBMPs as a method of intervening with academic and disruptive student behaviors, significant further examination of eBMPs is warranted.
Beyond the use of broad school-wide and classroom behavior management programs (e.g., SW-PBIS; eBMPs), some students need more personalized (i.e., individualized) behavior management interventions. SW-PBIS allows for intensified interventions at Tier three, however, it is unclear that student individualization is available through eBMPs. For those students, more intense behavior management strategies are needed. One particular approach that includes the skills needed for effectively managing classroom behavior and has been effective at behavior change in the natural classroom environment on an individual level has been DBRCs.

**Research on Daily Behavior Report Cards**

Daily behavior report cards are designed to: (a) specify a behavior, (b) rate that behavior at least daily, and (c) share that information with someone other than the rater (Chafouleas, Riley-Tillman, & McDougal, 2002). Most often in schools, the classroom teacher serves as the rater, given his or her continual presence throughout the day (Riley-Tillman, Chafouleas, & Briesch, 2007). Research indicates DBRCs can have positive impacts on academic and social outcomes for students with disabilities (Atkeson & Forehand, 1979; Barth, 1979; Burke & Vannest, 2008; Chafouleas et al., 2002; Smith, Williams, & McLaughlin, 1983; Taylor & Hill, 2017; Vannest, Davis, Davis, Mason, & Burke, 2010).

Vannest and colleagues (2010) conducted a meta-analysis of single-case research analyzing 17 single-case research studies that examined DBRCs, from 1970 to 2007, involving 107 participants. Using improved rate difference (IRD) as the single case effective size measure, the study reports a wide range of effectiveness of DBRCs (range = 0.14 - 0.97). IRD is interpreted as follows: 50 or lower: small and questionable effect; between .50 and .60: moderate effect; and .70 or higher: large or very large effect (Parker, Vannest, & Brown, 2009). Mean IRD effect size across studies was 0.61.

Building on the work of Vannest et al. (2007), Riden, Taylor, Scheeler, and Lee (2018) conducted an examination and analysis of single-case and group design research literature that focused on the effectiveness of DBRCs from 2007 to 2017. Their review included 390 participants identified as at-risk, eligible for 504 services, or as having a disability (e.g., ADHD, specific learning disability, emotional behavioral disorder). Using Tau-U as the single case effect size measure, the study reports a range of
effectiveness for DBRCs \((\text{range} = .51 - .81)\). Tau-\(U\) scores can be interpreted using the following criteria: .65 or lower: weak or small effect; between .66 and .92: medium to high effect; and .93 to 1: large or strong effect (Parker & Vannest, 2012; Rakap, 2015). Using Hedges’ \(g\) as the group design effect size measure, the study reports a broad range of effectiveness \((\text{range} = 0.03 - 0.72)\). Interpretation of Hedges’ \(g\) effect sizes is as follows: .50 or lower: small effect; between .50 and .80: medium effect; .80 to 1: large effect (Cohen, 1988). Ultimately, within the research studies examined by the two reviews (Riden et al., 2018; Vannest et al., 2007), findings suggest that DBRCs are a viable tool for teachers to use for classroom/behavior management. Beyond evaluating the efficacy of DBRCs for students and classroom teachers, recent research examines the use of DBRCs for novice and pre-service teachers specifically.

Riden et al., (2018) examined the effectiveness of a DBRC implemented by a preservice special education teacher to reduce problematic and disruptive behavior of a high school female with autism spectrum disorder (ASD). A DBRC package consisting of (a) operational definitions of target behaviors; (b) the creation of a simple number rating system; (c) daily monitoring of target behaviors; (d) daily feedback provided to students on her performance of target behaviors and goals; and (e) communicating daily performance to the student’s mother was taught to and implemented by the preservice teacher. Results indicate improvement across three target behaviors (i.e., talks out, looks at other, picks finger). Visual analysis indicated a functional relation between intervention and dependent variables. Data from a DBRC treatment integrity checklist shows that the preservice teacher implemented intervention with 100% fidelity. Aggregated Tau-U results suggest a strong effect \([\text{ES} = .98, p < .001]\) in reducing target behaviors of the student. Based on the previous literature regarding DBRCs, Riden and colleagues identified and incorporated essential components of DBRCs that increase their potential success on changing target behaviors in the desired direction.

**Essential components of DBRCs.** There are five considerations when constructing DBRCs: (a) operationally defining target behavior or constellation of behaviors; (b) rating of behaviors using simple numbers or symbols on a behavior scale; (c) daily monitoring of behaviors; (d) providing feedback to students on their behavior(s); and (e) communicating performance of DBRCs between the student’s
teacher and home (Chafouleas et al., 2002; Chafouleas, Riley-Tillman, Sassu, LaFrance, & Patwa, 2007; Long & Edwards, 1994; Riley-Tillman et al., 2007). When operationally defining target behaviors teacher must avoid ambiguous definitions, instead definitions should be specific that leads to enhanced clarity (Mires & Lee, 2017). After behaviors of concern have been identified, teachers should identify positive replacement behavior using the fair-pair method to identify positive behaviors that serve the same function as the inappropriate behavior (Kaplan & Drainville, 1991). After identifying replacement behaviors teachers should create the DBRC with parental input, complete the DBRC daily and send it home with the student for parent review, collect the DBRC the next morning to gain parental insights, collect data on student behavior progress, and use that information to make data based decisions about fading the support (Mires & Lee, 2017).

An additional consideration when designing a DBRC is to focus on principles of ABA. Specifically when developing a DBRC, teachers should hypothesize the function of behavior by administering assessments that aide in identifying function, develop the intervention with the Premack principle in mind, include reinforcement strategies, identify preferred items that may be used as reinforcers, and systematically fade supports to prevent reliance on the DBRC.

While there has been scant research on broad classroom management interventions, there has been one research study focusing on incorporating technology and DBRCs. In their review of DBRC research, Riden et al. (2018) found only one empirical study that utilized technology for DBRC implementation (Williams, Noell, Jones, & Gansle, 2012). In their study, Williams et al. (2012) examine DBRCs with and without performance feedback for elementary aged students displaying disruptive behaviors. The authors used an email delivery method for the DBRC, which differs from traditional paper delivery of DBRCs. Their results suggest that an e-mailed DBRC: (a) decreases students’ disruptive behaviors, (b) even with performance feedback, will not produce superior outcomes, and (c) can be perceived as acceptable. As concluded by Riden et al. (2018) additional research should focus on incorporating technology with DBRCs as a viable strategy for changing behavior due to the increase of technology being used in classrooms to manage disruptive and challenging student behavior.
Purpose of Present Study and Research Questions

Previous research suggests that teachers need greater access to classroom and behavior management supports (Ficarra & Quinn, 2014; Moore et al., 2017). This is especially true for pre-service and novice teachers. Research also supports the use of DBRCs as a viable intervention for decreasing inappropriate behaviors and increasing appropriate classroom behaviors for students (Atkeson & Forehand, 1979; Burke & Vannest, 2008; Chafouleas et al., 2002; Taylor & Hill, 2017; Vannest et al., 2010). Further, emerging evidence exist that novice teachers can successfully implement DBRCs for students who need more intensive behavioral intervention (Riden et al., 2018). Lastly, previous research supports using DBRCs as an intensive behavior intervention, however, only one study (Williams et al., 2012) minimally incorporated technology (i.e., email) with a DBRC. Technology is now ubiquitous in and out of the classroom and as evidenced through the use of eBMPs, teachers are using and incorporating technology for behavior and classroom management. There is one study that examines the use of technology with a DBRC and that study focused specifically on the feedback component. As such, additional research is needed that focuses on other components of DBRC use including implementation, delivery, and feedback.

The purpose of the current study aims to examine a novel approach to preparing preservice special education teachers to manage challenging and disruptive behaviors in the classroom. Specifically, the study examines the use of an electronic daily behavior report card (eDBRC) in fostering positive student behavior as implemented by a novice teacher. The following research questions guide the investigation:

1. What are the effects of eDBRCs on student’s disruptive and challenging classroom behaviors?
2. To what extent do preservice teachers implement eDBRCs with fidelity?
3. Are eDBRCs a socially valid intervention?

METHOD

Participants and Setting
Two high school students and two preservice special education teachers participated in this study. The preservice teachers were entering their final student teaching experience at a large public university in the northeast. They were selected from a pool of ten interested volunteers. Inclusion criteria for the preservice participants consisted of: (a) working with students with disabilities displaying disruptive or challenging behavior, (b) placement in a K-12 academic setting, (c) had never implemented a DBRC of any kind, and (d) had access to technology (e.g., laptop, tablet). The preservice participants and their cooperating teachers referred a student for participation in the study based on high rates of general off-task behavior.

One female high school student with ASD and one male student with multiple disabilities (ID) and their guardians/parents participated in this study. The inclusion criteria for the student participants were as follows: (a) attends a public K-12 school, (b) receives services for a disability, and (c) engages in high rates of behavior that results in being off-task during instructional classroom time. The female student participant (participant one) was 18-years-old in twelfth grade diagnosed with ASD. The male student participant (participant two) was 17-years-old in ninth grade diagnosed as having an ID.

The study took place in a public high school serving students in 8th – 12th grade (total high school population = 2,301) in the northeast. The intervention for the female student participant was implemented in an autism support classroom during English Language Arts (ELA) class. The classroom consisted of seven students including the student participant. Instruction during this time was delivered with the student participant sitting at a table with three peers facing the teacher. Intervention for the male student participant was implemented during ELA and Art class. The classroom consisted of nine students including the student participant. Instruction during this time was delivered with the student participant sitting at a table with two peers facing the teacher during ELA and with eight peers facing the teacher during Art. The school followed a block schedule allowing for longer class periods and fewer classes each day. See Table 1 for participant demographic information.

**Dependent Variables**
Two behaviors were targeted for intervention for each student participant. For the female student participant the behaviors were talking out and off-task behavior. Behaviors for the male student participant were non-compliance and off-task behavior. Each target behavior was operationalized prior to data collection. A frequency count was used to collect data on each target behavior. Operational definitions of target behaviors for the female student participant were as follows: talking out was counted as any occurrence of an uninvited verbal statement during whole group instruction, independent work, or silent reading. Verbal statements included academic or non-academic verbal statements (e.g., shouting out answers). Talking out was not counted if they were a result of stereotypy, interactions with peers during group work, or asking her paraprofessional a question or for help. Off-task was counted as engaging with personal possessions (e.g., necklace, headphones), out of seat behavior, picking at self (e.g., picking at lips, biting fingernails). Operational definitions of target behaviors for the male student participant were as follows: non-compliance was defined as any response that does not match the delivered instruction the first time after instruction was delivered. Off task behaviors are defined as engagement in any tasks other than the assigned task or ongoing activity (e.g., out of seat behavior, talking about topics not related to the task). Off task does not include asking the teacher or paraprofessional for help.

**Independent Variable**

**Electronic daily behavior report card.** An eDBRC package was created consisting of operational definitions of target behavior, simple number rating system, daily monitoring of behaviors, feedback provided to students on their behavior, and communication of performance between the student’s teacher and home. The eDBRC (see Figure 1) was created using Google Forms and daily summary sheet (see Figure 2) using Google Sheets. Procedures for this study were adapted from a previous DBRC study conducted by Riden et al. (2018). The eDBRC was used by the preservice teacher to record the number of times the student engaged in the target behavior each day. This portion of the eDBRC was used to communicate with the first author about student behavioral progress. The daily summary sheet included the following:

- two yes/no questions for the preservice teacher to select from a drop down menu (i.e., (a) today...
we did a “check-in” with yesterday’s card and (b) today we did a “check-out with today’s card);
• a space for the student’s ID number, and the date;
• sections for each target behavior;
• sections to provide a rating for each behavior using a drop down menu (i.e., yes, no);
• two sections at the bottom of the DBRC for teacher comments; the other for parent comments.

The daily summary sheet was used to communicate student progress to the guardians/parents daily.

**eDBRC implementation treatment integrity checklist.** The author collected data on the preservice
teacher’s implementation during intervention. Treatment integrity data were collected to examine if
implementation of the intervention was conducted with fidelity. The eDBRC treatment integrity checklist
was a modified version used by Taylor and Hill (2017). See Figure 3 for the eDBRC treatment integrity
checklist.

**Experimental Design**

An ABAB reversal design was used to measure functional relations between the independent
variable (i.e., eDBRC) and dependent variables (i.e., target behaviors). An experiment using a reversal
design entails repeated measures of behavior in a given setting that requires at least three consecutive
phases: (a) an initial baseline phase in which the independent variable is absent, (b) an intervention phase
during which the independent variable is introduced and remains in contact with the behavior, and (c) a
return to baseline conditions accomplished by withdrawal of the independent variable (Cooper et al.,
2007). Baer, Wolf, and Risely (1968) described the basic operation of the reversal design where a
behavior is measured, and the measure is examined over time until its stability is clear. Then the
experimental variable is applied and continuously measured to see if the variable will produce a
behavioral change. If a behavioral change is detected the variable is discontinued to see if the behavioral
change just brought about depends on it. The experimental variable is applied again to see if the
behavioral change can be recovered. An A-B-A-B design is preferred because reintroducing the B
condition enables replication of treatment effect, which strengthens the demonstration of experimental control (Cooper et al., 2007).

**Trainings**

**Participant trainings.** The participants individually attended two separate trainings on implementing the eDBRC intervention. The author provided a 30-minute pre-baseline training and 30-minute intervention training to the preservice teachers. The preservice teachers met with the parent/guardian of the student participant to define their role during intervention. Preservice teacher participants introduced the eDBRC to the students prior to implementing the intervention. The goal of training was to gain experimental control of factors whose effects are under study, and controlling for extraneous variables that could potentially impact the intervention (Johnston & Pennypacker, 1993).

**Preservice teacher participant trainings.** The preservice teachers were provided training to introduce them to the study and train then on the data collection and intervention procedures. The preservice participants had only basic introductions to behavioral data collection. One day of training was provided prior to baseline data collection. On the first day of training the rationale for eDBRC as an intervention was presented including essential components of the intervention, implementation procedures, operational definitions, practice on baseline data collection procedures, and time to answer any questions. Day two of consisted of instruction on conducting the functional assessment screening tool (FAST; see Appendix B for data collection forms), the multiple stimulus without replacement (MSWO) preference assessment (see Appendix B), practice on intervention data collection procedures, intervention training, and scheduling of weekly intervention meetings.

**Student participant training.** A student training session was conducted after baseline data were collected. The training included why we are providing this support, how the support will be delivered, what the eDBRC will look like, and instruction on replacement behavior based on the likely function of behavior from FAST results (i.e., attention for student one and two). Replacement behaviors included: raising a hand to ask or answer a question instead of talking out and engaging in academic activities as opposed to engaging in off-task behaviors for the female student participant. Replacement behaviors for
the male student participant included: complying with a task demand the first time a request was made and engaging in academic activities as opposed to engaging in off-task behaviors for the female student participant. Once the replacement behaviors were introduced and modeled for the students, the students practiced the replacement behaviors until the behavior were performed correctly. During all training sessions positive language was used at all times (e.g., we are doing this to help you have better days at school, we are not doing this because you are in trouble).

**Parent participant trainings.** A parent training was conducted on the use of the eDBRC. The teacher participants met with the parent/guardian in the autism support classroom and gave a brief presentation explaining the target behaviors, introducing the eDBRC, and defining her role in the intervention. Time was allotted at the end of the presentation to answer any questions the parent had about the intervention.

**Data Collection Procedures**

**Pre-Baseline.** Prior to baseline the first author conducted preliminary behavior screenings using both indirect and direct methods, to determine the appropriateness of a behavior change program. Behavior pinpoints were then defined according to Hawkins and Dobes (1977) that states good behavior definitions have to be objective, very clear, and talk about what the behavior is and what the behavior is not. Interviews were conducted with the pre-service participants and the classroom special education teachers familiar with the student participants. Interview questions were adapted from the functional assessment interview (O’Neil et al., 1997). Based on answers to interview questions the author conducted three one-hour direct observation sessions. Continuous measurements were used to collect antecedent-behavior-consequence data so all instances of the behaviors of interest were detected during the observation sessions (Johnston & Pennypacker, 1993). Replacement behaviors were selected based on the results of pre-baseline data collection.

**Baseline.** Observations occurred during 90-minute classroom periods. Periods were divided into six 10-minute intervals. Data were not collected for the final thirty minutes as this time would be used to review eDBRC expectations, student performance, filling out the eDBRC form, and delivery of
reinforcement contingent on performance during intervention. A frequency data collection procedure was used to achieve a count of the operationally defined behaviors using a frequency data form during instruction for ease of data collection (see Appendix B). Mean baseline data for the female student participate were: talking out ($\textit{Mean} = 23.4$) and off-task ($\textit{Mean} = 39.4$). Mean baseline data for the male student were: non-compliance ($\textit{Mean} = 23.14$) and off-task ($\textit{Mean} = 35.43$). Dependent variables in baseline should occur until a pattern of responding is consistent, allowing for a predication of future responding (Horner et al., 2005).

**Intervention.** Intervention sessions were divided into six 10-minute sessions during 90-minute periods. At the beginning of each observation session the preservice participants reviewed behaviors necessary to earn points during for the day, reminded the students about reinforcers that could be earned contingent on performance, and delivered all instruction on behavior expectation in a positive manner. Throughout the eDBRC period, the preservice participants collected behavior data, reviewed performance at the end of each interval with the students, assigned point, reviewed points not earned in a non-threatening tone, and described how the students could earn points next time. Behavior-specific praise was provided to the students during each interval. At the conclusion of observations, the preservice teachers reviewed overall performance using the eDBRC. After which, the students were granted access to reinforcers contingent on their performance. Student participant one earned time with a preferred teacher in the class to work on a puzzle book and student participant two earned time working with a preferred teacher to create artwork and notes for his mother. Lastly, the preservice teachers provided feedback to the guardians/parents using the eDBRC Summary Sheet and electronically shared it with guardians/parents for review at home and delivery of reinforcement contingent on student performance at school.

**Fading.** After the behavior improves and is consistently appropriate, use of a DBRC should be faded. Several researchers (e.g., Chafouleas et al., 2002; Vannest et al., 2010) have noted the importance of fading a DBRC to prevent dependence on the intervention. To fade a DBRC (in this case an eDBRC), a teacher might consider implementing the intervention for fewer days or in fewer settings across the week.
(Mires & Lee, 2017). After intervention was implemented with check-ins for each 10-minute interval (total of 6 each day), intervention check-ins were faded to one check-in before the session, one check-in at the 30-minute mark (after the third 10 minute interval) and one check-in at the conclusion of the session. The intervention was faded further after three days of steady responding to one check-in before the start of the session and one check-in at the conclusion of the session. Finally, intervention was withdrawn and behaviors were moved into maintenance.

**Maintenance.** Maintenance of behavior refers to the lasting change in behavior (Cooper et al., 2007). Maintenance data were collected on each target behavior after the fading procedures. Maintenance data were collected to see if the students engaged in the desired behavior after intervention was removed. The preservice participants collected maintenance data for three days over the span of two weeks. The frequency data collection form used during intervention was used to collect maintenance data and was reported to the first author using the eDBRC Google form. Interobserver agreement was conducted by the first author on a minimum of 20% of maintenance data collection procedures. See Appendix C for the timeline for this study.

**Data Analyses**

Data analysis consisted of visual analysis of the data and Tau-U effect size analysis to examine the effectiveness of the eDBRC intervention (see Table 2). Data are examined to determine if a meaningful change in the behavior occurred and the degree to which this change can be attributed to the independent variable during a visual inspection of the data (Khang et al., 2010). In visual analysis, level, trend, and variability in the data are examined when evaluating experimental control (Cooper et al., 2007) across all behavior to determine a functional relation between eDBRCs and target behaviors. Median for each condition across target behaviors were used to determine level changes. When discussing level the author used the terms deteriorating and improving. Level changes were considered to be improving if the behavior reduced from baseline levels and were considered to be deteriorating if the levels of behavior increased.
The split middle method was used to determine a therapeutic or non-therapeutic trend (Lane & Gast, 2014). A therapeutic trend refers to a decreasing trend in the data. Conversely, a non-therapeutic trend refers to an increasing trend in the data. As described by Lane and Gast (2014) the split middle method includes, for each condition, splitting the data in half, identifying the mid-date for each half, finding the mid-rate (i.e., the median value on the ordinate), and drawing a line passing through the intersection of the mid-date and mid-rate for each condition. A stability envelope criterion of 80% of data must be within ±30% of the median to be considered stable. The distance from the median is calculated by drawing horizontal lines above and below the median line using the distance from median total to complete your envelope. Once your envelope has been established you calculate the percentage of data points that fall within the stability envelope. If 80% or more of the data fall within the bound of the stability envelope the data is considered to be stable. Stability was determined for each phase from baseline through maintenance.

Statistical analysis (i.e., Tau-U) was calculated to examine effectiveness of eDBRCs on target behavior within phases and between phases. The author calculated Tau-U to show percentage of non-overlap between phases or percentage of data showing improvement between phases (Parker, Vannest, Davis, & Sauber, 2011). Tau-U was calculated for baseline data and phase one data (to detect immediate effect) and baseline data and total intervention (overall effectiveness) data for all target behavior separately. As suggested by Parker et al. (2011), Tau-U is calculated using the formula: \( \tau = \frac{S}{\# \text{ of pairs}} \) where \( S \) represents the Kendall’s rank correlation coefficient. Interpretation of Tau-U is as follows: small effect \(<.65\), medium to high effect \([.66 - .92]\), strong effect \([.93 \text{ to } 1]\) (Parker & Vannest, 2012; Rakap, 2015). A Forest Plot is included to visually represent Tau-U results (see Table 3).

**Reliability, Fidelity, and Validity**

**Preservice teacher participant one.** The first author conducted mean count per interval interobserver agreement (IOA) on 40% of baseline phases on frequency count data collected by the preservice participant one. The first author sat in an inconspicuous spot in the classroom and
independently collected data on the target behavior. At the end of each IOA observation period the first author compared IOA data to the preservice teachers data. Mean count per interval IOA data for baseline were 89.75% across all behaviors (range = 87.5% to 92%). Mean count per interval IOA was also calculated for a minimum of 20% for each intervention, withdrawal, fading, and maintenance phases. Mean count per interval IOA data for intervention, withdrawal, fading, and maintenance phases were 89.2% across all behaviors (range = 72% to 100%).

**Preservice teacher participant two.** The first author conducted mean count per interval interobserver agreement (IOA) on 29% of baseline phases on frequency count data collected by the preservice participant two. The first author sat in an inconspicuous spot in the classroom and independently collected data on the target behavior. At the end of each IOA observation period the first author compared IOA data to the preservice teachers data. Mean count per interval IOA data for baseline were 80.15% across all behaviors (range = 64% to 90%). Mean count per interval IOA was also calculated for a minimum of 20% for each intervention, withdrawal, fading, and maintenance phases. Mean count per interval IOA data for intervention, withdrawal, fading, and maintenance phases were 89% across all behaviors (range = 81% to 96%).

**eDBRC data collection reliability.** Interobserver agreement (IOA) was conducted on 40% of baseline phases on data collected by the preservice participants using mean count per interval. Mean count per interval was used for IOA during intervention. Interobserver agreement data were collected a minimum of 20% for each subsequent phase. The author sat in a discrete section of the classroom and collected data on the target behavior independently. At the end of each observation period the first author compared IOA data to the data collected by the preservice participant. According to Kratochwill et al. (2013) a summary of IOA for a variable must be based on at least 20% of data points within each condition with acceptable values of IOA at ≥ 80%.

**eDBRC implementation integrity.** Treatment integrity is the degree to which the independent variable is implemented as planned (Cooper et al., 2007). The author, using a treatment integrity checklist, determined implementation integrity on a minimum of 20% of intervention phases. A doctoral
candidate naive to the study collected treatment integrity data to calculate IOA for 20% of the treatment integrity observations. IOA for implementation integrity between the author and the doctoral candidate was 100%.

**eDBRC social validity.** The work of Schwartz and Baer (1991) and an adapted version of The Usage Rating Profile-Intervention (Chafouleas, Briesch, Riley-Tillman, & McCoach, 2009) were used to construct social validity measurement tools using Google Forms. The preservice teacher, (see Appendix B), student participants (see Appendix B), and mother of the student participant, (see Appendix B) completed social validity surveys to access the acceptability of the eDBRC intervention. Each social validity survey used a Likert-type scale of one through six (i.e., 1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = somewhat disagree, 5 = disagree, and 6 = strongly disagree). The social validity surveys were adapted from a study conducted by Riden and colleagues (2018).

**RESULTS**

Results suggest improvement across behaviors for all participants. Visual analysis indicates a functional relation between independent and dependent variables. Data from the eDBRC treatment integrity checklist suggests preservice teachers implemented intervention with high levels of fidelity. Treatment integrity results indicate that preservice teachers can implement an eDBRC with high levels of fidelity that results in positive behavior changes for high school students with ASD and ID. Social validity data indicate that the eDBRC intervention is acceptable to preservice teachers, student, and parent(s)/guardian(s) participants.

**Effects of eDBRC on Students Classroom Behaviors**

**Visual analysis.** Visual analysis techniques were employed to evaluate data results. Specifically, level, trend, and variability were inspected to determine if a functional relation exists between independent and dependent variables. Visual Analysis procedures were used to examine effectiveness from initial baseline to the first implementation of intervention, from the first implementation of intervention to withdrawal phase, and from the withdrawal phase to reinstatement of the intervention. Visual analysis procedures were also used to analyze data during fading and maintenance phases.
Level. There was an immediate and considerable decrease in level of off-task behavior from baseline to the first intervention phase for participant one (see Figure 10). During baseline, data indicate off-task behaviors were occurring at a high level (Median = 38). A marked decrease in level occurred when the intervention was introduced (Median = 7). During the second baseline phase there was an increase in level (Baseline₂ Median = 16) and decrease in level when the intervention was reintroduced (Intervention₂ Median = 2). During fading phase one, there was a slight increase in level (Median = 5). Fading phase two resulted in a slight decrease in level (Median = 3). Once off-task behavior was moved to maintenance phase the author saw a slight decrease in level (Median = 2).

Participant one’s data indicate an immediate change in level from the first baseline to intervention phases for talking out behavior (see Figure 11). During baseline, data indicate talking out behaviors were occurring at a high level (Median = 25). A noted change in level occurred when intervention was introduced (Median = 8). During the return to baseline and intervention phases, the author saw an increase in level (Baseline₂ Median = 15), and decrease in level (Intervention₂ Median = 7). During fading phase one, there was a further decrease in level (Median = 3). Fading phase two resulted in a slight increase in level (Median = 6). When talking out behavior was moved to maintenance the author saw a slight decrease in level (Median = 2).

There was an immediate change in level from initial baseline to initial intervention for off-task behavior for participant two (see Figure 6). During baseline, data indicate off-task behaviors were occurring at a high level (Median = 34). The author saw a change in level when intervention was introduced (Median = 10). When intervention was removed the author saw an increase in level (Baseline₂ Median = 26) and saw a drop in level when intervention was reintroduced (Intervention₂ Median = 11). During fading phase one there was a slight increase in level (Median = 12). Fading phase two resulted in a decrease in level (Median = 5). When off-task behavior was moved to maintenance the author saw a slight increase in level (Median = 6).

For participant two there was an immediate change in level from baseline to intervention phase one for non-compliant behavior (see Figure 7). During baseline, data indicate non-compliant behaviors
were occurring at a high level \((Median = 23)\). The author saw a change in level when intervention was introduced \((Median = 10)\). When intervention was removed the author saw an increase in level \((Baseline_2\ Median = 16)\), and saw a drop in level when intervention was reintroduced \((Intervention_2\ Median = 13)\).

During fading phase one there was a decrease in level \((Median = 9)\). Fading phase two resulted in a decrease in level \((Median = 6)\). When non-compliant behavior was moved to maintenance the author saw a decrease in level \((Median = 4)\).

**Trend.** Trend analysis of off-task behavior data for participant one resulted in a non-therapeutic trend during baseline, a therapeutic trend when intervention was introduced, a non-therapeutic trend when intervention was removed, a therapeutic trend when intervention was reinstated, and a therapeutic trend during fading phases one and two. After this behavior was moved to maintenance the author continues to see a therapeutic trend in the data. Trend analysis of talking out behavior for participant one resulted in a non-therapeutic trend during baseline, a therapeutic trend when intervention was introduced, a non-therapeutic trend when intervention was removed, a therapeutic trend when intervention was reinstated, and a non-therapeutic trend during fading phases one and two. After moving behavior to maintenance the author continued to see a therapeutic trend in the data.

Trend analysis of off-task behavior data for participant two resulted in a non-therapeutic trend during baseline, a therapeutic trend when intervention was introduced, a non-therapeutic trend when intervention was removed, a therapeutic trend when intervention was reinstated, a therapeutic trend during fading phase one, and non-therapeutic trend during fading phase two, and a therapeutic trend during maintenance. Trend analysis of non-compliant behavior data for participant two resulted in a non-therapeutic trend during baseline, a therapeutic trend when intervention was introduced, a non-therapeutic trend when intervention was removed, a therapeutic trend when intervention was reinstated, a therapeutic trend during fading phase one, and non-therapeutic trend during fading phase two, and a therapeutic trend during maintenance.

**Variability.** An analysis of baseline data of off-task behavior for participant one indicates a stable baseline. Data during intervention phase one and withdrawal were stable. When intervention phase two
was implemented the data were not stable. During fading phases one and two, the data returned and maintained stability. Visual analysis of maintenance data suggests minimal variability result in a result of not stable. An analysis of baseline data of talking out behavior for participant one indicates a stable baseline. Data during intervention phase one, withdrawal, and intervention phase two were stable. Data were not stable during phase one of fading but returned to stability during the second fading phase. Visual analysis of maintenance data suggests stability in the data for the talking out behavior.

An analysis of baseline data of off-task behavior for participant two indicates a stable baseline. Data during intervention phase one, withdrawal, and intervention phase two were stable. Data were not stable during phase one of fading but returned to stability during the second fading phase. Visual analysis of maintenance data suggests stability in the data for the off-task behavior. An analysis of baseline data of non-compliant behavior for participant two indicates a stable baseline. Data during intervention phase one, withdrawal, and intervention phase two were stable. Data were not stable during phase one of fading but returned to stability during the second fading phase. Visual analysis of maintenance data suggests stability in the data for the non-compliant behavior.

**Effect size analysis.** The author calculated Tau-U scores for all participants and their behavior to determine the effect of the eDBRC intervention on reducing the frequency of target behaviors. Tau-U was calculated per participant per behavior, and as aggregated across participants. Tau-U results for student participant one are as follows: off-task [ES = 1.000, p < .001, CI (95%) = .469 – 1.000]; talking out [ES = .880, p < .001, CI (95%) = .349 – 1.000]. Aggregated Tau-U for student participant one suggests a strong effect on behavior [ES = .940, p < .001, CI (95%) = .409 – 1.000]. Tau-U results for student participant two are as follows: off-task [ES = 1.000, p < .001, CI (95%) = .490 – 1.000]; non-compliance [ES = .872, p < .001, CI (95%) = .362 – 1.000]. Aggregated Tau-U for student participant two suggests a strong effect on behavior [ES = .936, p < .001, CI (95%) = .417 – 1.000]. Overall, there was a calculated strong effect size across behaviors for both student participants [ES = .938, p < .001, CI (95%) = .417 – 1.000].

**Preservice Teachers eDBRC Implementation Fidelity**
Preservice teacher one implemented the intervention with 98.4% fidelity (range = 92% – 100%) during each fidelity probe conducted by the first author. Additionally, a doctoral student naïve to the study conducted treatment integrity reliability data on 20% of treatment integrity sessions conducted by the first author. Reliability was 100%. Preservice teacher two implemented the intervention with 95% fidelity (range = 86% – 100%) during each fidelity probe conducted by the first author. Additionally, a doctoral student naïve to the study conducted treatment integrity reliability on 20% of treatment integrity sessions. Reliability was 100%. Results of treatment integrity data analysis suggest preservice teachers can implement an eDBRC intervention with high levels of fidelity.

**Social Validity of eDBRC**

The preservice participants, the parent(s)/guardian(s) of the student participants, and student participants completed social validity surveys with a Likert scale rated 1 through 6 at the conclusion of the study to assess the usefulness of the eDBRC intervention as well as their attitudes towards its effectiveness and ease of implementation.

**Preservice teacher participants.** After the conclusion of the study, the preservice teacher participants were asked to complete a social validity survey. On the six-question social validity survey, the preservice participants scored all of the questions as Strongly Agree or Agree ($M = 1.33$) lending strength to the social validity of the eDBRC intervention from a preservice teacher’s perspective. See Table 4 for a complete description of preservice teacher participant’s social validity results.

**Student participants.** After the conclusion of the study, student participants were asked to complete a social validity survey with support from the preservice teacher participants. On the six-question social validity survey, the student participants scored all of the questions as Strongly Agree, Agree, or Somewhat Agree ($M = 1.58$) lending strength to the social validity of the eDBRC intervention from a student’s perspective. See Table 5 for a complete description of student participant’s social validity results.

**Parent(s)/Guardian(s) of student participants.** After the conclusion of the study, the parent/guardian participants were asked to complete a social validity survey. On the six-question social
validity survey, the student participants one’s guardian scored all of the questions as Agree or Somewhat Agree ($M = 2.16$) lending strength to the social validity of the eDBRC intervention from a parent or guardian perspective. See Table 6 for a complete description of parent(s)/guardian(s) participant’s social validity results.

**DISCUSSION**

There were three primary purposes of the current study. First, the authors wanted to assess the effectiveness of eDBRCs to reduce challenging and/or disruptive classroom behavior of students with disabilities. Second, this study sought to examine the effectiveness of an eDBRC when implemented by preservice special education teachers. Finally, the author sought to examine the social validity of the eDBRC as rated by students, preservice teacher implementers, and parents. Findings suggest a functional relation between the eDBRC and problem behaviors across both student participants. Both teacher participants consistently implemented intervention with high levels of fidelity. Positive results support previous research on DBRCs in reducing challenging student behavior and promoting positive student behaviors (Lebel, Chafouleas, Britner, & Simonsen, 2013; Williams et al. 2012). Encouraging social validity ratings by preservice and student participants as well as the guardian of one student participant suggest that eDBRCs are an acceptable intervention for all parties involved. The social validity results are highly meaningful as using a DBRC must encourage buy in from teachers, students, and the parents/guardians at home which maximize its effectiveness (Riden et al., 2018).

**Development and Utility of the eDBRC**

The eBMPs that are being implemented across the US and worldwide also include basic principles of ABA but have not been examined on the individual student level. Furthermore, after reviewing the research on eBMPs it is unclear that the basics principles of ABA are being implemented as intended. The author developed the eDBRC with essential components as suggested from DBRC and ABA research. When designing the eDBRC the author focused on five principles of ABA: (1) hypothesizing function of behavior; (2) Premack principle; (3) Reinforcement strategies; (4) Identifying preferred items; (5) systematically fading supports. The author hypothesizes that designing the eDBRC
with empirically sound ABA principles contributed to the effectiveness and support the efficacy of this intervention.

The eDBRC was designed to support new teachers in providing targeted behavior supports to students with challenging and/or disruptive behaviors. Moreover, the author built the eDBRC to examine the efficacy of using technology as a behavior management program to reduce undesirable classroom behaviors. Outcomes of this study support novice special education teachers using eDBRCs effectively to manage classroom behavior.

**Implementation Fidelity**

Implementing evidence-based practices is becoming both a goal and standard across medicine, psychology, and education (Horner, Sugai, & Fixsen, 2017). Fidelity of treatment, or integrity of implementation for interventions, means interventions are used according to predetermined criteria detailing activities, materials, and behaviors so the intervention has the desired effect on students’ behaviors (Smith, Daunic, & Taylor, 2007). Fidelity means the intervention is used true to the way it was originally designed (King-Sears, Walker, & Barry, 2018). Stahmer et al. (2015) state students are more likely to benefit from interventions used as intended, although researchers find many evidence-based practices are not implemented as originally planned.

As such, the authors examined the treatment integrity of eDBRCs as implemented by preservice teachers. The preservice participants had minimal experience working with student with disabilities in a classroom setting and had zero experience as a full time special education teacher managing a classroom and the challenges that accompany it. Due to the lack of experience in the field, the author developed trainings for the participants that would support implementation. During training preservice participants the author implemented the programming common stimuli generalization strategy (Stokes & Baer, 1977) to program the generalization from the training setting to the natural setting (i.e., classroom). Programming common stimuli can be defined as bringing elements used in the training session (e.g., data collection sheets developed to observe student behavior, or games to practice math facts) into the natural setting (classroom), and/or bringing elements of the natural setting into the training session to serve as
discriminative stimuli to facilitate performance of the teaching behaviors across setting (Scheeler, 2008). The author theorizes that programming common stimuli in our training sessions were in part responsible for the high levels of treatment integrity exhibited by the preservice participants though this was not tested for. Implementing interventions as intended strengthens the effects of intervention (Fiske, 2008) and is supported in the research literature (e.g., Arkoosh et al, 2007; Vollmer, Roane, Ringdahl, & Marcus, 1999) and may be one reason for the effectiveness of the independent variable in this study.

Elaborating further on the treatment integrity of intervention by preservice participants the author saw moderate to high levels of treatment integrity in the area of sharing the eDBRC summary sheets with the parent(s)/guardian(s) of the student participants (range = 75% - 100%). Preservice teacher one shared the summary sheet with the student participant’s guardian 100% of the time (16/16 opportunities). The guardian was instructed to review and complete the summary sheet each day. The return rate was 50% for participant one (8/16 opportunities). It is important to note that the student participant was placed in a group home for 5 days during intervention phases, which may have influence, the rate of return. Preservice teacher two shared the summary sheet with the student participant’s guardian 75% of the time (12/16 opportunities). The parent was instructed to review and complete the summary sheet each day. The return rate was 6.25% for participant one (2/16 opportunities). Although the return rate is not ideal and home-school communication is important, intervention was still successful for reducing student two’s challenging classroom behavior.

Social Validity of eDBRC

The use of evaluative feedback from consumers to guide program planning and evaluation is often referred to as the assessment of social validity (Schwartz & Baer, 1991). Assessing social validity is necessary to gain insight as to whether participants enjoyed the intervention and if they are likely to use this intervention in the future. High levels of social validity from the preservice, parent/guardian, and student participants lend support to a highly socially valid intervention that has been shown to be effective in reducing challenging classroom behaviors. The relative simplicity in using the Google platform to implement an eDBRC and the high ratings on social validity surveys adds to the research
literature in using technology to create an effective eBMP. Yet, it is important to note that the author created and prepared all intervention materials for the preservice participants. Therefore, the preservice participants only had to log in to their Google Drive and open the shared folder containing all materials, separated into week, to run the intervention. This may have led to the high social validity ratings from the preservice teacher perspective.

LIMITATIONS AND FUTURE RESEARCH

There are at least four limitations to this study that must be considered and may inform future research on the use of eDBRCs to reduce students’ disruptive and/or challenging classroom behaviors. First, the author began to see variability in the data using visual analysis toward the end of intervention, particularly during fading phases. Due to the reduction in student behaviors our data envelope used to assess stability was extremely thin leading a non-stable result using visual analytic techniques. Second, the author was collecting data in the classroom, which may have produced a Hawthorne effect. The Hawthorne effect refers to study participants understanding that they have been selected to participate in the study, which may alter their behavior (Claus, 2007; Druckman & Swets, 1988). As such, researchers should consider a way to conduct data collection where student and teacher participants are unaware they are being observed. A third limitation was the lack of parental involvement in the eDBRC intervention. Student one was moved to a group home for one week during intervention, during this time no eDBRC were completed by the guardian. Additionally, eDBRCs were completed sporadically during intervention by the parent of the second student participant. Researchers must consider developing contingencies for the parent(s)/guardian(s) to increase their involvement in implementing eDBRCs. Finally, there are instances the author saw a non-therapeutic trend when a therapeutic trend was anticipated. Non-therapeutic trends occurred during fading phases. The author theorizes that this was due to the systematic removal of supports during fading phases. However, the frequency of behaviors never exceeded prior intervention phases. Future research should investigate strategies for fading eDBRC to ensure behavior maintains at low levels as supports are removed.
In education, the list of things that have been demonstrated to work is larger than the list of things being used well (Horner, 2017). The recent emergence of implementation science is recognition that greater appreciation is needed of the complex array of variables that affect the use of new practices (Fisher, Shortell, & Savitz, 2016). With emphasis on implementing interventions as designed, future research should consider how to provide adequate training and strategies to increase treatment integrity when employing an eDBRC. Researchers should engage in component analyses to identify critical features of the eDBRC to ease the implementation of the intervention by classroom teachers. Finally, DBRCs (in this instance eDBRC) are often used to reduce challenging and disruptive behavior or increase desired behaviors. However, researchers should investigate their impact on academic behaviors (e.g., sustained reading, completion of assignment/homework).

**IMPLICATIONS**

There are several implications from this study that may inform future research and practice. There are several how to’s for DBRCs in traditional pen and paper format. The eDBRC in this study was an email that describes student performance and areas for parent and teacher comments. During this study, the eDBRC was developed using a host of Google tools and was completely housed using the same platform. Using Google allowed for free access to technology to create an individualized eDBRC that has been empirically shown to reduce challenging and disruptive classroom behaviors. This is significant as the deluge of companies developing and marketing eBMPs to schools focus on class wide strategies and to date have not been investigated at the individual student level.

Challenging and disruptive student behavior continues to be a struggle for teachers and students alike (e.g., Butler & Monda-Amaya, 2016, Moore et al., 2017). One factor that may impede teachers’ ability to manage classroom behavior is the lack of training of this skill during teacher preparation programs. Several reports have criticized teacher preparation programs for their lack of course offerings in the area of classroom and behavior management (e.g., Greenberg et al., 2013; Oliver & Reschly, 2010). With training eDBRCs can be used by novice teachers to effectively reduce undesirable student behaviors showing that even the most novice educators can be trained to implement behavior reduction strategies.
The author saw this reduction across all participants and behaviors. Although the author did not systematically collect data in classrooms outside of the intervention setting, anecdotal reports from the classroom teachers note that the replacement behaviors generalized to other classes. For example, one of the mentor teachers in the classroom our preservice teacher was working said “I wish you could have seen student one yesterday during art.” “She began to have a meltdown because her paint spilled, but instead of having a full blown meltdown, which she would have previously, she pouted for a moment but then raised her hand to ask for help.” “This is something we did not see prior to preservice participant one working with her.”

Teachers are underprepared to manage student behaviors that impede learning, interfere with instruction, and are a factor in teacher burnout (Butler & Monda-Amaya, 2016). Varying amounts of exposure to strategies and tactics for modifying student behavior leads to variable results in the classroom. However, exposing novice teacher to behavior interventions based on the principles of behavior analysis has been shown in this study to significantly reduce students’ challenging and disruptive classroom behaviors. Therefore, introducing novice teachers to behavior modification strategies, in this case eDBRCs, can have significant impacts on student behavior as well as reducing stressors impacting teachers on a daily basis. The field of behavior management and teacher preparation can benefit from research surrounding high quality training, technology to manage and monitor student behavior, and developing contingencies that evoke desirable classroom behaviors.
REFERENCES


doi:10.1177/0888406416654212 doi:10.3200/PSFL.52.3.51-60


doi:10.1002/pits.10027

doi:10.1177/10983007070090010401

doi:10.1353/etc.2012.0000


Moore, T. C., Wehby, J. H., Oliver, R. M., Chow, J. C., Gordon, J. R., & Mahany, L. A. (2017). Teachers’ reported knowledge and implementation of research-based classroom and behavior


<table>
<thead>
<tr>
<th></th>
<th>Dyad 1</th>
<th>Dyad 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Age</td>
<td>38</td>
<td>22</td>
</tr>
<tr>
<td>Highest Level of Education</td>
<td>B.S. in Elementary Education</td>
<td>B.S. in Secondary Education</td>
</tr>
<tr>
<td>Experience</td>
<td>Substitute Teacher (4 years)</td>
<td>N/E</td>
</tr>
<tr>
<td><strong>Student Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Age</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Grade</td>
<td>11&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>ASD</td>
<td>ID</td>
</tr>
</tbody>
</table>

*Note. ASD = Autism Spectrum Disorder; B.S. = Bachelors of Science; ID = Intellectual Disability; N/E = No Experience*
Table 2

*Results of Visual Analysis*

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Student One</th>
<th>Student Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-task</td>
<td>A₁–B₁ = Improving</td>
<td>A₁–B₁ = Improving</td>
</tr>
<tr>
<td>Talking Out</td>
<td>A₁–B₁ = Improving</td>
<td>A₁–B₁ = Improving</td>
</tr>
<tr>
<td>Level</td>
<td>A₁–B₁ = Improving</td>
<td>A₁–B₁ = Improving</td>
</tr>
<tr>
<td></td>
<td>B₁–A₂ = Deteriorating</td>
<td>B₁–A₂ = Deteriorating</td>
</tr>
<tr>
<td></td>
<td>A₂–B₂ = Improving</td>
<td>A₂–B₂ = Improving</td>
</tr>
<tr>
<td></td>
<td>B₂–F₁ = Deteriorating</td>
<td>B₂–F₁ = Deteriorating</td>
</tr>
<tr>
<td></td>
<td>F₁–F₂ = Improving</td>
<td>F₁–F₂ = Improving</td>
</tr>
<tr>
<td></td>
<td>F₂–M = Improving</td>
<td>F₂–M = Improving</td>
</tr>
<tr>
<td>Trend</td>
<td>A₁ = Non-therapeutic</td>
<td>A₁ = Non-therapeutic</td>
</tr>
<tr>
<td></td>
<td>B₁ = Therapeutic</td>
<td>B₁ = Therapeutic</td>
</tr>
<tr>
<td></td>
<td>A₂ = Non-therapeutic</td>
<td>A₂ = Non-therapeutic</td>
</tr>
<tr>
<td></td>
<td>B₂ = Therapeutic</td>
<td>B₂ = Therapeutic</td>
</tr>
<tr>
<td></td>
<td>F₁ = Therapeutic</td>
<td>F₁ = Therapeutic</td>
</tr>
<tr>
<td></td>
<td>F₂ = Non-therapeutic</td>
<td>F₂ = Non-therapeutic</td>
</tr>
<tr>
<td></td>
<td>M = Therapeutic</td>
<td>M = Therapeutic</td>
</tr>
<tr>
<td>Stability</td>
<td>A₁ = Stable</td>
<td>A₁ = Stable</td>
</tr>
<tr>
<td></td>
<td>B₁ = Stable</td>
<td>B₁ = Stable</td>
</tr>
<tr>
<td></td>
<td>A₂ = Stable</td>
<td>A₂ = Stable</td>
</tr>
<tr>
<td></td>
<td>B₂ = Non-stable</td>
<td>B₂ = Stable</td>
</tr>
<tr>
<td></td>
<td>F₁ = Stable</td>
<td>F₁ = Non-stable</td>
</tr>
<tr>
<td></td>
<td>F₂ = Stable</td>
<td>F₂ = Non-stable</td>
</tr>
<tr>
<td></td>
<td>M = Non-stable</td>
<td>M = Stable</td>
</tr>
<tr>
<td>Functional Relation</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>-----</td>
</tr>
</tbody>
</table>

*Note. A = Baseline Phases A₁ = Baseline/Withdrawal Phase; B = Intervention Phases; B₂ = Intervention Phase 2; F₁ = Fading Phase 1; F₂ = Fading Phase 2; M = Maintenance*
Table 3

Results of Statistical Analysis and Forest Plot

<table>
<thead>
<tr>
<th>Student One</th>
<th>Tau-U ES</th>
<th>95% CI</th>
<th>Forest plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-task</td>
<td>1.00</td>
<td>.4292 &lt; &gt; 1.00</td>
<td></td>
</tr>
<tr>
<td>Talking Out</td>
<td>.8800</td>
<td>.3492 &lt; &gt; 1.00</td>
<td></td>
</tr>
<tr>
<td>Aggregated ES</td>
<td>.9400</td>
<td>.4092 &lt; &gt; 1.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Two</th>
<th>Tau-U ES</th>
<th>95% CI</th>
<th>Forest Plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-task</td>
<td>1.00</td>
<td>.4903 &lt; &gt; 1.00</td>
<td></td>
</tr>
<tr>
<td>Non-compliance</td>
<td>.8723</td>
<td>.3626 &lt; &gt; 1.00</td>
<td></td>
</tr>
<tr>
<td>Aggregated</td>
<td>.9362</td>
<td>.4265 &lt; &gt; 1.00</td>
<td></td>
</tr>
</tbody>
</table>

| Aggregated ES | .9381    | .4719 < > 1.00 |             |

Note. CI = Confidence Interval; ES = Effect Size; Tau-U effect sizes 0.65 or lower = small effect; between 0.66 and 0.92 = medium to high effect; and 0.93 to 1.00 = very high effect
Table 4

*Preservice Teacher Participant Responses to Social Validity Survey*

<table>
<thead>
<tr>
<th>Question</th>
<th>Teacher One</th>
<th>Teacher Two</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>This intervention addresses important behavior(s) of the child.</td>
<td>1</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>I understand how to use the eDBRC.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I could implement this intervention by myself.</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>This is an acceptable intervention strategy for the child’s behavior.</td>
<td>1</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>I saw significant change in the student’s behavior using the DBRC.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Overall this intervention is beneficial for the child.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Averages**

1.16 1.5 1.33

*Note. 1 = Strongly agree; 2 = Agree; 3 = Somewhat agree; 4 = Somewhat disagree; 5 = Disagree; 6 = Strongly disagree*
Table 5

*Student Participant Responses to Social Validity Survey*

<table>
<thead>
<tr>
<th>Question</th>
<th>Student One</th>
<th>Student Two</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>This eDBRC addressed behaviors that are important to me.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I would be excited to use do this again.</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>I could use this strategy in other classrooms.</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>I liked using the eDBRC.</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>I did better in class using the eDBRC.</td>
<td>1</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Overall I feel this intervention has been helpful to me.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Averages</strong></td>
<td>1</td>
<td>2.16</td>
<td>1.58</td>
</tr>
</tbody>
</table>

*Note.* 1 = Strongly agree; 2 = Agree; 3 = Somewhat agree; 4 = Somewhat disagree; 5 = Disagree; 6 = Strongly disagree
Table 6

*Parent(s)/Guardian(s) Participant Responses to Social Validity Survey*

<table>
<thead>
<tr>
<th>Question</th>
<th>Student One</th>
<th>Student Two</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>This intervention addressed important behavior(s) of the child.</td>
<td>2</td>
<td>N/R</td>
<td>N/C</td>
</tr>
<tr>
<td>I understand how to use the eDBRC.</td>
<td>2</td>
<td>N/R</td>
<td>N/C</td>
</tr>
<tr>
<td>This is an acceptable intervention strategy for the child’s behavior.</td>
<td>2</td>
<td>N/R</td>
<td>N/C</td>
</tr>
<tr>
<td>I saw significant change in the student’s behavior using the eDBRC.</td>
<td>3</td>
<td>N/R</td>
<td>N/C</td>
</tr>
<tr>
<td>I found it easy to deliver rewards based on the eDBRC.</td>
<td>2</td>
<td>N/R</td>
<td>N/C</td>
</tr>
<tr>
<td>Overall this intervention is beneficial for the child.</td>
<td>2</td>
<td>N/R</td>
<td>N/C</td>
</tr>
<tr>
<td>Averages</td>
<td>2.16</td>
<td>N/R</td>
<td>N/C</td>
</tr>
</tbody>
</table>

*Note.* 1 = Strongly agree; 2 = Agree; 3 = Somewhat agree; 4 = Somewhat disagree; 5 = Disagree; 6 = Strongly disagree; N/C = Not Calculated; N/R = Not Returned
Tuesday's Daily Report

Here is today's behavior data.

How many times did the student talk out today?
Short answer text

How many times did the student passively look at others today?
Short answer text

How many times was the student off-task today?
Short answer text

Figure 1. Example of Electronic Daily Behavior Report Card
### Daily Behavior Report Card (Daily Summary Sheet)

**Student Name:**

**Date:**

<table>
<thead>
<tr>
<th>Subject/Period</th>
<th>Behavior Goals Met?</th>
<th>Yes / No</th>
<th>To be completed by teacher:</th>
<th>To be completed by parent/guardian:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talk out</td>
<td>-</td>
<td>-</td>
<td>Reviewed student successes</td>
<td>Parent Activities</td>
</tr>
<tr>
<td>Passively Looking</td>
<td>-</td>
<td>-</td>
<td>on eGRBC</td>
<td>Please select yes or no from</td>
</tr>
<tr>
<td>Off-task</td>
<td>-</td>
<td>-</td>
<td>Provided reward at home</td>
<td>the drop down menus below</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>based on goals being met</td>
<td></td>
</tr>
</tbody>
</table>

**Teacher Comments:**

**Parents Comments:**

*Figure 2. Electronic Daily Behavior Report Card Summary Sheet*
<table>
<thead>
<tr>
<th>eDBRC Implementation Treatment Integrity Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student ID# ________________________________</td>
</tr>
<tr>
<td><strong>Upon Arrival</strong></td>
</tr>
<tr>
<td>eDBRC is ready</td>
</tr>
<tr>
<td>Behaviors necessary to earn points discussed</td>
</tr>
<tr>
<td>Behavioral goals for the day set (total number of points to be earned)</td>
</tr>
<tr>
<td>Reinforcer that the student can earn is identified</td>
</tr>
<tr>
<td>Expectations are worded positively</td>
</tr>
<tr>
<td>Teacher checks for eDBRC from previous day. If parent did not fill out eDBRC form, teacher sends an email reminder to the parent</td>
</tr>
<tr>
<td><strong>Throughout the eDRBC Period</strong></td>
</tr>
<tr>
<td>Reviews behavior(s) on the eDBRC at the end of each period</td>
</tr>
<tr>
<td>Assigns point total for behavior demonstrated (what the student earned)</td>
</tr>
<tr>
<td>Reviews points not earned in a neutral tone</td>
</tr>
<tr>
<td>Reviews how the student can earn the point(s) next time</td>
</tr>
<tr>
<td><strong>End of eDBRC Review Period</strong></td>
</tr>
<tr>
<td>Reviews overall performance</td>
</tr>
<tr>
<td>Celebrates success and grants student access to reinforcer if point goal is met</td>
</tr>
<tr>
<td>Maintains neutral affect if points are not earned and reviews behaviors that should be demonstrated next time to earn points</td>
</tr>
<tr>
<td>Reminds student that tomorrow is a new day and the point sheet starts over</td>
</tr>
<tr>
<td>Teacher provides feedback for parents/guardians on eDBRC</td>
</tr>
<tr>
<td>eDBRC is shared with parents/guardians with the student</td>
</tr>
</tbody>
</table>

*Figure 3. Treatment Integrity Checklist*
Figure 4. Frequency count for student Participant One’s off-task behavior. A = Baseline; B = Intervention; F1 = Fading one; F2 = Fading two; M = Maintenance
Figure 5. Frequency count for student Participant One’s talks out behavior. A = Baseline; B = Intervention; F<sub>1</sub> = Fading one; F<sub>2</sub> = Fading two; M = Maintenance
Figure 6. Frequency count for student Participant Two’s off-task behavior. A = Baseline; B = Intervention; F$_1$ = Fading one; F$_2$ = Fading two; M = Maintenance
Figure 7. Frequency count for student Participant Two’s non-compliant behavior. A = Baseline; B = Intervention; F₁ = Fading one; F₂ = Fading two; M = Maintenance
APPENDIX A

Literature Review

Electronic Behavior Management Programs: A Review of the Literature

Benjamin S. Riden

The Pennsylvania State University
ABSTRACT

Electronic behavior management programs (eBMPs) are quickly replacing traditional classroom management systems in classrooms throughout the world. With little evidence supporting them, eBMPs are being used to address classroom management issues for student with and without disabilities. In order to examine the effectiveness of eBMPs the authors review the literature to identify empirical support for eBMPs. The purpose of this literature review and analysis is to summarize findings on the use of eBMPs on disruptive and academic behaviors with students in K-12 academic settings. Ten studies were identified in the literature examining eBMPs with 484 participants across various student characteristics including those with autism spectrum disorder, attention-deficit hyperactivity disorder, specific learning disabilities, other health impairments, low socioeconomic status, disruptive behaviors in kindergarten through eighth grade academic settings. Effect sizes were calculated using Tau-U and Hedges’ g for single case and group design studies respectively, to obtain overall effect for each study. A visual analysis of the identified single case studies was also conducted to examine if a functional relation exists between the independent and dependent variables. Findings suggest that using eBMPs have a range from small to large effects on the academic and disruptive behaviors of students in K through 8th grade academic settings. Implications for research and practice are discussed.

Keywords: behavior management, classroom management, technology, behavior supports, electronic classroom tools
Electronic Behavior Management Programs: A Review of the Literature

Classroom behavior management is the foundation for effective teaching that maximizes time for academic instruction, student engagement, and achievement (Sugai & Horner, 2002). Evertson and Weinstein (2006) broadly define classroom management as the actions a teacher takes to create an environment that supports and facilitates both academic and social-emotional learning. Despite classroom behavior management being the cornerstone that holds a classroom together, teachers report being woefully underprepared to manage problem behavior when they enter the field (Melnick & Meister, 2008; Westling, 2010). Further, issues surrounding behavior management can become so severe that teachers leave the field of education; specifically, classroom teaching positions (Algozzine, Christian, Marr, McClanahan, & White, 2008; Billingsley, Carlson, & Klein, 2004; Butler & Monda-Amaya, 2016).

Challenging and disruptive classroom behaviors not only impact teachers, but also can have a dire impact on the students (Riden, Taylor, Lee, & Scheeler, 2018). Disruptive student behavior fosters a classroom environment that is not conducive to learning, limits time for instruction, and contributes to negative peer interactions in the classroom, and, therefore, creates a cause for concern in schools (Pas, Cash, Brennan, Debnam, & Bradshaw, 2015).

Recently, there has been a shift in traditional classroom management procedures (e.g., token economies, positive and negative reinforcement strategies, surface management techniques) to using technology to encourage positive classroom behavior. One approach for classroom management has been to utilize electronic behavior management programs (eBMPs) to monitor student behavior. Electronic behavior management programs have the potential to benefit teachers, students, and families in several ways. If eBMPs are effective, they may have the ability to reduce problematic student behavior and, at the same time, increase desired behavior, reduce teacher stress and burnout, and facilitate positive home-school communication.

Along with the potential of eBMPs for teachers and their classroom management, there are also pitfalls that users of eBMPs should be aware of. A classroom teacher that is struggling to manage her or his classroom can do a quick search on Google and find thousands of results for electronic behavior
management. The challenge for teachers include knowing if strategies are (a) credible, (b) research-based, and (c) do what they say the will do. When teachers implement interventions that are not evidence-based, there is potential to do significant harm to students.

**The Importance of Behavior/Classroom Management for Students and Teachers**

The short and long term impacts on individuals displaying challenging behaviors and those around them are monumental (Riden et al., 2018). Students with behavior challenges have internalizing and externalizing behaviors that impede social, behavioral, and academic progress, demand teacher attention, and interfere with instruction (Lane, 2007). Behaviors that demand teacher attention can become barriers to effective instruction and social development (Horner, Diemer, & Brazeau, 1992; Horner, Carr, Strain, Todd & Reed, 2002). For students who engage in chronic challenging academic and social behaviors the data are disheartening (Butler & Monda-Amaya, 2016). Problem behaviors exhibited by students can threaten their continued placement in educational settings, interfere with academic and social skill acquisition, generalize to other classrooms or settings, create toxic teacher-student relationships, and may follow them into adulthood (Nietzel, 2010; Pas et al., 2015; Sutherland & Morgan, 2003; Walker, Ramsey, & Gresham, 2004; Wehby, Symons, Canale, & Go, 1998).

Challenging and disruptive classroom behaviors can have far reaching consequences for teachers as well as students. Reports from the field indicate that teachers feel poorly prepared to effectively manage student behavior in classrooms (Coggshall, Bivona, & Reschly, 2012; Melnick & Meister, 2008; O’Neill & Stephenson, 2012). Teachers frequently identify student behavior and classroom discipline as areas of concern and need (Meister & Melnick, 2003; Melnick & Meister, 2008; Veenman, 1984). In fact, the New Teacher Project (2013) reported that teachers self-identified students’ problem behavior as consistent and top concerns in their classrooms. Additional research further highlights teachers’ need for knowledge and support to provide effective interventions for students with the most problematic behaviors (Moore et al., 2017). Teachers are particularly concerned about managing the most problematic student behaviors (e.g., talking out, work completion, following classroom rules). They also described that the classroom management content during their preparation programs focused on ideal classroom
environments where students engage in low rates of problem behavior (Meister & Jenks, 2000). These expressions from teachers emphasize the importance of preparing teachers to use positive behavior supports.

**Positive Behavioral Interventions and Supports**

Evidence-based classroom management practices are available to support educators’ ability to foster positive classroom climates and address the academic and behavior needs of all students, including those with special education needs (Lewis, Hudson, Richter, & Johnson, 2004; Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008). Examples of evidence-based practices include structuring your classroom, implementation of classroom rules and routines, active student engagement, and consequences for appropriate and inappropriate classroom behaviors (Taylor, 2016). In addition to effective instruction, empirically supported classroom management practices, if implemented correctly and consistently, can increase the likelihood of improved student behavior and academic outcomes (Myers, Freeman, Simonsen, & Sugai, 2017). Positive Behavior Interventions and Supports (PBIS) is a universal, school-wide prevention strategy that is implemented in over 26,000 schools in the U.S. and many other countries worldwide (Bradshaw, 2018). PBIS aims to alter school environments by creating improved systems and procedures that promote positive change in student and staff behaviors (Bradshaw, Koth, Bevans, Ialongo, & Leaf, 2008).

In general terms, PBIS refers to the application of positive behavioral interventions and systems to achieve socially important behavior change (Sugai et al., 2000). In the beginning PBIS was as an alternative to aversive interventions used with students with significant disabilities who engaged in extreme forms of self-injury and aggression (Durand & Carr, 1985; Meyer & Evans, 1989). Recently, PBIS has been applied with a wide range of students, in a wide range of contexts (Carr et al., 1999; Horner, Albin, Sprague, & Todd, 1999), and extended from an intervention approach for individual students to an intervention approach for entire schools (Colvin, Kame'enui, & Sugai, 1993; Colvin, Sugai, Good, & Lee, 1997; Todd, Horner, Sugai, & Sprague, 1999).

Even if PBIS is not adopted teachers are able to implement PBIS strategies in their classroom
(Simonsen & Myers, 2015). When classwide positive behavior interventions and supports (CW-PBIS) is implemented in the classroom, it may be referred to as classroom PBIS, positive classroom behavior support, positive and proactive classroom management, or a variety of other synonyms. CW-PBIS includes preventative and responsive approaches that may be effectively implemented with all students in a classroom and intensified to support small groups or a few individual students (Office of Special Education Programs, 2017).

Classwide positive behavior interventions and supports strategies are important tools that can be used to support student behavior in an individual classroom and can be used with or without implementing school wide PBIS (Simonsen & Myers, 2015). Although individual teachers may implement PBIS in their own classrooms regardless of the broader school context, the effects of classroom PBIS strategies are maximized by (a) implementing within a school-wide multi-tiered behavioral framework; (b) directly linking classroom and school-wide expectations and systems; (c) merging CW-PBIS strategies with effective instructional design, curriculum, and delivery; and (d) using classroom-based data to guide decision making. School- and classroom-level supports should be in place to optimize the fidelity and benefits of implementation (Simonsen et al., 2015). In addition to PBIS and CW-PBIS another approach to managing classroom behavior and creating a positive classroom environment is entering classrooms. Technology in schools is abundant as is the call for evidence-based interventions for students who need additional supports to be successful (Bruhn, Vogelgesang, Fernado, & Lugo, 2016). However, there is a dearth of research examining the use of technology based behavior management programs, making the effectiveness of such systems difficult to quantify. Despite limited research supporting them, eBMPs are being implemented in thousands of schools across the globe.

**Electronic Behavior Management Programs**

As technology has advanced, so has the use of technology in the classroom. There is a long history of academic learning adapting to and adopting the technology of the age including the use of records and record players; audiotapes and players; and computers and compact disc read-only memory (CD-ROM) programs (Collins & Halverson, 2010; Tamim, Bernard, Borokhovski, Abrami, & Schmid,
For behavioral/classroom management in schools, most of the strides in technology use have occurred in past 20-25 years. Research that examines technology and behavior management has included the use of pager/vibratory monitors (Moore, Anderson, Glassenbury, Lang, & Didden, 2013) and bug-in-ear technology (Scheeler, McKinnon, & Stout, 2012). More recent technological advances have allowed for the development of the TLE TeachLivETM program which is a mixed-reality, avatar-based simulation environment to prepare teacher candidates or improve the effectiveness of in-service teachers in a lab that provides participants the opportunity to learn teaching skills and craft their practice without placing “real” students at risk during the learning process (Dieker, Rodriguez, Lignugaris-Kraft, Hynes, & Hughes, 2013); as well as, the development of mobile device application (app) or web-based behavior/classroom management systems (e.g., ClassDojo).

Recently education startup companies have begun targeting classroom management procedures using technology to encourage positive classroom behavior and as a viable revenue stream (i.e., a positive money making business). There are no hard and fast rules on defining a startup. However, one key attribute of a startup is its ability to grow, and as a result are designed to scale up (i.e., go from financial losses to profit generating) quickly (Robehmed, 2013). A major concern with startup companies as educational tool generators is their possible focus on bottom line profit. This focus may lead to educational tools that put student outcomes as secondary and profit margins first.

In examining what companies are marketing for schools and school districts in the area of technology-based classroom/behavior management tools, one approach used by education startups is to develop eBMPs to monitor student behavior. Electronic behavior management programs use traditional classroom management procedures (e.g., token economies, positive and negative reinforcement strategies) using technology to encourage positive classroom behavior. Electronic behavior management programs using traditional classroom management procedures have been introduced in classrooms throughout the world as a tool for managing problematic classroom behaviors. These programs have become so popular that two of the largest companies (i.e., ClassDojo, LiveSchool) report their programs being implemented on a large scale (i.e., internationals and nationwide). In fact, one company (i.e., ClassDojo) reports their
program is being actively used in 90% of K-8 schools in the US and in over 180 countries. While there might be potential in using technological programming to support student behavior, the evidence of their effectiveness is unclear.

When searching eBMPs there is no shortage of instructional how-to’s. Robacker, Rivera, and Warren (2016) go into great detail using ClassDojo as a token economy and the implementation procedures, the response cost aspects of the program, as well as providing a vignette about Ms. Zimmerman, a teacher implementing ClassDojo. Along similar lines there are articles that describe the plethora of eBMPs and other technologies teachers can choose from. Cumming (2013) provides a list of 50 possible mobile devices/application that can be used to implement evidence-based practices (EBP) including eBMPs that can be used with students that display disruptive and challenging behaviors. This information is only a few results out of thousands of search results connected to eBMPs. Yet, empirical evidence of their effectiveness is incredibly limited. Only ten studies in the research literature have actually examined eBMPs and the impact on student outcomes. Further, no studies have looked at the quality of studies that did examine eBMPs effect on student outcomes.

**Purpose of Study and Research Questions**

Due to the rapid introduction of eBMPs in schools worldwide the purpose of this study is to answer the following overall research question and sub-questions:

1. Based on published research, what are the results of eBMPs in reducing challenging classroom behavior?
   a. What are the variables of interest in these studies?
   b. How are eBMPs implemented?
   c. How effective are eBMPs on target behaviors?
   d. When examining research studies of eBMPs, how many single-case and group design qualities indicators are met?

**Methods**

**Search Procedures**
Multiple databases were searched for empirical studies examining eBMPs. No date restrictions were imposed on this search. The following electronic databases were used: PsycINFO, Educational Resources Information Center (ERIC), and ProQuest Educational Journals using the following search terms in descriptor field boxes individually or in combination by employing Boolean operators: electronic behavior management, electronic classroom management, class dojo, iReward, behavior tracker pro, goal tracker, iPraiseU, rich kids behavior contract, electronic PBIS, web based PBIS, electronic reward system, web based rewards. Lastly, a hand search of the Behavior Disorders, Journal of Emotional and Behavioral Disorders, Journal of Special Education Technology, Contemporary Issues in Technology and Teacher Education, Journal of Research on Technology in Education

The initial search resulted in identification of 559 articles. Ancestral search of identified articles resulted in four additional article qualifying for our review. Titles, abstracts, and methods sections of identified articles were examined; reducing the number of identified articles to 54. From the 54 articles identified two single-case research design articles and four group design articles, and four dissertations meeting inclusion criteria in this review and analysis (n = 10). Figure 1 displays a flow diagram showing our search procedures using the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA; Moher, Leberati, Tetzlaff, & Altman, 2009).

**Inclusion and Exclusion Criteria**

The following inclusion and exclusion criteria was used to identify viable articles that qualified for this review: (a) investigate electronic behavior management systems used with academic and behavioral outcomes for students in academic settings, (b) use group, or single-case research designs, (c) participants in Pre-K through 12th grade, academic settings, (d) explicitly describe the use of electronic behavior management systems, (e) published in English language peer-reviewed journals. Articles were excluded if they did not: (a) explicitly investigate electronic behavior management systems, (b) use empirical group, or single case-research designs, (c) involve Pre-K through 12th grade academic settings.

**Study Coding**
Included studies were coded based on number of participants, descriptive characteristics of participants (e.g., age, gender, ethnicity), independent and dependent variables, academic settings (i.e., general education, special education), behavior principles (e.g., positive reinforcement, response cost), research design (i.e., single-case research, group research), length of intervention, person implementing intervention (e.g., peer, school psychologist, etc.), feedback (i.e., provided; not provided), and outcomes (e.g., off-task, engaged). Participants, independent, and dependent variables were coded verbatim using the number of students reported in each study and descriptive information, respectively. Student characteristics from each study were coded based on their individual characteristics (i.e., ethnicity, gender, grade level, age, disability or area of need). Two classroom settings were identified as where DBRCs were being implemented (i.e., general education classrooms; special education classrooms). Based on the studies qualifying for this review, four grade levels were identified (i.e., Pre-K, elementary, middle, and high school). Lastly, each study was identified as either a group or single case research design.

**Data Extraction and Analyses**

Data were systematically extracted from group design and single case design studies as appropriate. Data were extracted from graphs in identified single-case research design studies using the Web Plot Digitizer (Rohatgi, 2015) web-based application. The Web Plot Digitizer allows data to be extracted and digitized from existing plot images to reduce error in extracting numerical data (Riden, 2017). Text and data tables for each group design study were examined for data extraction of means, standard deviations, and number of participants.

Data analyses were conducted for single case and group design studies as appropriate for comparison between studies by type. Group design study data were used to calculate Hedges’ g effect sizes. Hedges’ g was used to account for the overestimation that occurs when calculating effect size using studies with small sample sizes (Hedges, 1981). Hedges (1981) and Ellis (2009) suggest calculating Hedges’ g using the formula:
Hedges’ $g$ effect sizes can be interpreted using the following criteria: .50 or lower: small effect; between .50 and .80: medium effect; .80 to 1: large effect (Cohen, 1988).

For studies that used single case design methodology, two types of data analyses were conducted (i.e., visual analyses and Tau-U effect size analyses). Visual analysis of data is the process for reaching a judgment about reliable or consistent intervention effects by visually examining graphed data (Kazdin, 1982). Specifically, visual analyses of graphs were conducted for level, trend, and variability using parameters set by Lane & Gast (2014). Means for each condition for all graphs provided in identified single case studies to determined level changes, split middle to determine trend, and calculated a data envelope to determine stability (Lane & Gast, 2014). Data were considered stable if 80% of the data points fell within 25% of the median. Effect sizes for single case studies were calculated using the Tau-U measure (Parker, Vannest, Davis, & Sauber, 2011; Vannest, Parker, & Gonen, 2011). For each study, one overall effect size was calculated regardless of design. Data for baseline and intervention were entered into the Tau-U effect size calculator to determine effect sizes for each participant. Once effect sizes were obtained for each participant effect sizes were aggregated for all participant to obtain an over all effect size for each study. Tau-U is used to show the percentage of non-overlap between phases or percentage of data showing improvement between phases. Tau-U was calculated as suggested by Parker, Vannest, and Davis (2011) using the formula:

$$\text{Tau-U} = \frac{S}{\# \text{ of pairs}}$$

The number of pairs is calculated as the product of two Phase Ns and Kendall’s rank correlation outputs Kendall’s score representing S in the formula (Parker et al., 2011). Tau-U scores can be interpreted using the following criteria: .65 or lower: weak or small effect; between .66 and .92: medium to high effect; and .93 to 1: large or strong effect (Parker & Vannest, 2012; Rakap, 2015).

Research Quality Indicators
Each study was examined for quality research indicators. In order to assess single-case quality indicators, a rubric was created based on suggestions from Horner, Carr, Halle, McGee, Odom, and Wolery (2005). Indicators included examining descriptions of participants and settings, dependent variables, independent variables, baseline procedures, internal validity, external validity, and social validity (Horner et al., 2005). Group design articles identified in this review were examined individually using essential and desirable quality indicators presented by Gersten, Fuchs, Compton, Coyne, Greenwood, and Innocenti (2005). Using the Gersten et al. (2005), a rubric was created to assess the quality of group design articles. Group design quality indicators are used to evaluate articles by included descriptions of participants, independent and dependent variables, and the results presented in the study. Gersten et al. (2005) suggested that quality indicators are to be used to define acceptable and high quality research proposals and studies.

**Inter-coder Agreement**

Two doctoral students contributed to inter-coder agreement in four areas: literature search procedures, data extraction, effect size analysis, and research design quality indicators. A doctoral student was trained who was blind to the purpose of the study on the literature search procedures in order to independently identify articles meeting search criteria. Initial agreement on article identification was 80% after further discussion and training 100% agreement was met.

The author trained a second doctoral student who was blind to the data extraction procedures for group and single-case research design. Five randomly selected studies (50%) were identified to conduct independent data extraction. Initial agreement on group design data extraction reached 100% (2/2 agreements). Reliability results had to be within +/- .05 with the Web Plot Digitizer (Rohatgi, 2015). Initial agreement on single-case research data extraction resulted in 100% (3/3 agreements) agreement. A doctoral student also co-calculated effect sizes on the same three randomly selected studies using Tau-U and Hedge’s g as appropriate. Initial agreement was 100%.

The same doctoral student was trained on coding research design quality indicators procedures. Initial agreement on single case research design quality indicators reached 100% (7/7 agreements). Initial
agreement on single case research design quality indicators reached 100% (21/21 agreements). Initial agreement on group design articles reached 95% (39/41 agreements).

**Results**

Ten studies were identified to determine the impact of eBMPs on student classroom behavior. Identified articles were summarized for review by their eBMPs characteristics, participant characteristics, dependent variables, independent variables, and the number of quality indicators met for single-case and group designs.

**Variables of Interest from eBMPs Research Studies**

**Study characteristics.** Descriptive statistics were calculated for the following study characteristics: participants, disability category/area of concern, dependent variables, independent variables, academic setting, research design, and grade level. Across all qualifying studies, 484 participants were identified as having disabilities or behavior concerns in K through eighth grade academic settings. See Table 1 for characteristics of research studies.

**Research methodology.** We identified six (60%) single-case research design studies (Bruhn et al., 2015; Bruhn et al., 2016; Dadakhodjaeva, 2017; Dillon, 2016; Lynne, 2016; Sager, 2017) and four (40%) group design studies (Chiarelli et al., 2015; Krach et al., 2017; MacLean-Blevin, 2013; Williams et al., 2012), for review.

**Setting.** Settings for the 10 studies include: general education (70%), special education (10%), self-contained (10%) classrooms in elementary and middle school. One study (10%) did not specify a setting.

**Dependent variables.** Dependent variables in the studies that use single-case research designs included academically engaged behavior (40%), disruptive behavior (20%), talk outs (10%), out of seat (10%), vocalizations (10%), and positive behaviors (10%). Dependent variables in group design studies included positive/negative/neutral notations by teachers (10%), working quietly (10%), focusing on work (10%), using classroom resources (10%), double checking work (10%), asking questions (10%), carefully reading directions (10%), orientation to teacher (10%), conversations with others (10%), appropriate
conversations with teachers (10%), prompted statements to teacher (10%), unprompted statements to teacher (10%), mumbled/jumbled speech (10%), interruptions (10%), perseverative speech (10%), talking out (20%), vocalizations (10%), out of seat (10%), touching others (20%), following directions (10%), off-task (10%), and being kind (10%).

**Participant characteristics.** Based on disability, eligibility, and/or identifying characteristics, the studies yielded the following results: seven studies (70%) examined students with ADHD; two (20%) studies examined eligible individuals (both studies were conducted in non-categorical states); one (10%) study examined students with learning disabilities, low socioeconomic status, or struggling behaviorally; one (10%) study examined students with emotional disturbance two studies (20%) examined students with speech and language needs three studies (30%) examined students with specific learning disabilities; two (20%) examined students with other health impairments; two (20%) studies examined students with autism spectrum disorder, one (10%) study examined students with disruptive behavior; one (10%) study included zero students with disabilities or behavior. See Table 2 for Descriptive statistics of participant characteristics (i.e., gender, race) on a study-level basis.

**Implementation of eBMPs in Research Studies**

Seven studies (70%) identified for review implemented ClassDojo as an eBMPs (Chiarelli et al., 2015; Dadakhodjaeva, 2017; Dillon, 2016; Krach et al., 2017; Lynne, 2016; MacLean-Blevins, 2013; Saeger, 2017). Studies that implemented ClassDojo used similar procedures including the teacher creating an account with ClassDojo, uploading class rosters, choosing student avatars. Students personalized their avatars and identified classroom behavior with support from the teacher that would be used as their classroom behavior plan. The teacher assigned or deducted points using sounds built into the program contingent on classroom behaviors. In the studies using ClassDojo the sound was a ring, ding, or buzz and this is what the author considered feedback.

Two studies (20%) used a program called SCORE IT as an eBMP (Bruhn et al., 2015; Bruhn et al., 2016). In these studies students would meet with their teacher after each classroom activity (i.e., whole group, small group, independent reading, computer). During this meeting students would rate
themselves on a Likert-type scale using an iPad. Their teacher would follow the same procedure. Once both parties rated performance they would sit down and compare ratings. Following the comparison the teacher would provide specific praise, corrective feedback, or directions for future behavior. Providing specific praise, corrective feedback, and direction for future behavior is a critical component of SCORE IT.

One study (10%) used electronic daily behavior report cards as their eBMP (Williams et al., 2012). During the intervention period, each evening prior to a school day, parents were instructed to e-mail a blank DBRC to the teacher. This email served as a prompt to implement the DBRC for the teacher. The following day, teachers would reply to the parents’ e-mails with a completed DBRC indicating students’ behavioral performance. Teachers would evaluate the students’ behaviors and parents would provide consequences based on the teacher report. Parent-selected-daily consequences included praise, rewards (e.g., small toys, food items, adult attention, etc.), and punishments (e.g., loss of privileges).

Effectiveness of eBMPs in Research Studies

We determined the effectiveness of eBMPs on a study-by-study basis. Two types of analyses were conducted for single case studies (i.e., visual analysis and Tau-U statistical effect size analysis) to determine effectiveness of studies. Group design studies were evaluated using Hedges’ g effect size analysis.

Single case research studies.

Visual analysis. Using visual analysis we see variability in functional relations in the data of identified studies. Only one study did not show a functional relationship. Two studies (Dillon, 2016; Dadakhodjaeva, 2017) show a clear functional relation. Two studies show a functional relation for some participants and no functional relation for other participants (Bruhn et al., 2016; Lynne, 2016). One study (Bruhn, Vogelgesang, Schabilion, Waller, & Fernando, 2015) suggests no clear functional relation. See Table 3 for a detailed summary of visual analyses areas of level, trend, and variability.

Tau-U analysis. We calculated Tau-U for five of the six single-case research design studies. Results indicate that eBMPs investigated using single-case research methodologies have a small to large
effect on student’s classroom behavior (range = .65 - .99). Study level effects were small for one study (Tau-U = .65) and medium to high for two studies (Tau-U = .75 and .78). Two studies had large effect (Tau-U = .96 and .99).

**Group design studies.**

*Hedges’g.* Study-level effect sizes were small-to-medium. Williams et al. (2012) had a small effect size of 0.47. Krach et al. (2016) had a large effect size of .85. Effect sizes for the remaining group design studies were unable to be calculated because studies did not provide means, standard deviations, or number of participants. For effect size results see Table 4.

**Quality of eBMPs Research Studies**

**Single-case design research quality indicators.** Quality indicators focus on clearly describing participants, settings, dependent variables, independent variables, and baseline data (Riden et al., 2018). Single-case researchers must also engage in and document experimental control/internal validity, external validity, and social validity (Horner et al., 2005). Five studies (Bruhn et al., 2015, 2016; Dadakhodjaeva, 2017; Dillon, 2016; Lynne, 2016) met all quality indicators while one study (Saeger, 2017) failed to meet four quality indicators (i.e., adequately describing baseline procedures, establishing experimental control/internal validity, controlling for external validity, assessing social validity). A detailed summary of quality indicators met for single-case research studies identified in this review is included in Table 5.

**Group design research quality indicators.** For the four studies with group research designs, we used two categories of quality indicators (i.e., essential and desirable). Included in essential quality indicators is the clear description of participants, the implementation of the intervention and description of comparison conditions, outcome measures, and data analysis (Gersten et al., 2005). Desirable Quality Indicators include the reporting of attrition rates among intervention samples, conducting internal consistency reliability, test-retest reliability, and interrater reliability, addressing outcomes for intervention effects, presenting evidence of criterion-related and construct validity, assessing fidelity implementation, documenting the nature of instruction, including audio or video recording that captures the nature of the intervention, and presenting results in a clear, coherent fashion (Gersten et al., 2005).
One group design studies identified in this review met the standards to be considered a high quality group design study (Krach et al., 2015). A detailed summary of quality indicators met for group design research studies identified in this review is included in Table 6.

**Discussion**

The purpose of this review was to analyze the body of literature to determine how effective eBMPs are in reducing challenging classroom behavior. We calculated effect sizes to provide information on the effectiveness of eBMPs for students considered having disruptive classroom behavior and academic behavior. There was variability in the development and implementation of eBMPs based on the research studies that qualified for this review and analysis, three components became apparent: defining target, feedback provided to students, and reinforcement contingent on desired behaviors. Additionally, the authors of the identified articles implemented eBMP intervention with a variety of disruptive and academic behavior. Based on the results of the identified studies it can be concluded that eBMPs have a moderate to large impact for students in general and special education settings.

Overall, the efficacy of eBMPs in the 10 studies in this review was variable. Single-case studies ranged in effectiveness \( \text{range} = .65 - .99 \). Three studies (Bruhn et al., 2015; Dadakhodjaeva, 2017; Lynne, 2016) demonstrated a medium to high effect and two studies (Bruhn et al., 2016; Dillon, 2016) demonstrated a large effect. We were unable to calculate effect size for Saeger (2017) due to graphical data being omitted. We were able to calculate effect size for two identified group \( \text{range} = .47 - .85 \). This was due to authors omitting means, standard deviations, or number of participants. We believe one of the big findings of this literature review is variability in development and implementation. Variability in the size of effects and intervention efficacy of the 10 eBMP studies that we reviewed may be related to variability in implementation of eBMPs that investigators used in these studies as well as the quality of the research conducted by researchers.

Based on the identified studies, the results show that eBMPs have been primarily researched with general education elementary age students identified as having a disability or as having challenging classroom behavior. However, two studies examined secondary age students with ADHD or were
considered an eligible individual (Bruhn et al., 2015, 2016). The majority of participants were considered as having disruptive classroom behavior or challenging academic behaviors. No studies examined the use of eBMPs with students in high school. Without information on high school students it is not possible to generalize results to students in that stage of their academic careers.

**Implementation of eBMPs**

*ClassDojo.* Studies that implemented ClassDojo (Chiarelli et al., 2015; Dadakhodjaeva, 2017; Dillon, 2016; Krach et al., 2017; Lynne, 2016; MacLean-Blevins, 2013; Saeger, 2016) followed similar processes when setting up the programs in their classroom. First the teacher created an account on the ClassDojo website. Next the teacher uploaded the class roster. The ClassDojo program or the teacher assigned avatars. Avatars are characters in ClassDojo that represent the students in the class. Students then personalized their avatars and with teacher guidance identified behaviors to be part of the classroom behavioral plan (e.g., following directions, being kind and helpful, whisper/talking low while working with buddy). Then icons were chosen to represent each of the identified behaviors. Next, sounds were selected for positive and negative behaviors (i.e., ring or ding for positive, a buzz for negative). Points were added and subtracted based on student behavior entered into the eBMP by the teacher. Feedback was provided to the class via the sounds; however there were times when students did not know who received the positive or negative sound.

Additionally in ClassDojo the teacher can choose to display the system to the class. An icon on the displayed screen tells what behavior the buzz or ding rewarded or "redirected" (Chiarelli et al., 2015). Teachers are able to use a computer or smart phone to keep track of student behavior and award points. Classroom rules poster can be developed for each classroom after teacher consultations; the rules consistent of the behavioral expectations in accordance target behaviors.

The challenge here is that students may not know who was responsible for the points being awarded or deducted. We see this as a potential pitfall for managing challenging classroom behaviors. Prior research shows that feedback should be immediate, specific, positive, and corrective to be effective and efficient (Scheeler et al., 2004; Stormont & Reinke, 2014). Researchers using ClassDojo were not
specific, positive, or corrective feedback as identified by Van Houten (1980) who states feedback is organized into three categories: (a) the nature of the feedback, (b) the temporal dimensions of feedback and (c) who delivers the feedback.

**SCORE IT.** SCORE IT was implemented in two studies (Bruhn et al., 2015; Bruhn et al., 2016). Teachers and students used this eBMP to monitor and evaluate student adherence to classroom expectations (i.e., be respectful, be responsible, be ready). After each instructional rotation (i.e., whole group, small group, independent reading, computer), students met with their teacher who had the iPad. On the first screen, the users are asked if they are a teacher or student. The students select their name on the screen. Depending on which instructional rotation they had just completed, they selected the corresponding icon. This brought them to a screen listing the three expectations. They rated themselves on a Likert-type scale (0 = never, 1 = a little, 2 = sometimes, 3 = a lot, and 4 = always) on how they met classroom expectations (Bruhn et al., 2015). Once they completed their rating, the teacher followed the same procedures (but selecting teacher rather than student) and rated the students’ behavior. By touching an icon on the screen, the teacher and students could view both scores simultaneously as student ratings were outlined in orange and teacher ratings were outlined in green. Then, based on these ratings, the teacher provided the students feedback about their behavior. Feedback was in the form of specific praise (e.g., “You did a great job staying on task”), correction (e.g., “You were not doing a good job of listening while I was giving directions”), or directions for future behavior (e.g., “Keep up the good work;” “Make sure to raise your hand next time”). At the end of the class period, the teacher and students viewed a graph of their data for the day (Bruhn et al., 2015; Bruhn et al., 2016).

Behavior specific praise (BSP) is defined as praise that is contingent on a targeted behavior or processes used by a student (Markelz & Taylor, 2016). Teachers can deliver BSP to students by providing verbal statements directly referencing the behavior being reinforced contingent on the student engaging in the behavior (Riden, 2017). BSP is a consistently effective teaching strategy connected to improved student behaviors (Brophy, 1981; Rose & Church, 1998).
e-DBRC. One study (Williams et al., 2012) implemented an electronic daily behavior report card as their eBMP. During the intervention period, each evening prior to a school day, parents were instructed to e-mail a blank daily behavior report card (DBRC) to the teacher. This parent initiated action served as a prompt to implement the DBRC for the teacher. The following day, teachers would reply to the parents’ e-mails with a completed DBRC indicating students’ behavioral performance. That is, teachers would globally evaluate the level of students’ behaviors. Then, parents would provide consequences based on reported behavioral performance. Parent-selected-daily consequences included praise, rewards (e.g., small toys, food items, adult attention, etc.), and punishments (e.g., loss of privileges). Parents were asked to carbon copy, CC, all e-mailed correspondence to the investigator daily (Williams et al., 2012). The procedures for implementing an eDBRC by Williams et al. (2012) align with previous research on daily behavior report cards (Atkeson & Forehand, 1979; Barth, 1979; Riden et al., 2018; Vannest, Davis, Davis, Mason, & Burke, 2010).

Quality of Research Studies

Single-case quality indicators are used to judge the quality of single-case research (Horner et al., 2005). Using the single-case research quality indicators presented by Horner et al. (2005), five of the six single-case research studies (Bruhn et al., 2015; Bruhn et al., 2016; Dadakhoodjaeva, 2017; Dillon, 2016; Lynne, 2016) met all quality indicators. One study (Saeger, 2017) only met three quality indicators. Saeger (2017) did not clearly describe baseline procedures, establish experimental control or internal/external validity, and failed to assess for social validity in their study on eBMP. Definition of the baseline condition should be sufficiently precise to allow replication of the condition by other researchers (Horner et al., 2005). The researchers failed to document three demonstrations of experimental effect, which is needed to establish experimental control. Additionally, the research did not engage in replication across participants or conditions that is needed to establish external validity. Finally, it is important to assess for social validity to ensure the behaviors we are identifying for intervention have high social importance, can be implemented by typical intervention agents, and that procedures are acceptable, feasible, effective, and will be used after supports are removed (Horner et al., 2005).
Gersten et al. (2005) suggested eight quality indicators for group design research studies with four described as “essential indicators” and four described as “desirable indicators.” In order to be considered acceptable quality, a research proposal or study would need to meet all but one of the “essential indicators” and demonstrate at least one of the “desirable indicators” (Gersten et al., 2005). To be considered high quality a study would need to meet all but one of the “essential indicators” and demonstrate at least four of the “desirable indicators” (Gersten et al., 2005). Only one (Krach et al., 2017) of the four group studies identified for review met the required number of quality indicators to be considered high quality group design studies. The remaining studies failed to meet the requirements to be considered acceptable or high quality research studies. This is due to a failure to adequately describe participants, a vague description of the independent variable, the use of inappropriate data analysis procedures, lack of participant and implementation fidelity description in the essential indicators, no effect size reported, a lack of reporting of attrition rates in the study, a failure to adequately measure dependent variables, no information on fidelity implementation, no audio or video excerpts and/or clearly present results. It is necessary for researchers to adhere to the quality indicators set forth by Gersten et al., (2005) because the indicators are the standards that we use to determine if an intervention is to be considered evidence-based.

**Limitations of This Review**

We identified four limitations in our review of eBMPs. The first limitation is the small number of total studies (N = 10) that constituted the database for our analytic review and, in particular, having only four studies that qualified in the category of group design. Having only group design studies makes it challenging to generalize our findings to a larger population. Our second limitation was that we did not contact authors of the 10 studies to request raw data. Instead, we used the Web Plot Digitizer (Rohtagi, 2015), for purposes of calculating effect sizes for the single case studies. Using the Web Plot Digitizer to extract data from the single case graphs prevents getting an accurate data point. We extracted data from group design articles. However, contacting the authors for their data would have allowed us to do our own analysis. Third, as descriptive statistics of the independent variables indicate, there is variability between
implementation of the independent and dependent variables identified in the literature making
generalization difficult. Additional studies with similar methodologies would have made comparisons
between studies more reliable. Finally, we were unable to calculate effect sizes for three studies due to a
lack of data presented in the studies. Because of these limitations effect size results should be interpreted
with caution.

**Implications for Future Research and Practice**

Four areas of weakness were identified in the most current research. First, there was variability in
the independent variables across studies providing no clear-cut standard for implementing eBMPs.
Second, there was high variability in the dependent variables, which makes it challenging to identify the
most effective uses of eBMPs. Third, given the range of effectiveness (i.e., small to large) future
investigations should examine what populations DBRCs are most effective and if pairing DBRCs with
other strategies (e.g., self-monitoring, goal setting) might increase their effectiveness. Finally, the quality
of group design research conducted investigating various eBMPs calls into question the results presented
in the identified studies. Only one study (Krach et al., 2017) met standards to be considered a high quality
research study. The remaining group studies failed to meet high quality standards.

Results of this review demonstrate eBMPs have the potential to be an effective method of
intervening with academic and disruptive student behaviors. However, the implementation of eBMPs is
shown to be variable in this review. Based on the results of this review:

1. Behaviors used in eBMPs should be clearly defined.
2. Performance feedback should be provided to students on the behavior.
3. Feedback should be immediate, specific, and corrective.
4. Reinforcement must be delivered contingent on student performance.

Future research should continue to examine the effects eBMPs for students’ with disruptive
academic behavior. An exploration of barriers to implementing eBMPs with fidelity should be conducted
in order for eBMPs to be more effective for students with disruptive behavior in academic settings.
Reducing variability on how eBMPs are implemented can tell us what steps are needed to ensure a positive outcome for students. Additionally, researchers must adhere to the highest standards of our practice to ensure studies are being run with fidelity. If researchers engage in high quality research it increase the believability of the intervention effects. Finally, no studies examined the effectiveness of eBMPs in a high school setting. An investigation of eBMPs is warranted to examine impacts with student in high school settings.

To our knowledge, this is the first literature review examining eBMPs and their impact on school age children. At the rate educational startups are developing educational tools that are being adopted large scale it is imperative to ensure these products are vetted appropriately. The aim for many startups is to scale up quickly and make money. The aim for educators and educational researches is to ensure students are safe, provided with academic opportunities, and supported in their learning during academic careers and beyond. The task falls to us to ensure programs that are being implemented in schools with children are based in credible evidence.
References

References marked with an asterisk indicate studies that qualified for our review.


doi:10.1177/001440290407000305


doi:10.1177/0888406416654212
doi:10.3200/PSFL.52.3.51-60

Carr, E. G., Horner, R. H., Turnbull, A. P., Marquis, J. G., Magito McLaughlin, D., McAtee, M. L., 


programs for support and accountability.* Washington, DC: National Comprehensive Center for Teacher Quality. Retrieved from

Erlbaum Associates.


Colvin, G., Kameenui, E. J., & Sugai, G. (1993). Reconceptualizing behavior management and school-


emotional and behavioral disorders: A proposed approach and brief review of current practices.

*Behavioral Disorders, 29, 247–259.


doi:http://dx.doi.org.ezaccess.libraries.psu.edu/10.1007/s10864-013-9180-6


doi:10.1016/j.jsp.2014.12.005


Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and


TABLES AND FIGURES

Figure 1. PRISMA flow diagram of search process
Table 1

**Descriptive Variables of Interest in Electronic Behavior Management Programs Studies**

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Number of Participants</th>
<th>Disabilities / Areas of Concern</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Academic Setting</th>
<th>Research Methodology</th>
<th>Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruhn et al., (2016)</td>
<td>2</td>
<td>ADHD, EI</td>
<td>AE, DB</td>
<td>Score It</td>
<td>1 – Not specified 2 – SPLED</td>
<td>Single-case</td>
<td>7th, 8th</td>
</tr>
<tr>
<td>Bruhn et al., (2015)</td>
<td>2</td>
<td>ADHD, EI</td>
<td>AE, DB, TO</td>
<td>Score It</td>
<td>Not specified</td>
<td>Single-case</td>
<td>6th, 7th</td>
</tr>
<tr>
<td>Chiarelli et al., (2015)</td>
<td>24</td>
<td>LD, Struggling, Low SES</td>
<td>FD, TO, Hands to self, OT, Being kind</td>
<td>ClassDojo</td>
<td>Self-contained</td>
<td>Group</td>
<td>1st</td>
</tr>
<tr>
<td>Dadakhodjaeva (2017)</td>
<td>60</td>
<td>ADHD, ED, SL, SLD, OHI</td>
<td>AEB</td>
<td>ClassDojo</td>
<td>GE</td>
<td>Single-case</td>
<td>6th</td>
</tr>
<tr>
<td>Dillon (2016)</td>
<td>74</td>
<td>ADHD, ASD, SLD</td>
<td>OS, V</td>
<td>ClassDojo</td>
<td>GE</td>
<td>Single-case</td>
<td>5th</td>
</tr>
<tr>
<td>Lynne (2016)</td>
<td>65</td>
<td>ADHD, ASD, OHI, SL, SLD</td>
<td>AEB</td>
<td>ClassDojo</td>
<td>GE</td>
<td>Single-case</td>
<td>1st, 4th</td>
</tr>
<tr>
<td>MacLean-Blevins (2013)</td>
<td>23</td>
<td>ADHD</td>
<td>Working quietly, Focusing on work, Using classroom resources, Double checking work, Asking</td>
<td>ClassDojo</td>
<td>GE</td>
<td>Group</td>
<td>3rd</td>
</tr>
<tr>
<td>Study</td>
<td>N</td>
<td>Disorder</td>
<td>Context</td>
<td>Behaviors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>----</td>
<td>----------</td>
<td>---------</td>
<td>----------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saeger (2017)</td>
<td>19</td>
<td>ADHD</td>
<td>Positive behaviors</td>
<td>ClassDojo, GE, Single-case, 2nd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Williams et al.,</td>
<td>46</td>
<td>DB</td>
<td>Talking out, Making noise, Out of seat, Touching others</td>
<td>E-DBRC, GE, Group, 1st, 3rd, 4th, 5th</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* ADHD = Attention Deficit Hyperactivity Disorder; AE = Academic engagement; AEB = Academically engaged behavior; ASD = Autism Spectrum Disorder; DB = Disruptive behavior; ED = Emotional Disturbance; E-DBRC = Electronic Daily Behavior Report Card; EI = Eligible individual; FD = Following direction; GE = General education; LD = Learning Disability; MB = Multiple baseline; OHI = Other Health Impairment; OS = Out of seat; OT = Off-task; PO = Playing with objects; SL = Speech and Language; SLD = Specific Learning Disability; SPLED = Special education; TO = Talk out; V = Vocalizations
Table 2

*Descriptive Statistics of Participant Characteristics*

<table>
<thead>
<tr>
<th>Author</th>
<th>Number of Participants</th>
<th>Gender</th>
<th>Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruhn et al., (2016)</td>
<td>2</td>
<td>1 Male; 1 Female</td>
<td>1 White; 1 not specified</td>
</tr>
<tr>
<td>Bruhn et al., (2015)</td>
<td>2</td>
<td>2 Males</td>
<td>2 White</td>
</tr>
<tr>
<td>Chiarelli et al., (2015)</td>
<td>24</td>
<td>16 Males; 5 Females</td>
<td>9 White; 5 African American; 8 Hispanic; 2 Multiracial</td>
</tr>
<tr>
<td>Dadakhodjaeva (2017)</td>
<td>60</td>
<td>26 Males; 34 Females</td>
<td>1 White; 55 African American; 1 Asian; 1 Pacific Islander; 1 Hispanic</td>
</tr>
<tr>
<td>Dillon (2016)</td>
<td>74</td>
<td>81 Males; 32 Females</td>
<td>47 White; 26 African American; 1 Multiracial</td>
</tr>
<tr>
<td>Krach et al., (2017)</td>
<td>169</td>
<td>81 Males; 75 Females; 13 Gender not reported</td>
<td>169 African American</td>
</tr>
<tr>
<td>Lynne (2016)</td>
<td>65</td>
<td>33 Males; 32 Females</td>
<td>62 White; 2 African Americans; 1 Hispanic</td>
</tr>
<tr>
<td>MacLean-Blevins (2013)</td>
<td>23</td>
<td>11 Males; 12 Females</td>
<td>Not reported</td>
</tr>
<tr>
<td>Saeger (2017)</td>
<td>19</td>
<td>11 Males; 8 Females</td>
<td>3 White, 9 African American, 3 Hispanic, 1 Indian, 1 Multiracial</td>
</tr>
<tr>
<td>Williams et al. (2012)</td>
<td>46</td>
<td>37 Males; 9 Females</td>
<td>40 White; 6 African American</td>
</tr>
</tbody>
</table>
Table 3

Results of Visual Analysis

<table>
<thead>
<tr>
<th>Studies</th>
<th>Level</th>
<th>Trend</th>
<th>Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruhn et al.,</td>
<td>Participant 1: AE</td>
<td>Baseline = 65</td>
<td>Participant 1: AE</td>
</tr>
<tr>
<td>(2016)</td>
<td>Intervention = 80</td>
<td>Intervention =</td>
<td>Baseline = Stable</td>
</tr>
<tr>
<td></td>
<td>Result = Therapeutic</td>
<td>Accelerating</td>
<td>Intervention = DB</td>
</tr>
<tr>
<td></td>
<td>Participant 1: DB</td>
<td>Result = Therapeutic</td>
<td>Baseline = Variable</td>
</tr>
<tr>
<td></td>
<td>Baseline = 5</td>
<td>Participant 1: DB</td>
<td>Intervention = Stable</td>
</tr>
<tr>
<td></td>
<td>Intervention = 4</td>
<td>Baseline = Decelerating</td>
<td>Participant 1: AE</td>
</tr>
<tr>
<td></td>
<td>Result = Therapeutic</td>
<td>Intervention =</td>
<td>Baseline = Variable</td>
</tr>
<tr>
<td></td>
<td>Participant 2: AE</td>
<td>Baseline = Decelerating</td>
<td>Participant 2: AE</td>
</tr>
<tr>
<td></td>
<td>Intervention = 65.5</td>
<td>Decelerating</td>
<td>Intervention =</td>
</tr>
<tr>
<td></td>
<td>Participant 2: DB</td>
<td>Result = Therapeutic</td>
<td>= Variable</td>
</tr>
<tr>
<td></td>
<td>Baseline = 9</td>
<td>Participant 2: DB</td>
<td>Intervention =</td>
</tr>
<tr>
<td></td>
<td>Intervention = 20</td>
<td>Baseline = Decelerating</td>
<td>Participant 2: AE</td>
</tr>
<tr>
<td></td>
<td>Result = Non-</td>
<td>Intervention =</td>
<td>Baseline = Variable</td>
</tr>
<tr>
<td></td>
<td>therapeutic</td>
<td>Therapeutic</td>
<td>Intervention =</td>
</tr>
<tr>
<td>Bruhn et al.,</td>
<td>Participant 1: AE</td>
<td>Baseline = Decelerating</td>
<td>Participant 1: AE</td>
</tr>
<tr>
<td>(2015)</td>
<td>Intervention = 80</td>
<td>Intervention =</td>
<td>Baseline = Stable</td>
</tr>
<tr>
<td></td>
<td>Result = Therapeutic</td>
<td>Accelerating</td>
<td>Intervention = DB</td>
</tr>
<tr>
<td></td>
<td>Participant 1: DB</td>
<td>Result = Therapeutic</td>
<td>Baseline = Variable</td>
</tr>
<tr>
<td></td>
<td>Baseline = 21</td>
<td>Participant 1: DB</td>
<td>Intervention = Stable</td>
</tr>
<tr>
<td></td>
<td>Intervention = 8</td>
<td>Baseline = Decelerating</td>
<td>Participant 2: AE</td>
</tr>
<tr>
<td></td>
<td>Result = Therapeutic</td>
<td>Intervention =</td>
<td>Baseline = Stable</td>
</tr>
<tr>
<td></td>
<td>Participant 2: AE</td>
<td>Baseline = Decelerating</td>
<td>Participant 2: AE</td>
</tr>
<tr>
<td></td>
<td>Baseline = 65</td>
<td>Intervention =</td>
<td>Baseline = Stable</td>
</tr>
<tr>
<td></td>
<td>Intervention = 86</td>
<td>Accelerating</td>
<td>Intervention =</td>
</tr>
<tr>
<td></td>
<td>Result = Therapeutic</td>
<td>Participant 2: AE</td>
<td>Participant 2: TO</td>
</tr>
<tr>
<td></td>
<td>Participant 2: TO</td>
<td>Baseline = Decelerating</td>
<td>Baseline = Stable</td>
</tr>
<tr>
<td></td>
<td>Baseline = 1</td>
<td>Intervention =</td>
<td>Intervention =</td>
</tr>
<tr>
<td></td>
<td>Intervention = .65</td>
<td>Accelerating</td>
<td>Stable</td>
</tr>
<tr>
<td></td>
<td>Result = Therapeutic</td>
<td>Participant 2: TO</td>
<td>Intervention =</td>
</tr>
<tr>
<td>Dadakhodjaeva</td>
<td>Classroom A: AE</td>
<td>Classroom A: AE</td>
<td>Classroom A: AE</td>
</tr>
<tr>
<td>(2017)</td>
<td>Baseline = 51</td>
<td>Baseline = Zero trend</td>
<td>Baseline = Stable</td>
</tr>
<tr>
<td>Classroom A: AE</td>
<td>Classroom A: DB</td>
<td>Classroom A: OT</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>Baseline = 46</td>
<td>Baseline = 50</td>
<td>Baseline = 5</td>
<td></td>
</tr>
<tr>
<td>Intervention = 29</td>
<td>Intervention = 30</td>
<td>Intervention = 11</td>
<td></td>
</tr>
<tr>
<td>Result = Therapeutic</td>
<td>Result = Therapeutic</td>
<td>Result = Non-therapeutic</td>
<td></td>
</tr>
<tr>
<td>Classroom B: AE</td>
<td>Classroom B: DB</td>
<td>Classroom B: OT</td>
<td></td>
</tr>
<tr>
<td>Baseline = 52</td>
<td>Baseline = 41.5</td>
<td>Baseline = 12</td>
<td></td>
</tr>
<tr>
<td>Intervention = 66</td>
<td>Intervention = 8.5</td>
<td>Intervention = 11</td>
<td></td>
</tr>
<tr>
<td>Result = Therapeutic</td>
<td>Result = Therapeutic</td>
<td>Result = Therapeutic</td>
<td></td>
</tr>
<tr>
<td>Classroom C: AE</td>
<td>Classroom C: DB</td>
<td>Classroom C: OT</td>
<td></td>
</tr>
<tr>
<td>Baseline = 60</td>
<td>Baseline = 25</td>
<td>Baseline = 15</td>
<td></td>
</tr>
<tr>
<td>Intervention = 75.5</td>
<td>Intervention = 20</td>
<td>Intervention = 8</td>
<td></td>
</tr>
<tr>
<td>Result = Therapeutic</td>
<td>Result = Therapeutic</td>
<td>Result = Therapeutic</td>
<td></td>
</tr>
<tr>
<td>Classroom C: AE</td>
<td>Classroom C: DB</td>
<td>Classroom C: OT</td>
<td></td>
</tr>
<tr>
<td>Baseline = 25</td>
<td>Baseline = 35</td>
<td>Baseline = 50</td>
<td></td>
</tr>
<tr>
<td>Intervention = 55</td>
<td>Intervention = 30</td>
<td>Intervention = 30</td>
<td></td>
</tr>
<tr>
<td>Result = Therapeutic</td>
<td>Result = Therapeutic</td>
<td>Result = Therapeutic</td>
<td></td>
</tr>
</tbody>
</table>

Dillon (2016)
<table>
<thead>
<tr>
<th>Classroom</th>
<th>AE</th>
<th>DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>52</td>
<td>40</td>
</tr>
<tr>
<td>Intervention</td>
<td>94</td>
<td>10</td>
</tr>
<tr>
<td>Result</td>
<td>Therapeutic</td>
<td>Therapeutic</td>
</tr>
<tr>
<td>Classroom C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>38.5</td>
<td>57</td>
</tr>
<tr>
<td>Intervention</td>
<td>78</td>
<td>20</td>
</tr>
<tr>
<td>Result</td>
<td>Therapeutic</td>
<td>Therapeutic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classroom A</th>
<th>AE</th>
<th>DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>32</td>
<td>55</td>
</tr>
<tr>
<td>Intervention</td>
<td>32</td>
<td>57.5</td>
</tr>
<tr>
<td>Result</td>
<td>Non-therapeutic</td>
<td>Therapeutic</td>
</tr>
<tr>
<td>Classroom A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>62</td>
<td>30</td>
</tr>
<tr>
<td>Intervention</td>
<td>72.5</td>
<td>16</td>
</tr>
<tr>
<td>Result</td>
<td>Therapeutic</td>
<td>Therapeutic</td>
</tr>
<tr>
<td>Classroom C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>65</td>
<td>22</td>
</tr>
<tr>
<td>Intervention</td>
<td>80</td>
<td>19.5</td>
</tr>
<tr>
<td>Result</td>
<td>Therapeutic</td>
<td>Therapeutic</td>
</tr>
</tbody>
</table>

Lynne (2016)
| Saeger (2017) | ng | ng | ng |

Note. AE = Academic engagement; DB = Disruptive behavior; ng = no graph; OT = Off-task, TO = Talk out
Table 4

*Effect Sizes for Electronic Behavior Management Program Research Studies*

<table>
<thead>
<tr>
<th>Study</th>
<th>Tau-U (95% CI)</th>
<th>Hedge’s g (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single-case Studies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bruhn et al., (2015)</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>Bruhn et al., (2016)</td>
<td>.99</td>
<td></td>
</tr>
<tr>
<td>Dadakhodjaeva (2017)</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Dillon (2016)</td>
<td>.96</td>
<td></td>
</tr>
<tr>
<td>Lynne (2016)</td>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>Saeger (2017)</td>
<td>ND a</td>
<td></td>
</tr>
<tr>
<td><strong>Group Design Studies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiarelli et al., (2015)</td>
<td>ND b</td>
<td></td>
</tr>
<tr>
<td>Krach et al., (2017)</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>MacLean-Blevins (2013)</td>
<td>ND b</td>
<td></td>
</tr>
<tr>
<td>Williams et al., (2012)</td>
<td>0.47</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* ND a = Not determined; study did not provide graphical data to calculate Tau-U; ND b = study did not provide means, standard deviations, or number of participants
Table 5

Quality Indicators in Single-case Research Design Studies

<table>
<thead>
<tr>
<th>Studies</th>
<th>Participants/Setting</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Baseline Procedures</th>
<th>Experimental Control/Internal Validity</th>
<th>External Validity</th>
<th>Social Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruhn et al., (2015)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Bruhn et al., (2016)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Dadakhodjaeva (2017)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Dillon (2016)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Lynne (2016)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Saeger (2017)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Note. Participants/Settings = Described sufficiently and selection described; Dependent variable = Described with replicable precision, quantifiable, measurement described with replicable precision, measurement occurred repeatedly, inter-observer data reported; Independent variable = Described with replicable precision, systematically manipulated, procedural fidelity described; Baseline procedures = Repeated measurement and evidence of pattern, described with replicable precision; Experimental validity = Three experimental effects at three points in time control for common threats to internal validity; pattern demonstrates experimental control; External validity = Effects replicated across participants, settings, materials; Social validity = Dependent variable socially important; magnitude of change in DV from intervention is socially important, implementation of IV practical and cost effective, enhanced by implementation
Table 6

Quality Indicators in Group Design Studies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficiently described</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Comparable across conditions</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Interventionists described</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Described clearly</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Description of fidelity of implementation</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Description of comparison condition</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple measures implemented</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Outcomes measured at appropriate times</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Results</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data analysis techniques used appropriately</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Effect size reported</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Desirable quality indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attrition rates documented</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Attrition rate (&lt; 30%)</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evidence of test-retest reliability, internal consistency reliability, and IRR | N | Y | N | N | N
| Adequate inter-observer score | N | Y | Y | Y | Y
| Data collectors blind to study conditions and unfamiliar with participants | N | N | N | Y | Y
| Outcomes measured beyond immediate posttest | N | N | N | N | N
| Criterion and construct validity provided | N | Y | N | Y | Y

**Independent Variable**

Fidelity of implementation included | N | N | N | N | N
| Comparison conditions described | N | Y | N | Y | Y

**Results**

Audio or videotape excerpts included | N | N | N | N | N
| Results were clear and coherent | N | Y | N | Y | Y

| Total Indicators Met | 5/21 | 14/21 | 3/21 | 14/21 |

*Note. Y = Yes; N = No; If information on attrition was omitted the study received a no response as well as a no response on the following quality indicator of attrition < 30%*
### APPENDIX B

**Data Collection Measures**

#### I. Functional Screening Assessment Tool (FAST)

**FUNCTIONAL ASSESSMENT SCREENING TOOL (FAST)**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Age:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior Problem:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informant:</td>
<td>Interviewer:</td>
<td></td>
</tr>
</tbody>
</table>

**To the Interviewer:** The Functional Analysis Screening Tool (FAST) is designed to identify a number of factors that may influence the occurrence of problem behaviors. It should be used only as an initial screening tool and as part of a comprehensive functional assessment or analysis of problem behavior. The FAST should be administered to several individuals who interact with the person frequently. Results should then be used as the basis for conducting direct observations in several different contexts to verify likely behavioral functions, clarify ambiguous functions, and identify other relevant factors that may not have been included in this instrument.

**To the Informant:** After completing the section on "Informant-Person Relationship," read each of the numbered items carefully. If a statement accurately describes the person's behavior problem, circle "Yes." If not, circle "No." If the behavior problem consists of either self-injurious behavior or repetitive stereotyped behaviors, begin with Part I. However, if the problem consists of aggression or some other form of socially disruptive behavior, such as property destruction or tantrums, complete only Part II.

**Informant-Person Relationship**

<table>
<thead>
<tr>
<th>Indicate your relationship to the person: Parent</th>
<th>Teacher/Instructor</th>
<th>Residential Staff</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long have you known the person?</td>
<td>Years</td>
<td>Months</td>
<td></td>
</tr>
<tr>
<td>Do you interact with the person on a daily basis?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>If &quot;Yes,&quot; how many hours per day?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If &quot;No,&quot; how many hours per week?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In what situations do you typically observe the person? (Mark all that apply)</td>
<td>Self-care routines</td>
<td>Academic skills training</td>
<td>Meals</td>
</tr>
<tr>
<td></td>
<td>Leisure activities</td>
<td>Work/vocational training</td>
<td>Evenings</td>
</tr>
</tbody>
</table>

#### Part I. Social Influences on Behavior

1. The behavior usually occurs in your presence or in the presence of others
2. The behavior usually occurs soon after you or others interact with him/her in some way, such as delivering an instruction or reprimand, walking away from (ignoring) the him/her, taking away a "preferred" item, requiring him/her to change activities, talking to someone else in his/her presence, etc.
3. The behavior often is accompanied by other "emotional" responses, such as yelling or crying

Complete Part II if you answered "Yes" to item 1, 2, or 3. Skip Part II if you answered "No" to all three items in Part I.

#### Part II. Social Reinforcement

4. The behavior often occurs when he/she has not received much attention
5. When the behavior occurs, you or others usually respond by interacting with the him/her in some way (e.g., comforting statements, verbal correction or reprimand, response blocking, redirection)
6. (s)he often engages in other annoying behaviors that produce attention
7. (s)he frequently approaches you or others and/or initiates social interaction
8. The behavior rarely occurs when you give him/her lots of attention
9. The behavior often occurs when you take a particular item away from him/her or when you terminate a preferred leisure activity
10. The behavior often occurs when you inform the person that (s)he cannot have a certain item or cannot engage in a particular activity
11. When the behavior occurs, you often respond by giving him/her a specific item, such as a favorite toy, food, or some other item
12. (s)he often engages in other annoying behaviors that produce access to preferred items or activities
13. The behavior rarely occurs during training activities or when you place other types of demands on him/her.

(If "Yes," identify the activities: self-care academic work other)
14. The behavior often occurs during training activities or when asked to complete tasks. Yes No
15. (S)/he often is noncompliant during training activities or when asked to complete tasks. Yes No
16. The behavior often occurs when the immediate environment is very noisy or crowded. Yes No
17. When the behavior occurs, you often respond by giving him/her a brief "break" from an ongoing task. Yes No
18. The behavior rarely occurs when you place few demands on him/her or when you leave him/her alone. Yes No

Part III. Non-social (Automatic) Reinforcement
19. The behavior occurs frequently when (s)he is alone or unoccupied Yes No
20. The behavior occurs at relatively high rates regardless of what is going on in his/her immediate surrounding environment Yes No
21. (S)he seems to have few known reinforcers or rarely engages in appropriate object manipulation or "play" behavior. Yes No
22. (S)he is generally unresponsive to social stimulation. Yes No
23. (S)he often engages in repetitive, stereotyped behaviors such as body rocking, hand or finger waving, object twirling, mouthing, etc. Yes No
24. When (s)he engages in the behavior, you and others usually respond by doing nothing (i.e., you never or rarely attend to the behavior.) Yes No
25. The behavior seems to occur in cycles. During a "high" cycle, the behavior occurs frequently and it is extremely difficult to interrupt. During a "low" cycle the behavior rarely occurs. Yes No
26. The behavior seems to occur more often when the person is ill. Yes No
27. (S)he has a history of recurrent illness (e.g., ear or sinus infections, allergies, dermatitis). Yes No

Scoring Summary
Circle the items answered "Yes." If you completed only Part II, also circle items 1, 2, and 3.

Likely Maintaining Variable
1 2 3 4 5 6 7 8 Social Reinforcement (attention)
1 2 3 9 10 11 12 13 Social Reinforcement (access to specific activities/items)
1 2 3 14 15 16 17 18 Social Reinforcement (escape)
19 20 21 22 23 24 Automatic Reinforcement (sensory stimulation)
19 20 24 25 26 27 Automatic Reinforcement (pain attenuation)

Comments/Notes:
II. Multiple Stimulus Without Replacement Preference Assessment

**MSWO Data Sheet**

<table>
<thead>
<tr>
<th>Student Name:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Collector:</td>
<td>Primary / Reliability (circle one)</td>
</tr>
<tr>
<td>Session #:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trial</th>
<th>Stimuli Selected</th>
<th>Target Behavior(s)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
III. Frequency Record

**Frequency Record**

**Student:**

**Instructor:**

**Behavior 1:** Talking out was any occurrence the student made an uninvited verbal statement during whole group instruction, independent work, or silent reading. Verbal statements included academic or non-academic verbal statements (e.g., shouting out answers) but did not include stereotypy or interactions with peers during group work. Verbal statements do not include asking her paraprofessional a question or for help.

<table>
<thead>
<tr>
<th>minute intervals</th>
<th>Tally</th>
<th>Total</th>
<th>Goal Met: Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Behavior 2:** Passively looking at others included looking at others in the classroom or out the window. Passively looking at others does not include looking at the teacher during instruction, looking at paraprofessionals to ask for help, and looking at other students during collaborative group work.

<table>
<thead>
<tr>
<th>minute intervals</th>
<th>Tally</th>
<th>Total</th>
<th>Goal Met: Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Behavior 3:** Off-task included engaging with personal possessions (e.g., necklace, headphones), out of seat behavior, picking at self (e.g., lips, biting fingernails), and non-compliance (failing to get to work after first request).

<table>
<thead>
<tr>
<th>minute intervals</th>
<th>Tally</th>
<th>Total</th>
<th>Goal Met: Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Class ____________________________
Period __________________________
IV. Preservice Social Validity Survey

Preservice Social Validity Survey

Please complete the following questions.

This intervention addresses important behavior(s) of the child.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

I understand how to use the eDBRC.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

I could implement this intervention by myself.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree
This is an acceptable intervention strategy for the child’s behavior.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

I saw significant change in the student’s behavior using the DBRC.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

Overall this intervention is beneficial for the child.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree
V. Student Social Validity Survey

Student Social Validity Survey

Please work with your student to complete this survey.

This eDBRC addressed behaviors that are important to me.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

I would be excited to use do this again.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

I could use this strategy in other classrooms.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree
I liked using the eDBRC.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

I did better in class using the eDBRC.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

Overall I feel this intervention has been helpful to me.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree
VI. Parent Social Validity Survey

Parent Social Validity Form

Please answer the following questions regarding the intervention we did with your child.

This intervention addressed important behavior(s) of the child.

- [ ] Strongly Agree
- [ ] Agree
- [ ] Somewhat Agree
- [ ] Somewhat Disagree
- [ ] Disagree
- [ ] Strongly Disagree

I understand how to use the eDBRC.

- [ ] Strongly Agree
- [ ] Agree
- [ ] Somewhat Agree
- [ ] Somewhat Disagree
- [ ] Disagree
- [ ] Strongly Disagree

This is an acceptable intervention strategy for the child’s behavior.

- [ ] Strongly Agree
- [ ] Agree
- [ ] Somewhat Agree
- [ ] Somewhat Disagree
- [ ] Disagree
- [ ] Strongly Disagree
I saw significant change in the student’s behavior using the eDBRC.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

I found it easy to deliver rewards based on the eDBRC.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree

Overall this intervention is beneficial for the child.

- Strongly Agree
- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree
- Strongly Disagree
### APPENDIX C

**Study Timeline**

<table>
<thead>
<tr>
<th>September 2017</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present study to State College School District Director of Special Education</td>
<td>12/08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>January 2018</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify all eligible teacher participants, send out invitation to participate</td>
<td>1/08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>February 2018</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain consent from teacher preservice participants</td>
<td>2/15</td>
</tr>
<tr>
<td>Baseline data collection</td>
<td>2/16-2/28</td>
</tr>
<tr>
<td>Identify and obtain consent from student participants’ parents</td>
<td>2/18-2/28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>March 2018</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct FASTs for student participants</td>
<td>By 3/1</td>
</tr>
<tr>
<td>Conduct initial observations</td>
<td>By 3/1</td>
</tr>
<tr>
<td>Conduct preference assessment</td>
<td>By 3/1</td>
</tr>
<tr>
<td>Intervention phases</td>
<td>3/2-3/29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>April 2018</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention phases continued</td>
<td>4/4-4/12</td>
</tr>
<tr>
<td>Maintenance Week 1</td>
<td>Week of 4/16</td>
</tr>
<tr>
<td>Maintenance Week 2</td>
<td>Week of 4/23</td>
</tr>
</tbody>
</table>
Curriculum Vita (Abbreviated)

Benjamin S. Riden
Benjaminriden@gmail.com

EDUCATION
Ph.D. Pennsylvania State University, University Park, PA Aug. 2018
M.Ed. University of Utah, Salt Lake City, UT May, 2013
B.A. Shippensburg University of Pennsylvania, Shippensburg, PA May, 2004

TEACHING EXPERIENCE
University Teaching Experience – The Pennsylvania State University
Instructor, SPLED 401 Fall, 2017
Motivating Exceptional Learners
Practicum Supervisor
Instruction for Student with Mild Disabilities (SPLED 495E) Spring, 2016
Practicum Supervisor
Experience with an Integrated Inclusive Classroom (SPLED 495G) Fall, 2015

Public School Teaching Experience
Special Education Teacher
Canyons School District, UT 2014-2015
Eagle County Schools, CO 2013-2014

Behavior Support
Service Provider
Leonard Consulting LLC 2010 – 2013

PUBLICATIONS


